



Principles of Hospital Administration & Planning



2
Edition

BM Sakharkar

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***Principles of
Hospital Administration
and Planning***

Principles of Hospital Administration and Planning

SECOND EDITION

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Principles of Hospital Administration and Planning

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Foreword

The current scenario of health care envisages preventive and curative health. The Government is trying its best to improve the primary health care since we attained independence 61 years ago. Rapid strides have been made to improve the quality of curative health care services to the people. There have been some spectacular successes such as eradication of smallpox. The infant mortality rate has also shown a steady decline. Life expectancy has doubled. The technological advances are taking place rapidly, and there is an improvement in the quality of total health care which has resulted in a rapid fall in the crude death rate from 27 per cent in 1951 to 9.8 per cent in 1991, and at present it stands at 6.4 per cent. New development in vaccinology is instrumental in providing protection against major communicable diseases.

The health care provides a three-tier system—the dispensaries of the primary health centres, the hospitals managed by the Government and the local authorities like Municipal Corporations and Hospitals managed by corporate organisations, and then tertiary care centres including the medical colleges.

As we prepare ourselves to enter the 21st century, the organisation and management of health services and hospitals will also have to change rapidly in tune with the advanced technological innovations. A thorough knowledge of proper application of the existing infrastructure would help the management to plan efficiently for acquiring more modern equipments. Organisational potency of any institution will depend on the achievement of the required output of its managers and professionals. Such organisations which are endowed with organisational potency would be able to help to achieve the desired health care goals. It is therefore very necessary that each and every professional in the organisation should be equipped with the knowledge of the managerial functions.

A brief review of the post-independent era would reveal that health services are extremely inadequate in spite of implementation of the various recommendations made by the committees appointed from time-to-time to suggest measures towards the improvement of it. We have made significant progress in the production of health professional manpower and establishment of specialised hospitals.

The concept of improving administration through education and training and by providing orientation to the administrators and heads of health care institutions has been widely accepted and practised. However, there is a need to have suitable books on the subject covering the principles of hospital administration and planning. This book will certainly fulfill the long felt need.

Some of the chapters in the book deal with general principles of management in adequate details taking into consideration the fact that these principles are to be applied by hospital administrators and planners in order to achieve maximum efficiency in providing medical services.

The chapter on Ethical and Legal Aspects of Hospital Administration which is written in the light of medical services coming under the orbit of the Consumer Protection Act is most useful to the medical fraternity to guide them and make them understand the responsibilities.

This book will be of great value not only to the medical fraternity but also to the administrators in medical and health care field and students of hospital management in improving the operational aspects of hospital planning and administration.

Dr BM Sakharkar has put in his very best which has culminated in an excellent production of this book. I hope that the contents of this book will be useful to the society and serve the community to provide better health care.

October, 1998

Snehalata S Deshmukh MS FRCS FAMS
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Preface to the Second Edition

When the first edition of *Principles of Hospital Administration and Planning* was published in 1998, it was the only book of its kind on the subject beside one other smaller volume, covering the varied facets of hospital administration and planning which hospital administrators as well as students of hospital administration were asking for. The book was enthusiastically welcomed and appreciated by both classes of readers. Nevertheless, commending the overall content of the book, many well-wishers and friends offered valuable suggestions for betterment of the overall content and inclusion of some additional topics. I am grateful to all these friends and well wishers for their suggestions and advice.

Appropriate changes and modifications have been incorporated in this edition as suggested by readers. Intensive Care Unit which could not be included in the previous edition due to various reasons, has now been covered. Recurrent natural and other disasters and the lackadaisical responses to them by various agencies including hospitals, prompted me to add a chapter on Disaster Management. Biomedical Waste (Management and Handling) Rules which were notified by the Government after the publication of the first edition, necessitated a major revision of the chapter on management of hospital waste. The chapter has been completely revised in the light of these Rules. With rising expectations of the people that hospitals should be obliged to provide an acceptable standard of medical care at reasonable cost, combined with increasing privatization of health care, marketing of health care services is assuming increasing importance. This subject has now been dealt with in adequate detail in a new chapter. Another new topic viz. Hospital Linen and Laundry Service has also been included in this edition.

Government support for health care has been historically low, averaging less than one per cent of the GDP at present. The private sector stands at over five per cent. The boom in health care is slated to rise from Rs 92,700 crore in 2001 to Rs 2,08,800 crore by 2012. Of this, upmarket private health care may go up to Rs 30,000 crore by 2012.

The entry of private hand in health care is not new, but the entry of big corporates is. Apart from those already in, about fifty more are slated to take off in the next three years. Because they have the wherewithal to mobilize huge resources, health care is being promoted as a brand product by large corporate hospitals, requiring a comprehensive understanding of the structure, functions, working methodologies and administrative procedures of hospitals by budding hospital administrators at all levels.

In administration, while current problems get tackled, new problems evolve. At the same time, approaches to many existing problems can throw up new opportunities. Hospital administrators are required to be alive to such situations at all times; visualize and anticipate problems in time so that they are prepared to tackle them before they turn into crisis situations. It is hoped that this revised edition would fulfill this need.

February 14, 2009

BM Sakharkar

Preface to the First Edition

The drift from compassion and care to a shift towards technology and technical competence in the field of medical care has necessitated reshaping of hospital services. The dilemma in medical care services is, while as most of the society does not need and cannot afford high-cost technology, the demand for it is growing.

There is a great deal more to medical care than the diagnosis and treatment of disease. Hospitals are expensive to build and equip and equally expensive to maintain. With the shift towards newer diagnostic and treatment technologies, hospitals need a sizeable investment in resources and their prudent management. The challenge lies in effective planning and implementation, efficient utilisation of limited resources and providing effective medical care.

For all those involved in the provision of medical care, understanding the nuances of administration and management assumes significance in the light of the above. Ever since my days at the All India Institute of Medical Sciences, New Delhi in the late seventies where we learnt hospital administration and management from British and American books, I felt the need for a source book covering most of the material on the subject in a single volume under one cover. This book is an attempt to meet that need by bringing together much of the knowledge pertaining to hospitals in a compact form for all those interested in better medical care.

Problems in medical care services are a direct result not only of the gap between requirement of resources and their availability but also of the inefficient manner in which they are managed. In this context, the problems of government hospitals are no more different than those of hospitals in the corporate or voluntary sector. Whether he or she is the chief executive of a charitable, a proprietary, corporate or a government hospital, the outlook, expertise and experience which a manager needs in handling problems are the same.

Starting from the current scene in hospital field, the book progresses to an understanding of the process of hospital planning in general, with outpatient services and nursing services being covered in somewhat detail.

This is followed by a discussion on planning, organising, directing and controlling which are the common ingredients of the management of any enterprise. Descriptions of individual clinical and other departments of the hospital follow. The format progresses from the general to the particular and would help to equip the administrator in effectively dealing with problems.

I do not claim exclusive credit for the book. Much of the material has been collected from professional journals, periodicals, review articles, books, discussions, personal communications and similar sources. In collecting, reviewing and collating the material, there are likely to be unintentional errors and inadvertent omissions. I take full responsibility for all such shortcomings and hope that the book will be a useful aid to health care professionals and students of hospital administration and management.

BM Sakharkar

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SECTION

ONE

*The
Hospital*





CHAPTER

1

Role of Hospitals in Health Care

Medical care is a programme of services that should make available to the individual, and thereby to the community, all facilities of medical and allied services necessary to promote and maintain health of mind and body. This programme should take into account the physical, social and family environment, with a view to the prevention of disease, the restoration of health and the alleviation of disability.

—WHO, 1959

A Hospital is an integral part of a Social and Medical organisation, the function of which is to provide for the population complete health care, both curative and preventive, and whose outpatient services reach out to the family and its home environment; the hospital is also a centre for the training of health workers and biosocial research.

—WHO definition of Hospital

HEALTH AND MEDICAL CARE

Individual as well as group health has evolved as a product of human biology, environment, ways of living, economic status, and health services. The physical and mental traits of a person are also determined among others, by his or her genetic endowment, as evidenced by the discovery of many disorders being of genetic origin. The health status and disease status are, thus, a result of the process of a continuous adjustment between the internal and external environment.

Internal environment within the human being pertains to every tissue and organ system. Man is also exposed to external environment. Thus, whileas the external environment air, water and food, and his personal environment relating to his work, eating, drinking, smoking, etc., i.e. his way of living, all have a bearing on his health. Health habits,

personal hygiene, health knowledge, and mental attitude to life also influence health.

Economic growth has had a positive bearing on improving the health indicators such as life expectancy at birth, morbidity and mortality rates, and in improving the quality of life. Poverty is the most common cause of disease and death in emerging countries through deprivation of adequate nutrition, lowered natural resistance and exposure to insanitary environment. On the other hand, economic affluence has been blamed for rising cardiovascular disorders, mental diseases, diabetes, cancer and the so-called life-style disease.

The society's health is influenced by the accessibility, affordability, quality, availability and utilisation of health services. The best health services are those that are easily **accessible**, both time-wise and distance-wise to all classes of society, those that can be **afforded** by the society and

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government which provides them and *affordable* by people who utilise them, of a minimum *acceptable standard* in keeping with the need of the users at each level, *available to all classes of society* who need them, and which range in their *coverage from womb-to-tomb*, with effective deployment of available resources.

Some people feel that health defined as a state of complete physical, mental and social wellbeing and not merely the absence of disease is an unattainable ideal, at best it can be a desirable objective, a comprehensive concept. Some approach it from a different angle which considers health to be a state of “optimal physical, mental and social adaptation to one’s environment”. For example, an individual with a chronic disease condition, e.g. chronic heart disease can never return to complete wellbeing, but can adjust and adopt quite adequately. On the other hand, for the patients with terminal illness, facilitating adaptation would mean helping to prepare for and adjust to the realities of life.

Cynics may say that anything done in the name of health care including prayer, talisman, copper bracelet, magnet, *vibhuti*, naturopathy, special foods, prescription drugs—any thing at all—will be successful most of the time, because no matter what is done most patients get well most of the time. Therefore, many question the difference that a purely hospital-based, disease-oriented medical care approach alone can make to mortality and morbidity.¹

Outcome of community development programmes in India during the successive five-year plans have indicated that health cannot be isolated from other socioeconomic factors in a developmental process. Social, cultural and psychological factors influence health and disease and are responsible for the response of individuals, families and communities towards measures for promotion and restoration of health. These factors also influence the attitude of the community towards utilisation of facilities provided by health and hospital organisations.

Environmental Health Services

Environmental health services are considered as a component of public health, with overlaps. It covers the following:

1. Water supply
2. Pollution control
3. Sewage disposal
4. Food hygiene
5. Ecology and environmental pollution.

Public Health Services

Public health services are concerned with the following.

1. Control of communicable diseases

2. Sanitation
3. Maternal and child health
4. Public health education
5. Vital statistics
6. Health planning
7. Occupational health and reduction of health hazards.

As has been evident from the examples of developed countries, which were at the same state of development as we are now, that public health measures such as sanitation have a greater impact on improving health than personal health care services alone.

Personal Health Services

Personal health services are the services provided by hospitals, health centres and nursing homes, apart from privately practising physicians.

The care provided has been traditionally classified into:

- i. promotion of health,*
- ii. prevention of disease,*
- iii. early diagnosis and treatment, and*
- iv. rehabilitation.*

Promotion of Health

Promotion of health is not directed at any particular disease and is generally considered the responsibility of the individual. Good health practices promote health through adequate nutrition, exercise, rest, personal hygiene, health screening and health education. Although the primary responsibility is that of the individual, others outside the health system are also concerned with health promotion. Health promotion programmes aim at physical and mental fitness, diet, alcohol and drug abuse, recreation and genetic counselling. However, by itself, improved health is an insufficient incentive for many individuals to adapt good personal health practices. As a society we are concerned about placing incentives on members of the health team, but do little to place incentives on the individual. To cut down costs on hospital-based care, plans are now being proposed in many countries to provide financial incentives and disincentives through health insurance plans to individuals to promote their own health and avoid using health care services. Healthful behaviour tends to promote more healthful behaviour.

All concerned with medical care, i.e. doctors, nurses and auxiliary medical staff are among the people actively concerned with the promotion of health. We need to find ways for the health team and the individual to work together more effectively in health promotion as well as illness care.

Prevention of Disease

Primary prevention is a service designed to protect against specific diseases through immunisation, use of specific nutrients and protection against occupational hazards and accidents. All diagnostic and therapeutic activity has a preventive component in that it seeks to prevent further deterioration of a man's health. In this context, early detection of disease through mass screening services among vulnerable population helps in prevention of disease, although this approach is questioned by many from economic point of view. The cost of mass multiphasic screening can be high.

Multiphasic health screening, annual medical examinations and surveillance of individuals and groups with susceptibility to certain diseases falls under secondary prevention. Prevention of disease and accidents, e.g. refraining from smoking and alcohol, wearing appropriate protective clothing at work and wearing helmets while driving are matters of personal habits. Sports are needed to inculcate habits of healthful living among the people. Appropriate employee health programmes by employers and advice by physicians, and health education of patients while in hospital do contribute to prevention of diseases.

It is reasonable to expect that by preventing disease to the extent possible, the number of patients seeking medical care can be reduced and thus control overall health care costs. However, prevention of disease is dependent on many other factors, not the least of which is medical. This multiple causality calls for a many-pronged approach with emphasis on secondary prevention, screening, recognition and avoidance of risk factors and harmful life-styles, and attention to housing and sanitation.

Early Diagnosis and Treatment

The earlier a disease is diagnosed and treated, the better it is from the point of view of prognosis and for preventing secondary cases in the community. The principle of early detection and treatment of cases in the general population is the basis on which disease control is built. A good deal of early diagnosis now comes through hospital-based screening for disease programmes and periodical medical checkups among the apparently healthy people.

Diagnostic and treatment services can be made available both through ambulatory outpatient care or inpatient hospital care. Outpatient care is also provided in the general physician's clinics, although over the last two decades or so it is the hospital-based outpatient services which are increasingly in demand. Inpatient services by hospitals are

also in increasing demand, but the provision of hospital beds alone is no substitute for effective environmental and preventive health services, which itself can lead to a reduction in the number of hospital beds required.

The all encompassing concept of treatment of all ailments in hospitals has also undergone change over the last two decades. Whereas in the past every patient irrespective of the type and duration of the disease was considered fit to be admitted to a hospital on humanitarian grounds if not on others, hospitals now are not considered as the sole repository of sick and dying patients. The concept of a place for medical treatment now incorporates health centres, health maintenance organisations, home care services, day care centres and night hospitals.

Primary, Secondary and Tertiary care: Treatment services are categorised as primary, secondary and tertiary care. Primary care is the entry point into the health system and usually obtained through family physicians and through the hospital-based ambulatory outpatients services—besides the community health workers and multipurpose workers at the grass-roots level. WHO defined primary health care as “essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families. It is the first level of contact of individuals, the family and the community....and constitutes the first element of a continuing health process.”² Secondary care services are at an intermediate level in the chain of hospitals. The services of smaller peripheral hospitals and general hospitals would fit in this category. Tertiary care refers to highly specialised care in specialist hospitals and speciality services provided in superspeciality centres and research centres.

Rehabilitation

WHO defines rehabilitation as “the combined and coordinated use of medical, social, educational and vocational measures for training or retraining the individual to the highest possible level of functional ability”. Apart from restoration of function (medical), rehabilitation medicine involves disciplines such as physical medicine, occupational therapy, speech therapy, education, vocational guidance. Rehabilitation is thus not an end-activity of the hospital, but must start early in the process of medical treatment.

Health Team

No single agency can deliver the entire range of medical and health care. Achievement of health and medical care

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can best be a joint function of many professional groups of workers like physicians, nurses, paramedical workers, health educators, health visitors, public health engineers and many others who share a common, unifying goal. This joint effort materialises through teamwork. The functional classification of the teams concerned with group health and personal health is as follows.

The health care team which consists of all those who are involved in improving health in a community setting, without necessarily being in active contact with patients.

The medical care team which consists of those professionals and paraprofessionals who provide service for the patient generally in a hospital setting, but without any direct or personal contact with the patient.

The patient care team which comprises any group of professionals and semiprofessionals in a hospital setting who jointly provide service that brings them into direct contact with the patient.

Comprehensively speaking, therefore, health and medical services cannot be delivered through any one agency. As earlier discussed, all the responsibility devolves on three health sectors, viz. environmental health, public health and personal health sector. Additionally, the two other service systems indirectly connected with health are the social welfare services and educational services.

HOSPITALS

History of Hospitals

Medieval Period

The word “hospital” originates from the Latin ‘hospice.’ In fact the word hospital, hostel and hotel all derive from the common Latin root hospice. The place or establishment where a guest is received was called the hospitium or hospitale. The term hospital has at different times been used to refer to an institution for the aged and infirm, a place of rest, a hostel where people lived as a small community, and an institution for the care of the sick and wounded. Lodging for the pilgrim and the wayfarer was also one of the primary functions of the early hospital. In its earliest form, the hospital was aimed at the care of the poor and the destitute, giving the aura of a “almshouse”.

In the early Greek and Roman civilisations, the temples of the gods were used as hospitals. These hospitals were not separate entities but formed an integral part of the temples. Little distinction was made between the disease and the supernatural powers that caused diseases, where mysticism and superstition saddled medical practice, and

where more soul healing than physical healing was practised. The Greeks and Romans considered the temples of gods and their priests responsible for providing shelter and sustenance to the sick. Charity was the principal source for defraying illness costs of the poor. It was in Greece that Hippocrates—universally acknowledged as the father of western medicine—was born, in 460 BC (see Appendix 1 for the significance of the rod of Aesculapaeus and the snakes in medical emblems).

With the birth and spread of Christianity there was an impetus to hospitals which became an integral part of the Church and its monasteries. Medicine was reverted to religion, the nuns and monks practising it. Gradually, these Christian hospitals replaced those of Greece and Rome. During the crusades. (Christian expeditions to recover the Holy land from Mohammedans, 1100-1300 AD) over 19,000 hospitals were founded in Europe to cater for those suffering from war injuries and diseases. The order of St. John was one such sect, responsible for creating chains of hospitals. This order has survived all these centuries and still functions as St. John Ambulance Corps in England with its branches all over the world, including India.

Subsequently, certain decrees issued by the Church for divesting religion from medical succour had the effect of lowering the status of the entire medical profession and stopping the monks from practising medicine. In 1163 AD, the Church formally restricted the clergy from working as physicians, and this restriction heralded the beginning of the end of hospitals towards the end of the Crusades (around 1300 AD). During early nineteenth century, nurses of religious orders were replaced by lay people who treated patients badly. Patients were crowded together in common bed, and infection and gangrene were commonplace all over the hospitals.

Some of the notable hospitals established in the Western world date back to the ancient times. In 542 AD the earliest hospital was founded at Hotel Dieu in Paris. St. Bartholomew’s hospital in London dates from the year 1123 AD. In keeping with the hospital philosophy then prevalent, there was a general tendency to lump together the sick, the physically handicapped, the socially unwanted and the pauper all together. The Spanish built the first hospital in Mexico city in 1524 and the French in Canada. In North America, the first general hospital, Pennsylvania Hospital, opened in 1751, Bellevue hospital in New York in 1736 and Massachusetts hospital in 1811 AD. This was followed by establishment of hospitals in quick succession in many other places in USA.

Nineteenth Century

The middle of the nineteenth century saw the arrival of Florence Nightingale on the hospital scene. It fell upon Florence Nightingale to revolutionise nursing by supplementing good intentions and humane concern with scientific approach to nursing through training. The working of hospitals underwent a sea change as a result of her efforts when she was sent to attend to the sick and wounded at the Crimean War (1853-1856 between the joint forces of Britain and France with Russia. Total casualties: Allies—2,52,000, Russian—2,56,00) in 1854. This was the turning point in the history of hospitals in the Western World.

Various developments in medical sciences gave impetus to further progress in the hospital field. Discovery of anaesthesia and the principles of antisepsis (asepsis was to follow later) were two most important influences in the development of hospitals. Discovery of steam sterilisation in 1886, X-ray in 1895 and rubber gloves in 1890 revolutionised surgical treatment and gave further philip to hospital development. Great progress was being made in cellular pathology, clinical microscopy, bacteriology and so on during the period from 1850 to 1900, and each one of these had a definite impact on hospital progress.

Besides the scientific advances during this period, rapid industrialisation during the last quarter of 19th century generated enormous funds in the Western World. Hospital development in the 20th century has, therefore, been explosive, especially in the USA and Europe. A hospital was no longer a place where people went to die. The advances in medical science brought about by antibiotics, radiation, blood transfusion, improvement in anaesthetic techniques and the spectacular advances in surgical techniques and medical electronics have all brought about tremendous growth and improvement in hospital services.

Hospitals in India

Early Indian rulers considered the provision of institutional care to the sick as their spiritual and temporal responsibility. The forerunners of the present hospitals can be traced to the times of Buddha, followed by Ashoka. India could boast of a very well-organised hospital and medical care system even in the ancient times. The writings of Sushruta (6th century BC) and Charaka (200 AD) the famous surgeon and physician respectively were considered standard works for many centuries with instructions (in *Charaka Samhita*) for creation of hospitals, for provisions of lying-in and children rooms, maintenance and sterilisation of bed linen with steam and fumigation, and use of syringes and other medical appliances. Medicine based on the Indian system

was taught in the ancient university of Taxila. *Charaka Samhita*, a treatise on medicine based on the teaching of Charaka was written around 600 AD and *Sushruta Samhita*, a treatise of surgical knowledge, was compiled during 400 AD.

The most notable of the early hospitals were those built by King Ashok (273-232 BC). There were rituals laid down for the attendants and physicians who were enjoined to wear white clothes and promise to keep the confidence of the patients.

However, the age of Indian medicine started its decline from the Mohammedan invasions in the tenth century. The Mohammedans brought with them their *Hakims* who followed the Greek system of medicine which came to be known as “Yunani”. This system and its physicians started to prosper at the expense of *Ayurveda* and its *Vaidyas*. However, the influence of *Ayurveda* continued in the South.

The Modern system of medicine in India was introduced in the 17th century with the arrival of European Christian missionaries in South India. In the 17th century, the East India Company—the forerunner of the British empire in India—established its first hospital in 1664 at Chennai for its soldiers and in 1668 for civilian population. European doctors started getting popular and during the later part of 18th and early 19th century, there was a steady growth of modern system of medical practice and hospitals, pushing the indigenous system to the background. Organised medical training was started with the first medical college opening in Calcutta in 1835, two in Delhi in 1835 and 1836, followed by Mumbai in 1845 and Chennai in 1850.

As the British spread their political control over the country, many hospitals and dispensaries originally started to treat the army personnel were handed over to the civil administrative authorities for treating civil population. Local government and local self government bodies (municipalities, etc.) were encouraged to start dispensaries at tehsil and district level. In 1885 there were 1250 hospitals and dispensaries in British India. But the medical care scarcely reached 10 per cent of the population.

Emergence of Health Care Delivery System and Hospitals in Independent India

The health scenario when the country became independent in 1947 was, to say the least, unsatisfactory. The bed to population ratio was 1:4000, doctor to population ratio 1:6300 and nurse to population ratio 1:40,000. Although the population was distributed in urban and rural areas in the

8 Principles of Hospital Administration and Planning

proportion of 20:80, a great disparity existed in the facilities available in urban and rural areas. The medical resources were polarised in the ratio of 80:20. The indicators of health spoke of a poor state of health of the people as indicated in the Table 1.1.

Table 1.1: Health indicators in India during 1947

1. Crude death rate	27.2 per 1000
2. Infant mortality rate	162 per 1000 live births
3. Death less than 10 years of age	48 per cent of total deaths
4. Expectancy of life at birth	30.9 years
5. Infectious disease accounted	Over 50 per cent of total deaths

On the eve of independence in 1947, there were 7,400 hospitals and dispensaries in the country with 11,000 beds giving a bed to population ratio of 0.25 per 1000. There were 47,000 doctors, 7000 nurses, 19 medical schools and 19 medical colleges in the country.

Bhore Committee: The need to take stock of health care status of the country and plan appropriate measures was felt by the government in the early forties. Thus was born the “Health Survey and Planning Committee”, better known as Bhore Committee (by the name of its Chairman, Sir Joseph Bhore), in 1943. The committee was asked to survey the then existing health care organisation resources and to advice on the development of health care services in the country. The recommendations of the committee are considered the blueprint of health care delivery system in independent India which laid the foundations for the development of health care delivery system in development plans in independent India. The infrastructure for the delivery of medical and health care system was laid down on this committee’s recommendations.³

The committee made extensive recommendations which can be classified into five broad headings as under—

1. Provision of adequate preventive, promotive and curative services to all in the form of comprehensive health care (integration of services).
2. Delivery of this comprehensive health care through an infrastructure of hospitals, dispensaries and by opening primary health care (PHC) centres at block level, and taluka level hospitals.
3. Development of adequate communications in rural areas.
4. Demarcation of health services into two groups, viz. personal and impersonal.
5. Fitting the above concepts into a short-term plan and a long-term plan.

The **short-term plan** envisaged a province-wise organisation for the combined preventive and curative health work through establishment of a number of primary,

secondary and district health units. The impersonal health services were to include town and village planning, housing, water supply, drainage and general sanitation. The bed:population ratio was planned to be raised from 0.2 in 1946 to 1.03 per 1000 population at the end of ten years, in 1956. **The long-term plan** envisaged a PHC for every 40,000 population with a 30 bedded rural hospital to serve four PHCs with a provision to double this number after ten years. Raising of hospital accommodation to 2 beds per 1000 population was also an important long-term goal, with creation of 12 more medical colleges in addition to 43 established during the first ten years. The committee recommended high priority to be given in the health development programme to reduction of sickness and mortality among mothers and children, with emphasis on nutrition, health education, school health services, housing, water supply, industrial health and legislation for environmental health.

Mudaliar committee: To provide guidelines for further national health planning in the context of the five-year plan, a fresh look at the health structure and resources was called for by the year 1959 to survey the progress made since the implementation of Bhore Committee report and to make recommendation for the future development. The Health Survey and Development Committee (also known as Mudaliar Committee for the name of its chairman) thus come into being in 1959. It was found by this committee that the implementation of the Bhore Committee recommendations was slow and the progress not as expected. Among others, it recommended consolidating the gains rather than going in for more services, the District hospital envisaged to play keyrole in the referral services from PHCs and *taluka* hospitals, mobile service teams, suggestion for a small fee for service in public hospitals, practical bed:population ratio of 1:1000, 50 bed *Taluka* hospitals, and district hospital with 300 beds, and long-range health insurance policy for all citizens.⁴

Other committees: There were many committees and study groups appointed from time-to-time. The following two were notable among them for the conceptual changes in the hospital services.

1. The Hospital Review Committee (Dr KN Rao Committee) 1968 while reviewing Delhi Hospitals made the following general recommendations.
 - a. That the hospital should function as an integral part of the comprehensive health service, both curative and preventive.
 - b. That the office of the medical superintendent should be a full-time appointment with administratively qualified doctor with no clinical responsibilities.

- c. That the administrative structure should be tripartite:
- i. clinical,
 - ii. nursing, and
 - iii. business administration.
2. The Study Group on Hospital (1968) appointed by Central Government had recommended the following.
- a. By 1971 the following bed capacity should be attained:

Teaching hospitals	— At least 500
District hospitals	— At least 200
<i>Tehsil/Taluka</i> hospitals	— At least 50
 - b. The projected bed capacity of 4.2 lakh beds in 1976 should be raised to 6.3 lakhs bringing the bed: population ratio to one bed per thousand population by 1976.
 - c. A regular system of giving liberal grants-in-aid to voluntary organisations to open institutions for giving medical care on nonrestrictive basis.
 - d. In difficult areas and in areas where distances are long and communications difficult, such as hilly districts, certain *tehsil/taluka* hospitals should be developed as full-fledged referral centres (Ref: Report of the study group on Hospitals [Jain Committee], 1968. Min. of Health Govt of India, New Delhi).

Military hospitals: In 1910 a committee appointed by the British Govt recommended the establishment of Station Hospitals for Indian troops of the British Army and the raising of an “Indian Army Hospital Corps” for the menial staff. These proposals were approved in 1918. All the 148 hospitals thus established were to be administered by Indian Medical Service (IMS) which had begun as a military service. A few years later the name was changed from station hospitals to military hospital, separately for British and Indian troops (BMH, IMH) and at some places combined (CMH). The advent of second World War (1939-45) saw some modifications. After the end of the War most of the hospitals created to cater for the needs of war casualties became surplus to the requirement and were disbanded in the two years following the end of the war, only some military hospitals were retained. Following the Chinese aggression in 1962, rapid expansion and modernisation of forces hospitals was initiated.⁵ The Army has now over 100 hospitals including a large research and referral hospital (Delhi), five command hospitals (CHs) and five base hospitals, the bed strength of MHs (excluding the research and referral hospitals and command hospitals) varying from 75 to 500. The navy and Air force have their own hospitals. As compared to national bed:population ratio, the bed: population ratio in armed forces is 18:1000 population.

Hospitals, Beds and Medical Manpower

There is an ongoing race between the medical resources and increasing population. Even though there has been a tremendous growth in the medical resources, they have not been able to cope up with increasing demand due to unchecked growth of population. What we have now in the form of hospitals, beds and medical manpower is as depicted in Tables 1.2 to 1.4.

Table 1.2: Hospitals and beds

	1991		2003	
	No. of Hospitals	No. of Beds	No. of Hospitals	No. of Beds
States				
1. Andhra Pradesh	615	36,400	2,950	5,5524
2. Arunachal Pradesh	18	1,091	262	3,246
3. Assam	207	14,460	268	16,000
4. Bihar	298	28,137	328	44,642
5. Goa	108	3,383	114	4,232
6. Gujarat	1,563	46,374	2,528	78,664
7. Haryana	78	7,003	79	9,522
8. Himachal Pradesh	65	4,274	57	7,679
9. Jammu and Kashmir	67	8,202	67	9,000
10. Karnataka	288	34,477	293	49,949
11. Kerala	2,924	70,349	2,040	87,195
12. Madhya Pradesh	362	22,103	363	28,724
13. Maharashtra	2,104	1,11,420	3,115	1,26,528
14. Manipur	25	1,460	30	2,059
15. Meghalaya	15	1,754	15	2,915
16. Mizoram	14	1,154	17	1,929
17. Nagaland	31	1,114	31	1,549
18. Orissa	287	13,988	371	16,642
19. Punjab	230	15,018	245	24,892
20. Rajasthan	267	21,815	278	35,142
21. Sikkim	5	525	6	905
22. Tamil Nadu	408	48,780	438	61,000
23. Tripura	23	1,531	25	2,162
24. Uttar Pardesh	735	47,278	745	74,450
25. West Bengal	410	53,977	421	67,078
Union Territories				
26. Andaman and Nicobar	8	735	11	1,101
27. Chandigarh	2	1,500	7	2,500
28. Dadar and Nager-Haveli	2	62	3	112
29. Daman and Diu	3	150	3	150
30. Delhi	80	18,241	82	22,838
31. Lakshadweep	2	70	2	110
32. Pondicherry	10	2,608	10	3,211
Total	11,254	6,19,433	15,204	8,43,239

Source: Health Information of India: Directorate General of Health Services.⁶

In 1947, there were seventeen Medical Colleges with an intake of 1400 students. In 1995, the number of Colleges, rose to 146 with 15,000 seats. In 2007, there are 269 medical colleges with an annual intake of 30,000 students. Out of this, half are private Medical Colleges.

Table 1.3: Medical manpower

Population	1000 million (2001)	
Hospitals	15,204	Urban : 4,903 Rural : 10,301
Dispensaries	28,279	Urban : 16,315 Rural : 11,964
Hospital beds	8,70,160	
Bed : population ratio	0.84 per thousand	
Doctors	5,03,947	
Nurses	7,37,000	
ANMs	3,01,691	
Dental surgeons	28,705	
Doctor:population ratio	1:1985	Urban : 1:500 Rural : 1:14,000 to 18,000
Nurse: population ratio	1:1649	
Nurse: doctor ratio	1.0.83	
Medical colleges	140	

Source: Health Information of India: Directorate General of Health Services.⁶

Table 1.4: Hospitals and doctors of Indian System of Medicine (ISM)

	No. of Hospitals	No. of Dispensaries	No. of Practitioners
Ayurveda	2,230	14,048	3,52,328
Unani	183	977	41,630
Siddha	122	335	12,528
Total	2,535	15,360	4,06,486

Source: Health Information of India : Directorate General of Health Services.⁶

THE CHANGING ROLE OF HOSPITALS

From its gradual evolution through the 18th and 19th centuries, the hospital both in the eastern and the western world—has come of age only recently during the past 50 years or so, the concept of today's hospital contrasting fundamentally from the old idea of a hospital as no more than a place for the treatment of the sick. With the wide coverage of every aspect of human welfare as part of health care—viz. physical, mental and social wellbeing, a reach-out to the community, training of health workers, biosocial research, etc.—the health care services have undergone a

steady metamorphosis, and the role of hospital has changed, with the emphasis shifting from:

- i. acute to chronic illness
- ii. curative to preventive medicine
- iii. restorative to comprehensive medicine
- iv. inpatient care to outpatient and home care
- v. individual orientation to community orientation
- vi. isolated function to area-wise or regional function
- vii. tertiary and secondary to primary health care
- viii. episodic care to total care.

Impediments to Medical Care Delivery and Role Perception of Hospitals

In spite of the phenomenal growth in the number of hospitals and medical manpower, it is a paradox that medical services have remained inaccessible to many. Geographical barriers, climatic features, insufficiency of resources and inability to provide finances, the conditional nature of the right to services under social security institutions, poverty and illiteracy are some of the causes that make medical services inaccessible to a great proportion of the population.

In a society well-protected against epidemics, each individual seeks medical advice 3 to 4 times a year either for protection of his or her health or because of illness or injury. In the 50s and 60s, the frequency of hospital admissions in such a society was between 150 and 200 per 1000 population per year, with each admitted patient spending as an average of 1.5 to 2 days a year in the hospital. The cost of an average hospitalisation episode was about four to five times the average per capita daily income, the overall expenditure on hospitals being 2 to 3 per cent of the GNP. Although health promotion and disease prevention have the greatest impact on health, diagnostic and therapeutic factors, i.e. physician and hospital services receive primary attention only when health problems are encountered.

Many authorities point an accusing finger at the complacency of hospitals which have developed as highly sectionalised segments of medical care and which have drifted further away from their true role as community institutions that should assume a larger role than just “caring for the sick and relieving often.”

To fulfil its role a hospital need not be content with bidding goodbye to cured patients at its gates and expressing sympathies for the dead and noncured. It is useful only if it is in tune with the economic limits of the people it has to serve, and patients and family members coming to the hospitals should be able to go back home after being

educated on the present disease, its prevention and their personal role in prevention of disease and promotion of health in general.

Informed nonmedical opinion considers that medical and hospital services are “crisis care”—concerned with illness, not health. Sociologists believe the reason for this is that it is concerned with personal attitudes—people respond only when they have to. A shift in the emphasis of medicine is therefore needed, that from “cure” to “care”. Although medicine can claim many effective cures, it must confront the task of caring for the sick with greater zeal and effectiveness. Caring necessitates concern with the quality of life of the ill and reduction in any handicap consequent to disease.

The important factors which have led to the changing role and functions of the hospital are as follows.

1. Expansion of the clientele from the dying, the destitute, the poor and needy to all classes of people
2. Improved economic and social status of the community
3. Control of communicable disease and increase in chronic degenerative diseases
4. Progress in the means of communications and transportation
5. Political obligation of the government to provide comprehensive health care
6. Increasing health awareness
7. Rising standard of living (especially in urban areas) and sociopolitical awareness (especially in semiurban and rural areas) with the result that people expect better services and facilities in health care institutions
8. Control and promotion of quality of care by statutory and professional associations
9. Increase in specialisation where need for team approach to health and disease is now required
10. Rapid advances in medical science and technology
11. Increase in population requiring more number of hospital beds.
12. Sophisticated instrumentation, equipment and better diagnostic and therapeutic tools.
13. Advances in administrative procedures and management techniques.
14. Reorientation of the health care delivery system with emphasis on delivery of primary health care.
15. Awareness of the community.

If the task of the hospital is to restore health and not merely to cure a disease entity, the role and responsibility of hospitals assume great significance. It goes far beyond the diseased organ or individual. The modern hospital is a social universe with a multiplicity of goals, profusion of personnel and extremely fine division of labour.

HOSPITAL VIEWED AS A SYSTEM

A hospital can be variously described as a factory, an office building, a hotel, an eating establishment, a medical care agency, a social service institution and a business organisation. In fact, it is all of these in one, and more. Sometimes it is run by business means but not necessarily for business ends. This complex character of the hospital has fascinated social scientists as well as lay people.

Management science defines a system as “a collection of component subsystem which, operating together, perform a set of operations in accomplishment of defined objectives.” A system is viewed as anything formed of parts placed together or adjusted into a cohesive whole. Every system is therefore a part of a large system and has its own subsystem.⁷

A system is construed as having inputs which undergo certain processing and get transformed into output, the output itself in turn sending feedback to the input and the process, which can be altered to achieve still better output. A system is therefore a continuous and dynamic phenomenon (Fig. 1.1).

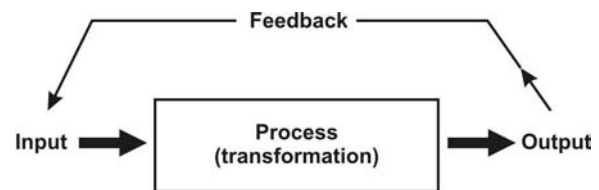


Fig. 1.1: Conceptual representation of a system

Transformation of matter, energy or information produce the output by two processes, *viz.* decision process, *i.e.* the process of deciding what to do, how best to do it, when to do it and so on, and action process, *i.e.* the process of putting the above decisions in action.

Peculiarities of a Hospital System

In spite of the simple definition of a system, a hospital system is more than the sum of its parts. The peculiarities of a hospital system are as follows.

1. A hospital is an open system which interacts with its environment.
2. Although a system generally has boundaries, the boundaries separating the hospital system from other social systems are not clear but rather fuzzy.
3. A system must produce enough outputs through use of inputs. But the output of a hospital system is not clearly measurable.

4. A hospital system has to be in a dynamic equilibrium with the wider social system.
5. A hospital system is not an end in itself. It must function, as a part of the larger health care system.
6. A hospital system like other open social systems tends towards elaboration and differentiation, i.e. as it grows, the hospital system tends to become more specialised in its elements and elaborate in structure, manifesting in the creation of more and more specialised departments, acquisition of new technology, expansion of the “product lines” and scope of services.

In considering the hospital as a system for the delivery of personal services, which is the most important of its functions, Anand (1984) views the system from four different perspectives which are as follows.⁸

1. **Client-oriented perspective** which is that of access to service, use of service, quality of care, maintenance of client autonomy and dignity, responsiveness to client needs, wishes and freedom of choice.
2. **Provider-oriented perspective** that of the physician, nurses and other professionals working for the hospital, and include freedom of professional judgement and activities, maintenance of proficiency and quality of care, adequate compensation, control over traditions and terms of practice and maintenance of professional norms.
3. **Organisation-oriented perspective** which covers cost control, control of quality, efficiency, ability to attract clients, ability to attract employee and staff, and mobilisation of community support.
4. **Collective orientation perspective** which includes proper allocation of resources among competing needs, political representation, representation of interests affected by the organisation, and coordination with other agencies.

Hospital as a Social System

Sociologists have considered hospital as a social system based on bureaucracy, hierarchy and superordination-subordination. A hospital manifests characteristics of a bureaucratic organisation with dual lines of authority, viz. Administrative and Professional. In teaching hospitals and in some others, many professionals at the lower and middle level (interns, junior resident, senior residents, registrar) are transitory, whileas in others, all medical professionals are permanent with tenured positions and nontransferable jobs. In order to continue in a orderly fashion, every social system has to fulfil the functional needs of that system, viz. the need for pattern maintenance, the need for adaptation, for goal attainment and integration.

In a hospital system, the patients’ needs determine the interactions within the system. When a patient is cured and discharged, in his or her place a new patient is admitted. This new patient also demands all the attention and skills of doctors, nurses and others, thus, forcing the essential and separative components into immediate action, repeatedly as each patient is admitted. Free upward and lateral communication is an important characteristic of any system.

So far as communication within the hospital system is concerned, in fact there is considerable restriction in communication among people in the hospital. Doctors communicate freely with doctors, nurses with nurses and patients with each other (if not too ill) and with their relatives, but there is little communication between these groups at the nonformal level.

In the course of interaction among the various units of a hospital social system, tensions and conflicts emerge. These strains have to be dealt with effectively if the system is to function properly. The system has to develop mechanisms of tension management to cope with such strains.

Integration deals with the problem of morale and solidarity in the hospital social system. Morale is necessary both for integration as well as pattern maintenance. Integration has to be achieved at the microlevel. It involves the development of loyalty to the system, to its other members and the values for which the system stands.

Need for pattern maintenance acts as a barrier to upward or lateral mobility of the staff. One occupational group cannot be promoted to the other group, e.g. laboratory technician cannot become nurse and nurses cannot become doctors.

In general, there is a trend in bureaucratisation of hospitals, in which hospitals are seen to work towards achieving their goals through reliance upon such structural devices as systems of division of labour, an elaborate hierarchy of authority, formal channels of communication, and sets of policies, rules and regulations.

The two lines of authority (viz. administrative and professional) come into conflict, because each group has a different set of values. One is concerned with the maintenance of organisation and the other with providing medical expertise. This leads to interpersonal stress. A system that operates through multiple subordination subjects the subordinates to multiple orders which are often inconsistent with one another.

A hospital is more than the sum of its parts. The major components of a hospital system are depicted in Figure 1.2 and Table 1.5.

Table 1.5: Hospital as a system

Input	Process – Transformation	Output
People A. Staff <ul style="list-style-type: none"> • Physician • Nurses • Paramedical • Supportive B. Patients, their attendents and relatives Material <ul style="list-style-type: none"> • Drugs and chemicals • Equipment • Diet Money <ul style="list-style-type: none"> • To maintain staff, facilities and procure materials 	Communication: Between <ul style="list-style-type: none"> • Physicians and patients • Physicians and nurses • Physicians/nurses and paramedical staff • Physicians and administrator • Administrator and community • Administrator and nursing/paramedical staff • Nursing/paramedical staff and patients Decision Making For <ul style="list-style-type: none"> • Cure: Diagnosis, treatment • Care: Creature comforts of patients, diet • Procurement of materials in right place at the right time Action <ul style="list-style-type: none"> • Putting decisions into practice • Balanced mix of communication, decision-making and action 	E F F I C I E N T P A T I E N T C A R E

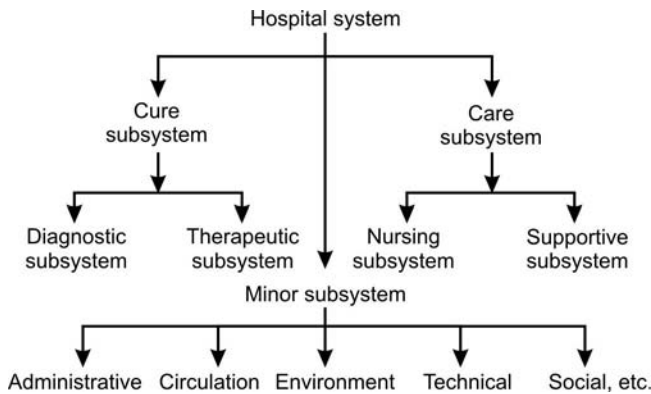


Fig. 1.2: Components of a hospital system

individual’s physical and mental well-being, the increasing demands for a better standard of living and health awareness of the people have all had a significant effect on hospital system and the trend of services provided by hospitals.

INTRAMURAL AND EXTRAMURAL FUNCTIONS OF HOSPITAL

The activities of the present day hospital can be divided into two distinct types—intramural and extramural. Intramural activities are confined within the walls of the hospital, whereas extramural activities are the services which radiate outside the hospital and to the home environment and community. These functions are set out in Table 1.6.

HOSPITAL AND COMMUNITY

The ultimate purpose of the health services is to meet effectively the total health needs of the community.

There are a lot of factors which determine the health needs of community and solutions to them. Some of the important factors are listed in Table 1.7.

A good hospital would build its services on the knowledge and understanding of the community it is to serve, its success will depend upon the involvement of many groups, both professional and nonprofessional within and outside the hospital.

As a component part of health system, the first task of the hospital is to reach people all the time at a cost the community can afford. The concept of hospital as the centre of preventive medicine has enlarged its role enormously. The primary task of the hospitals is the provision of medical care to a community. However, the hospital has two other important roles to fulfil—to be a centre for the education of all types of health workers, doctors, nurses, midwives and technicians and for the health education of the people.

The growing realisation of the thin line of distinction between health and disease, the important relationship between social and material environment, its effects on the

Table 1.6: Intramural and extramural functions of a hospital

Intramural Functions of a Hospital

1. Restorative
 - a. Diagnostic : These comprise the inpatient service involving medical, surgical and other specialities, and special diagnostic procedures.
 - b. Curative : Treatment of all ailments
 - c. Rehabilitative : Physical, mental and social rehabilitation
 - d. Care of emergencies : Accidents as well as diseases
2. Preventive
 - a. Supervision of normal pregnancies and childbirth
 - b. Supervision of normal growth and development of children
 - c. Control of communicable diseases
 - d. Prevention of prolonged illness
 - e. Health education
 - f. Occupational health
3. Education
 - a. Medical undergraduates
 - b. Specialists and postgraduates
 - c. Nurses and midwives
 - d. Medical social workers
 - e. Paramedical staff
 - f. Community (health education)
4. Research
 - a. Physical, psychological and social aspects of health and disease
 - b. Clinical medicine
 - c. Hospital practices and administration

Extramural Functions of a Hospital

1. Outpatient services
2. Home care services
3. Outreach services
4. Mobile clinics
5. Day care centre
6. Night hospital
7. Medical care camps

The Providers, Support Group and Community

The hospital being a distinct, albeit integral, part of the health service, is influenced by all the above mentioned factors and the health services in turn influence those factors. It has to deal with three different groups which form the larger community.

Table 1.7: Factors determining the health needs of community

1. *Demographic Factors*
 - Age
 - Sex
 - Marital status
 - Family composition
 - Education
2. *Enabling Factors*
 - Family financial resources
 - Family relationships in the household
 - Availability and accessibility of services
 - Health insurance (compensation for illness changes health behaviour)
 - Attitude to health and disease
3. *Internal or Health System Factors*
 - Manpower availability
 - Physical facilities
 - Organisation and structure
 - Interface with users
4. *External Factors*
 - Political
 - Social
 - Administrative

1. *The first group* is the “providers” of medical care, viz. the doctors, nurses, technicians and paramedical personnel.
2. *The second group* is management, administrative and support group comprising of personnel dealing with nonclinical functions of the hospitals, such as diet, supplies, maintenance, accounts, housekeeping, watch and ward, etc.
3. *The third group* and the most important one for whose benefit the first two groups exist in the first place, is that of the patients who seek hospital service and their attendants, relatives and associates who, along with patient come in close contact of the hospital. This group is broadly termed as the “community.”

Hospital-Community Relationship

In a complex juxtaposition between the providers of care and intermediate support group on the one hand and the patient and the community on the other, it will not be unusual to expect conflicts between the two groups. The nature of relationship between the two groups influences community relationship, and on this relationship depends the image of the hospital. To better this image, hospitals have to reorientate themselves to the expectations of the community (Fig. 1.3).

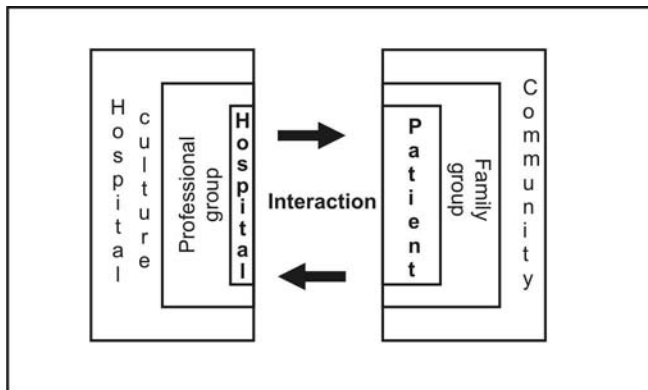


Fig. 1.3: Hospital community relationship

Relevant communication and information must reach the user community in order to promote their participation and involvement. A community that is well-informed and aware of its social responsibilities can become an effective instrument of cooperation and support.

However, the unpleasant fact that this community participation can be distorted by sectional interests trying to use the community as a pressure group (to attain specific objectives which are not always compatible with the paramount aims of the hospital programmes) need also to be remembered.

People go to the hospital with high expectations believing that every disease is fully and quickly curable. The average health consumer regards contemporary hospitals as the panacea to all his health problems. They cannot appreciate the limitations of the hospital. There is an increasing demand for better care and quick cure. Besides giving care to every patient public expects sympathetic understanding of the behaviour of the patient and his or her attendants and relatives. This shift has necessitated a new approach to doctor-patient and hospital-community relationship.

On the other hand, some questionable assumptions on which the value system in hospital is based are still prevalent among medical personnel. These are that cure is more important than the care of patients, that the staff assume power over the patients, that every problem has a solution, and that death is the worst thing that can happen to man.

Respect for the dignity of the patient is one of the most basic rights and needs of the patient. Concern for the care of the human being as a whole needs contribution from everyone working in the hospital. The hospital is like a federal system with several departments each enjoying considerable autonomy and discretion in its management of work. The great challenges is one of coordination.

Whether it wishes to stress its links with the community and its human and personal character, or its power and glory as a temple of healing will depend upon the hospital itself. From starting as a work of charity, hospital care has developed into a science with many specialisations, to a high perfection industry, but still a social institution which yet remains to be integrated with society. There has to be a growing interest in the importance of human well-being, in the integration of health services provided.

PRIMARY HEALTH CARE (PHC) AND HOSPITALS

Realisation of the importance of the role of hospitals in primary health care (PHC) was generated as a result of the International conference on Primary Health Care held at Alma Ata in the erstwhile USSR in 1978 jointly sponsored by WHO and UNICEF. PHC is a concept providing comprehensive health care, i.e. promotive, preventive, curative, and rehabilitative services covering the main health problems in the community. Hospitals have an important role in fostering and encouraging the growth of primary health care.

Health being dependent on economic conditions and correlated to social and cultural values of the society, the quality, quantity, nature and content of health services under this concept are bound to vary between different societies. The exercise of providing primary medical care (supported by other components of medical and health services) has evolved into certain concepts based on basic technical knowledge. "Health for all by 2000 AD" declared as a goal of all nations at Alma Ata and accepted by India needs to be supported by all components of medical and health care services.

Elements of Primary Health Care

Eight essential elements of PHC as described by the WHO are as follows.⁹

1. Adequate nutrition
2. Safe and adequate water supply
3. Safe waste disposal
4. Maternal and child health and family planning services
5. Prevention and control of locally endemic diseases
6. Diagnosis and treatment of common diseases and injuries
7. Provision of adequate drugs and supplies
8. Health education.

Benefits to the Health Care System

Tremendous costs are incurred everytime a patient is treated in a hospital who could well be treated in an efficient PHC facility which is inexpensive, avoiding the overuse of the hospital by unnecessary patient self-referral.

However, there has been a traditional hospital disinterest in PHC activities. The interest of acute care hospitals has been centering around development of quality secondary and tertiary care facilities and programmes. Hospitals have viewed their role as delivery of curative services and not in early intervention, reduced mortality, prevention of disease or health education which are the basis of most PHC programmes. However, there is now a growing realisation of the role hospitals can play in PHC.¹⁰

PHC as Entry Point into Hospitals

In large cities there is marked tendency to bypass primary care facilities in preference for the teaching hospital resulting in primary and routine care workload on specialised services, defeating the special role of such hospitals. Opening PHC units within the premises as the first entry point to the hospital for such routine direct cases will reduce avoidable routine workload for specialised outpatient departments (OPD). Teaching hospitals, as a back-up support to PHC, can start screening units within their premises for patient's coming directly for routine medical care as part of PHC. These PHC units can also be utilised as laboratories for experimentation with different models of primary health care after epidemiological research, beside setting examples for hospitals at district level and others.

The Role of General Practitioners (GPs)

The position of GPs in providing primary health care and the potential for integrating their activities with other health personnel is being increasingly recognised. A community primary health care programme (CHP) started by a small urban hospital can establish a strong relationship between the CHP and the hospital, with GPs helping to run the primary health care centre. Coordination between these CHPs and the hospital at the appropriate level with open channels of communication can keep the programme going well. However, it is also feared that an excellent programme can fail if it lacks constant drive to maintain a certain level of standard and if consistent supervision is lacking. One of the difficult problems to solve is keeping the hospital focussed on primary care. It is natural for a small facility to want to keep growing bigger and more sophisticated.

Some PHC Related Experiences Abroad

In USA a changing relationship is emerging between hospitals and PHCs. A shift from cost reimbursement to hospitals to the fixed fee payment schedules for specific diagnostic related groups (DRGs) has forced hospitals in USA to cut costs and resulted in reduced length of stay, reduced admissions, reduced utilisation of ancillary services, and large increases in outpatient procedures. The decreasing demand for inpatient acute care has thus resulted in overcapacity of hospital beds. In some areas many hospitals are only 50 per cent occupied. Another factor that has focussed the attention of hospitals on PHC is the rapid popularity of health maintenance organisations (HMOs) in the USA. HMOs are interested in primary and not secondary health care. They are interested in health education, prevention, screening and immunisation programme, early detection and diagnosis, "wellness" and other primary care activities." They (HMOs) carry out these programmes with a variety of health professionals including midwives, physician, assistants, nurse practitioners, registered nurses and other allied health professionals.¹¹

Sweden, whose health care was based totally on hospitals, has realised the need for primary health care. The expansion of primary health care implied an increase in the number of general practitioners, district nurses and other types of staff to get over the necessity of too many patients being admitted for inpatient care just because the appropriate services were not available in day care or other institutions. The Swedish concept envisage that patient who need continuity in their relationship with doctors and those with multidimensional problems should be better off with well-functioning primary care services.¹²

Finland, one of the pioneers in primary health care implementation in Europe, presently spends about 55 per cent of its health expenditure on preventive and ambulatory services and 41 per cent hospitals. Sweden has adopted the "lowest level of care" concept.

Development of a PHC Policy by Each Hospital

To decide the scope and extent of the PHC to be provided by it, every hospital will have first to prepare a PHC policy and strategy. The policy statement should outline the essential points to be included and then list the actions needed ensure putting the policy into effect.

The hospital's effective involvement in PHC would require a much broader vision than cure alone, and therefore, a broader range of action. What restricts the effective

involvement of hospitals is that few hospital professionals are trained and inclined to think in this communitywide context, so that a substantial change of attitude is needed to accept the centrality of PHC as the basis of hospital involvement.

The hospital may either assume a lead role in organising PHC for its population or play a purely supportive role. With its concentration of health professionals, a hospital is in a position to effectively supervise and monitor PHC work, in addition to providing primary care through the hospital-staffed mobile and outreach clinics. The secondary care role of the hospital would support PHC by providing referral from primary health services, technical and logistic support and acting as a centre for education and training of PHC-oriented manpower.

Referral Function

1. Organising a two way referral system from mobile and outreach clinics to the hospital and referral back with reports for follow-up
2. Backing up the referral system with medical records
3. Organising visits of hospital specialists to outreach clinics
4. Carry out training and reinforcing skills at PHC workers by visiting specialists
5. Giving preferences to patients referred from PHC centres for specialist clinics and for admissions.

Support Function

1. Providing logistics support in respect of equipment, materials, drugs and other supplies
2. Reinforcing diagnostic capabilities of PHC workers and outreach clinics
3. Providing transport for referrals and outreach services
4. Making hospitals facilities available for training and retraining of PHC workers.

THE CHANGING SCENE IN THE HOSPITAL FIELD

Our technical abilities have outstripped our social, economic and political policies. The technological advances in the field of medical sciences have provided clinicians with more esoteric aids to diagnose and treat illnesses. Clinics and communities will continue to pressure hospital management to provide such advances even though they will be very costly. Not only pressures will increase for providing newer technological capabilities, but there will be growing demands for such care. There are growing indications that this has started happening in our Indian situation.

Since treatment is provided free of charge in government hospitals, it has in many cases resulted in abuse, particularly in the outpatient department. This has led to the patient being made to pay a small charge, varying between 10 to 20 per cent of the cost of medical attention, which, though modest is a useful contribution to hospital running costs.

The model of the nationalised health system that took shape in Great Britain and some other countries has not found true acceptance in India, because health and medical care is not a central but state subject. Allocation of funds for the health sector both in the central and state budgets has also declined gradually. Perhaps this is the reason, among others, that private institutions, commercial firms and corporate bodies are jumping into the medical care field to form investor-owned, for-profit hospitals.

One-third of the last decade’s increase in medical costs is attributed to increase use of high technology medicine, particularly surgical and diagnostic procedures. Even then, successful launching of state-of-the-art investor owned hospitals has proved that hospitals can benefit from corporate management principles and can function profitably and efficiently without sacrificing quality and affordability.

At the turn of the century most people died at home cheaply. Today, more than 20 per cent die in expensively equipped hospitals, and it is estimated that up to half of an average person’s lifetime medical expenses will occur during his last six months.

The changing trends are indicating the following—

- In determining the extent and coverage, there will be more and more dominance by consumers rather than providers or producers.
- Hospitals and health care institutions will become akin to industries.
- Not all services under one roof. Hospitals will be catering more and more to the needs of patients in fragments, which:
 - i. will lead to more and more specialised hospitals in place of general hospitals which provided medical, surgical, obstetric and gynaecological, ENT, paediatrics, etc. under one roof
 - ii. people will medical care
 - iii. hospitals will require more and more management skills as administrators at each level
 - iv. will lead to growth of corporate hospitals and modern management concepts
 - v. will be capital intensive
 - vi. will be technology intensive
 - vii. ascendancy of technical expectations over human values.

Urban Hospital Concentration

More and more doctors are concentrating in larger cities, as a result the quality of service which the outlying communities get has remained mediocre. The government and health care services are increasingly dependant upon young doctors to provide medical care services through measures promoting two or three year's rural service in peripheral hospitals and primary health care centres. This is not a pleasing arrangement for rural people who have constant changes of their doctor, and the latter regards his or her stay as a temporary one with no future to it in the rural health centre/hospital.

The teaching of medicine and medical research play a decisive role and have therefore a great influence on hospital planning. Today, specialised training comprises a very large part of medical curriculum, and a student spends more and more time in the specialist departments. The peoples preception of teaching hospitals as centres for highly specialised treatments and excellence has tended patients to concentrate in urban centres with medical colleges.

Sickness Insurance

The charitable nature of hospital of the past has given way to the principle of the universality where every social class is admitted. The introduction of sickness-insurance and social security schemes, although not on a universal scale has contributed to this. The economic structure in India has not yet permitted large scale application of this principle, but the hospital system has to take stock of this emerging development.

Preventive Medicine, Health Promotion and Hospitals

The scope of medical examination and treatment is being extended gradually to take care of the post-sickness conditions and the importance of rehabilitation of sick and disabled people is being emphasised. The scope of medicine is also expanding to include "pre-sick" conditions of human beings. In this context, the example of the so-called "ningen dock" in Japan, which performs complete physical check-up of apparently healthy people is illustrative. The term "ningen dock" is a colloquial Japanese term meaning examination in dock, comparing to a ship's dock wherein a ship is thoroughly inspected on completion of long voyage. Ordinary people can undergo a complete physical check-up at such facilities during a period of three to seven days once every year or two, be hospitalised and receive early treatment if any disease condition is discovered, and can receive proper guidance and instruction on their physical

condition. Most general hospitals in Japan have beds specially reserved for this "ningen dock" programme.

Priorities in the developing countries should be of preventive nature, whereas modern medical technology strives to lessen the effects of disease, to defer incapacity or death. The organisation of preventive medicine and the hospital system have developed independently along dual lines. The fusion of preventive medicine activities and the hospital has not yet emerged. But as medicine has both a preventive and curative purpose, ideally hospital facilities should meet both these ends. In making available the resources of specialised establishments for prevention on one hand and inpatient care and treatment on the other, the multipurpose centre, combined and coordinated with other health activities, represent the best service available. The future hospitals will have to develop on these lines.

Rising Mental Illness, Heart Disease and Cancer

The myth that underdeveloped or developing countries are not as much susceptible to degenerative, mental or cardiovascular disorders and cancer has been recently exploded. India now faces the unenviable task of not only curbing the high incidence of communicable diseases but also checking the rapid rise of noncommunicable diseases like mental illness, heart disease and cancer.

Geriatric Care

Even as we have not eradicated the scourge of communicable diseases, we are experiencing a rise in the incidence of health problems associated with old age. A national Sample Survey had revealed that 45 per cent of the elderly population (viz. about 27 million) suffers from chronic diseases. Old age is associated with growing incidence of heart disease, high blood pressure, osteoarthritis, cognitive disorders, prostate enlargement and cancer and urinary tract infections.

The growing elderly population will throw a public health challenge, including institutional care. In future, our hospitals will be compelled to remodel their resources to face this challenge.

Building New Hospitals and Establishing Linkages

During the fifth and sixth five year plan, one in every four primary health centres upgraded to a 30-bedded rural hospital were expected to provide general service in medicine, surgery and obstetrics, with emergency and acutely ill cases referred to them from neighbouring primary health centres. This

was expected to result in relieving overcrowding in district and other hospitals, and bring expert medical care within easy reach of outlying communities. However, for various reasons this has not happened the way it was visualised.

A large majority of our hospitals fall in the category of small hospitals with obvious limitation in the scope of their services. These are not able to provide a complete service to the patient even though it is obvious that more small hospitals are needed. Unless their services are supplemented by knowledge, skills and resources from the larger hospitals, and unless they are linked with larger hospitals, patients would increasingly get disillusioned with them, continue to trickle to large city hospitals for all services, and the services of the small hospitals would go waste.

Correcting this will require building up a relationship among hospitals whereby the larger and better staffed and equipped hospitals will support smaller hospitals with the skills and resources which the smaller hospitals do not have. In essence, it requires coordinating among hospitals on a regional basis. The practice of supporting a few peripheral hospitals by certain medical college hospitals are steps in this direction. These steps have to turn into standard practices with honest involvement of all concerned and active material support from government agencies.

Development of New Management Practices

Exchange of knowledge pertaining to hospital practices by consultation and coordination among hospitals, and on the same lines consultation and guidance in administrative matters including costs, purchasing, personnel and other phases of hospital administration would promote efficient utilisation of personnel and finances. Hospitals in a defined area can accomplish better standards of patient care and promotion of efficiency through cooperation among participating hospitals.

MARKETING OF HOSPITALS

Health care industry in India seems to have arrived at a turning point. As in some other service industries, viz. banking and the hospitality (hotels, restaurants, travel, tourism) industry, health care industry is going through a marketing revolution.

During the 1980s in USA hospital trustee boards and hospital administrators realised that because institutional strategic planning is an essential management task—

1. Marketing can be a useful function that should not be rejected summarily because of the sanctimony attached to health care activities.

2. Promotion, including advertising is not inherently bad but is an important communication activity.
3. The word “customer” is not a dirty word.

Strategic Planning

Diligent promotion of the marketing concept is changing professional attitudes as it challenges the institution to provide services that consumers want and will pay for.

Strategic planning is that set of decisions and actions which lead to the development of an effective strategy to achieve the basic objectives of the hospitals, viz. quality patient care at a reasonable cost and achieving excess revenue over costs. Strategic planning is gaining importance in advanced countries, because the health care needs and technology is changing so fast that it is the only way to anticipate future threats and opportunities. Strategic planning is the need of the “market place”—which the health care industry resembles in some respects.

Marketing of Medical Services

India now does not lack the infrastructure to attract overseas patients in substantial numbers. We do not have a lobby to sell medical services to the West. Yet, among the services that India can sell to the West, health care could be one of the easiest. And the pickings promise to be plentiful in foreign currency.

When the UK’s National Health Service found hospital beds going empty at home, it began to sell health care services to the US. India needs to market its medical services abroad aggressively if it is to win a share of the global health care market.

India can now offer world-class facilities and services, with its growing number of well-equipped corporate hospitals at costs far below the international rates. The cost of a major surgical procedure, e.g. open heart surgery is still about one-third to half of that which would cost in UK or US.

Hospitals will have to be more receptive to marketing management philosophy which involves many conceptually new approaches within the framework of strategic planning. With increasing health insurance coverage, price competition becomes an appealing marketing tool. We can anticipate competitive pricing schemes, use of incentive premiums, new attitude towards admissions, discharge, food service, “package pricing” obstetrical family participation programmes, and similar other changes designed to attract and service patients and his or her family members.

A competitive health care industry, with carefully devised marketing strategies for market product combinations is an

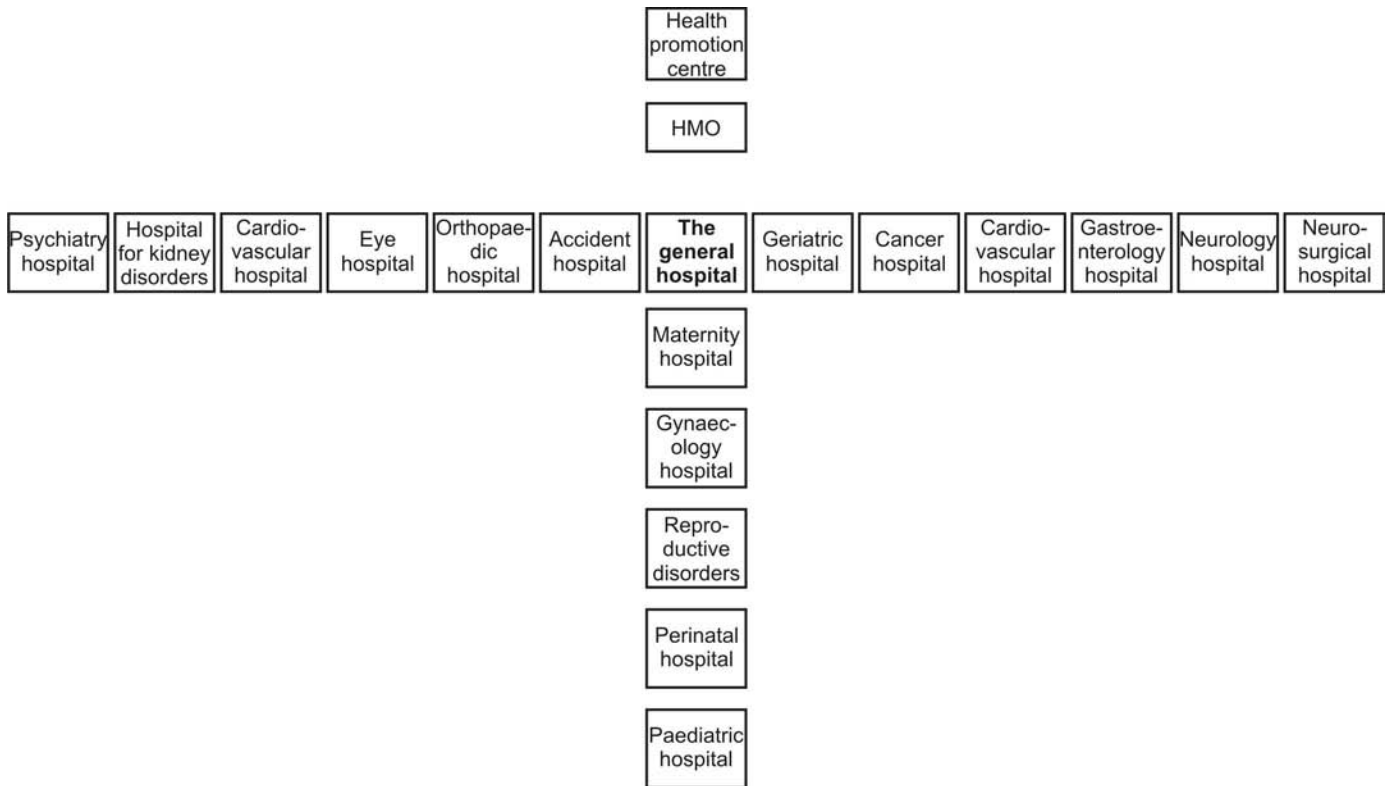


Fig. 1.4: Proliferation of specialty hospitals

emerging alternative to a heavily regulated and socialised system. Strategic planning and marketing are associated with the challenge to do better in the health care market place, and to provide new dimensions to hospital management. The subject is dealt with in more detail in a later chapter.

Specialty Hospitals

Medical science has expanded laterally to include the conditions surrounding sick people. Specialised hospitals are coming up in many places in recent years, e.g. those for cancer and cardiovascular diseases, geriatric hospitals, paediatric hospitals and perinatal hospitals.

Health maintenance organisations are institutions that are concentrating on preventive aspects of medicine, emphasising on diet, exercise, antismoking and antialcohol programmes, meditations and the like, with provision of only primary medical care. The scope of conventional preventive medicine is being expanded by the health check-up centres. And the time may not be far when health promotion centres be in vogue as extensions of hospitals (Fig. 1.4).

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CHAPTER

2

Hospital Planning and Design

INTRODUCTION

The picture regarding medical care services in developing countries including India can be described as chaotic. Hospital beds are inadequate, the hospitals are located far away from the communities which need them, most crowded in towns and cities, and heavily biased in favour of urban populations. As a result, although the average national bed:population ratio is less than 0.8 beds per 1000 population, it is as high as 2.5 beds per 1000 population in metropolitan centres like Delhi and Mumbai and as low as one bed per 3700 to 14000 population in rural and tribal areas in India. Where there is inadequate medical care in rural areas there is also surfeit of care in some places. Specialist services are concentrated in urban centres, and there is duplication of services in many others.

There are many reasons for the current state of affairs. An absence of a realistic national health policy, haphazard medical care planning, and inadequate availability of funds for the health sector are amongst the main reasons. The current national health policy document was released in 2002 with the avowed objectives to increase the current bed:population ratio, improve medical care facilities for rural areas and improve quality of service in the existing hospitals and medical care institutions. The policy was revised in view of experiences gained, and a fresh National Health Policy was released by the Govt. in the year 2002. Many of the objectives of the revised policy are still eluding the health planners.

Experience of many countries having advanced medical care systems has shown that hospitals are very expensive

to build. Their initial capital costs are high, and the construction and equipment consumes tremendous capital investment. But what is more important is they are also very expensive to operate, with their running costs amounting to approximately one-third of the initial construction costs for each year of operation.

Haphazard planning at initial stages by inexperienced and uncommitted technical personnel results in changes at constructional stage resulting in avoidable drainage of funds.

With the exception of some private hospitals built for privileged classes of people where money is not a restricting factor, adequate financial resources for new hospitals are not available in most developing countries even though medical care needs are immense. Essential hospital service required for the community can be met most economically only with adequate thought given to planning, design, construction and operation of health care facilities. Even where financial resources are adequate, best use of resources will only be made when sufficient thought is given to planning.

GUIDING PRINCIPLES IN PLANNING

A hospital is responsible to render an essential service. In fulfilling this responsibility, hospital planning should be guided by certain universally acknowledged principles. The principles are useful irrespective of the level of planning, i.e. whether at the national level, state level or individual hospital level.

These principles were developed in the context of the American system of hospitals¹ but have relevance and

usefulness to hospital planning in India, and they are as relevant today as they were over five decades ago.

Patient Care of a High Quality

Patient care of a high quality should be achieved by the hospital through adopting following measures.

1. Provision of appropriate technical equipment and facilities necessary to support the hospital's objectives.
2. An organisational structure that assigns responsibility appropriately and requires accountability for the various functions within the institution.
3. A continuous review of the adequacy of care provided by physicians, nursing staff and paramedical personnel and of the adequacy with which it is supported by other hospital activities.

Effective Community Orientation

Effective community orientation should be achieved by the hospital through adopting following measures:

1. A governing board made up of persons who have demonstrated concern for the community and leadership ability.
2. Policies that assure availability of services to all the people in the hospital's service area.
3. Participation of the hospital in community programmes to provide preventive care.
4. A public information programme that keeps the community identified with the hospital's goals, objectives and plans.

Economic Viability

Economic viability should be achieved by the hospital through taking these measures:

1. A corporate organisation that accepts responsibility for sound financial management in keeping with desirable quality of care.
2. Patient care objectives that are consistent with projected service demands, availability of operating finances and adequate personnel and equipment.
3. A planned programme of expansion based solely on demonstrated community need.
4. A specific programme of funding that will assure replacement, improvement and expansion of facilities and equipment without imposing too much cost burden on patient charges.
5. An annual budget plan that will permit the hospital to keep pace with times.

Orderly Planning

Orderly planning should be achieved by the hospital through the following.

1. Acceptance by the hospital administrator of primary responsibility for short and long-range planning, with support and assistance from competent financial, organisational, functional and architectural advisors.
2. Establishment of short and long-range planning objectives with a list of priorities and target dates on which such objectives may be achieved.
3. Preparation of a functional programme that describes the short-range objectives and the facilities, equipment and staffing necessary to achieve them.

Sound Architectural Plan

A sound architectural plan should be achieved by the hospital through the following:

1. Engaging an architect experienced in hospital design and construction.
2. Selection of a site large enough to provide for future expansion and accessibility of population.
3. Recognition of the need of uncluttered traffic patterns within and without the hospital for movement of hospital staff, patients, and visitors and for efficient transportation of supplies.
4. An architectural design that will permit efficient use of personnel, interchangeability of rooms and provide for flexibility.
5. Adequate attention to important concepts such as infection control and disaster planning.

Medical Technology and Planning

Developments in medical technology are taking place so rapidly that now the use of sophisticated technology determines professional status. The diffusion of medical technology vis-a-vis shortage of resources constantly play on the minds of the planners.

Even in western countries, "rational" planning for medical technology is an evasive subject. The workshop on problems of planning of health services in urban areas in Europe felt that rational planning is aided by a hospital hierarchy of specialisation, and by national review agencies which have strong links with similar agencies in other countries. Specialised coronary care units (CCUs) were introduced on the basis of clinicians' opinions about the effectiveness of such units. The evidence is suggestive that the innovation had serious flaws but once CCUs were

established, there was great resistance to formal controlled trials. Some studies suggest that admission to a CCU is no better than treatment at home. However, the professional as well as popular view of these units is so entrenched that it is often difficult to plan for the proper use of these expensive facilities.

REGIONALISATION OF HOSPITAL SERVICE

Hospitals and other health care institutions have traditionally remained individualistic entities independent of each other. On the contrary they should be coordinated in order to make up a system of medical and health care which provides services on area-wise basis. Therefore, it would be ideal to plan the hospital services on area-wise basis. However, this cannot become possible without active involvement of the Government. Apart from erstwhile USSR, Chile and Great Britain, where complete regionalisation of medical care has taken place, few other countries have reorganised the hospital system along these lines.

Understanding the concept of regionalisation is necessary because regional planning of health facilities and hospitals is something to which health planners have aspired for many years. Through its application, it is thought that construction of new hospitals and health centres can be tailored to the requirements of the users and that the necessary rational distribution of buildings and facilities will be obtained, enabling health services to be delivered according to a system in which different levels of competency adapted to the needs of the patients can be distinguished.

If regional planning is to become a functioning reality, it should be based on a full and detailed study of the objectives and functions of the health system. It will also be necessary to give a role in the planning process to representatives of the groups that receive the services.

Although regionalisation of hospital services² is theoretically possible to be enforced by law it has been implemented to full in a few countries only, because of several obstacles such as multiplicity of ownership (Government, semigovernment, private, charitable, etc.) difficulty in coordination between private and public institutions, problems of movement of personnel and staff, prestige, bureaucratic obstacles, and lack of continuous effort and team approach. Therefore, introduction of the concept is a complex process not easy to achieve.

A WHO working group had identified that in order to put into operation true regionalised system, it is essential that some prior conditions be met. It is easier to bring about

in those countries which have a planned economy and a decentralised economic and social development administration. It is also very useful, when there exists a political and administrative body with executive and coordinating authority over the regional services, not only in health but also in the educational, housing, welfare and other fields. Even when these ideal conditions do not exist, it is still possible for countries to establish a regionalised health service provided a firm political decision is taken and is backed by legislation.

What is Regionalisation?

Regionalisation is a system of technical and administrative decentralisation by establishment of "levels of care" which range from primary health centre at the community level, to general hospital and specialised polyclinics at the intermediate level, and culminating in higher medical centres where the practice of all specialities is carried out with teaching and research as major concerns. The relationship between organisational scale on one hand and the effectiveness and efficiency on the other, influences indirectly their numbers and locations (Fig. 2.1).

Regional planning envisages creating a hospital system on a three-tier basis. The rural community is served with local hospital (rural hospital) of say 30 to 100 beds, probably undifferentiated, providing general, medical, surgical and maternity care. The intermediate hospitals (say district hospital) of several hundred beds serves as a local hospital for the population in its immediate vicinity and as a referral hospital for a group of rural hospitals in its region. Such a general hospital would provide medical, surgical, obstetrical and other specialised treatment. At the third tier, the regional

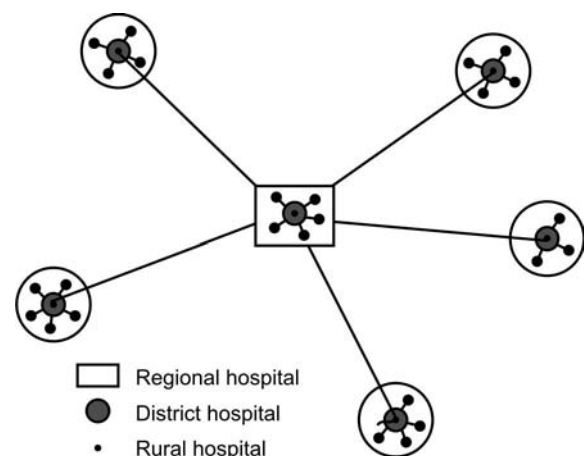


Fig. 2.1: Concept of regionalisation of hospitals

hospital catering to the intermediate hospitals in a geographical region is designed to provide a complete range of treatment including such specialities as radiotherapy, neurosurgery, thoracic surgery, oncology and so on. Usually, such a hospital would be associated with a medical college and postgraduate teaching centre. This hospital would be strategically located in the region so that patients in need of its highly specialised services could be readily referred to it.

Regionalisation envisages a two-way flow of patients and services and also sharing of senior medical staff by holding consultant sessions at district hospitals, and vice versa, and regular visits to small local hospitals.

One more aspect of regionalisation which is not so frequently stressed is the aspect of quality and cost. It has been brought out that the organisational structure in regionalisation has a direct beneficial effect on quality and cost of medical services. The direct effect on costs is because large volumes reduce costs. However, adverse effects would result if the size of the organisational scale were to lead to frequent failures in communication, coordination and control.

The General Hospital

The term general hospital covers many types of institutions ranging from the rural hospital to the district hospital to the bigger institution with facilities for teaching and research.

For the provision of comprehensive medical care to the community, the general hospital is the most appropriate institution. Such a hospital aims to provide treatment with a range of general medical, surgical, obstetric and gynaecological, paediatric, orthopaedic, eye and ENT services, except for illnesses requiring highly sophisticated treatment in specialised institutions. A general hospital pervades the medical care scene and is the dominant medical care facility. It is the general hospital that is the subject of this chapter and considered as a prototype in describing the planning process. The services and departments which form the hospitals are listed in Appendix III.

CLASSIFICATION OF HOSPITALS

Hospitals in general can be divided into two categories depending upon the agencies which finance them.

Government or public hospitals are those that are managed by government services, either central or state or public, municipal or departmental bodies that are financed from the overall budget for public services.

Nongovernment hospitals, on the other hand, are those that are managed by individuals, charitable organisations,

religious groups, philanthropic bodies, cooperative societies, industrial undertakings or individuals. Many are operated on noncommercial, nonprofit (and sometimes no-profit no-loss) basics. Its modern variant is the private hospital run on commercial basis, funded and managed as a commercial enterprise by corporate groups or individuals. On the basis of ownership patterns, nongovernment hospitals are classified as follows.

1. Private (Personal)
2. Partnership
3. Private (family) trust
4. Public charitable trust
5. Cooperative society
6. Private limited company
7. Public limited company.

Hospitals in India have been traditionally run by government and semigovernment bodies and philanthropic organisations with an air of tolerant benevolence. Such hospitals function with meagre financial and material resources. There has been very little effort in the direction of cutting costs, improving services and meeting increasing needs. But the scene is changing. First to utilise modern methods of hospital planning and administration were the hospitals run by Christian charitable organisations. Added to this are the institutions being created by organisations of commerce and industry. And now, many private individuals and organisations are entering the hospital field with money brought back by medical professional returning from abroad to their roots in India. The era of the corporate sector entering the hospital field has already begun.

This shift, however, is only discernible in large urban centres. The danger, therefore, looms large of more and more beds and services being provided in towns and cities, whereas those in the remote areas remain static, still widening the gap between demand and need. Rapid and unrestrained growth of the urban sector and the widening rural-urban divide have political and social dimensions that do not lead to easy solutions.

Prior to 1960, UK enjoyed a monopoly as a world class medical centre. In the last three decades, however, the USA became an acknowledged medical referral centre. Most westerners used to think that the best hospitals existed only in Europe and America. Till the early '70s, Indians on the lookout for high-quality health care also looked to UK and USA.

Hospital in the west still possess the most sophisticated medical facilities, but zooming health care costs are driving them out of the reach of many. Now, with both the UK and

USA hard put to rein in the rising costs of health care, many patients looking for affordable yet world-class facilities are turning their attention towards India, with its growing number of well-equipped corporate hospital, at costs far below international rates. More and more patients are coming, for everything from bypass grafting to dental surgery.

The cost comparisons are striking indeed. A bypass grafting can run up bills between Rs. 7 and 15 lakh in any western hospitals. In India, the same surgery costs just Rs. 1.3 lakh. Cardiac imaging in the west is twice or even thrice as expensive as in India.

India, with all its potential and infrastructural facilities is lacking only marginally in technology back-up, but can compete internationally with its vast trained manpower and comparatively cheap services. These hospitals therefore could attract more foreigners to avail of the competent but at the same time cheaper services, thereby, earning foreign exchange and making India a major medical centre.

How fast this happens in the foreseeable future remains to be seen. If it happens, this development is again likely to be at the cost of the people in rural areas who require hospital service most—unless the government steps in to realistically implement its avowed policies declared in the National Health Policy on hospitals and medical care.

HOSPITAL PLANNING TEAM

One must realise in the very beginning that hospital project planning and execution is likely to be a difficult and frustrating task.

All the people involved in the delivery as well as utilisation of services are concerned with hospital planning. The people, patients, nursing, medical staff and the management all have their own peculiar requirements.

Technical requirements of a particular professional group in isolation have led to creation of physical forms limited in their utility. On the other hand, the interest of administrators is attracted by other than technical requirements of patients, community and owners. A critical understanding of these relationships is necessary to blend the differences of pro-fessional prestige, functional requirements and administrative considerations.

Suitably qualified and competent planning staff are scarce to find. And they will need a long time to do the necessary work in a careful manner at each stage. It is a common practice, once the idea of a hospital has taken root, to go ahead too hastily in the preparation of building plans without much deliberation. The result is that when plans come under the scrutiny of the personnel who are going to work in the

hospital, they are found to be all wrong. *Therefore the key feature in planning of all good medical facilities should be the extensive participation of the medical staff in the process.* In the initial stages time spent on spelling out clearly what the requirements would be from the staff's standpoint will save both money and time in the long run. Approximately 10 to 12 per cent of the proposed outlay on construction can be saved if changes at the construction stage or within the short span of commissioning the hospital can be avoided.

The basic reason for the hospital's existence—the patient and his human needs—seem to have been subordinated many a times in design consideration. Hospitals which have been designed only to meet the health professional's needs have failed to develop an environment which meets patient's needs. The planning team's views must relate to this regard for the needs of patients, staff and visitors alike and not to the architect's and the consultant's skill in selling their own plans.

The difference between an overall function and the activity components of that function is often confused. To that extent, there is a need to educate the planning group, especially the nonmedical members of the group, in the description of spaces and activities. The design of a hospital must also meet patients' needs as a human being—his/her social habits, privacy, need for sociability, food habits and so on (Fig. 2.2).

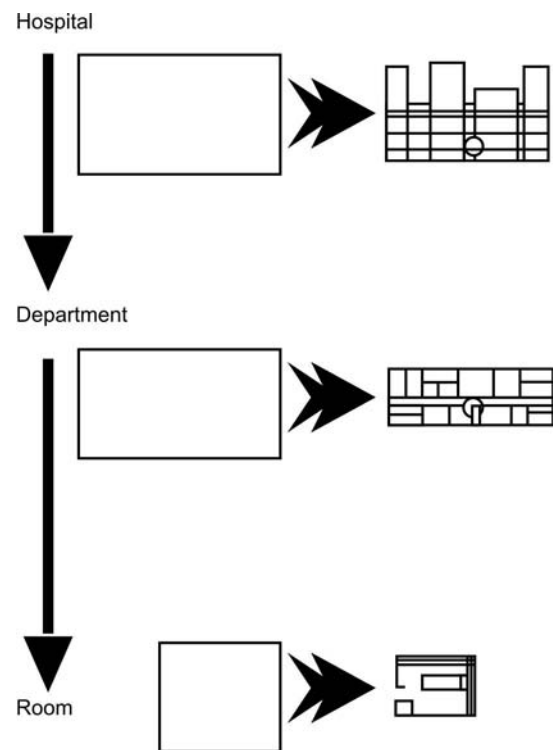


Fig. 2.2: Functional programming system

Because the hospital building language is not understood by doctors, nurses and medical administrators, we have only been lapping up the ideas the architects and engineers thrust on hospitals. Even though the multidisciplinary nature of a hospital project involves participation by professional doctors, specialists, nurses, technical staff, architects, engineers and medical administrators, the lack of a common technical language needed for understanding of the common objective of this group tends to delay progress, because the language and semantics used by various participants of the group can confuse and create ambiguity. Therefore, medical men must first understand the language of hospital project planning before interacting with architects and engineers.

Hospital Consultant

Of utmost importance in planning a new hospital or addition of new facilities in an existing hospital, is the utilisation of a competent hospital administrator-consultant. In Europe and USA, a class of professionals called the “hospital consultant” has emerged separate from the professional hospital administrator. It is a matter of debate whether such strict compartmentalisation is useful, or even necessary. A professional trained as a hospital administrator with adequate experience can profitably combine the job of hospital consultant and administrator. Such a professional is referred to here as a “hospital consultant”.

An experienced hospital consultant would have had opportunities to study the operation of many hospitals and similar institutions, to work in different kinds of situations and to compare ideas and developments with others in the medical care field. He can approach a problem objectively and bring proper perspective both to problem solving and planning for the future. Only the specialised knowledge of alternative methods of doing things, and systematic approach can give the hospital project a fair chance of success on a functional basis consistent with economy.

The medical hospital consultant is able to provide experienced guidance in areas which cover, (i) local and regional surveys of medical and health care, (ii) analysis of the demand and need for hospital facilities, (iii) assessment of the extent and range of services required, (iv) equipment selection, and (v) administrative and organisational relationships.

The first step in planning a hospital project is to assemble a planning team. The nucleus of the team can consist of a hospital consultant, one or two medical and lay administrators, a nursing administrator, and hospital architect. Nurse

administrators feel that nurses tend to be brought in to react to plans drawn up by others, rather than to participate in their preparation. When she is associated from the beginning, the nurse in the planning team is better prepared to guide and support line nursing managers in determining departmental systems.

It has been suggested by some that a social scientist and even a health educationist should form part of the planning team. Whereas their usefulness at the level of national health care planning cannot be denied, their association with the planning team at the hospital level is unlikely to add to the effectiveness of the team.

The Core Group

The hospital consultant and one or two medical administrative personnel would work without other medical members in the early stages of the project. However, this core team will need to be enlarged gradually as the project develops by addition of a hospital engineer, a financial expert, and experts in the respective speciality fields when clinical services are taken up for consideration.

As planning requires understanding of the nature of activities and their impact on each other. It is desirable to funnel information through as small a group as possible, with one person assuming primary responsibility and providing the necessary leadership to keep the process in motion.

Hospital Consultant, Communication and Leadership

Funding bodies, government and community agencies, professional and social groups, suppliers and consumers who are all involved in some stage of the planning process fail to communicate effectively. The role of the consultant therefore, is to maintain progress in decision making by coordinating their work. They must fully understand the proposals and their implications on financial, manpower and other resources.

Many decisions have to be made before the architect appears on the scene. If the planning body has not been able to make such decisions, then it devolves upon the architect to prod the decision making process, to ask the controversial questions, and at times to cajole or bully in leading the way to decision making. Here, it must be understood that architects start by asking questions on the total budget expenditure for the project, for obvious reasons. The initiative must remain with the planning body.

Hospital Architect

The architect has to acquire an understanding of the comprehensive technical and administrative needs of the hospital. His responsibility is to translate clinical and administrative requirements into architectural and engineering realities which encompass site selection, orientation of buildings, supervision of construction, utilities and electrical and mechanical installations. The requirements have to be understood in depth by the architect from the hospital consultant, from which should develop a programme in writing stating clearly all the requirements in comprehensive terms, viz. number of beds, their distribution, departmental needs, area requirements, major equipment, number and type of personnel to be employed, departmental functions and relationships.

An architect can be of value only if he has experience of hospital architecture and construction. There are specialist architects employed at the central and state government levels in the ministry/department of health for work in the government sector. During recent past, architects with hospital experience have also become available in the open market.

Therefore, it will be best to engage the services of architects who are specialists in hospital construction or with experience in hospital projects. As the project goes on, architects and engineers without previous experience in hospital building can be employed in an executive capacity without detriment to the project.

Architectural creativity lies in synthesising all elements into appropriate solution patterns. For a hospital architect, to create a hospital which satisfies the functional requirements of the profession (medical, nursing, administration), meets the cost limits set by the owners and yet retains some quality of architecture, is a task requiring imaginative approach, a high degree of professional skill and ingenuity.

In general, a hospital project undergoes the following phases.

1. Inception
2. Feasibility studies
3. Outline proposal
4. Scheme design
5. Detail design
6. Tender action
7. Construction
8. Commissioning
9. Shake-down.

These phases can be grouped in the following six stages from A to F, with evaluation as the last stage (Table 2.1).

Table 2.1: Hospital project staging

Stage A	
Functional content	: Project team
Outline brief	: Assessment of functional content
	: Submission to owners (Govt, private organisation, etc.) for approval
	: Site appraisals, gross floor areas
	: Building space. Draft master plan
	: Estimation of cost and phasing
	: Appraisal of work by owners
Stage B	
Operational policies	: Operational policies
Development plan	: Departmental and inter-related activities
	: Departmental and hospital policies
	: Development control plan
	: Budget cost
	: Continuous informal discussion with owners through—stage B
Stage C	
Schedules of accommodation, sketches, final cost estimate	: Schedules of accommodation
	: Sketch drawing
	: Equipment schedules component estimates
	: Cost revenue and staffing estimates
	: Final cost approval
Stage D	
Detail design working drawings, tender action	: Working drawings
	: Engineering detail
	: Bills of quantities
	: Calling tenders
Stage E	
Contract and construction	: Assessments of tenders
	: Award of contract
	: Construction
	: Engineering commissioning
Stage F	
Commissioning	: Staff assembly and training
	: Equipment and supplies assembly
	: Testing of installations
	: Opening

ASSESSMENT OF THE EXTENT OF NEED FOR THE HOSPITAL SERVICES

One of the first task of the planning team is collection of data to assess the extent of need for the particular hospital and the range of services required. Such data should usually be available with the existing health care agencies in the government sector with local, district or state health authorities.

There are two methods of assessing the extent of functional need for a hospital. They are (1) the empirical

method which applies the norms of the past and rules of thumb to the problem, with appropriate modifications to suit local conditions, and the (2) analytical method which makes a more fundamental, systematic approach to the problem. The empirical method hinders evolution of new solutions whileas the analytical method lacks the controlling elements of the “norms”. Use of such norms and rules of thumb also tend to perpetuate past faults. The analytical method overcomes some of these faults. In practice, therefore, a combination of the two method will usually be applied.

Relationship between Demand and Need

1. **Demand** for hospital services can be estimated by studying statistical returns of current usage and morbidity statistics.
2. Measurement of **need** for hospital services takes account of a more positive approach by aiming at a quantitative estimation of the amount of illness in the community which would require hospital services.

The term **demand** is commonly used to denote “effective demand”(potential user manages to reach the facility, gets into it and demands service), **and generally equated with utilisation of service**. However, demand should not be equated with need. It is often found that many people who demand care hardly need it (in medical terms), while many people who need medical care do not demand it for various reasons. “Coverage” refers to the proportion of a target group which can utilise the facility or service. The three determinants of coverage are availability, accessibility and acceptability. In developed countries with high standards of medical care, the methods for surveying the need and demand depend on the assumption that demand for care is reasonably close to the need.

This assumption will not be valid in developing countries like ours where medical services are in an intermediate stage of development and in which the need is far greater than the overt demand. In such cases, there is no merit in trying to measure demand as it exists. It will be necessary to estimate the need for medical care on the basis of personal experience, supplemented by ad hoc surveys in the area.

In any case, when the bed:population ratio in a region is less than one per thousand for acute diseases, there is little chance of going wrong in extending the bed complement up to double.

People will choose which facility to attend in an “open” system:private practitioners, private hospitals or government hospitals. However, two points need to be reiterated at this juncture. Firstly, there is a tendency for patients needing

only primary care to demand care at higher level. Secondly, “better service” attracts more patients; given a choice, they will go to a facility providing better service even by spending more money. Because of better service, attendance is likely to increase, and this may further result in lowered quality of care.

Notwithstanding what has been said above the elements that require consideration and analysis are summarised in Table 2.2.

<i>Morbidity Statistics</i>	
Prevalence of	: Communicable diseases : Degenerative diseases : Accidents rate : Specific diseases/disorders
Measurement of	: Death rate : Birth rate : Maternal mortality rate : Infant mortality rate
Demographic	: Age and sex profile : Population density : Occupational characteristics : Extent of urbanisation : Extent of migratory population : Economic development of the area
<i>Socioeconomic statistics</i>	
	: Economic status of the community : Literacy and educational standard : Social habits and sociocultural grouping : Housing conditions : Styles of living : Industrialisation
<i>Hospital statistics</i>	
	: Type of existing hospital services : Admission rates : Disease-specific admission rates : Hospital beds in the region : Utilisation of existing health and hospital services : Extent and effectiveness of general practitioner service

Epidemiological Approach in Medical Care Planning

While applying epidemiological methods in collection and evaluation of scientific evidence relating to health of the population, the need, demand and outcome can only be crudely evaluated. Here, it should be realised that planners

get impatient with the timeframe of full epidemiological studies. Epidemiology also overlooks the tremendous importance of the practical and political limitations to epidemiological calculations-decisions on allocation of resources cannot entirely depend on epidemiological calculations alone. Many important issues remain matters of judgement.

Levels of Medical Care

Level of care is primarily determined by the level of staff in crucial role, i.e. the staff involved in decision making in diagnosis, treatment and referrals. There are four levels of medical care as in Table 2.3.

Table 2.3: Levels of medical care

<i>Level of care</i>	<i>Medical facility</i>	<i>Level of decision maker</i>
1. Primary	Dispensary, Primary health centre or subcentre	General practitioner medical assistant, multi-purpose worker
2. Secondary	District hospital (intermediate) or equivalent	Mostly general practitioner, partly specialists
3. Tertiary	Provincial or similar hospital (regional)	Specialists
4. Quaternary	Institute of research and higher training	Superspecialists, researchers

In practice, medical facilities of higher levels also provide care at lower levels. For example, a superspecialist institute will deliver tertiary care through specialists and secondary care through junior specialists and nonspecialists.³

Factors Influencing Hospital Utilisation

Before proceeding further, it will be worthwhile to reflect upon the significance of the points considered so far.

Social, economic, educational and cultural characteristics of the people and the attitudes of the medical profession influence both the manner in which existing hospital facilities are utilised and the extent of utilisation. However, where hospital facilities fall woefully short of the bare minimum requirement, utilisation statistics do not depict the correct picture.

There is no such thing as a standard population to be served by a hospital although a district general hospital usually serves 150,000 to 350,000 people. The exact size of a hospital's catchment area and of the population served depends on a variety of factors. The following factors affect the manner and extent of hospital bed utilisation, a knowledge of which will be of help during the planning process.

1. **Hospital bed availability:** As opposed to developed countries where utilisation is high because of large availability of hospital beds, in developing countries it is because of low bed : population ratio. A high available bed complement may lead to low bed occupancy rate.
2. **Population coverage and bed distribution:** Since full coverage of population depends upon equitable regional distribution rather than on total number of beds, an even distribution increases hospital utilisation by wider coverage of population. People from scarcely populated areas generally find it necessary to travel to district hospitals or metropolitan towns for more sophisticated type of medical care.
3. **Age profile of population:** A population with a high life expectancy (and consequently a higher proportion of aged persons) tends to raise the volume of hospitalisation. The effect of age on utilisation indices is reflected in an increase in the per person hospitalisation rate and in average length of stay.
4. **Availability of medical services other than hospitals:** Availability of well-organised dispensaries, outpatient clinics, mobile clinics and competent general practitioners reduce the load on hospital beds in an area.
5. **Customs and attitudes of medical profession:** Doctors order admissions primarily for medical reasons. On the other hand, people themselves influence the decision for admissions if a strong "hospital habit" is developed in them, or against admission because of fear of the hospital and unwillingness for separation from family. Physicians' attitude on these matters and their philosophy on early ambulation and home care influence hospital bed utilisation.
6. **Method of payment for hospital services:** Hospital services can be free, on payment by patient directly to the hospital, or by indirect payment through sickness insurance. Hospital utilisation is greatly influenced in the last case.
7. **Availability of qualified medical manpower:** In areas with very small number of qualified doctors, much illness remains undetected, and therefore admission rates are low. However, the customs and attitudes of medical profession and pattern of services available influence hospital utilisation more than the number of doctors.
8. **Housing:** Break up of the joint family system and a trend for nuclear families living in independent apartments result in increasing hospital admission because of inconveniences encountered in caring for the sick person at home. Shortage of home help in nuclear families and shortage of space in modern apartment dwellings are

jointly responsible for demand for hospital admissions in urban areas.

9. **Morbidity pattern:** Acute communicable diseases result in a demand for short stay hospitals, whileas chronic infective and degenerative diseases create demand for long-stay institutions. The former raises the admission rate and bed turnover, the latter needs longer average length of stay.
10. **Hospital bottlenecks:** The efficiency with which supportive services (radiography and laboratory, etc.) support and reinforce the total hospital organisation has direct influence on hospital utilisation. Poor supportive services and cumbersome admission and discharge procedures act as “bottlenecks” and result in longer hospital stay.
11. **Internal organisation:** A high degree of specialisation where specialist departments function as watertight compartments result in segmentation within a hospital, resulting in lesser degree of utilisation due to tight compartmentalisation of beds. This points out the need to provide the greatest flexibility in bed planning.
12. **Public attitudes:** There are certain factors which are of considerable importance in determining where people will go to receive medical care, these are public attitudes. The category includes social and religious attitudes, local customs and traditions, beliefs and mores, and group preferences.

Geographical, Environmental and Miscellaneous Factors

After consideration of the functional requirement, some geographical and other miscellaneous information will also have to be considered (Table 2.4).

Table 2.4: Geographical, environmental and miscellaneous factors

1. Meteorological information
 - Temperatures
 - Rainfall
 - Humidity
2. Geographical information-
 - Existing road and rail communications
 - Terrain: mountainous, riverine, plain
 - Surrounding district boundaries
 - Susceptibility to quakes/ floods
 - Ecology—atmospheric pollutants from adjoining industries and other sources, proximity of sources of noise such as air-fields or rail tracks
 - Building height restrictions due to proximity of airports
3. Miscellaneous
 - : Trained manpower
 - : Availability of Water
 - : Electricity
 - : Sewage disposal

Bed Planning

It is unlikely that elaborate calculations to determine number of beds will be required in starting a new hospital anywhere because nowhere has the bed:population ratio reached adequate levels. Even in cities where it has achieved such figures, more beds are required because of increasing urbanisation and high density of population.

Here, it should be realised that the hospital facilities in an area are not only utilised primarily by the population in the vicinity of the hospital—the direct population, but also by people who will constitute the indirect population in the larger catchment area. When these population factors are worked out, the calculation for total bed requirements can proceed as per guidelines of WHO.

Indices of direct and indirect admissions give the coverage hoped to be attained the assumed average length of stay and the occupancy rate indicate efficiency in the use of services. About 85 per cent bed occupancy is considered optimum.

Example

Data

Direct population	— 6,00,000
Indirect population	— 8,00,000
Admission per year per 1000 Population: <i>Direct population</i>	} — 165 (as per figures suggested by WHO)
Admission per year per 1000 Population: <i>Indirect population</i>	} — 55 (as per figures suggested by WHO)
Average length of stay in days	— 10
Occupancy rate desired	— 85%

Procedure

Admission per year (direct population):	$\frac{6,00,000 \times 165}{1000} = 99,000$
Admission per year (indirect population):	$\frac{8,00,000 \times 55}{100} = 44,000$
Total admission per year	= 1,43,000
Total bed days per year (Total admission × ALS)	} = 1,43,000 × 10 = 1,43,0000
Total bed days per year with 100% occupancy	$\frac{1,43,000}{365} = 3918$
{ Total bed days per year }	365
Total bed days per year with 85% occupancy	$\frac{3918 \times 100}{85} = 4610$
{ Total beds with 100% occupancy }	85%

Deducting the number of already available beds in the region from the figures arrived at will give the shortfall of beds and therefore beds to be planned for that region.

Hospital Size

How big, in terms of the number of beds, should a hospital be?

Between a very large hospital of say 1000 beds or so, which becomes extremely unwieldy to operate, and a very small hospital of say 50 beds or so, a number of bed strength are possible depending on the need of each area. From functional efficiency standpoint, it is advisable to plan two separate hospitals of 400 beds, each with scope for future expansion, rather than a single one of 800 beds. On the other hand, instead of building a small hospital of 50 beds, it would be profitable if these beds are added to an existing hospital in the area under an expansion project rather than a separate hospital. An exception to this would be if the projected demand is much more than only 50 beds, then these 50 beds can start as the first phase of a bigger hospital with appropriate allowances in land requirement and budget provision made.

If too big, the hospital tends to lose human touch and becomes a somewhat soul-less, impersonal, unwieldy machine. At the lower end of the scale, the general hospital should not contain fewer than 100 beds, for it becomes difficult to provide a differentiated service. A hospital of 200 to 400 beds or thereabout enables adequate departments of general surgery, general medicine, eye and ENT, paediatrics and obstetrics, the several departments being large enough to justify the appointment of full-time specialists to the staff.

When it increases beyond 600 beds, it becomes increasingly difficult to maintain a cohesive administrative structure, resulting in diminishing efficiency. However, the Chinese University of Hong Kong advances valid arguments for both small and large hospitals, the solution being dictated by circumstances.⁴ A 1200 beds hospital in, as it were, “the middle of nowhere” makes no sense, but a similar hospital in a densely populated area such as Hong Kong where land is also at a premium is a different matter. A “large” hospital is inevitably more impersonal than a “small” one. But it also has some positive advantages. Capital cost per bed will be lower and nursing cost almost certainly less, there is more flexibility in the deployment of staff, clinics and clinical investigation areas can be strengthened so as to minimise unnecessary admissions, and by vertical development the use of available land can be maximised. In Hong Kong,

there are several hospitals of 1400 beds or more which successfully treat and discharge large number of patients every year. Similar is the case with all our medical college hospitals in India in the government sector.

Civil Hospital, Ahmedabad (Gujrat) is the largest hospital in India, with a bed strength of 2,250 beds, attached to BJ Medical College Ahmedabad with an annual student intake of 250 UG students and having about 500 PG students at any one time. Bed capacity of a hospital is calculated on the basis of beds assigned exclusively for inpatient care. For this purpose, beds in the following are included in the bed count.

1. Observation beds equipped and staffed for overnight use
2. Paediatric bassinets and incubators in paediatric department.

However, beds in the following areas do not form a part of the bed count.

1. Bassinets and incubators in the maternity suite
2. Labour room beds
3. Casualty/emergency department
4. Recovery room
5. Any other which are not equipped and staffed for overnight use.

CHOOSING A SITE

General Considerations

The second task of the planning team will be to choose the site for the hospital. Site is a very important factor for, upon the suitability of it, will depend the hospital's fate and utility in future. With increasing demand on hospital beds, planning for expansion at a future date should always be kept in mind right at the outset while choosing the site.

Therefore, the site should be large enough to enable future expansion and growth. However, strategic sites large enough for the project requirement may be hard to find in urban areas. In dense urban areas, a large site near the periphery of the present town is suitable that will, in due course become central to the major residential areas at a later date. Close collaboration with local town planning authorities will pay dividends in choosing the site.

The earlier idea that a hospital should always be established on an open site is open to question in large towns and cities. The idea was based on experiences obtained from the pavilion type of wards of old where indeed a large plot was required. The social function of the hospital demands that a hospital should be situated in the heart of society.

Accessibility is the most striking need—the location must be within easy reach of the users. This choice means that the hospital does not belong to an empty, uninhabited office area, but in a living and habitable city centre.

Defining catchment areas in large cities is a first step in deciding the location, subject to availability of suitable sites. In crowded localities seldom will there be a building site of the usually accepted acreage (2.5 to 5 acres per 100 beds) available in a central place.

Land Requirements

Determining the requirement of land depends upon many factors. In rural and semi-urban areas, plentiful land may be available permitting the hospital to grow horizontally. However, in urban areas there will always be great premium on land and the only available avenue will be a vertical growth.

Site cover on a plot of land is expressed as percentage as under

Site cover percentage

$$= \frac{\text{Total ground floor area of all buildings} \times 100}{\text{Total area of site available}}$$

However, the degree of crowding on a site is considered in terms of floor area ratio (FAR). It is the ratio of the total covered area on all floors of a building to the total area of the site, i.e. if a hospital building standing on a plot of land measuring 12,000 sq. metre has four floors, each floor having 1,500 sq. metre floor area (total floor area on all floors 6,000 sq. metre) the FAR at this site will be two.

A floor area ratio of **one** represents a building whose added-up floor area of all floors equals the area of the plot of land. This would mean that if a hospital is a two-storey structure, half of the area will be covered with building, and the remaining half available as open space for parking, approach and internal roads, lawns, garden, etc. A plot ratio of **2:1** is the highest that should be considered for hospital development, and that this ratio is acceptable only in the centres of cities, where a high density of buildings is the rule. When a limited site is the inevitable choice for a new hospital, the hospital size has to be limited.

Generally, it will be found that hospitals developed at a plot ratio of 2:1 will give a crowded site, high buildings close to one another, very little open space, and a certain amount of overshadowing and over-looking between the buildings. In suburban and rural areas, a site should be sought that gives plot ratios of 0.5 to one or less. In practice, hospital development with plot ratios between 0.5:1 and 1.5:1 are

economically the best although a few hospitals in our metropolitan towns like Mumbai have been built almost on “postage stamp” sites. Whether the hospital is in rural or urban area, the character of the buildings in the surrounding will also influence the degree of build up on the site.

The question remains, as to which form of construction may be the most efficient—the high-rise or low-rise, and which shape will be appropriate. Economy, functional utility and ease of operations should be the guiding factors. With modern constructional methods, buildings can rise very high, but there are limiting factors too, e.g. cost of building methods, planning bye laws, need to allow for expansion, etc. For city dwellers, the hospital complex of imposing buildings poses no great problem. However, for some who live in rural areas, even visiting the rural hospital can be an alarming event. Many hospitals seems to be more intimidating rather than welcoming.

Big buildings are impressive, however, even smaller size hospitals can be visually comforting. A building can make a good situation better or a bad situation worse. A good hospital building stimulates good hospital care. Many building shapes and configurations shown in Figure 2.3 satisfy the many demands of hospital planning.

There are many advantages in a compact hospital but more the hospital is planned as a single, massive block, the more difficult will it be to make effective provisions for

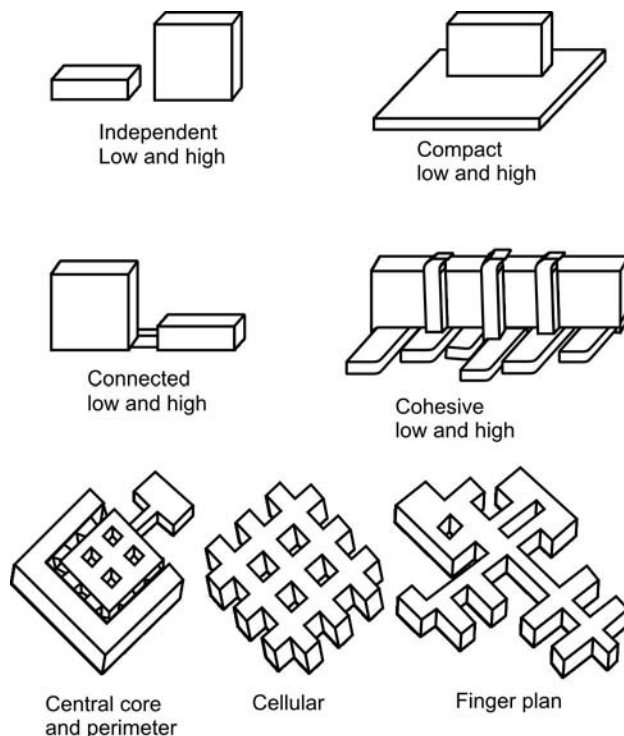


Fig. 2.3: Building shapes for hospitals

growth and change. The concentration of departments close to one another means that only a very little space is available for each to expand into. Further, concentration makes it inevitable that the buildings go up to a fair member of storeys, and to add to a department on the fourth or fifth floor of a block is always difficult and sometimes impossible. If such a department needs to be expanded, it means taking over space from some adjoining department above or below it. This will involve massive redistribution and reorganisation of many departments. Therefore, it is necessary to weigh very carefully the advantages and disadvantages of concentrated versus diffused types of structure. The principal factor in the decision is the predicted amount of change.

Soil Structure

In the selection of site, two very important factors that should be looked into the level of subsoil water and the structure of the soil. A preliminary soil survey to determine subsoil water level and the "bearing" quality of the soil will help determine the type of foundation, possibility of constructing a basement, and effectiveness of sewage plant (if it is to be built on the site).

Public Utilities

Three other important considerations in site selection are the availability of water supply, sewage disposal system and electric power.

Water

Water is required for patients and patient care activities in wards and also for the supportive services. The national building code of the ISI suggests 455 litres of water per consumer day (LPCD) for hospitals up to 100 beds and 340 LPCD for hospitals of 100 beds and over.⁵ For planning purposes, the overall requirement of water in hospitals is estimated at about 300 to 400 litres per bed per day. If staff quarters and nurses' hostel are going to form part of the hospital complex, additional availability of water for these will have to be ensured. Storage capacity for three days requirement must be build at the site.

Sewage Disposal

Liquid and semisolid effluent in the hospital originate from all departments and service areas. Solid waste from hospitals is approximately 1 kg per bed per day. Liquid effluents will be about the same as the hospital's requirement of water, i.e. between 300 to 400 litres per bed per day. If a public

sewage disposal system is in existence in the area, the hospital sewage disposal will be connected to this system. Otherwise, the hospital will have to build and operate its own sewage disposal plant.

Power

Requirement of electric power is minimum 1 kW on a per bed per day basis. This includes the needs of all departments and services including power requirement of X-ray department, operation theatres, laboratories, central sterile supply department, laundry, and kitchen. A hospital with many life-support systems cannot afford to remain without power even for a short-time. It is preferable that power supply should be available on a multigrid instead of the unigrid system in general use, so that a continuous supply of electricity is assured to the hospital at all times. Besides this, stand-by generator is also a necessity.

Electrical Substation

A hospital will have its own transformer and electrical substation for distribution of power to various areas. The total substation area depending on the transformers capacity is given in Table 2.5.

Table 2.5: Area for electrical substation

<i>Transformer capacity</i>	<i>Area for transformer</i>	<i>Total substation area</i>
1 × 500 kVA	24 sq. m.	80 sq. m.
2 × 500 kVA	36 sq. m.	130 sq. m.
2 × 800 kVA	40 sq. m.	135 sq. m.
2 × 1000 kVA	40 sq. m.	150 sq. m.

THE MASTER PLAN IN ITS TOTALITY

The third task of the planning team is to prepare the draft master plan document.

It is never possible to achieve perfection in planning, and the best compromise may have to be adopted. Once the results of studies based on data so far collected become available, and after careful consideration of various other factors so far considered, the architect will have enough basic material to prepare a draft master plan for the site as a whole. Preparation of a master plan is more or less equivalent to an exercise in town planning on a miniature scale. Although the details of functional requirements of wards, departments, and services are not known in precise terms at this stage, the hospital architect should be able to calculate the approximate volume of each building.

A master plan takes into consideration the future development of the hospital. By now it will be apparent whether it can develop into a concentration of multistoreyed blocks, or be a comparatively loose conglomeration of spread-out structures over larger areas on the ground employing low buildings. With these the master plan should take into account the circulation routes, areas to be allotted for each department, relative dispositions of departments into functional zones, compactness, also considering light, wind, hospital engineering and hospital hygiene aspects.

CIRCULATION ROUTES

The utility and success of hospital plans depend to a large extent on the circulation routes on hospital site and within buildings. Wayfinding in hospitals is a major problem for most new patients and many old ones too, leaving them with a feeling of helplessness and frustration.

To ensure placement of departments and equipment in proper relationship, flow charts depicting movements of patients, personnel and visitors should be developed for predicted movements *between* departments and *within* departments. These charts should be provided to the architect and checked later against his preliminary drawing.

A basically linear circulation system simplifies the development of the project in stages. There are two types of circulation in the hospital: internal and external.

Internal Circulation

Internally, traffic routes are required for linking major clinical departments for use by patients and staff, and for delivery of supplies to these departments. The circulation space involves corridors, stairways and lifts. Corridors with less than 8 feet width are not desirable in hospitals, and protective corner beading is a necessity in hospital corridors.

A large volume of internal traffic in hospital involves use of patient trolleys. Supplies and stores are also moved on trolleys. In multistoreyed buildings, provisioning for vertical movement of patient trolleys has, therefore, to be catered for. In high-rise buildings the problems of internal circulation arise from wide dispersion of vertical circulation points. It may be economical in effort to concentrate lifts at one place than distribute them among different parts of the building: four lifts banked together will give the same service as eight individual lifts scattered at separate points. Two lifts are the minimum for any multistoreyed buildings. In not so high buildings, planning for ramps for trolley traffic (rampwell) must also be considered in addition to the stairwell.

The point to remember while considering internal circulation is that internal traffic should remain orderly, and there is no undue criss-crossing of the patients, staff, supplies and visitors. Use of multi-storeyed buildings is more economical than low buildings connected by long corridors and scattered lifts. In the linear spine concept of a building, additional departments are entered from a central spine, which may have several levels. It steers the circulation, takes the hospital growth easily, and labyrinthine patterns, so common in large buildings, are avoided. An example of the linear spine concept is depicted (Fig. 2.4).

In considering the feeling of getting lost in the labyrinth of a large hospital, the hospital is compared to a village where its central focus is the high street or the market square, wherefrom everyone living or visiting the village are able to orientate themselves.⁶

Planning for efficient internal circulation should therefore consider a central recognisable main communication artery serving the whole complex, which cannot be confused with departmental corridors. But it is quite surprising that entrances to major departments in hospitals are given so little prominence and so little identity.

The entrance door to a department should be approached through a “pause space” which serves as a transition between the public and the private domain. Like the transition from outside to the hospital is through the main hospital entrance, so the transition from the hospital street to the department should be through its distinctive pause space.

Ramps, steps, stairs: Handrails must be provided on both sides of steps and stairs, and should extend beyond the first and the last steps on at least one side. Hard, level, nonskid

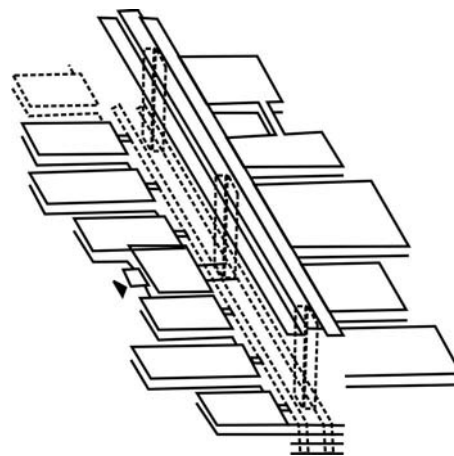


Fig. 2.4: Illustration of the linear spine

surfaces are essential for steps and stairs, and handrails must not be of slippery material.

External Circulation

Only one entrance to the hospital for vehicular traffic from the main road is desirable. Provided the entrance and exist points are wide enough to take two lanes of traffic, one entry has the advantage of clarity for all visiting traffic, and one exit the advantage of security from administrative viewpoint.

The volume of external traffic reaching a hospital is quite enormous. Not only the patients but supplies, ambulances, staff and visitors need access to the hospital at different points. Supplies and stores also arrive on handcarts, pushcarts, rickshaws and other vehicles. Patients, their attendants and visitors come to hospitals in a variety of transport. Therefore, appropriate areas have to be earmarked for scooter, car, rickshaw and bicycle parking facilities for patients, visitors and staff.

The main bulk of hospital stores are delivered at one or two central points. Independant access will be helpful in transport of heavy or bulky articles directly to the point at which required. These could also be useful to bring in fire-fighting vehicles in case of fire in the hospital.

The circulation routes will be influenced by the orientation of the site, e.g. a site with its broadside facing the main entrance from the road, a narrow site at right angle to the main road, or a site which is irregular in spread and level. Some site may be sloping, but a sloping site is not necessarily a disadvantage. The architect can exploit it by planning part of the structure on stilt columns and using the basement for car parks, goods delivery points, soiled disposal, and storage.

DISTANCES, COMPACTNESS, PARKING, LANDSCAPING AND VISUAL IMPACT

Distances

Distances must be minimised for all movements of patients, medical, nursing and other staff and for supplies, aiming at minimum of time and motion. Similarly, the routes which the patients will have to take on stretchers, wheelchairs or on foot from their wards to the radiography department, laboratory and physiotherapy require careful thought to minimise the length of these routes.

Compactness

Functional efficiency and economy depend also on the compactness of the hospital. Horizontal development demands more land involving extra costs in development and installation of services, roads, water supply, sewage, electric lines and so on. From this angle, multistoreyed construction has the advantage of being convenient because of compactness.

Parking

For each inpatient bed there is likely to be at least one visitor a day. For each inpatient bed, there will be about 3 outpatients, many of them coming in cars, taxis, three-wheelers and two-wheelers. One car parking space per two beds is desirable in metropolitan towns, lesser in smaller urban areas whileas much less in semiurban and rural areas. Additional parking for three-wheelers, scooters and motor cycles and separate parking for bicycles and rickshaws should be considered.

Employees and staff parking areas are preferably separated from public parking.

Landscaping

The psychological effect of the visual impact of attractive grounds, buildings and surroundings on patients, visitors and staff cannot be underestimated. If possible the building is best located on a relatively high ground, the elevation being not so great to be a handicap for those approaching on foot.

The site should permit orientation of the structure in such a way that most of patients' rooms will derive maximum benefit from natural light, and maximum advantage should be taken of the prevailing wind for natural ventilation. In the tropics, the long sides of buildings occupied by patients should face north and south as much as possible.

Deft use of sloping sites can be made by the architect for car parking, temporary refuse storage, and recreational activities.

Visual Impact

Architectural handling of the design determines the visual impact of the hospital. The architect has the opportunity to give visual expression to the human units of which the hospital is composed, or suppress these divisions in the interests of uniformity. For instance, in designing a ward building, he could allow each nursing unit individual expression on the facade of the building, or by giving each

unit an identical series of windows, he could carry uniform architectural treatment over the whole.

Linearity

Linearity exhibits a high degree of stability with reasonable adaptability. The image of a hospital designed linearly will be low, and not monumental.

The problem of giving form to a hospital offers an opportunity to the architect to create a unique institution. The central problem for the architect is understanding the relationship between the hospital and its environment, and how to mould this into correct form.

ZONAL DISTRIBUTION AND INTER-RELATIONSHIPS OF DEPARTMENTS

Each major department, clinical area, supportive units and administrative units have to be distributed over the site in appropriate zones to group them in such a manner that they are related to each other in contiguity and proximity.

The departments which come in close contact with the public should be isolated from the main inpatient areas and allotted areas closer to the main entrance to the site. Such departments are the outpatient department and accident and emergency or casualty department. The supportive service departments, viz. the X-ray and laboratory services are extensively used by outpatients and need to be located as near the outpatient department as possible, at the same time integrated with the main inpatient wards. Therefore, these departments need to be located in such a way that they are approachable by separate entrances by outpatients as well as through inpatient areas, but preferably closer to the outpatient department.

Beyond this, from the main entrance should be the main inpatient zone which will consist of ICU, wards, operation theatres and delivery suite. This zone will be as far away, and therefore isolated, from the hubbub of activity that takes place in areas proximate to the main entrance to hospital site.

The other supportive and clinicoadministrative departments in the hospital consist of the hospital stores, kitchen and dietary department, pharmacy, central sterile supply department (CSSD), engineering services, workshop and laundry. Central services, especially the heavy duty service departments are better located on the ground floor—they include laundry, CSSD hospital stores, pharmacy, kitchen and cafeteria. These departments should be preferably grouped around a service core area. Not each and every one of such departments described below will form part of every hospital. Smaller hospitals will have only the most

essential services areas, whileas a large hospital may incorporate all of them.

Hospital Stores

If the volume of stores is only a few days' consumption requirement and remains small, the various items of stores—rations and vegetables, linen, drugs and dressings and laboratory supplies can be kept in the respective storage areas in the kitchen, laundry, pharmacy and laboratory respectively. When the bulk of these goods is high, it is necessary to design a central place as hospital store. This will depend upon the hospital's philosophy on materials management. The central store should be approachable by supply vehicles and should therefore have separate service entrance. The risk of fire and explosion in a medical supplies storehouse, storage of acids, inflammable materials and oxygen and other gas cylinders will require special attention while earmarking for such stores.

CSSD

Central sterile supply department (CSSD) mostly serves the operation theatres, but its other users include the emergency and casualty department, the wards and maternity suite and should be so sited as to be central to all these.

Hospital Kitchen

It will have to be located taking into consideration the prevailing wind direction so that smoke and kitchen odours are not constantly wafted to patient care areas. The best site for a kitchen is at the ground level. However, kitchens on first, second and higher floors are in existence, with stores located on ground floor and connected to the kitchen with lift.

Hospital Workshop

A large quantum of various types of mechanical and electrical equipment is installed in a hospital and requires repair and preventive maintenance. Even if the major installation, plant and equipment may have maintenance and repair contracts with outside agencies for maintenance, some equipment will from time to time require repairs by the hospital's in-house maintenance staff. No large hospital can function satisfactorily without a workshop.

Laundry

Mechanical laundries are becoming popular with larger hospitals. Used linen from wards, operation theatres and

delivery suites may be infected, and therefore needs careful handling at an area remote from all other clinical and supportive services departments. If the indigenous *dhobi ghat* type of laundry arrangement are planned, then space for *bhatties*, *dhobi-stores*, drying sheds and ironing rooms have to be catered for at an appropriate area, preferably at a remote corner of the site with plentiful supply of water.

Miscellaneous

There are some more points that remain to be considered for zonal distribution at this stage. They are as follows:

1. Medical Gases

A reliable supply of medical gases and vacuum is a pre-requisite for a modern hospital. Medical gases for patient care activities in hospital include medical oxygen, nitrous oxide, carbon dioxide, medical grade air and vacuum for suction. All these (except suction) are provided in metal storage cylinders.

Medical air: Compressed air is required to operate surgical instruments such as pneumatic drills and saws in operating rooms and procedure rooms. Air is also used to run ventilations in ICU and other units.

Carbon dioxide: It is injected during laparoscopy, endoscopy, arthroscopy, etc. to enlarge and stabilise body cavities for better visibility of the surgical field in laparoscopic surgery.

Manifold system: When a large scale continuous supply of various gases is needed, two or more cylinders of the gas are connected to one another and their common outlet is connected to the central piping system through a control panel. Such an installation is called a 'manifold' (oxygen manifold, nitrous oxide manifold, etc.), and the entire pipeline system including the manifold is referred to as the 'manifold system'. The objective of the medical gases manifold system is to provide adequate *quantity* of medical gases (including vacuum suction) at appreciate *pressure* at all outlet points. The manifold system is a network of pumps, compressors, pressure regulators, cylinder manifold and a maze of pipes.

Location of medical gases manifold system: Location of the manifold system is always on the ground floor. Oxygen and the anaesthetic gases being flammable, the location should be away from kitchens or place with open flames, locations storing combustible materials, electric substations or power transformers, and areas of critical patient care.

Handling of compressed air and gases is covered under the Explosives Act. Therefore, sanction of the

Department of Explosives of Govt. of India in necessary for the manifold system.

Pipelines carrying medical gases/air and vacuum for suction are coloured in different colours as per internationally accepted colour coding standard. The following is the colour coding.

Colour coding of gas pipelines distribution system

Item Colour of pipeline

• Oxygen	–	Yellow
• Nitrous oxide	–	Dark blue
• Compressed air	–	Sky blue
• Vacuum	–	Sky blue

- Size and location of water storage tanks—whether underground, overhead or roof mounted. Storage capacity should be at least three times the total daily requirement.
- Location of the hospital incinerator where trash and infected material will be burned.
- Boiler house for supply of steam to laundry, CSSD and kitchen.
- Garages for ambulances and staff vehicles.
- Mortuary for storage of dead bodies, and postmortem room.
- Residential campus for specialists, residents, nurses and other essential staff.
- A "community centre" with grocery and fruit shop, barber's shop, newspaper and bookstall, chemist shop, and a community hall.
- Dharamshala* or choultry for attendants and relatives of the patients to stay.

All of these may or may not be required in all hospitals. Each of these will be dealt within adequate detail in chapters to follow, except the last three which are considered below. Basic requirements in respect of engineering service department (covering civil mechanical, electrical, engineering department and the like) for a general hospital have been recommended by ISI in their standard IS:10905-part-I.⁷

Considering the Requirements of Residential Campus, Community Centre and Dharamshala

Residential Campus

The necessity to provide residential accommodation to various categories of staff within the hospital complex rests on the need of the individual hospital. In a sprawling hospital complex with a teaching centre, it may be essential to provide residential accommodation to all grades of medical staff, nurses, as well as student doctors. In such a case, it may

be better to have the residential campus near but outside the boundary of the main hospital.

On the other hand, no residential accommodation need be provided if availability of staff can be ensured on shift duties or on as required basis. In between these two extremes, there are many possibilities and each hospital has to decide its requirement in the light of its own peculiar needs. Today it is not considered essential for more than a small number of people to reside within the hospital site. On the other hand, for hospitals developed in areas remote from urban centres, many of the staff members may leave if residential accommodation appropriate to their status is not available.

Nevertheless, it is necessary to provide substantial on-site accommodation for the nursing staff and full accommodation for student nurses. The extent of housing to be provided for the nursing staff will depend upon local housing conditions, viz. availability of suitable accommodation on hire in the vicinity. In the past, a hostel for single members of nursing staff on the campus was usually enough, but not any more now. Due to changing social trends, more and more nurses are getting married, and the proportion of nurses getting married but still wanting to continue the service is increasing. Many nurses' hostels attached to hospitals built 20 to 30 years ago are not fully occupied, because the married nurses cannot get into such hostels.

Community Centre

In future hospital projects, it is necessary to provide for a facility that combines a recreational facility with a small shopping centre to meet the needs of the patients and also of the staff. Such a facility may be called the community centre. The centre may have a hair dresser's parlour, a bookstall and newspaper stand, fruit shop, flower shop, and a canteen where light refreshments and beverages are served. A grocery and general merchandise shop can also form part of this centre. A chemist's shop should be available on the premises from where medicines prescribed and not supplied by the hospital pharmacy can be purchased.

A recreational facility that can be provided in this centre includes the community hall. A community hall serves the purpose of an indoor recreational centre for the hospital's community for various functions, including public relation activities, meetings, exhibitions and so on.

Dharamshala

In most of the developing countries like India, a vast majority of patients seeking hospital services come from far flung

rural areas. The relatives of such patients who have to accompany them virtually live within the hospital campus thereby converting it into a perpetually temporary "camp" with its obvious hazards. For others having no place to stay, the pavements outside the hospital look so inviting to them. This is a common site in all our large hospitals including institutes of national importance.

An institution which can provide temporary shelter to patients and their relatives, a *dharamshala* (choultry) or *atithigriha* has now become necessary as an extension of the hospital, where relatives and attendants of patients can stay for a minimum period. Such an institution existed in the western world in the past as the "medical inn". Where there is always pressure on available beds, an added advantage of such a *dharamshala* is that it serves as a preadmission lodging facility where patients from far flung areas can stay during the stage of investigations before admission. It can also serve in the same way to enable the discharged patients to attend the hospital for immediate outpatient follow-up.

The *dharamshala*, for obvious reasons, must not be located within the hospital complex. A suitable nearby site should enable people to come to hospital within a short time without the need of any transport. For this purpose, a site at a walking distance of five to ten minutes should be acceptable.

The number of rooms to be provided will be governed by the hospital size, type of clientele, popularity of the hospital, and extent of the hospital's "catchment area". Accommodation should be provided in single rooms, each with a small anteroom, and two to four beds for a family. Toilet facilities can be centralised for a group of such rooms. It is also desirable to have dormitory type accommodation in large halls for single persons. Community facilities like adequate number of water taps, bathrooms and latrines will have to be provided. Cooking platforms sheltered from the elements will enable the people to cook their food.

GROSS SPACE REQUIREMENTS

A major mistake in planning is to attempt somehow to meet pressure for beds, which is a dominant requirement, without giving equal consideration to supporting facilities. Hence, one simply moves from crisis-to-crisis. Some years ago, from 500 to 600 net square feet per bed was relatively adequate. With development in the medical and administrative sciences, the minimum total has increased to 700 to 900 square feet per bed.

In some densely populated urban centres in advanced countries, the average floor space per bed in hospitals constructed in the 60s was 55 to 60m² (550-600 square feet). The current ratio of floor space occupied by wards, outpatient department, diagnostic and therapeutic services, administrative services and services departments is shown in Table 2.6.

Table 2.6: Distribution of floor space by wards and departments

Wards	OPD	Diagnostic and therapeutic	Administrative	Service depts.
37-45%	12-18%	18-22%	8-12%	15-20%

Each unit must get essential space for the determined volume of service, for the specified numbers and categories of workers, for working room, for placement of equipment and furniture and for storage of supplies.

Space requirements for various units and departments can be arrived at only when their functions, programmes and activities are clearly understood. For inpatients, functionally 100 square feet per bed in general hospitals has been accepted as area essential per bed, with 75 square feet as minimum for beds located in rooms with four beds or more. The total hospital area works out to approximately ten times this.

Approximate breakdown of hospital space is given in Table 2.7.

Table 2.7: Break-up of space requirements—General hospitals

Area	Sq ft per bed
Nursing units	250 – 280
Nursery	12 – 18
Delivery suite	15 – 20
Operation theatres	30 – 50
Physical medicine	12 – 18
Radiology	25 – 35
Laboratory	25 – 35
Pharmacy	4 – 6
CSSD	8 – 25
Dietary	25 – 35
Medical records	8 – 15
Housing keeping	4 – 5
Laundry	12 – 18
Mechanical installations	50 – 75
Maintenance workshop	4 – 6
Stores	25 – 35
Public areas	8 – 10
Staff facilities	10 – 15
Administration	40 – 50
Total	567 – 751
Circulation	115 – 140
Total net area	682 – 891

Add walls, partitions: 95–125 sq ft

Gross total area (*Building gross*): 780–1005 sq ft
(72.50 to 93.46 sq mtr)

A building gross square footage figure includes everything within a building’s perimeter, viz. stairs, corridors ducts, wall thicknesses and mechanical areas.

Taking the liberal figures of 1000 sq feet per bed the land requirement for a 500-bedded hospital would be as follows—

1. At floor area ratio of 0.5 to 1: about 22 acres
2. At floor area ratio of 1.5 to 1: about 6 acres
3. At floor area ratio of 2 to 1: about 4 acres.

Indian Standards Institution in their standard IS 10905 Part-I have recommended an area of one hectare for every 25 beds.

Space Requirements of Some Basic Departments and their Inter-relationships

Five functional areas need to be given special attention in respect of siting and space requirements. These departments are: (i) outpatient and casualty department, (ii) main inpatient wards, (iii) laboratory, (iv) operation theatres, and (v) radiology department. These departments form the very core of any hospital.

Internal structural details will become apparent only after the preparation of working drawings later, but the requirement of approximate volume of each department and building will have to be assessed at the stage when the master plan document is being prepared. In this endeavour, the architect will be guided by the planning team.

OPD and Casualty

With limited bed availability, hospitals have to take on a large load of patients on outpatient basis. An OPD gets patients as emergency cases, cases who report on their own, i.e. unreferred cases, and referred cases. In a general hospital say, a district hospital, about 40 per cent of patients attending OPDs need referrals to specialists and the remainder may be dealt with and disposed of by general duty doctors. Therefore, facilities for screening of all OPD patients should be planned lest specialist clinics get overburdened with cases that could be disposed off in general OPD clinics, especially in large hospitals.

This purpose is served by a polyclinic system and the structural requirements of the OPD incorporating the polyclinic will depend on the number of specialist departments. OPD is a fast growing component of the hospital. Therefore, it is necessary to provide for expansion of the department. In many cases, outpatient departments

built only some years back have been found to be too small within few years because of increased demand, growth of specialities and desirability of carrying out increasing range of investigative procedures on OPD basis.

Therefore, the OPD has to be planned with a measure of adaptability in its internal arrangement as well as a capacity for growth. A multistoreyed building may not be suitable for the OPD and a single-storey structure may be more practical from this point of view.

On an average, 2 to 3 outpatients for each hospital bed attend the OPD per day. Space will be required for a reception and enquiry counter in the main waiting area near the OPD entrance. The number of examination rooms will depend upon the expected load. The “**holding capacity**” of a OPD needs to be considered keeping in view the number of persons that accompany each patient. Generally, each patient is accompanied by one, two or sometimes even more attendants, friends and relatives. In a OPD which expects 100 outpatients a day, place for up to thrice that number may have to be considered in respect to main waiting area, subsidiary waiting areas, toilet facilities, parking facilities and for the smooth flow of large numbers. However, as all outpatients do not arrive at the same time, the facilities will have to be planned on the basis of peak time loads.

A minor operation theatre to attend to minor surgical conditions will be an integral part of the OPD. Other adjunct services that form part of the OPD complex are laboratory specimen collection centre, injection room, dressing room, plaster room and pharmacy.

As part of the administrative back-up, space for registration counters and for OPD medical records have to be catered for at appropriate places. In a polyclinic system, there may be one main registration counter with subregistration counters for each specialist clinic. Similarly, the requirement for OPD medical records will depend upon whether it is planned to hold them at one central place or stored at specialist clinics.

Office space for OPD coordinator in large hospitals: a great deal of coordination on a continuous basis between various constituents of the outpatient department is required for which an outpatient department administrator or coordinator is appointed. Office space will have to be provided for this purpose in the OPD.

Inpatient Service

It is desirable to group all inpatient accommodation together. Excepting for paediatric, maternity, infectious diseases and psychiatric service whose needs have special characteristics,

all other types of patients can be cared for in accommodation basically similar in its plan and equipment. A ward is a temporary home to the patient. It is also a nursing unit, and the planning of such units should be based on the work of the nursing staff.

Bed distribution: It has been generally found that about 165 out of every thousand population will be hospitalised for an average of about seven days each. The number of beds necessary to care for this number will be about 3 to 4 per thousand population.

Determining the bed size of the hospital is governed by the service capacity to be provided which itself will depend on the projected number of admissions and consultations. Admissions and consultations will reflect in the number of beds and consulting rooms that would be necessary. Making calculations for beds will require data on the morbidity pattern in the dependent population and the average length of stay. With this information available, beds per 1000 population required for a given population in a given region is calculated by the following formulae:

$$\text{Bed : population} = \frac{A \times S \times 100}{365 \times \text{PO}}$$

- where, A = number of inpatient admissions per thousand population per year
- S = average length of stay (ALS)
- PO = percentage occupancy.

It must be realised that this method is useful in areas in which reasonably satisfactory hospital coverage facilities are in existence and accurate statistics are available. In areas where existing bed:population ratio is less than one bed per thousand population the requirement of beds can only be need-based.

Bed distribution among various specialities will vary from hospital-to-hospital. It has been generally observed that the distribution of patients in general hospitals conforms to the following range.

Medical	30–40 per cent
Surgical	25–30 do
Obstetrical	15–18 do
Paediatric	10–12 do
Miscellaneous (including Eye and ENT)	10–15 do

There is no universally accepted formula on the breakdown of beds into various disciplines. The distribution must be based on the actual needs of the area in which the hospital has to function. However, as a starting point of the exercise, the following distribution is suggested for a general hospital (Table 2.8).

Table 2.8: Percentage of distribution of beds

<i>Disciplines</i>	<i>Percentage</i>
Medicine	30
Surgery	20
Obstetrics and Gynaecology	17.5
Paediatrics	7.5
Orthopaedics	2.5
Eye	5
ENT	5
Dermatology	2.5
Emergency	2.5
Isolation	5
Psychiatry	2.5
Total	100

A concept that has been found to be useful from bed utilisation point of view is that some percentage of beds (up to 20%) may not be assigned to any particular speciality permanently. This practice enables such beds to be used interchangeably, mainly for general medical and surgical services and offers flexibility in bed utilisation.

Nursing units: Variations in utilisation of beds from one discipline to the other from time-to-time necessitate reallocating hospital beds amongst various disciplines. This can be carried out without problem if the nursing units are of a similar pattern and if there are no special design requirements between nursing units. There is a great advantage in having a standard ward unit. If each speciality had accommodation designed only for its own specialised requirements, it would be impossible to readjust beds among specialities. It is economical to construct and maintain a building composed of identical nursing units.

Maximum observability of patients by nursing staff, and reduction of “nurse fatigue factor” by minimising movements of staff between patient beds and other areas are the basic principles behind planning of ward units. For administrative as well as technical control, two or more of these could advantageously be combined on one floor.

The old pavilion type of ward (the Nightingale ward) has gradually given way to other types of nursing units which include the Rigs pattern, the “racetrack”, semicircular, circular and other patterns.

Apart from a nurses station, ancillary facilities in a patient care unit include the bathrooms and toilets, dirty and clean utility rooms, pantry, dressing/treatment room, linen and store room, toilet for staff, office for head nurse, an interview room which can also be used as a seminar room. Spatial relationship of all these to each other has to be thought of at the outset.

There is no agreement amongst planners and administrators on the ideal size of a ward unit. Although a large unit of say 35 to 40 patients may lead to loss of personal contact between the nursing staff and patients, smaller units require greater number of nurses, and the design of a hospital of this purpose presents difficulties. It is uneconomical to provide full set of ancillary rooms for very small units. It is convenient as well as economical to plan ancillary accommodation to be shared between two or more units. However, a functionally minimum number of one-bed and two-bed rooms must be catered for serious patients and patients with special nursing requirements.

Certain variations from the general description given above are required for paediatric, maternity, psychiatric and orthopaedic nursing units and intensive care units. The peculiar requirements of some of them are dealt with separately at appropriate places.

Operation Theatres

As a high standard of asepsis is required to be maintained, it is advantageous to group the operating rooms together in one area, keeping in view the concept of protective, clean, aseptic and disposal zones. A good standards of air hygiene also requires recourse to artificial ventilation (air-conditioning). This is achieved economically by pooling all the operating rooms together in one complex.

Majority of operations—including ophthalmic, ENT and orthopaedic—can be carried out in well-designed standard operating rooms which also provide maximum flexibility in their use. However, in large hospitals, at least one or two operating rooms should be larger than the rest to facilitate wheeling in of bulky equipment for specialised surgery. The number of operating rooms will be dependant on the number of surgical beds. On an average an operation theatre can cater for a mix of 4 to 5 major and minor operations per working day.

Beside the operating room itself, the operation theatre consists of a lay-up room for preparation of instrument trolleys, a wash-up room containing sinks and disposal containers where used instruments and dirty material is passed on, a scrub-up room where surgeons and theatre sisters scrub up and put on sterile gowns, gloves and masks, and an anaesthesia room equipped for use by the anaesthetist.

Apart from the above, the operation theatre contains changing rooms separately for medical and nursing staff, toilets, store rooms, common room-cum-rest rooms and office for the theatre superintendent.

If in the whole hospital only the operation theatres are air conditioned, it is advantageous to have a central air-conditioning plant for operation theatres, and space for this plant will have to be earmarked in the vicinity of the operation theatres.

Laboratory

Laboratory tests are ordered for diagnosis and assessment of response to treatment. A well-planned and equipped laboratory can reduce the running costs of a hospital by reducing length of stay of inpatients by rapid return of investigation results facilitating early diagnosis. By its link with the outpatient department, it can also reduce the number of patients admitted solely for laboratory investigations.

Many a times a false sense of economy is sought to be achieved by curtailing the space requirements of the laboratory by shifting it in an insignificant corner of the hospital. Rapid developments in diagnostic laboratory methods are taking place resulting in increasing demand for space and equipment. To reduce potential health hazards due to the very nature of tasks performed in the laboratory and to obviate laboratory accidents, a hospital laboratory space needs to be provided on generous lines.

The laboratory be so located that it is easily accessible to all clinical departments. Laboratory service is extensively used by outpatients and therefore should also be easily accessible to the outpatients. Separate entrance for the outpatient and inpatient areas are desirable.

A hospital laboratory consists of clinical pathology microbiology, biochemistry, haematology and histopathology sections. To serve these sections, associated service areas, *viz.* rooms for media preparation, washing facilities, sterilisation and storage will be required.

For patients sent to the laboratory, provision for waiting rooms and toilet facilities has also to be catered for. Staff requirements such as common room, changing rooms, and toilet facilities will also be part of the laboratory. Administrative areas will consist of specimen receiving counters separately for outpatients and inpatients, result distribution counters and office space for pathologist. And lastly, accommodation for laboratory animals will be required in separate building adjoining the laboratory.

Although artificial lighting would still be required, the laboratory building can be oriented to natural light. This is possible by providing adequate window space but taking care to minimise excessive solar glare.

Radiology Department

Radiology department is used by outpatients, inpatients and emergency cases. Therefore, like the laboratory its sitting

should take into consideration ready accessibility from all wards, OPD and casualty department.

Space requirement of the department depends upon number of X-ray machines to be installed, expected number of X-ray per machine for outpatients and inpatients, number of dark rooms required, and whether automatic film-processing unit is to be installed. It is economical to plan one dark room between a pair of X-ray rooms. It is worthwhile to consider sectioning the department into two sections without physically separating them, one for catering for accident and emergency cases at all hours and for urgent OPD cases, and the other for catering to the needs of inpatients and OPD cases with appointments.

A proportion of patients to this department will come on wheelchairs and trolleys. Liberal corridor space is needed for patients on trolleys, and a "trolleys waiting area."

All radiology departments have potential radiation hazards. The design of the radiography rooms and directional placement of X-ray machines in them have to be done to reduce scattered radiation to the minimum. It is advisable to study the regulations laid down by the Atomic Energy Commission or by other regulatory agency. At present no regulatory agency has a role in certifying the safety of a radiodiagnostic facility and the amount of undesirable radiation that such a facility can unintentionally cause is anybody's guess.

Ancillary accommodation includes a room for reception and registration of patients, a storage room protected from stray radiation for storage of (unexposed) radiographic films, a separate room for storage of chemicals and preparation of solutions, and a record room for old radiographic films and records. There will be the radiologist's office (one for each radiologist) where films are viewed. There will at least be one mobile X-ray machine in any hospital, and this will require a room to store it. Barium examinations need a separate set of rooms consisting of barium meal and enema preparation area, room for rectal wash-out, a toilet and WC and a rest room for patients.

One or two spare rooms should be planned in the beginning which can be used as seminar or conference room, and as office for the physicist or electronics engineer in large hospitals where expansion of radiology department to take up radiotherapy at a later date is envisaged.

CLIMATIC CONSIDERATION IN DESIGN

India has a predominantly tropical climate ranging from the hot and humid climate in the east and north eastern states,

hot and dry climate of the central and western Indian plains, to the cold climate in the northern regions. Orientation of buildings to direct sunlight and to prevailing wind direction is an important factor to be considered in the tropics where temperatures in the shade can reach as high as 45°C.

Orientation of Buildings

In very hot climate buildings will have to be cooled in summer by artificial means. Nevertheless, even in hot climate, it is not always necessary to use extensive artificial cooling. Some natural cooling is possible by building orientation and design. The design of the buildings can be carefully planned to derive maximum natural cooling and thus reduction in energy consumption. Natural ventilation aided by forced air circulation by fans is adequate in most instances, with recourse to air-conditioning only where inescapable.

The directional orientation of buildings and their placement so as to shade one another is of importance. The architect should study the shadows cast by the sun to maximise this benefit. Effect of direct sunlight striking the buildings from the east or west at a low angle is very harsh. The effort should be to confine it to the end walls. This is achieved if the buildings are oriented to face their long sides north and south or northeast and southwest. Sun falling on the buildings from north or south can be controlled by louvers or awnings.

The design of building for comfort in a hot, and humid climate is different from those in hot, and dry climate. In a hot and humid climate, forced circulation of air aids in natural cooling, Air movement through the building and past the bodies of the occupants is the objective. Therefore, the building should be open, and oriented in such a way that even a slight breeze can pass through the building to cool its insides. This is of course aided by circulation of air by fans. A high concentration of buildings is not possible in hot and humid climate without the installation of air-conditioning. For effective natural ventilation and cooling, the buildings should be spread out.

In hot, dry climate the nights are cooler though the temperatures during the day may reach fierce levels. The building design should permit protection of the occupants from the intense heat during the day. To some extent, building with heavy thick walls and small windows serve this purpose, where heat is absorbed by the heavy walls during the day time and dissipated during the night, and the small windows minimise the amount of radiated heat entering the building.

Another way of controlling the effects of direct sun is to place verandahs on either side of the length of a building. This may be possible where there are only one-storeyed buildings. In multistoreyed buildings, this is uneconomical in space and costs.

Staircases, stairwells and rampways occupy a considerable part of space in each multistoreyed building. These should be positioned at the ends of the blocks of buildings.

Artificial Ventilation

Where air-conditioning is considered necessary, the design of the building will have to be as compact as possible.

Air-conditioning is the process of treating air to control all or some selected parameters *viz.* temperature, humidity, pressure, air movement pattern, air velocity and air cleanliness.

The cost of air-conditioning has direct relationship with the volume of the building. Therefore, the aim should be to restrict air-conditioning to the minimum and only where inescapable. This is achieved by resorting to keeping the volume of the buildings low by low ceilings and restricting the size of the rooms to the absolute minimum. However, certain areas of the hospital should always need air-conditioning. These are the operation theatre, labour room, postoperative recovery ward, premature nursery and accident and emergency department/ward and ICU.

Air-conditioning and artificial ventilation systems normally installed in offices, hostels and residential buildings are not suitable for hospitals. Air hygiene, which is not at all considered in other buildings is the most important factor to be considered in hospitals, and particular attention must be paid to it. The basic principle to be adhered to is that the contaminated air from one part of the hospital is not transmitted to another. The decision should be taken at an early stage as the whole design of the buildings is affected by this decision.

Windows regulate the amount of light that enters a building. Very large areas of glass can result in overheating of the building in summer. It also produces severe discomfort from glare. The patients lying in bed should not be exposed to too large an area of sky in direct view through the windows. It may be necessary to plan for shadowing devices to cut off the view of the sky from wards.

One of the ironies of planning hospitals in India is that when natural light abounds in the tropics, there is a tendency to provide for abundant artificial lighting. The effort should be to utilise natural light to the maximum and to consider the building design to cut power costs.

Planning for Energy Conservation and Saving

A colossal amount of energy is used in hospitals for various engineering services. For lighting, heating, ventilation, air-conditioning, boilers for CSSD, kitchen and laundry, pumps, lifts and incinerators the energy costs are a substantial percentage of the cost of running a hospital. A 800-bed teaching hospital spends approximately rupees twenty lakhs a month on electricity charges alone. In air-conditioning systems, design criteria regarding comfort levels and air changes per hour are factors influencing the energy consumption. The bifurcation of areas according to their period of AC requirements, say 8 hours, 12 hours, etc. during the design stage can result in energy saving. Similarly, solar water heating systems can be installed for preheating water used in laundry and kitchen.

PREPARATION OF FUNCTIONAL BRIEF

The fourth task of the planning team will be the preparation of what is called the functional brief or “**architect’s brief.**”

Analysis of functional needs, definition of operational policies, inter-relationships of departments, the grouping of accommodation and the main outline of traffic flow, engineering services and communication provide a firm basis for the designers’ work.

Before an architect can develop a hospital design that will best serve its functions, he would have been provided with a written programme explaining the hospital’s operational policies, particularly those related to the design of clinical areas. The differentiation, interrelationships and inter-dependence between the outpatient department, ward wings, diagnostic departments, nursing units, consultation rooms, X-ray, surgical suites, laboratory, kitchen, store rooms, etc. have to be considered in its totality. To enable a hospital to serve its purpose, “**design must follow function.**”

Architect’s Brief

Architect’s brief is a written document which explains the types of services to be provided, operational policies, and inter-relationship of facilities with one another. In a way, it is a written expression of the client’s need expressed in consultation with professionals in various medical specialities and engineers.

Contents of the Brief

1. Introduction : General introduction, mission, and philosophy of the proposed hospital

- 2. Site information : To include topography of the area/site, boundaries, surface area–
 - Existing public utilities
 - Nearest city, airport, railway station
 - Weather
- 3. Workload projection and functional content : Specifying expected workload (peak and phase-wise), functions and contents of departments. To include number of beds and bed mix, work flow, traffic flow
- 4. Equipment : Type of items of medical equipment and quantities
- 5. Zoning : Specific grouping and zoning of departments and facilities
- 6. Policies and procedures : This should include processes and procedures related to
 - Patient and staff movement
 - Services: CSSD, laundry, catering, etc.
 - Mains and standby electric supply
 - HVAC
 - Fire protection
 - Infection control
 - Pollution control
 - Further expansion plans.
- 7. Schedules of accommodation : Include description of functions and spaces, number of personnel working at each duty station, list of all other spaces listing the activities performed in each of them. Also the functional relationship *within* a deptt. and also *between* Departments.
- 8. Phasing : If the whole project in considered for breaking up into phases, the activities/work/schedules will have to be suitably divided into appropriate phases.
- 9. Financial aspects : Should include estimation of
 - Construction cost
 - Equipment cost
 - Furniture cost
 - Total project cost
 - Sources of funds

As planning progresses, the planning team is enlarged by co-opting experts, preferably the same persons who will later head the service. For example, while “micro” level planning of operation theatres is taken up, the original planning team will have to co-opt a surgeon, anaesthetist and a theatre sister.

At this stage, advice would also be required from people with practical experience in running the various services. It is a mistake to tailor a department according to the whim and fancy of an individual clinician. In the detail functional planning of a department, it is better to seek the advice of more than one consultant in the speciality with the object of obtaining a balanced view. Unless care is taken at this point, there is a risk that the architect’s brief will reflect, with minor improvements, some old building which enshrines methods of work that are out of date or otherwise unsatisfactory. The key feature in functional planning is the extensive participation of the medical staff in the process.

Determination of the services to be provided in quantitative terms requires consideration of the following for each of the several units ranging from an operation theatre and delivery suite to a utility room.

- Functions
- Location
- Relationship
- Utilisation
- Staffing pattern
- Space requirements
- Work flow
- Communication
- Traffic flow pattern
- Equipment
- Finishes
- Special requirements

From this follows the preparation of the “schedules of accommodation” based on the peculiar requirement of each service department.

One of the methods of functional planning of facilities is to frame questions appropriate to a particular room or department in respect of activities, personnel, equipment, methods and processes and jot down their answers. Analysis of these answers leads to clearing a large amount of doubts especially in respect of interdepartmental relationships. It is impossible to cover every department of a hospital in a book of this nature. Therefore, a questionnaire format for only three departments, viz. a patient care unit, labour suite and laboratory have been charted as an illustration, in the Appendix-II to this chapter. It is hoped that functional planning and programming will become clearer after reading this Appendix II.

Preliminary Drawings, Working Drawings and Estimate

The next step is the preparation of schematic drawings and sketch plans by the architect in interpretation of the Brief.

The result is a fairly accurate concept of the final form of the hospital which should be studied by all concerned and then approved. Up to the stage of finalisation, a lot of discussion among members of the planning team and the architect goes on. Once preliminary drawings have been approved any major changes thereafter will only escalate cost and add to the delays.

The architect studies the technical aspects to determine the most economical system of structural framing, foundations, plumbing, ventilation, internal circulation, electrical conduiting and other related engineering problems. After this the architect makes an approximate estimate of the cost of the project which includes the cost of construction of the buildings, fixed and movable equipment, paths and roads, landscaping and contingencies, and architects inspection and supervision fees.

Reading Architect’s Drawing and Sketches

A drawing demonstrates the general principle of a future building or gives information about details of layout and appearance. As the project progress so do the drawings from the general and rather ill-defined to the particular and precise. Here, it is better to ask the architect or engineer how each of them would help in decision making. It is also important to understand the scale of a drawing. Scale which transforms a room or building to a flat piece of paper is confusing to a layman. However, scale on paper becomes easier to comprehend with use to standard templates.

The architect now proceeds to prepare the specifications and working drawings to convey to the builders all details pertaining to the construction of buildings. These drawing are made to scale, and a complete set of these drawings comprises of architectural, structural, mechanical and electrical sections.

1. Architectural drawings show the plan of the site, roads and paths, floor and roof plans, sections, exterior wall elevations, large scale details of important items, schedules of doors and windows, and the finishes of exteriors and interiors.
2. Structural drawings show location and size of foundations, footings, columns, beams, girders and slabs.
3. Mechanical drawings show details of all piping, both concealed and exposed, plumbing, ventilating and air-conditioning work.
4. Electrical drawings show details of electric feeders, location of electric panels, fixtures and other electrical equipment.

Modular Grids

A major factor which promotes internal adaptability in hospital design is modular planning. A standard space module used throughout the building would ensure compatibility between structure, room dimensions, service facilities and fittings, and it would help to coordinate a detailed space programme. It is easy to see how coordinated modular planning makes for a more efficient and economical use of space.

To rationalise floor space for various facilities, use of a functionally optimal planning grid is made to arrive at a space planning module. A 1.6 m grid has been found to be ideal from many points of view. Multiples of this grid in varying combinations give standardised areas. An example of a planning grid of 1.6 m is shown below. Five such grids (3.2 × 4.8 m) give a carpet area of about 14.0 square metres excluding wall thickness (Fig. 2.5). A viable module of 14.0 square metres is considered adequate for a single bedroom. This gives a unit of 3 grids for bed space in general ward and unit of 1.5 grids for the need of toilets and the like. A 1.6 m planning grid has been adopted by the Armed Forces for their hospital planning programme and has also been accepted as the Indian standard.⁸

The ‘structural grid’ (network of lines defining the locations of structural columns) is derived from the planning grid but need not necessarily be the same as planning grid. The position of the structure determined by the planning grid will continue downwards through the structural columns to the lower floors till their respective foundation where their load is transferred to the ground below.

Standardisation does not result in loss of function—in fact it is a gain. Studies made into modular grids for hospitals have resulted in flexibility in variable interior layouts within the limits of conventionally arranged working units.

Use of uniform planning grid also allows for application of standard building components. The aim throughout is to provide large spaces free of structural walls, giving maximum freedom for internal adaptation.

Design Efficiency

Design efficiency means the ratio of usable area to plinth area. The main object should be to realise the maximum proportion of work space in the building. For this purpose, it is suggested that built-up area may be split up into four categories, viz. **usable area**, **service area**, **circulation area** and **wall and column area**, and checked against the limits given in Table 2.9.

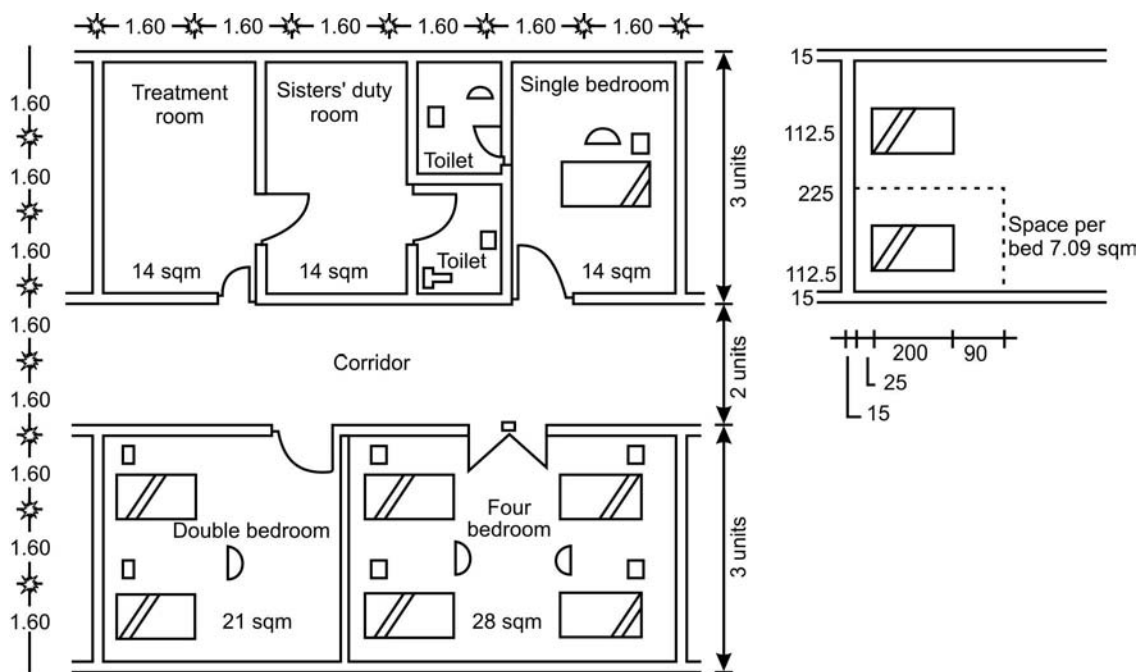


Fig. 2.5: Modular grid: Space-planning module

Table 2.9: Categories of built-up area and their limits

Categories of area	Load bearing structure	Framed structure
Usable area	55–60	60–65
Wall area	10–15	5–10
Service area	3–5	3–5
Circulation area	25–30	25–30

Project Administrator and Coordination

With so many interests involved (like clinical disciplines, architects, utility engineers and other specialist advisers from time-to-time), the project administrator has to take charge of coordinating the design team. Constant interaction between “clients” and works professionals during briefing and design process at all stages is a feature peculiar to hospital planning.

Project Cost

The most common method of estimating hospital construction costs has been the “per bed” method, i.e. if the total cost of a 100-bedded hospital has been Rs. 400 lakhs, the cost per bed is Rs. 4,00,000.

The complexity of modern hospitals defies determining the cost by such a general method. Certain hospitals have extensive research functions, classroom and educational facilities may be required for some, there may be emphasis on extensive outpatient clinical facilities for others, and still others are exclusively inpatient hospitals. Not only the range of services provided by one hospital may be vastly different from that of another, but also the gross areas per bed utilised by different hospitals will vary. General estimates based on comparison of costs are, therefore, difficult to make on a per bed or per square foot basis. However, in the absence of a more elaborate method, the “cost per bed” method is still generally in vogue. Seventy to eighty per cent of the total cost is generally consumed for construction including fixed equipment, 12 to 15 per cent for depreciable equipment of long life (10 years or more) and 6 to 8 per cent for depreciable equipment of 5 to 10-years life.

The building gross square footage represents an estimate of the total amount of space that will actually be constructed, and includes all circulation, mechanical and structural space. This total is multiplied by a per square foot cost factor prevalent at the point of time to arrive at the base cost of the building. To this is added the escalation factor, the site acquisition cost, and the working contingencies to arrive at the building project cost.

$$\begin{array}{rcl} \text{Direct} & & \text{Base} & & \text{Escalation} \\ \text{Project} & = & \text{Cost of} & + & \text{Factor} \\ \text{Cost} & & \text{Building} & & \\ & & \text{Fees} & & \text{Site} \\ & + & \text{(Architects)} & + & \text{Acquisition} \\ & & \text{(Consultants)} & & \\ & & \text{(Site Engineer)} & & \end{array}$$

Direct project cost does not include long-term finance cost, start up costs and legal fees.

It is estimated that the cost of constructing and equipping a general hospital is somewhere between Rs. three to ten lacs per bed.

Break-up of Project Cost

The total cost of a hospital project can be broken down broadly as under:

1. Acquisition of site
2. Site survey, investigation
3. Landscaping
4. Construction contract—building with fixed equipment
5. Supervision and inspection
6. Equipping the hospital—diagnostic and therapeutic equipment
7. Movable equipment—furniture, etc.
8. Architect’s fees
9. Consultant’s fees
10. Site Engineers fees.

It is advisable to make an approximate estimate even before the drawings and specifications are finalised in order to enable funding agencies to evaluate the finance and funding requirements, and if the costs are discovered to be too high, it will call for a revision or reappraisal of the project.

It is estimated that the total *operating costs* of a hospital will exceed its construction cost within two to three years. Therefore, the design of the facility should place as much emphasis on reducing operating costs as on construction costs. Thus, during the design phase, consideration must be given to the installation of maintenance and labour-saving devices which could reduce costs over the life of the structure. Wide consultations with equipment and supply firms can often contribute to the aspect.

When complete drawings and working specifications have been finalised, it should be possible to arrive at a fairly accurate figure. However, the total cost of the hospital project will not usually be known with accuracy until the project is actually completed. Therefore, cost monitoring and controls are required to be exercised throughout at each stage of execution.

An approximation of the cost of a hospital project is given in Table 2.10.

• Approximate cost of a hospital project on per-bed basis (General Hospital)	– Rs 6-10 lacs
• Construction cost (civil construction) (Does not include cost of residential buildings)	– 30-40% of total project cost
• Land development (Topographical survey, site clearance, compound wall, internal roads, landscaping, storm water drainage system)	– 1-3% of total project cost
• Utility services equipments (Communications, electrical substation, generators, UPS and allied electrical services, fire protection systems, HVAC, lifts, furniture and fittings, waste management system)	– 15-20% of cost civil construction
• Hospital equipment	– 40-50% of total project cost
• Project consultancy charge	– 5-8% of total project cost

Lastly, it is worth remembering that it is much more difficult to obtain decisions on matters of finishes, furniture and equipment than on the main planning principles.

EQUIPPING A HOSPITAL

The mechanical and electrical installations and the plant and equipment component in a modern general hospital has been estimated to cost about 40 per cent of the entire hospital project out of which about half (20%) is required for medical equipment(s) of general use.

Hospital equipment covers a broad range of items necessary for functioning of all the services. Various ways of classifying the equipment in hospitals can be used. However, for universal application the equipment in the hospital can be classified as:

- i. physical plant,
- ii. hospital furniture and appliances,
- iii. general purpose furniture and appliances, and
- iv. therapeutic and diagnostic equipment.

It is the manufacturer’s interest to see that hospitals buy and install as much equipment as possible, whileas it is in the hospital’s interest to have the minimum needed to carry out its essential functions. The hospital consultant with his knowledge and experience enables the hospital to select from what is available in the market only as much as is essential, convenient, efficient and economical without

compromising on the quality of care. In the selection of diagnostic and therapeutic equipment, it is not uncommon that complex and sophisticated equipment has been ordered for prestige reasons when simpler versions could do the same job. It is also of no use to buy equipment just because it is readily available in the market rather than plan acquisition of standardised equipment in advance. Often, different opinions are found among our clinical experts when their advice on evaluating costly equipment is sought, because they have different sources for their technical information, and also because at times they are involved in a particular system. A subcommittee must try to separate opinion based on good information from that based on different loyalties and personal preferences.

A broad range of the plant and equipment that is required in the general hospital is given in Table 2.11 which is by no means exhaustive.

Generally, all plant and equipment which are attached to the buildings or to mechanical services, such as cabinets and counters, laundry and kitchen equipment, boilers, etc. are included in the construction contract and the responsibility of their installation should be by the contractor. Diagnostic and therapeutic equipment, surgical apparatus, etc. are not included in the contract and are the responsibility of hospital administration, so is furniture required in connection with patient care and other movable equipment.

<i>Physical plant</i>	<ul style="list-style-type: none"> • Lifts • Refrigeration and air-conditioning • Fixed sterilisers • Incinerators • Boilers • Pumps • Kitchen equipment • Mechanical laundry • Central oxygen, suction • Generator
<i>Hospital furniture and appliances</i>	<ul style="list-style-type: none"> • Beds • Stretchers • Trolleys • Wheelchairs • Bedside lockers • Dressing drums • Kitchen utensils • Bedside lamps • Movable screens • Handwash stands • Operation tables • Instrument trolleys

Contd...

Contd...

- Bedpans
- Wastebins
- Hospital linen

General purpose furniture and appliances

1. Office machines

- Intercom sets
- Typewriters
- Calculators
- Cash registers
- Filing systems
- Electronic exchange
- Computer

2. Office furniture

3. Crockery and cutlery

Diagnostic and therapeutic equipment

1. Equipment for general use

- Surgical instruments
- BP instruments
- Suction machines
- Rehabilitation department equipment
- Physiotherapy department equipment
- Sterilisers
- Equipment for clinical laboratory
- Glassware washers
- Voltage stabilisers
- Refrigerators
- Chemical analysers—microscopes

2. Equipment interacting with patients during diagnostic and therapeutic procedures

- Short-way diathermy machines
- Electric cautery machine
- Defibrillators
- X-ray machines
- Monitoring equipment
- Respirators
- Incubators
- ECG machines
- USG machines

During the last decade, there has been an explosive growth of sophisticated electronic biomedical equipment in the hospital field. However, introduction of electronic equipment in haste without thorough assessment may pose problems of economy, safety, and obsolescent systems. Government officials and donor agencies also try to provide hospitals in developing countries with many kinds of most expensive electronic equipment without realising the extent of their actual use.

Apart from selection of the equipment, it is equally important that procurement of each item of major equipment is planned so as to arrive at the construction site at the required time. Schedules of installation of equipment will have to be planned in advance, with follow-up action at intervals. Complex and time-consuming bureaucratic

procedures, especially in the government may lead to arrival of the equipment much later after the initial proposal. This has to be guarded against.

CONSTRUCTION AND COMMISSIONING

Construction

Working drawings and specifications are prepared by the architect to provide to the contractor a detail picture of the work to be done, materials and methods to be used and responsibilities to be assumed for the project. Based on these, the contract bidders prepare their proposals and estimates for the building and submit their tenders when invited to bid competitively. The award of contract is made to the lowest bidder, considering also his standing and experience in the building trade. The architect supervises the construction to ensure that the work is carried out according to the contract, and that correct materials are used and specifications followed.

The agreement drawn between the owners and the contractor should lay down the time schedules, method and periodicity of payment to contractor, sureties to be furnished by the contractor, penalties in case of default, inspection procedures and allied matters. The draft of this legal document is prepared with the help of the architect and consulting engineers and executed through a law firm.

The contractor usually subcontracts various parts of the work to other contractors, each a specialist in a particular line of work. Nevertheless, the overall responsibility for the construction lies with the main contractor as per the terms of the contract.

As clarified earlier once the work has started, any change in the construction plan is going to disrupt the project and cost a lot of money. However, modifications may become necessary due to unforeseen circumstances during the construction stage. In such a case, the drawings and specifications which have to be changed by the architect may call for redrawing of the contract with the contractor.

Because planning invariably takes a considerable time, it is clear that by the time design and construction are complete, more modern ideas are being developed. The temptation to alter designs, because ideas incorporated in planning earlier are no longer the latest fashion must be avoided. Some modifications in detail may be permissible if it can be contained within the cost limit, but it may be cheaper to build the mistake—often mistakes may not be so bad when seen in retrospect.

It is desirable to engage the services of a mechanical engineer to supervise the installation of mechanical equipment of complex nature, under the overall control of the architect. Arrangements for safe storage of all equipment at the site must be made in advance, and adequate time should be earmarked to uncrate, check, inspect, assemble and install each item of equipment in its appointed place. The hospital administrator-consultant should be available to guide the placement and installation of diagnostic and therapeutic equipment.

Phasing

Few projects can be taken to the stage of completion without recourse to breaking it into phases. This is necessitated because of following factors.

1. The necessity to bring facilities into use as quickly as possible for operational reasons
2. The necessity to split a major project into smaller units of building work as a contractual consideration
3. The necessity of having certain departments ready before others
4. Local priorities for introducing services
5. Limitation on availability of capital funds.

Phasing requirements have a dominant effect on the future building shape depending on whether the phased development is on existing hospital site or a new site. The phased hospital on a new site has to provide the necessary basic services in the first phase which takes a disproportional amount of capital, severely reducing the clinical content. On the other hand, having to build basic supportive departments smaller than their ultimate capacity necessitates defining how they can provide the increased services required in the later phases whilst still maintaining operational efficiency and optimal departmental relationships. The way in which the first phase departments will expand to serve later phases will have to be very carefully considered.

Commissioning

The hospital is ready to be commissioned when its building is ready, all equipment has been installed, and the staff and manpower engaged (Fig. 2.6). The plant and machinery should have undergone many test runs before this, and the therapeutic and diagnostic equipment should have also been tested. The medical staff and other paramedical personnel should have been positioned a few weeks in advance.

The commissioning team would have started meeting much before the completion of the buildings and will comprise of key members who will be connected with the new hospital. It will have the hospital consultant, the hospital

administrator and with him the chiefs of clinical services, senior nurses, personnel manager, supplies officer and a few others, in fact the chiefs or representatives of all the departments. The role of the hospital administrator, who should have been selected in advance, become crucial now. The team has the task to bring the hospital buildings, plant and equipment to a state of the operational readiness, develop operational systems, testing the equipment for use, coordinate training of staff, ensure good communication with the public, communicate with outside organisations affected by the hospital. Establishing a project room for this purpose will be advantageous. It acts as a communication centre for the team where maps, charts, drawings, data sheets, systems manuals, equipment schedules, etc. are available.

Scheduling the Sequence of Services

Some services of the hospital will require to be ready while others have still ample time. For example CSSD requires lengthy trial runs and bacteriological checks, installation and calibration of X-ray machinery is lengthy job. The sequence of opening the departments should be planned carefully. The following grouping of services into four categories is suggested (Table 2.12).

It is possible that the commissioning task is far too narrowly conceived at the outset. It is also a task beset by uncertainties of progress, finance, responses of staff and so on. Although the commissioning task has been described as almost exclusively that of coordination, it is much more than that.

Table 2.12: Categorisation of services	
Group 1.	Services required immediately <ul style="list-style-type: none"> • Telephones • Domestic services • Central linen service • Stores • Works department
Group 2.	Requiring lengthy period of preparation <ul style="list-style-type: none"> • CSSD (for trial runs) • X-ray (“) • OT (“) • Pharmacy
Group 3.	May be partially open before patients admitted <ul style="list-style-type: none"> • Paramedical service • OPD
Group 4.	Will not be operational until all above departments are opened <ul style="list-style-type: none"> • Wards

Activity	2006 February	March	April	May	June	July	August	September	October	November	December	2007 January	February	March	
Equipment and supplies:	Tenders complete	Placing orders				Delivery of goods easily available		Delivery period for items more difficult to obtain							
Main contract							Install, check and calibrate								
Install and test			Have printed												
Printing/ documents	List of all requirements														
Other consumables	List of all requirements		Predict consumption												
Staff recruitment:	15	4													
Medical	2	7													
Technical	2	5													
Nursing	1	8													
Administrative	—	10													
Works	20	34													
Total						5	—	—	5	18	14		20		
Engineering and building						14	18	18	21	23	25		39		
Operational systems						9	12	49	54	97			85		
Organisation						8	23	6	12		13	10	38		
Training						62	42	55	74	68	65		34		
Patient services						98	95	128	166	183	23	27	216		
Public relations						Engineering commissioning		Essential post-contract alterations							
						Prehandover snag checks		Department heads to draw up procedures and department systems							
						Complete main discussions and document policies		Draw up organisation and committee structure							
						Draw up organisation and committee structure		Managerial							
						Commissioning orientation									
						Engineering commissioning		Essential post-contract alterations							
						Commissioning orientation									
						Review systems in operation									
						Induction and Orientation									
						Open first admission									
						Phased increase									
						Fully operational									
						Official opening									
						Site visit for local community									

Fig. 2.6: Example of a commissioning timetable for a hospital

Shake-down Period

A well-planned hospital passes from the construction stage to the commissioning stage with a smooth transition if adequate thought has gone into aspect planning, equipment and staffing. After commissioning, a hospital's staff, patients, community, buildings, facilities and environment interact and adjust with one another until the hospital settles into its usual routine.

The period from the time of commissioning of the hospital till it settles down into a satisfactorily functioning entity is the "shake-down period". It is the period during which it experiences its teething troubles. In general, this period will be shorter if adequate time and thought have been devoted to planning and execution and can last from a few months to a year. Any necessity for additions, alterations and modifications will become apparent during this period, as also the necessity to readjust staffing schedules.

EPILOGUE

"Talking about hospital planning is like talking about swimming. One can derive some principles and postulations,

and give advice. But, in the final analysis, the only way to achieve proficiency is to jump in and do it".⁹

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SECTION

TWO

*Outpatient,
Inpatient and
Nursing
Services*



CHAPTER

3

Outpatient Services

INTRODUCTION

Where hospitals did not exist, outpatient service in the past was provided by an institution called “Dispensary” run by government, local bodies and other organisations, but lacked the backing of supportive diagnostic services. The beginning of the current century saw the outpatient services progressively becoming an integral part of hospitals.

In many Western countries, general care is given by private practitioners and all hospitals do not have outpatient departments. In India apart from private practitioners outpatient services in hospitals are the primary means whereby people receive medical care. The focus in medical care has to a considerable extent shifted from entirely inpatient-oriented to the outpatient-oriented service.

Definition

Ambulatory medical care provided to patients who are not confined to bed can be provided at a general practitioner’s clinic, a specialist clinic, a health centre or a hospital. When such care is rendered at premises which are part of a hospital (outpatient department) such care is called outpatient care and the services originating from it are named outpatient services.

Outpatient department is defined as a part of the hospital with allotted physical facilities and medical and other staff, with regularly scheduled hours, to provide care for patients who are not registered as inpatients.

MAGNITUDE AND IMPORTANCE OF OUTPATIENT SERVICES

A review of the extent of outpatient services provided by hospitals in India makes fascinating reading. The extent of

the services are gigantic, and the problems of organising them are enormous. There are still large chunks of population who have no accessibility to medical care, even ambulatory care. According to currently available statistics:

1. a. About 25-35 inpatients are given service per bed in a year.
b. With 8,70,160 beds in the country, 2.7 to 3.0 crore inpatients are therefore served per year.
2. a. On the other hand, for each hospital bed, about 600 outpatients per year are given service.
b. This means that over 52 crore outpatients in a year are treated in the outpatient department of hospitals.

Let us view the problem at a different plane. From 2 to 4 episodes of sickness varying from a mild to moderate to severe nature are suffered by each person in a year. Considering that only two episodes out of these may require some kind of medical help, 240 crore episodes (for a population of 120 crore) of sickness would need attending to. Only one-sixth to one-fifth of these persons manage to seek medical care in the outpatient departments of health centres and hospitals. Others seek help from private practitioners, traditional healers, health workers and quacks.

The experience of the National Health Service of UK is similar. Statistics show that every person goes on an outpatient visit in a hospital once a year, visits his or her GP four times a year on an average.

There has been tremendous increase in the outpatient service all over the world during the last two decades. In USA outpatient visits increased by 180 per cent in the 15 years between 1951 and 1971 and almost doubled in the next decades again. As opposed to this, there are examples of developing countries where almost 55 per cent of

population is seemingly timid to go to hospital outpatient clinics, because this segment of the people cannot afford the out of pocket expenses due to their deplorable socioeconomic situation.

Much of investigative and diagnostic work that formerly necessitated admission to a hospital can now be carried out in a well-equipped outpatient department, with saving of expenses and avoidance of the disruption of family life that hospitalisation causes.

All patients get their first impression of the hospital from the outpatient department. **It is the first point of contact between the hospital and community and which, in many instances, can make or mar the reputation of the hospital.** The importance of the outpatient department lies in the following:

1. An outpatient department is the patient's first point of contact with the hospital and entry point into the health care delivery system.
2. It is an inseparable link in the hierarchical chain of health care facilities.
3. It contributes to reduction in morbidity and mortality.
4. It is a stepping stone for health promotion and disease prevention.
5. It helps reduce the number of admission to inpatient wards, thus, conserving scarce beds.
6. It acts as a filter for inpatient admissions, ensuring that only those patients are admitted who are most likely to benefit from such care.
7. It is the "shop window" of the hospital.

DEFINITIONS

Some terms in the context of outpatient services need defining at this stage.

Outpatient

A person given diagnostic, therapeutic or preventive service through the hospital's facilities and who, at the time, is not registered as an inpatient in the hospital.

Outpatients can be grouped under the following three broad categories.

Emergency Outpatient

A person requiring emergency care as a result of sudden severe illness or accident. The need of emergency care is determined clinically. However, there are conditions considered by the patient or his/her relatives as requiring emergency services; the perception of "emergency" by

patients or their relatives may be different from that of physicians.

Referred Outpatient

A person referred to the outpatient department by a private practitioner or other physicians from one clinical discipline to the other, for specific diagnostic or treatment procedures or opinion, and who will (or should) return to the referring physician for further care and disposal.

General Outpatient

A person not referred by other physician who comes to the outpatient clinic on his own and who is given diagnostic and/or therapeutic services on an outpatient basis, for other than an emergency condition. General outpatients, i.e. those who come to the outpatient department on their own with a variety of ailments and regard the hospital as some kind of dispensary, form the bulk of the users of the outpatient department in government run hospitals. A sizeable proportion of them may come for minor ailments because for them the hospital represents the only available source of medical care.

Outpatient Visit

An outpatient visit is the visit of a person at the outpatient department to receive service. The visit may be:

- i. new outpatient visit—outpatient visit by a person for the first time, or
- ii. repeat outpatient visit—outpatient visit by a person subsequent to initial outpatient visit.

Unit of Service

Unit of service is a measurable part of the volume of service rendered in diagnostic or therapeutic facilities of the hospital, expressed in terms of time and quantity.

Service Time

Service time is the time taken by the doctor to diagnose a patient's illness and in instructing him or her, and includes taking history, examination, making case note and prescription writing and signing requisitions for special medicines or investigations.

PLANNING OF OUTPATIENT SERVICES

Outpatient department of a hospital has functional and administrative links with the hospital of which it is a part.

It may also be linked with health centres, satellite clinics and dispensaries dependent on it. Expected demand will have to be determined based on the hospital's catchment area and the population to be served. As a matter of policy, preventive and promotive care should be provided with curative care.

An assessment of the expected demand for outpatient care must be made in the very beginning. A clear distinction needs to be made between expected demand for outpatient services in an area among a defined population and expected demand at a particular facility, which may be one of several such facilities in an area. Better service attracts more patients and having a choice, they will go to such facility even by spending more money.

Demand for outpatient care is commonly expressed on 'per capita per year basis.' It may vary from 1 to 10 visits per person per year, including revisits. However, as yet there is no standard by which demand for OPD services can be measured. It widely varies, depending on:

- i. cost to the patient,
- ii. distance,
- iii. transportation,
- iv. degree of urbanisation,
- v. socioeconomic status of community,
- vi. level of facilities and staff, and
- vii. quality of care provided.

PROJECTION OF OUTPATIENT LOAD FOR SELECTED TARGET AREA

Projection of outpatient demand in a given area depends on:

- i. unmet needs of population for general medical and surgical care,
- ii. potential of cases being referred by GPs (this will have a bearing on the demand on speciality clinics rather than on general medical and surgical clinics),
- iii. alternative services available in the area, and
- iv. reputation of the hospital.

Present statistics indicate that per hospital bed, 1.5 to 3 patients attend the outpatient department of a large Govt hospital per day. A 300 bedded hospital should expect to cater for 450 to 900 outpatients a day. The attendance tends to rise towards the higher side of the scale as the bed strength of the hospital increases, although the converse is not always the case. Figure 3.1 shows the sources of origin of outpatients.

Out of the cases seeking attention in a hospital, up to 65 per cent are for minor ailments and only 35 per cent are for major conditions. Of these 35, 10 per cent may be acute and 25 per cent nonacute. However, these figure can vary widely.

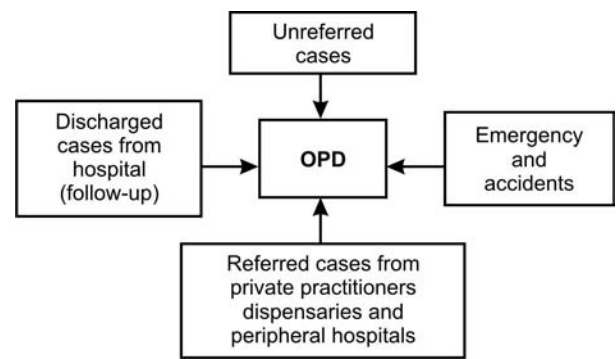


Fig. 3.1: Sources of origin of outpatients

PLANNING CONSIDERATIONS

After the expected demand has been determined, the following considerations should be taken into account.

1. Range of outpatient services to be provided and defining the functions of the outpatient department
2. Daily and hourly capacity required
3. Number of the staff needed by category and the tasks required of staff
4. Possible service time per patient, both average time and its distribution over various aspects of outpatient care
5. Flow of patients and work
6. "Holding capacity" and "lifting capacity"
7. Requirement of furniture and equipment
8. Layout of the department considering all the above.

Defining the Range of Outpatient Services and Scope of the Service

The range of outpatient services provided by a hospital should depend on the characteristics of patients, namely sex, age profile and socioeconomic characteristics and ability to easily reach the hospital. The level of staff, viz. junior or senior staff physicians, specialist or superspecialist would also influence the range of services. To be decided at the outset would, therefore, be the proposed scope and range of the services, viz., preventive, diagnostic, therapeutic, follow-up, rehabilitative, scheduled and unscheduled.

Currently, the one factor that appears to gain importance in OPD services is the continued demand for sophisticated and expensive medical instrumentation and equipment.

Daily and Hourly Capacity Envisaged

Clinics must be scheduled for regular hours, for a specific time and duration. A simple method to determine outpatient

scheduling is the calculation of room hours needed to deal with the expected number of visits, or assume the expected number of visits to determine number of rooms and rooms hours, based on the “possible service time”. **Room hours** mean the number of doctor’s examination and consulting rooms available multiplied by the number of scheduled clinic hours. Average service time in minutes can also be calculated (60 divided by average visits per room hour).

Staff Organisation and the Tasks Required of Staff

To the clinicians, outpatient work is just as important and interesting as inpatient work. Many observers feel that the senior members of the medical staff should play a leading role in the OPD clinics which should not be left entirely to the junior clinicians. The medical staff working in a hospital should be the same in both the inpatient and outpatient departments, i.e. the permanent staff of the outpatient clinics should be drawn from hospital staff and not separately employed to man outpatient services alone.

The nursing staff has to be headed by a senior sister incharge who will exercise supervision over the work of nurses and paramedical workers employed in OPD. Continuity of care could be maintained by rotation of such staff between the inpatient department and outpatient clinics. In speciality clinics like ENT, eye, paediatrics and psychiatry, it is definitely advantageous for the ward nursing staff to work in respective clinics in the OPD.

Possible Service Time per Patient and its Distribution

It is hard to determine the amount of time a physician should spend for an outpatient. Differing from clinic-to-clinic, service time is also likely to differ from physician-to-physician. Physician and clinic staff may be able to make their own assessment for new and return visits. The sequence of physician activity during the visit can have a considerable impact on the turnover of patients.

Flow of Patients and Work Scheduling

On outpatient visits, patients flow is in a predictable manner usually from Enquiry to Registration to Waiting to Examination room to Investigation facilities, although there are many exceptions to this. Nevertheless, it is beneficial to draw a flowchart of activities and movements in the outpatient department to guide the planning process for location of various facilities and their relationship with one another.

Holding Capacity and Lifting Capacity

All patients passing through the outpatient department do not do so at one and the same time. At any one time, the OPD will have certain number of people some of whom will be patients and the others their friends and relatives. The physical capacity of the OPD to hold the maximum expected number of people at any one time in the main waiting area, subsidiary waiting areas and the clinics constitutes the holding capacity of the OPD.

Lifting capacity refers to the capacity for vertical transportation in high rise, multistoreyed OPD blocks. It has to take into consideration the traffic of patients and those accompanying them, the staff, and stores and supplies transportation during scheduled OPD hours. Out of the probable number of lifts required, at least one should be large enough to take a stretcher trolley. Also, planning a bank of two lifts together has been found to be structurally and functionally more efficient than locating each of them at two different points.

SITTING, ACCOMMODATION AND PHYSICAL FACILITIES

A considerable volume of services of other departments of the hospital is consumed by the outpatient department.

Although outpatient services are intimately intermixed with the rest of the hospital, separate outpatient facilities planning has the following advantages.

1. Efficient in terms of scheduling of work
2. Easier for patients to find their way around
3. Separation of outpatients from inpatient areas facilitates traffic, access and circulation problems.
4. Less expensive structure but easy to expand.

The location of the outpatient department should be such that the diagnostic and treatment facilities, viz. radiology, pathology physical therapy and other adjunct services are easily accessible without intermixing with inpatient areas. This department is best located in a separate wing of the hospital with an independent approach.

In deciding the location of outpatient services, the question to be asked is orientation of activities of both inpatient and outpatient services. If a large proportion of the outpatient load is of follow-up visits of patients who had originally been hospitalised, it would be desirable to provide continuity of staff and environment, and therefore, outpatients should be seen in the same place as when they were inpatients. For example, activities involved in paediatric services are both inpatient and outpatient oriented with

common controlling factors. Paediatric outpatient services can be closely interlinked with the inpatient services.

Outpatient service is one of the rapidly growing services of the hospital. Therefore, in many instances, outpatient departments built in the recent past have been found to be too small over the years because of increasing demands, growth of new specialities and the desirability of carrying out an increasing range of diagnostic and therapeutic procedures on outpatient basis. The department must, therefore, be planned for a substantial capacity for growth.

In the general hospital, the outpatient department will consist of general outpatient clinic as well as speciality clinics, in the form of a polyclinic. The structural requirement of outpatient department incorporating a polyclinic will depend upon the extent of the services provided. The primary aim should be to provide large floor areas free of structural members to give the maximum adaptability for changing requirements.

For these reasons, location of the outpatient department is desirable on ground floor. Only in the case of larger teaching hospitals, which would most likely be multistoreyed, it may be more advantageous to have inpatient and outpatient departmental activities on contiguous floors.

Flow Pattern

In many hospitals, poorly planned physical relationship of the OPD are responsible for increasing the work of staff and causing embarrassment and unnecessary movements for patients.

On outpatient visits, patient flow usually progresses from Enquiry and Registration to Waiting, then to examination rooms, and thereafter to investigation facilities, and lastly the pharmacy. It is beneficial to draw a flowchart of activities and movements in the department (Fig. 3.2) to determine relationships of various facilities to each other. If the daily attendance as compared to total floor area of the OPD is low, a strict flow pattern is not warranted. However, the flow concept becomes important when the daily attendance crosses 400 to 500.

In comparison to the area occupied by other departments of the hospital, viz. wards, diagnostic and therapeutic services and administrative and service departments combined, the percentage of space occupied by the outpatient department of most existing public hospitals varies from 12 to 18 per cent. As evident from overcrowding in outpatient departments in hospitals, this space seems to be grossly inadequate.

The area required for the outpatient department should be adequate to accommodate **the reception and waiting hall, waiting rooms, registration and outpatient medical records, clinics, toilet facilities, and the injection and dressing room, pharmacy, minor OT and circulation routes.** Scales of space for outpatient department can hardly be standardised in view of the varied requirements and range of services provided. For planning premises, half square foot for each expected *annual* outpatient visits is considered to provide adequate space in case of most general hospitals. A hospital expecting 500 outpatients per day over 300 normal

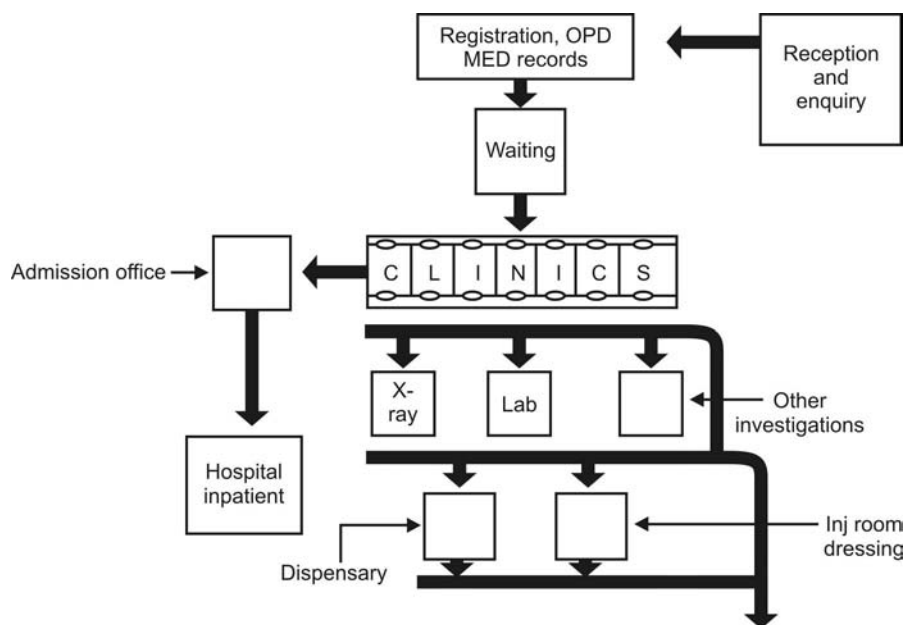


Fig. 3.2: Flowchart of outpatient department

working days in a year would thus require upto 75000 square feet (6975 sqm) of space for its outpatient department.

Reception and Enquiry

A new outpatient is usually a frightened person who needs reassurance and guidance in what, for him, is a strange place. A reception and enquiry counter in the outpatient department is necessary at the entrance lobby from where patients seek information about the location of various clinics, registration procedures and so on. This is located at a prominent place at the entrance of the department and also in close proximity to the emergency and casualty department. The entrance lobby should connect with public facilities and with a tea and snack bar.

To isolate it from the noise that usually prevails in such a place, reception and enquiry can be enclosed in a see-through cubicle. A small room with glass panelled wall above a height of 1.10 metre and a swinging door or doors has been found to be very suitable. This arrangement enables the patients to see the person manning the reception and enquiry from a distance as well as enabling this person to watch the activity all around. In the outpatient department of smaller hospitals, an open booth or counter will satisfactorily serve the purpose.

The reception and enquiry should be prominently signposted. Although seemingly of little importance compared to the other activities of outpatient department, reception and enquiry should be staffed during the working hours of outpatient department by an experienced and competent person. Some hospitals favour a medical social worker to a reception clerk for this purpose, but a senior nurse as well as a lay administrator is equally suitable, provided the person has complete knowledge of the location of every single facility and activity of the outpatient department. With tremendous amount of hectic activity taking place all around, tempers are likely to be frayed easily in this situation. Therefore, he or she should be well-mannered and cool-tempered with infinite patience to hear patients' innumerable queries and answer them.

Reception and enquiry should have good communication through telephone and intercom sets with all clinics and other important areas in the OPD. A well-illustrated, easily understandable guide map showing locations of all clinics and adjunct services units can be prominently displayed in this location.

Waiting Area

There should be a main entrance hall where people first arrive and get registered. On entering an outpatient

department the patient should find himself in the entrance hall faced by the reception and enquiry counter. There are various scales suggested for the waiting areas by various authorities, from one square foot per outpatient attendance per day to 8 to 10 square feet per daily patient visit in Western countries.

In many countries, the large waiting hall where hundreds of patients waited for attention has become a thing of the past by introduction of the appointment system. In our country and especially in large hospitals, it will perhaps take a long time to do away with centralised large waiting area where the hall also serves as a waiting place for the relatives or friends accompanying patients. It should be remembered that in our country each outpatient is usually accompanied by one or two relatives or friends.

Apart from the main waiting area, *subsidiary waiting areas* for a small numbers of patients will be needed at each clinic and at the diagnostic and therapy rooms. With the present volume and complexity of outpatient work in large hospitals, it becomes essential to provide subsidiary waiting areas for the clinics to expedite patient flow, to prevent corridors outside the clinics and consulting rooms from becoming overcrowded with waiting patients and impeding the circulation of traffic. Space provided in subsidiary waiting areas is 8 square feet per patient (0.75 m²) for one-third of the attendance at each department. For a doctor session of up to 30 patients in hospitals in NHS hospitals in UK, waiting area for one-third of the patients is considered adequate. For paediatric clinic, the waiting space should be approximately for 14 patients with a clinic attendance of 25 to 30. The size of the main waiting hall and subsidiary waiting areas determines the "holding capacity" of the outpatient department. This should be anticipated and planned in advance to avoid gross overcrowding at a future date.

Noise levels in the reception and registration area and in the main waiting hall has been found to be very high (up to 150 db) in public hospitals. An acoustical ceiling is desirable in the main reception and waiting hall to absorb the high level of noise that prevails there.

With a large number of people continuously passing through it (3000 to 4000 outpatients per day in All India Institute of Medical Sciences and Safdarjung hospital, Delhi, and up to 2000 patients in many medical college hospitals) over a short period of about 4 to 5 hours, the main waiting hall should be well-ventilated and easy to clean. In large public hospitals at least, the floor, preferably tiled, should be sloped towards an inset drain so that it is easy to sluice down with a hose. The halls should be furnished with

comfortable benches or chairs. If needed the waiting hall can be used for health education lectures and screening of health education films, thus utilising the patients waiting period for health education through diversionary audiovisual entertainment with television screens placed at appropriate places.

Adequate number of toilet facilities should be provided separately for males and females. A scale of 1 to 2 WCs for every 100 patients attending the OPD and at least one urinal for every 50 patients are recommended. Arrangement for drinking water in the form of a water cooler and dispenser should be made, and space for one or more public telephone booth should be earmarked.

The waiting area or entrance lobby should display boards for information of the patients and public regarding names of doctors and nursing staff on duty during a clinic session.

Wheelchair and Trolley Bay

For patients who cannot walk, stretcher-trolleys or wheelchairs will be required to carry them through the department. A place to park them should be provided at the very entrance to the outpatient department. Adjoining to the reception and enquiry room would also be a good location. The issue and replenishment of trolleys and wheelchairs can be organised under the overall control of the outpatient department coordinator/administrator. Adequate space for the required number of stretcher-trolleys and wheelchairs should be catered for.

Registration Counters and Medical Record Room

The registration counter and outpatient medical record room is conveniently located at one end of the main waiting hall.

All patients have to register at the outpatient registration counter. Each new patient is given a registration number in the form of a ticket, and an outpatient card is made for him/her which is sent to the physician to whose clinic the patient is directed. On subsequent visits, when the patient presents his ticket at registration counter, his folder is taken out from the record room and sent to the appropriate physician. The folder is deposited back in the medical records room by the clinic staff at the end of the day and are restored to their appropriate place by the medical records clerk. Considerable time can be wasted sorting unfiled papers and chasing missing reports. There should be a clear distinction between the work of medical records department and clinic staff.

A centralised registration and record system, wherein all outpatient visits are registered and record kept at one

place has advantages of conserving manpower and space, as opposed to the decentralised registration and record system wherein each clinic like medical, surgical, paediatric, etc. has its own registration counter and records room, or the mixed system wherein the patient's first visit is registered and outpatient card originated at the central registration, but subsequent visits are registered at the respective clinic where his or her medical record is then kept.

In the decentralised registration system, the patient goes directly to the appropriate clinic for registration on being directed at the reception and enquiry. In this case, there will be no registration counters and no records room in the main reception and waiting hall. In the mixed system, only the new outpatients will use the main registration counters, as repeat visits will directly be registered at the respective clinics. The type of system that is practised has a bearing on the requirement of space and manpower.

The records are kept in filing racks with shelves. Depending upon the daily number of outpatient visits, appropriate number of racks must be provided. Up to 1000 outpatient records can be accommodated on each shelf of the rack. It is estimated that 1200 square feet (112 m²) space would be required for outpatient medical records room for a 500-bedded hospital.

Consulting and Examination Rooms

Separate consulting rooms with attached examination rooms can be uneconomical in space. The number and arrangement of consulting and examination rooms will vary with the services offered and the outpatient load expected.

The essential point is that privacy of consultation should be assured and the flow of patients should be smooth. The organisation and operation of outpatient departments for efficiency is aided by carrying out actual studies to depict the number of patients which doctors in different specialities could be expected to deal with in a session with the proposed clinic organisation.

In a busy outpatient department, the arrangement of examination rooms should be such that doctors can see patients without waiting for patient to undress, lie down, etc. A two, three or four cubicle examination room for each doctor can achieve this.

In busy outpatient clinics, combined consulting-cum-examination rooms permit all activities associated with patient examination. It eliminates the use of dressing cubicles, with minimisation of movement around the clinic. A series of intercommunicating consulting-cum-examination rooms offers an efficient as well as economical arrangement. Each

doctor uses two or more such rooms according to the nature of the work, his speed of operation and the number of assistants with him. While the patient is dressing, the doctor can write his notes, then move on to the adjoining room to deal with the next patient who would be ready on the examination table.

With minor readjustments these types of consulting-cum-examination rooms can serve almost all specialities except otorhinolaryngology and ophthalmology. There is very little wastage of the doctor’s time in this arrangement which ensures a great deal of flexibility of use and economy of construction (Fig. 3.3).

In large hospitals, providing examination rooms and other accommodation suitable only for a particular speciality has disadvantages. If the volume of attendance in a speciality changes over time, accommodation intended for one may have to be used for others. Some specialities require consulting and examination facilities only for part of the week, and others are required to share them. Standardisation of layout of examination rooms therefore facilitates the work of clinics as well as of the nursing and auxillary staff who have to work in different clinics by rotation.

Determining the Requirement of Consulting-cum-examination Room

The quantum of probable work-load is determined by assuming the indices for consultation both for the direct and indirect population, average number of first and subsequent visits, estimated duration of each consultation and the time during which the consulting rooms are in operation (Table 3.1).

Table 3.1: Determining the requirement of consulting-cum-examination rooms	
<i>Assumptions</i>	
Direct population	100,000
Indirect population	50,000
Consulting per person per year (direct population)	2
Consulting per person per year (indirect population)	0.5
Average first consultations	30%
Average subsequent consultations	70%
Time taken for first consultation/exam	20 minutes
Time taken for subsequent consultation/exam	10 minutes
Scheduled hours of OPD	6 hours
<i>Procedure</i>	
Direct population × consultations	100,000 × 2 = 200,000 consultations
Indirect population × consultations	50,000 × 0.5 = 25,000 consultations

Contd...

Contd...

Total consultation/examination per year = 2,25,000

Consultation/exam per day: $\frac{2,25,000}{300} = 750/\text{day}$

$\frac{\text{Consultations/exam per day}}{\text{Working days per year}}$

First consultation/exam per day: $\frac{750 \times 30}{100} = 225$
(Consultation per day × 30%)

Subsequent consultation/exam per day: $\frac{750 \times 70}{100} = 525$
(Consultations per day × 70%)

Time for first consultations 225 × 20 min = 4500 min

Time for subsequent consultations 525 × 10 min = 5250 min

Total time = 9750 min

Consultation room hours per day required: $\frac{9750}{60} = 162$ hours

$\left(\frac{\text{Total time in minutes}}{60} \right)$

Consulting rooms required: $\frac{162}{2} = 25$ consulting rooms

$\left(\frac{\text{Consulting rooms hrs per day}}{\text{Scheduled hrs of OPD}} \right)$

Each room requires space for the examining table, doctor’s desk and chair, stool for patient, a wash basin, and instrument trolley. The examination table may be screened off by a curtain on overhead rails for privacy of undressing and dressing.

The number of patients that can be efficiently handled by one doctor during the outpatient clinic time is difficult to establish. In a outpatient clinic of a general hospital, a doctor should be expected to deal maximally with three or four new patients and perhaps twice that number of repeat patients per hour. Expecting the doctor to deal with more than these cannot be without sacrificing the quality of care.

It may be difficult to provide natural lighting in consultation rooms by normal windows. Artificial lighting in the rooms should provide for a general light required for the doctors consultation, desk and a wall-mounted light or a movable inspection light should be provided next to the examination couch.

Maintaining cleanliness in the outpatient department is always problematic due to the large number of people of all types using the services. To ease cleaning problems, dado should be provided up to a height of 1.25 m or more on all walls of the outpatient department including corridors, waiting hall, subwaiting areas and examination rooms.

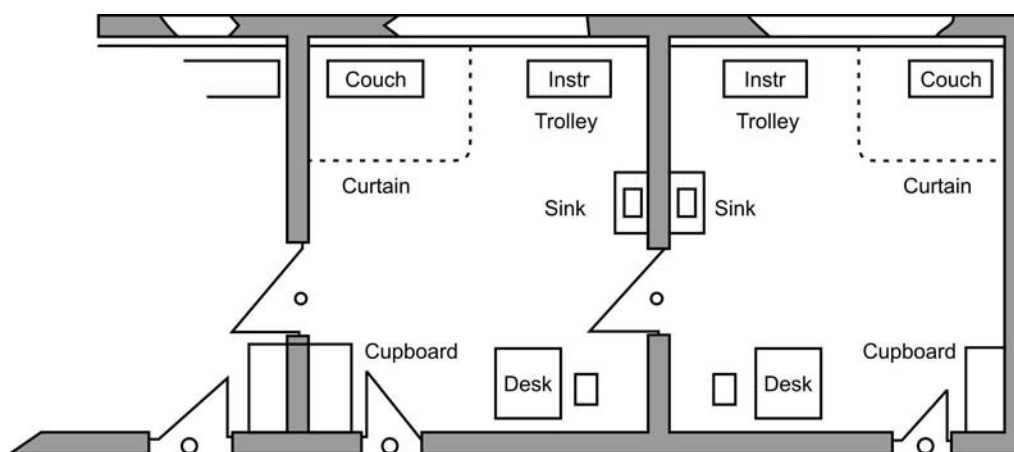


Fig. 3.3: Intercommunicating consulting examination rooms

ANCILLARY SERVICES

Certain additional facilities add to the functional efficiency in the outpatient departments of hospitals. A fairly large number of outpatients need dressings, injections, and investigations in the laboratory and many of them have their prescriptions filled by the dispensary. It has been generally found that:

- i. 50-60 per cent attend the dispensary
- ii. 10-20 per cent are administered injections
- iii. 30-40 per cent require pathological investigations and X-ray
- iv. 5-15 per cent need dressings
- v. 2-5 per cent minor surgical procedures.

These statistics refer to outpatient facilities at the peripheral hospital level. With this as the starting point, the number of patients attending various facilities will have to be based on the experience of hospitals in the area, supplemented by experience of the medical staff.

The following facilities would need special consideration.

Injection Room

The room is provided for all outpatients needing injections prescribed on outpatient basis. The room is staffed by a nurse. It should be of adequate size to accommodate an examination table for patient to lie down during injection, nurse's desk and chair, few chairs or stools for patients, a portable steriliser, and sink. Storage space for injections and syringes in the form of a cupboard should be adequate.

The room should be provided with an outlet from the central oxygen circuit and be equipped to deal with a case of anaphylactic shock if it occurs, with arrangements to summon a medical officer within seconds should such a situation arise.

Dressing Room

It will have space for a few chairs or stools and an examination table, dresser's desk and chair, a sink and adequate storage space for dressing materials. This room will be staffed by a nurse or a nursing orderly specially trained in dressing wounds, ulcers, etc. Many of the patients initially treated in the minor operation theatre needing subsequent dressings will also be attended here.

Minor Operating Theatre

Ambulatory surgery has been described as less complex than major procedure which require prolonged postoperative monitoring and hospital care.

Quite a load of minor surgical conditions can be handled in the outpatient department itself if it has a facility to deal with such cases, thus reducing the load on the main operation theatre suite of the hospital. Large hospitals may need more than one minor operation room with associated facilities. Because the outpatient department receives many patients needing intervention for abscesses, whitlows, ulcers, cuts and foreign bodies, minor septic surgery is likely to form the bulk of the work of this operating theatre. As all elective surgery, even minor, will be performed in the hospital's main operation theatre suite, the scope of surgery here may be somewhat restricted. Therefore, the design of this theatre will not be as elaborate as the hospital's main operation theatre suite.

Since the nature of operations also does not call for several assistants or bulky accessory equipment that is normally required in operation theatre, an area of 20 m² is considered sufficient. However, a recovery room should be provided additionally. This room would also be used as a plaster room for uncomplicated fracture cases.

Rising trends in outpatient surgery are apparent all over. Operations performed in USA in outpatient settings had risen from 19.6 per cent in 1980 to 31.5 per cent. To determine the need for such a facility separately for the outpatient department and to come to a understanding of the size and extent of the facility, the following questions will have to be answered.

1. What will be procedures that could be performed on outpatient basis?
2. Will such procedures be conveniently done in the main operation suite?
3. What is the likely average operating room time for each procedure?
4. What is the predicted number of outpatient procedures?
5. Will outpatient surgery be used for teaching purposes and how?

Dispensary

The dispensary has to handle hundreds of prescriptions daily from the outpatients. The area required should in no case be less than 250 square feet (23.25 m²) for even the smallest hospitals. There will be facilities for storage of drugs and raw materials, preparation of drugs, and dispensing. In fact, a lot of space is required here as storage space for drums, tins, jars and bottles of bulk drugs. It would be provided in the form of shelves or large drawers.

The dispensing is done through dispensing windows. On the inside, each dispensing window may be lined with drawers or provided with sectional drawer cabinets with cupboard bases.

Adequate waiting space adjoining the dispensing counters will have to be provided.

Laboratory Sample Collection Centre

Directing all patients requiring pathological investigation to the hospital laboratory causes a lot of interference in the inpatient areas in busy hospitals. In large hospitals, the problem can be ameliorated by provision of a specimen collection room in the outpatient department itself, where a technician receives urine and stool samples and draws blood specimens. The specimen can be taken on the same day it is ordered by the doctor although the result will be available only on the patient's next visit. The specimens are taken for processing to the hospitals main laboratory at the end of the outpatient day. The centre should be provided with toilet separately for male and female.

In busy hospitals, it may even be advantageous to equip this room to carry out simple blood tests such as

haemoglobin, total and different count and erythrocyte sedimentation rate (ESR) which are the most commonly ordered blood tests on outpatient basis. In this case, additional space for laboratory benching will have to be provided and provision for a sink made. This fragmentation of the laboratory service may appear to be wasteful of staff and duplication of effort. But in large, busy, hospitals, it is worth the effort. The following questions need to be answered in arriving at the decision.

1. What is the volume of tests to be generated per outpatient visit by category of tests?
2. Should there be a satellite laboratory for handling routine high volume procedures for outpatients?
3. Should the requirements be met by a specimen collection centre alone for routine high volume work?

Outpatient Radiology

Radiology is an essential part of investigations for outpatients in addition to the clinical laboratory. It is estimated that up to 40 per cent of new outpatient visits may result in radiological investigations.

The following questions associated with outpatient radiology services should be considered.

1. What is the expected volume by types of examinations?
2. What will be the impact of outpatient surgery on the workload of radiology department?
3. Will it be possible to handle all the OPD examinations in the main radiology department?
4. Can all outpatient cases, except for specialised examinations, be carried out in a separate dedicated outpatient facility?
5. Will emergency patients arriving during scheduled outpatient clinic hours also be handled here.
6. Is it possible to handle the OPD work separately from the standpoint of clinical necessity, convenience to patient and physicians and technical and administrative efficiency?

POLICIES AND PROCEDURES

In view of the interdependence of the staff, facilities and services of the hospital with that of the outpatient department, it is imperative that policies and procedures for each aspect of its functioning should be laid down in writing. *Policies* are guidelines for action in all situations in general. *Procedures* aim at putting the policies into practice and in adapting the facilities to the operational needs, and are therefore standardised methods of work. To run the

outpatient department efficiently, these should cover both administrative and technical (professional) aspects of the outpatient services.

Considerable care is required in compilation of the programme of all clinics. Commonly, a standard programme is prepared on a weekly cycle taking into account the availability of medical staff, type of accommodation and physical facilities, availability of equipment and a balanced deployment of staff. Clear policies and procedures should be understood by all concerned regarding the various aspects of OPD operations (Table 3.2).

COMMON PROBLEMS IN OUTPATIENT SERVICES

It is generally accepted that the three most important problems in outpatient services are as follows.

1. Appointment system jumping and long waiting
2. Nonavailability of test results, X-rays, etc.
3. Interruptions to consultation by telephone calls.

Similar and other problems are a constant woe of many a hospital.

A survey of the existing facilities in most public hospitals is likely to reveal that the services are not how they should be. Overcrowding, long queues, poor service, and staff as well as patient dissatisfaction can be encountered in varying degree and combinations. Solutions to all the problems in all hospital outpatient departments cannot be found. But the first step in tackling any problem is the identification of the problems and their causation.

Table 3.2: Policies and procedures for smooth functioning of OPDs

Clinics

1. Organisation
2. Functions
3. Staffing
4. Equipment
5. Techniques
6. Referrals
7. Consultations
8. Inter-relationship
9. Supervision
10. Records
11. Evaluation of care
12. Timings
13. Drugs
14. Supplies

Types of patients

1. General
2. Paying

Contd...

3. Referred
4. Eligibility
5. Medicolegal

Examination and treatment

1. General
2. Laboratory investigations
3. Radiological investigations
4. Consultations
5. Extent of treatment
6. Accident, injuries
7. Fractures
8. Injections
9. Dispensing
10. Records
11. Follow-up

Staff

1. Organisation
2. Duties
3. Responsibilities
4. Shifts
5. Inter-relationship

Equipment and supplies

1. Inventory
2. Requisition
3. Purchasing
4. Indenting
5. Accounting
6. Storage
7. Maintenance
8. Standards
9. Safety
10. Sterilisation

Records

1. Identification
2. Filing and retrieval
3. Retention

General

1. Safety and security
2. Budget
3. Accounting
4. Statistics
5. Housekeeping
6. Maintenance
7. Communications to the press
8. Public relations
9. Coordination

Problems can be looked at from different perspectives as follows.

- What are, and where are, the problems?
- Who's view? i.e. problems as seen by the staff, the patients, and the community.
- What cause? i.e. a search for the root of the problem.

Contd...

- What effect? i.e. how does it affect the operations of the outpatient service.
- How can the problem be solved?

What are the Problems?

Problems frequently mentioned or observed can be grouped as dealing with the following:

1. Operations—Long queues, Queue jumping, inadequate service time, patients queries not answered by medical staff, punctuality
2. Resources—Adequacy and competence of medical and other staff, availability of drugs and supplies
3. Efficiency
4. Physical facilities and layout
5. Quality of care
6. Patient and staff satisfaction.

Where are the Problems?

Problems in OPD operations can be encountered at the reception and enquiry, clinics, laboratory counter, injection and dressing room, pharmacy, registration and with patient flow.

Whose View?

Problems perceived by the staff are likely to be different from those perceived by the patients and the community, although there may be some overlap. The staff may complain of shortage of manpower, frequent breakdowns and

nonavailability of equipment, drugs and supplies out of stock, or just plain too many patients. On the other hand, long queues, long waiting time and inadequate service time, staff not being courteous or considerate and unpunctuality of staff are the main problems as seen from the patients and community’s point of view.

Cause and Effect

Sometimes, it is difficult to distinguish between cause and effect, but the distinction is important. Remedial measures must be directed to the root of the problem. Palliative measures are seldom effective or lasting.

Many problems have several causes, and one cause may have many effects (Fig. 3.4).

A Search for Solution to the Problems

Up to a limit, statements such as ‘the problems are beyond anybody’s control’ can often be challenged, because they may be subterfuges or exaggerations. The most important cause underlying the problems in OPD is the tremendous load and increasing demands for outpatient care, and therefore, an imbalance between demand and resources.

Solutions to some of the problems are discussed below.

Queuing and Waiting Time Problems

The maximum number of problems in OPDs of most hospitals belong to this category.

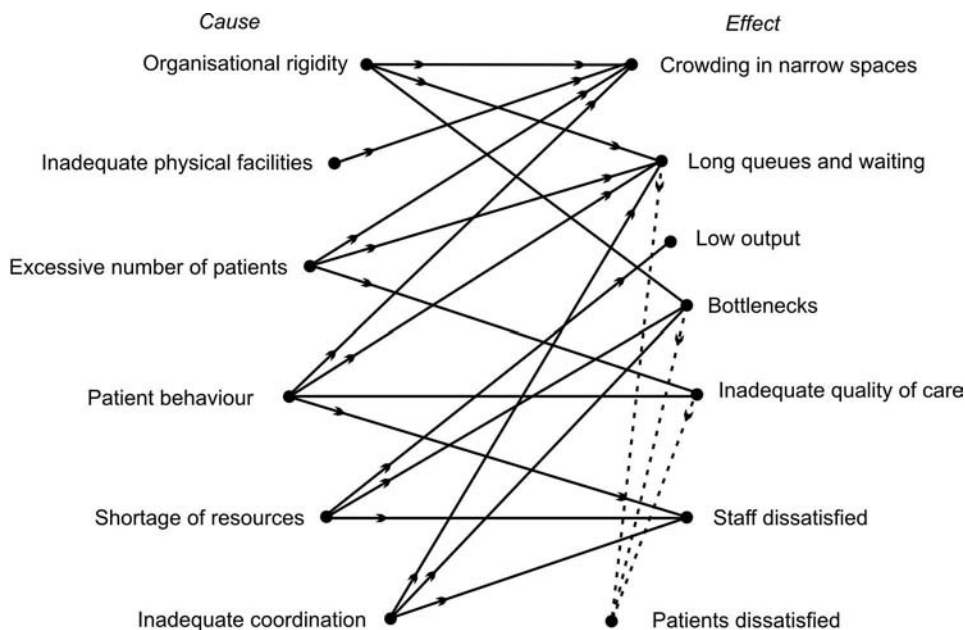


Fig. 3.4: OPD problems—some causes and effects

The service of an OPD is affected by the following.

1. **Arrival pattern**, or input rate of patients at the central waiting room
2. **Input and output rates** at various clinics and other supportive services units
3. **Service time** at various clinics
4. **Queue lengths** at waiting rooms of clinics.

Obviously, the above factors cannot be independent of each other. Queue lengths and waiting time at the central waiting room are related to the input rate at the waiting room and output rate at the doctors' clinics. The problem is caused by a large number of patients arriving early, coupled with late start of clinics. Figures 3.5 and 3.6 depict two patterns of arrival pattern, input-output rate, waiting time and queue lengths at two hospitals.

Queuing and waiting line problems can be dealt with in the following manner.

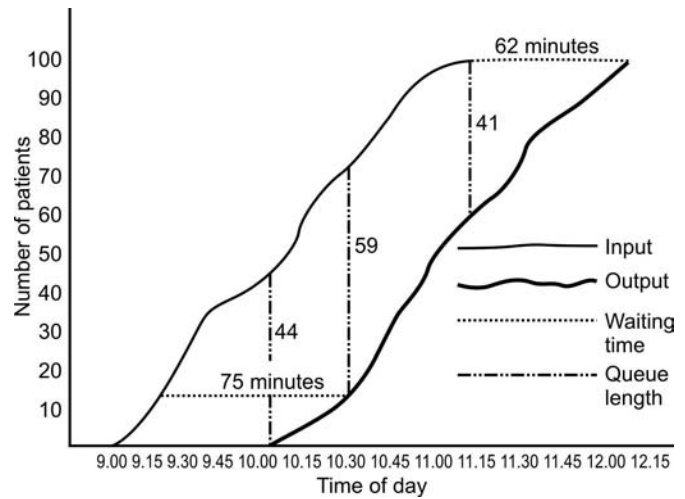


Fig. 3.6: Cumulative input-output at general OPD—another pattern

Appointment System

After the first visit, the patients are given the date and time for their next visit. However, this entails greater involvement of doctors in making as well as keeping appointments. Staggering of the appointment times can decongest the crowd, shorten the queues and lessen unnecessary waiting time of the patients. However, the doctor must keep a few appointments vacant to cater for serious patients who may have to be attended out of turn.

The appointment at a particular time can be for individual patients or for a block of patients. As opposed to individual appointments system, the block appointment system is intended to provide a pool of patients so that the physician will at no time find himself or herself idle. However, the system leads to long waiting lines for a majority of the patients. For example, if 10 patients are told to arrive at 9 AM and assuming all 10 actually turn up at 9 AM, if each consultation takes 10 minutes with the doctor, second, third, fourth and fifth patient would experience a waiting time of 10, 20, 30, 40 minutes respectively. The remaining five would experience waiting times varying from 50 minutes to one hour and thirty minutes. Smart patients will try to outwit the system by arriving late.

Nevertheless, the principles of appointment system are not being given adequate attention. The rate of calling patients to the clinic by appointment should match the particular doctor's rate of dealing with them. The appointment system should also take into account the net unpunctuality of both patients and doctor and the average extent of nonattendance

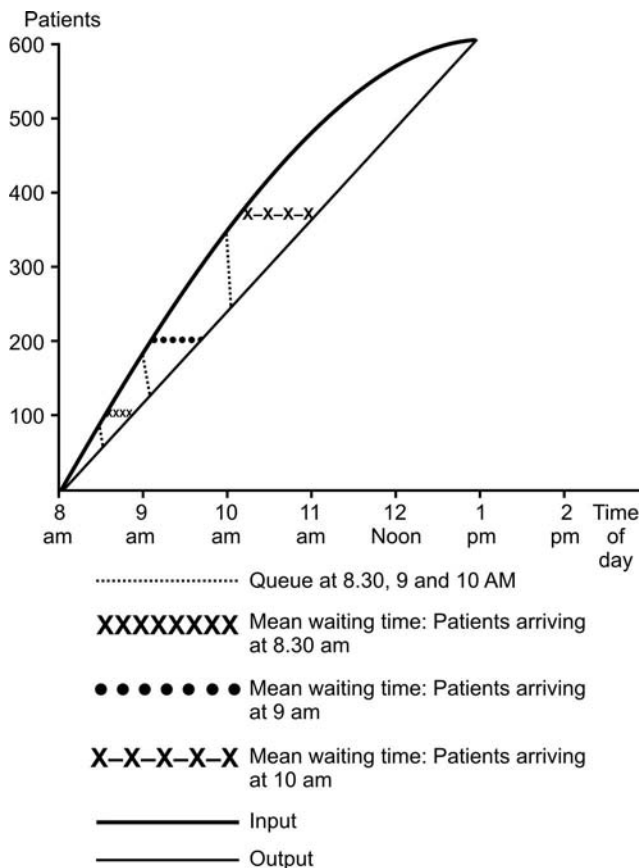


Fig. 3.5: Cumulative input and output at the waiting room of outpatient department of a public hospital

by patients. Invariably, some patients fail to attend and others arrive without appointment.

If the net average increase or decrease in attendance is catered for in the appointment system, then the effects on waiting times of irregularities in attendance can be very slight when averaged over a large number of clinics. A National Health Service (UK) study showed that even if a doctor is punctual, on an average 20 per cent of patients fail to attend. When this nonattendance is taken into account while giving appointments, i.e. in a clinic at which it is wished to see 30 patients, 36 (i.e. 20 per cent more than 30) are called, then the doctors average wait per clinic and the patient's average waiting time would be just over a minute less or more than if all the patients with appointments had attended.

Filter Clinics

All patients visiting the OPD do not require care by specialists. In the absence of screening, all patients irrespective of the level of care required, tend to crowd the speciality clinics. Since a large majority of ailments can be tackled at the level of nonspecialist general duty doctors, filter clinics manned by such doctors would be able to relieve congestion on speciality clinics.

With the people wanting to avail of the facilities of the hospital with which they associate the OPD, such clinics should be integral parts of the hospital's OPD itself.

Satellite Clinics

Satellite clinic is a variation of the above, the satellite clinics being located away from the main hospital OPD, to serve defined concentrations of populations, but having links with the main hospital. Such clinics can be manned entirely by general duty doctors, but with arrangements for referral of the patients to the hospitals' specialist outpatient clinics as well as by periodical consultation visits to satellite clinic by specialists.

Selective Service Charge

Excessive demand in government and charity hospitals may be discouraged by a high selective service charge to those patients who come directly to the speciality clinics without having passed through a filter clinic or satellite clinic, or without any type of referral. However, if the peoples' economic condition is good, levying of such a charge may be counterproductive.

Starting OPD in Time and Prolonging OPD Timings

Unpunctuality must be avoided at all costs. The staff must start the clinics as per the declared timings and always adhere to these timings. If patients know that the OPD starts at 8 AM, so the doctor and staff should be in position to see the first patient at 8 AM.

Prolonging the OPD timings till late afternoon or evening with a suitable break for the staff would enable a larger number of patients to be dealt with. Experiments to start evening OPD services in some large hospitals have not produced the desired effect for various reasons. But prolonging the existing OPD timings till evening appears to have a better chance of success than starting evening OPD. Of course, the extended timings of the OPD must be matched by all the supportive services like laboratory, and pharmacy.

While considering reduction of waiting time and ensuring that maximum patients are attended to with minimum of waiting time, one has to remember that progress is governed by the slowest procedure. This would require taking care of the bottlenecks.

Physical Facilities Problems

Sufficient waiting spaces, both at the central waiting area and at the clinic must be provided, with toilets, drinking water fountains, and comfortable seating. Adequate number of examination cubicles for each doctor should be provided. Inadequacies in the structure of the OPD impeding smooth flow of patients and creating bottlenecks can often be alleviated by relatively minor modifications like adding a door, shifting a wash basin, partitioning a room, widening a passage, demolishing a wall to eliminate an obstacle and so on.

However, accurate diagnosis of the problems would require in-depth study of each problem. Study of flow charts and some aspects of work study, viz. time and motion study, method study, and activity sampling would help in determining appropriate solutions.

Resources Problems

Proper resource utilisation require well-planned and coordinated deployment of men, materials and money. Shortage of resources is often relative. An apparent shortage of staff may reflect faulty deployment of available staff. Materials and supplies required to fulfil the functions of the

OPD need to be made continuously available. And, of course, the allotment of resources must meet the fluctuating requirements.

Ways and means to reduce costs and improve efficiency need to be continuously monitored, especially in the use of drugs, radiographic films, and other expendable items of general surgical and medical use. Prescription of commonly used drugs under many brand names, and prepacking of drugs for issue through pharmacy is an attempt in waste reduction, variety reduction, and cost reduction.

Coordination Problems

With so many activities simultaneously occurring within a short span of 4 to 5 hours in a busy OPD, the prime requirement is coordination and control. A possible answer is 'unity of command' by one person over all the OPD operations.

In public hospitals, it is not possible for a clinician or a group of the clinicians to effectively control and coordinate the day-to-day activities of the department. The responsibility for the day-to-day functioning and coordination of staff and facilities should, therefore, devolve on a designated officer who is directly responsible to the chief administrator, and who must have authority to participate in the policy decisions in that capacity. This may be achieved by granting the OPD administrator a full status of department head.

However, it is a moot point whether the clinician administrator having responsibility for the overall functioning and coordination of the departmental should take clinics himself. The size and complexity of the department would determine this. In a large OPD where the clinician-administrator has this overall responsibility he possibly cannot do justice to both the tasks.

A high degree of collaboration between the clinics, supportive services and other elements of OPD could be achieved by the OPD administrator by daily rounds, continuous monitoring, informal discussions with medical and other staff, periodical meetings with medical staff, and coordination through medicoadministrative committees. Preparation of a management check-list for outpatient services, phrased as question to a patient has been suggested for hospitals in the NHS of UK. These can be developed by the management of each hospital taking into consideration the peculiarities of each hospital.

In each department, there should be a sister who devotes her time essentially to the supervision and coordination of the work of nursing, auxiliary and paramedical workers stationed in OPD clinics. However, there is a danger of

overstaffing outpatient department with highly qualified nursing staff. As little as 7 per cent of qualified nursing staff time is found to be spent on nursing work.

OTHER MEASURES

At the OPD records and registration, common problems are delay in locating and retrieval of records due to faulty filing, numbering and storage. Although at present many small hospitals do not have the services of medical record librarians, OPD records systems without medical records librarian are difficult to visualise. At least one record librarian in even the smallest hospital should be a must, who can train the other paramedical staff in the OPD to maintain OPD records under his overall supervision.

Adequate space and filing racks for storage of records should be ensured, with identification numbers on each rack and shelf. Numbering of cards by a hand-operated machine should be introduced to obviate misinterpreting of numbers which is one of the most common cause of confusion in a busy OPD. Arrangement to position the records of patients by appointment on the desks of concerned doctors in advance must be organised. Use of cards of different colours could also be considered for different speciality clinics.

During busy hours at the enquiry and registration there may be a need to augment the services with additional staff. Some voluntary groups offer their services in large towns and cities. Otherwise the hospital should have the services of at least one medical social worker in the OPD who can help in many ways such as help to arrange for indigent patients drugs not stocked by the hospital, arrange help for the physically handicapped and otherwise incapacitated patients in going about the OPD.

The working of the OPD supportive services, central injection room, specimen collection centre, pharmacy and radiodiagnosis also need to be continuously monitored. In the injection room, sufficient availability of syringes and needles should be ensured. At the specimen collection centre, facilities and staff to draw blood samples and for collecting urine and stool samples should be adequate to the requirements. Laboratory investigation reports should be made promptly available with an in-built system of prompt distribution of reports to specialists. Insufficient number of counters and short supply of drugs are the two chief problems in Pharmacy. Sufficient number of pharmacists should be available to man all counters during the busiest hours.

It is certainly in the interest of the hospital to develop a reasonable standard of efficiency in the utilisation of staff and facilities in the outpatient department. Laying down policies and procedures for various aspects of OPD operation should help in many cases where an atmosphere of *laissez faire* now exists. The policies and procedures should be made known to staff, and those which pertain to patients should be made known to them in brief terms, by notices displayed at appropriate places. The policies should cover operational, administrative and technical aspects of OPD functioning.

In conclusions, it can be said that although many problems may be beyond solution by the OPD administrator and would require decision and support from the hospital's governing body or other higher authority, there is always scope for improving OPD operations in most hospitals. Efforts should be made to improve things by:

- i. simplification,
- ii. combination,
- iii. improved organisation,
- iv. delegation,
- v. task allocations and job descriptions,
- vi. communication,
- vii. improved motivation, and
- viii. discipline.

Due to an imbalance between demand and available resources, the long-term solution to the problems caused by sheer numbers can only be the provisioning of more

OPD services. But in the existing situation we should ask ourselves—can we do better with what we have? Can we make better use of available resources? Can we improve efficiency? Can we improve motivation and discipline? Even knowing that there is a limit to the possible increase in efficiency, the only short-term solution to the present situation is to strive for increased efficiency. This in turn requires reconsideration of the established operational policies and administrative procedures. Nevertheless, consideration of the long-term solution must also be taken up simultaneously.

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CHAPTER

4

The Nursing Unit

INTRODUCTION

The nursing unit, also called the “ward” is a grouping of accommodation for the patients with service facilities which enable a team of nurses to care for inpatients under the best possible conditions, and includes under one roof patient beds, the nursing station, the service area, storage area, work area and sanitary area. An ideal nursing unit should provide for the best possible physical facilities, should result in a high quality of nursing care, should be operated at the lowest possible cost, should provide the most desirable patient environment and provide a congenial work environment for the nursing and medical staff.

The planning of the nursing unit emerges from the work which the nursing and associated staff have to perform. Since it caters to the needs of a mixed group of people in various stages of illness or convalescence spending part or whole of their time in bed, it is like a temporary home to the patient.

THE NIGHTINGALE WARD

The traditional nursing unit was based on the ward concept established by Florence Nightingale, which centred around the head nurse. It was a self contained unit for 35 to 40 or more patients, with its own kitchen and arrangements for all stores and supplies, where the nursing sister was the matriarch who combined the role of housewife with that of nurse.

The Nightingale ward was a pavilion type of ward and consisted of patient beds in two rows at right angles to the longitudinal walls, with toilets and bathrooms at one end,

and the nurse’s table, doctor’s room and other technical facilities at the other end (Fig. 4.1). Nurses had to walk long distances to attend to patients. Subsequently, the nurse’s table saw a shift towards the centre of the ward, and the toilets and bathrooms were also shifted in the centre, in the form of an annexe. A later change was replacement of the nurse’s table by a nursing station to house various service facilities. In spite of these changes, the Nightingale ward suffered from disadvantages such as lack of privacy to patients, a not-so-quiet ward atmosphere and danger of cross-infection, all of which were a direct result of the pavilion.

It was gradually realised that a large ward of 40 patients and more resulted in reduction in human contact between the nurse and patient. This, subsequently led to the reduction in the number of patients in each nursing unit to enable the nursing staff to establish a closer relationship with their patients.

Due to increasing complexities of nursing procedures, technical advancement in medicine, understanding the concept of hospital infection and changing expectations of

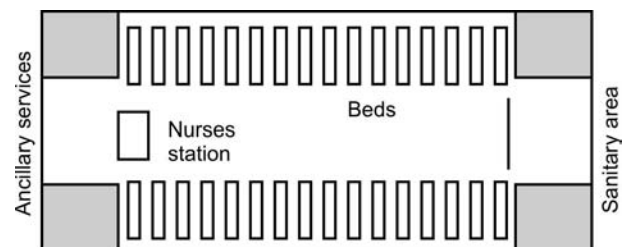


Fig. 4.1: Nightingale ward plan

patients, the nursing organisation has undergone considerable change during the recent past; the design of the nursing unit has changed accordingly.

Even though a nursing unit now is better organised and administered, results in better material handling, has better nursing organisation, and designed for economy in space which are all important in planning of nursing units, the patient and his or her human needs require equal emphasis in planning. They should not be subordinated to design considerations alone.

PROGRESSIVE PATIENT CARE

Nursing supervision is deliberately maximised in critical care units, where the patient is very ill and need for privacy is reduced. When the patient is getting better, observability can be reduced. Gradually, the recovering patient is transferred to a medically less sophisticated unit. Different kinds of units that offer varying degrees of patient adjusted care are replacing standard nursing units.

A system of progressive patient care has been adopted in most hospitals which has a considerable effect on nursing unit design. Under this system, the inpatient area is divided into various sections based on the intensity and type of nursing care required, as follows:

Intensive Care

The intensive care unit is for patients in acute stage of illness who are unable to communicate their needs. They require continuous observation and extensive nursing care with personnel specially trained for the job. The aim is to first support life in a crisis, prevent threat to life, and then to eliminate the cause of disfunction by specialised treatment and extensive nursing care. Therefore, the unit is equipped with life-saving equipment, and all necessary life-saving drugs and supplies are immediately available.

Intermediate Care

The intermediate care unit is for patients who are moderately ill, including patients transferred from intensive care unit who require moderate amount of nursing care. A large proportion of all hospital patients will be directly admitted to this unit.

Self Care

The self care unit is for those patients who, after the acute phase of illness is over, become ambulant during the period of convalescence, or are admitted for diagnostic procedures

and are able to look after themselves. Nursing care required for this category of patients will be minimal.

Long-term Care

The long-term care unit is for patients requiring prolonged nursing care and where such services not normally available at home, including adjustment to disabilities by physical and rehabilitation therapy.

The basis of progressive patient care system is the amount and type of nursing care required and the degree of dependence of the patient on others.¹ The design of the nursing unit and facilities to be provided differ from intensive care through intermediate, self-and long-term care units. However, it is debatable whether the system results in economy in bed utilisation because, if each section is capable of taking only patients of a particular category, bed utilisation would get adversely affected due to fluctuations in demand in each category.

CLASSIFICATION OF WARD ACCOMMODATION

While discussing accommodation for nursing units, it is advantageous to classify it into certain groups. Ward accommodation can broadly be classified into four groups viz. **Primary, Auxillary, Sanitary** and **Ancillary** (Table 4.1).

Table 4.1: Classification of ward accommodation

Primary

- Bed accommodation
- Nursing station
- Treatment room

Auxiliary

- Doctors' room
- Nurses' room
- Stores
- Clean utility

Sanitary

- Toilet block
- Dirty utility
- House-keeper (*Safaiwala* closet)

Ancillary

- Ward pantry
- Day room
- Conference room
- Stretcher trolley

WARD SIZE AND CONFIGURATION

It is common to plan ward accommodation in multistoreyed buildings, each floor plan resembling a template of the plan on the floor above. However, many hospitals have inpatients areas horizontally spread in single or two-storey buildings

linked by horizontal corridors. Although horizontal planning has limitations, it saves time in internal movements than is possible with a vertical inpatient block without lifts. The upper limit up to which a horizontal layout may have many advantages is between 150 and 200 beds. Beyond that, arrangement of wards in a vertical fashion will be more advantageous.

The optimum size of a nursing unit should primarily depend on the number of patients the nursing team can manage effectively. Smaller units are expensive to build and uneconomical to maintain, as are too large units. A 10-bed unit would require the same type of equipment, facilities and ancillary rooms as a 20-bed unit. Therefore, the possibility to plan for certain type of accommodation—treatment rooms, sluice room, pantry, toilet facilities,—etc. to be shared between two or more units should be explored.

The dilemma to choose between a large open type of ward and a unit divided into smaller rooms is faced by every hospital planner. Apart from the fact that nursing units with smaller rooms give a feeling of privacy and comfort they also allow for flexibility in the use of beds. On the other hand, they call for large staff and are difficult to supervise. Economy in the deployment of nursing staff precludes adoption of smaller wards system on a universal scale, and communal wards of larger number of beds may have to be retained in many hospitals, relegating the concept of privacy to the background in some cases.

The concepts of personal privacy are variable. Degrees of privacy desired is a function of family values and socio-economic status. In a society where crowded living conditions force a lack of privacy, or where privacy has never been experienced, privacy norms need not be as elaborate as in situations where they are a realistic social requirement. On the other hand, planning of ward design on the concept that all people are equal, and that if they are unequal they can be equalised, can also lead to problems. More private and personal facilities would, however, be a distinct feature of private hospitals.

A ward floor of 60 to 100 patients subdivided into two or three ward units—each cared for by a nursing team is functionally quite efficient. In a large hospital, grouping of wards in one area on each floor has distinct advantages. In multistoreyed buildings, the shape of each floor imposes itself upon the one below. Besides economy in building costs, the advantage is a compact hospital. The buildings go up to a fair number of floors. It is necessary to carefully weigh the advantages and disadvantages of concentrated and therefore high rise versus diffused type of ward areas.

In multistoreyed buildings, it is difficult to make provision for growth and change—very little space will be available for each unit to expand into.

Many different types of floor plans for wards have been adopted by various hospitals. The plan most suited according to the need should be selected after study of prevailing trends and extensive discussion with the architect. Figure 4.2 depicts various types of outline plans for ward floors.

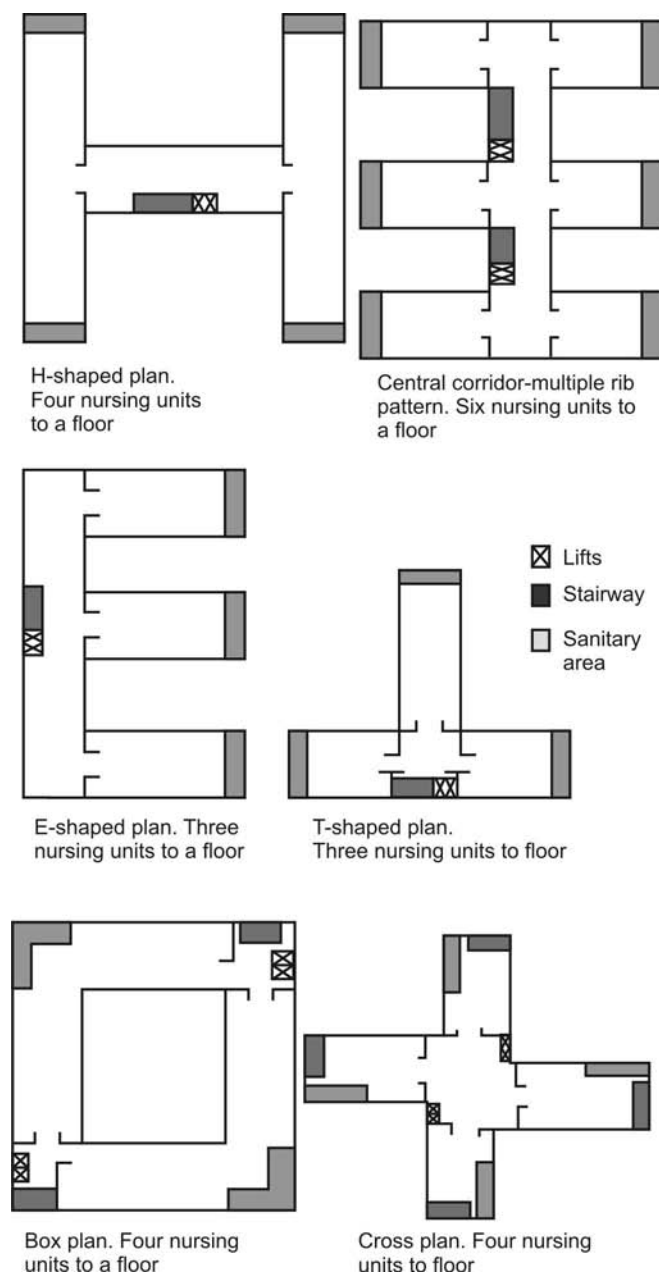


Fig. 4.2: Outline floor plans for ward floors

Within a ward the plan now generally accepted provides for grouping of patients into 6-bed and 4-bedrooms, together with a small number of 2-bed and 1-bedrooms for more serious patients and for patients requiring segregation from others for various reasons. Upto 20 per cent of the beds in a ward should be located in single bedrooms. This type of ward divided into small rooms of 6, 4 and 1 bed each, the beds being arranged parallel to the longitudinal wall of the ward, is called the **Rig's pattern** ward. By planning beds parallel to the exterior wall, the undesirable necessity of the patient facing an interior wall or the glare from the windows is eliminated (Fig. 4.3).

Even the Rig's type of ward suffers from certain disadvantages, viz. deprivation of direct observation of patients by the nurse, difficulty in communication between patients and nurse, larger amount of walking by nurses in the course of their duty, and requirement of more number of nursing staff. Some of these disadvantages have been overcome by devices like call bells, signal lights, two-way speakers and in some hospitals closed circuit television. However, designing a ward unit to reduce the number of nurses has defied solution. No standard blueprint can exist for this purpose. It has been observed that patients and nurses are more satisfied with circular designed nursing units for seriously ill patients [ICU], but preferred traditional rectangular units for more mobile patients.¹

Each ward has its own specific requirements and possibilities.

Modular Grids

Standardised dimensions for the nursing units can be provided by planning on a **basic space unit** concept, based

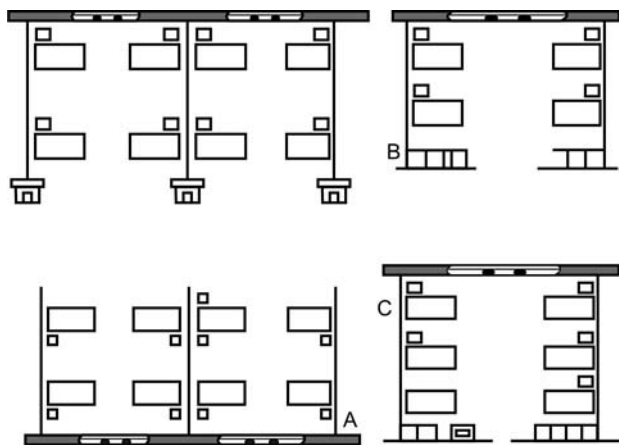


Fig. 4.3: Rig's pattern of ward cubicles

on a space planning module and a planning grid². A standardised planning grid of 1.6 m has been found to be very useful. Six such grid units, i.e. 3.2m × 4.8m give a carpet area of about 14.00 sqm, after deducting wall thickness. These are further subdivisible into 3 grid units for bed space in general ward, and 1.5 grid units to cater for the smallest need of toilets, etc.

The 4 bedroom is approximately 5 m wide by 6 m long. Central corridors of wards have to be minimum 2.50m wide. Service/ancillary rooms will have a floor area of 15m² or 20m² depending upon whether they have the same width as the patient room (in case of centrally spaced corridor) or are placed on the smaller side of the corridor dividing the ward (refer to Fig. 2.5 Modular grid: Space Planning Module in Chapter Two).

In this example, the total floor space of the nursing unit consists of a width of 12.80 m (4.80 m on either side of corridor, plus 3.20 m for corridor) multiplied by the length, usually 30 m. The area, thus, arrived at (30 m × 12.80 m) = 384 m² gives on overall floor space of 15 m² per bed for a 25 bedded ward. When the corridor is not in the centre and divides the ward unequally, single-bed or two-bedrooms are less wider, the width is reduced by 1 m, but approximately the same floor space can be obtained by increasing the length of the ward by few metres.

Combining Two Wards with Common Service Facilities

Two nursing units served by a common core of work areas can be economical in building design, at the same time efficient in functioning. Certain facilities like pantry, toilets, safaiwala's closets, dirty utility, day areas, etc. can be shared between two nursing units, whileas reception, waiting, staff offices, conference rooms, supply rooms, attendant overnight stay areas, etc. can serve several wards on a patient floor. Figure 4.4 shows these relationships.

A 32-bed ward in Figure 4.5 is shown divided in two sections, with service rooms placed with advantage in the centre of the unit, thus, ensuring effective separation of the two sections while still maintaining a single operational unit served by one team of nurses. To achieve separation of the circulation of patients and visitors, entrances can be provided at both ends of the unit. If necessary the central section used by medical and nursing staff can be barred for patients and visitors by doors. Should it become necessary to increase the beds in one section, some of the service rooms may be moved to one end and the rooms so vacated utilised as patient rooms. For example, the treatment room and ward

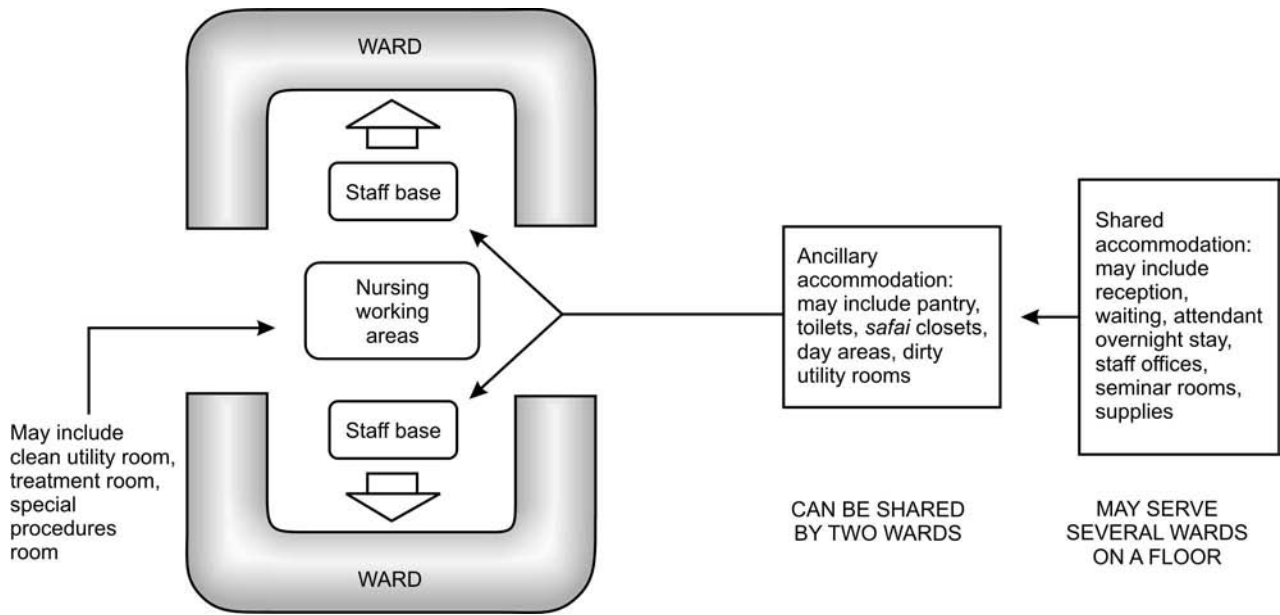


Fig. 4.4: Ward areas: Some sharing relationships

pantry can be shifted to the other section so as to leave 20 beds on one side and 12 on the other.

A similar combination is possible for two nursing units of 20 to 25 beds each, to be serviced by a single team of nurses, by provision of a common group of service rooms as depicted in Figure 4.6.

This arrangement has special advantage of economy in the deployment of nurses, because certain tasks common to both units can be done by a single nurse. It also permits

flexibility in the use of beds among, say, medical and surgical services.

Patient accommodation in the ward unit will thus consist of 6-bed, 4-bed, 2-bed and 1-bedrooms in the Rig's type ward. The minimum floor space for a bed in multiple bedroom (4 bed and above) should permit 7.0 m² physically per bed. The suggested optimum for a single bedroom is 14.00 m², and the 2-bedroom 21.00 m².

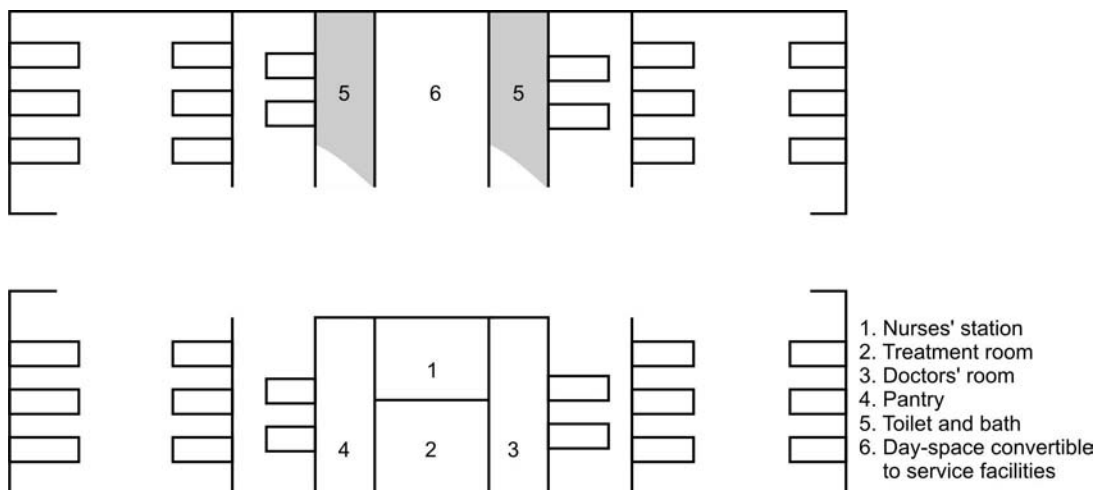


Fig. 4.5: Twin ward with common service facility

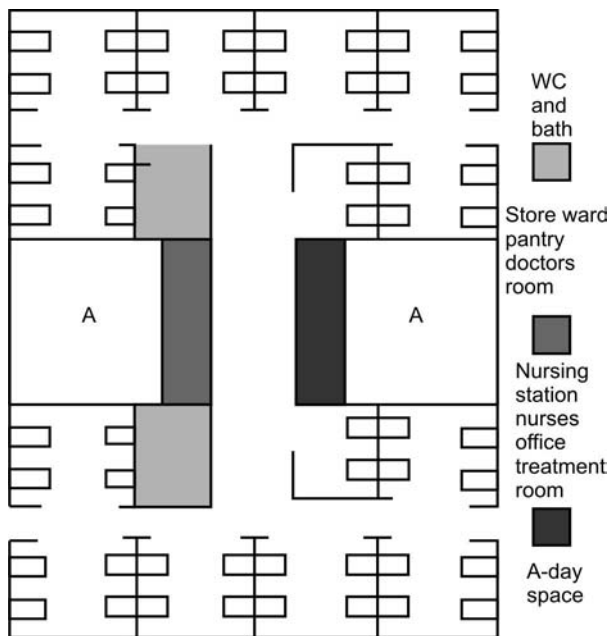


Fig. 4.6: Two nursing units with common service facilities

The distance between beds should permit as much unrestricted movement as possible. The distance between the wall and the side of the bed in case of beds closer to the wall should not be less than 0.65 m. The centre-to-centre distance between adjacent beds should be minimum 2.25 m, which gives a distance of 1.25 m between adjacent beds.

Although the above are accepted to meet most requirements without gross deviations, modifications in the dimensions should be possible, guided by local conditions. Four different types of layout studies are depicted in Figure 4.7.

Ceiling Height

The floor to ceiling height of the ward unit should not be less than 3.00 m and varies between 3.00 m and 3.60 m. The minimum vertical space under the bottom of beams or suspended ceiling fans should not be less than 2.60 m.

Width of Corridors

Suitable width of corridors is considered to be 2.40 m to facilitate movement of stretcher trolleys. Lesser dimensions would do for passages leading to departments which are not required to be used for movement of stretcher trolleys.

Windows

Window openings for admitting light and air should be approximate 20 per cent of the floor area of the rooms if windows are located only in one wall. It should not be less

than 15 per cent of the floor area if the window openings are located on the opposite walls at the same sill level. Use of venetian blinds to control direct sun should be made but restricted where essential, because venetian blinds gather dust, and their cleaning is liable to be neglected. This problem is now partly overcome by vertical venetian blinds.

Doors

The door width of all patient rooms should not be less than 1.20 m so that a standard hospital bed can be wheeled in or out without obstruction. A standard hospital bed measures 1.0 m in breadth and 2.15 m in length. The doors must not open towards the corridor. Doors which open towards the patients' bed give greater privacy even with the door partially open, but it should be ensured that they do not encroach upon the bed or cupboards inside the patient rooms. Door closers to prevent the doors slamming are necessary.

Ventilation grill on the top of door shutters should always be provided for rooms opening into the central corridor and having only one wall for windows.

Dado

From the standpoint of hospital hygiene, it is imperative to have the dado extended at least up to 1.20 m high in all rooms and corridors.

Noise Reduction

Use of acoustical structure for ceiling in corridors is preferable to minimise transmission of noise in corridors.

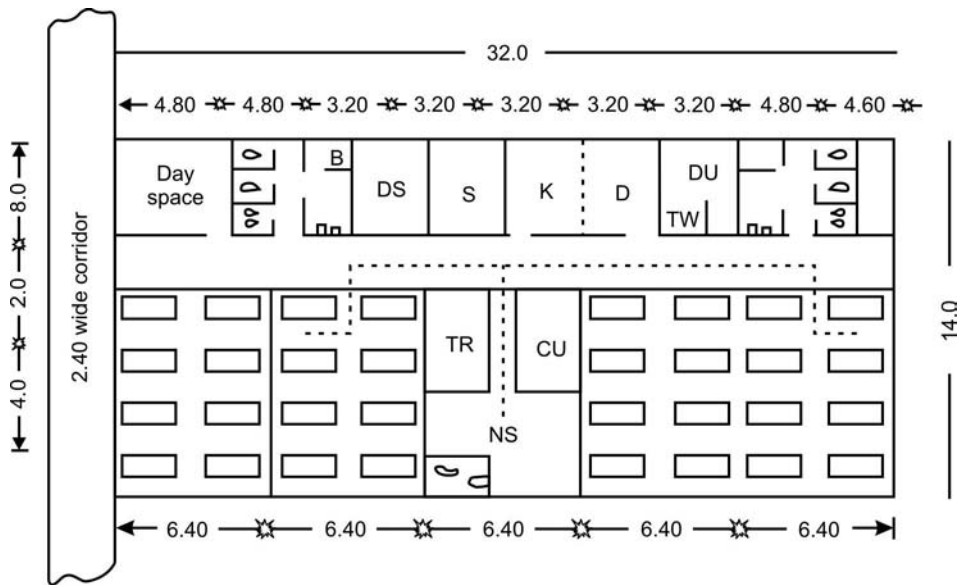
Bedside Lockers and Built in Cupboards

A bedside locker for patients' belongings should be provided for each bed. Built-in cupboards for hanging clothes and storage of personal effects are desirable at the scale of one for each bed in a Rig's ward. The only other piece of movable furniture that should be provided beside each bed is a comfortable chair for the patient to relax when not obliged to lie in bed.

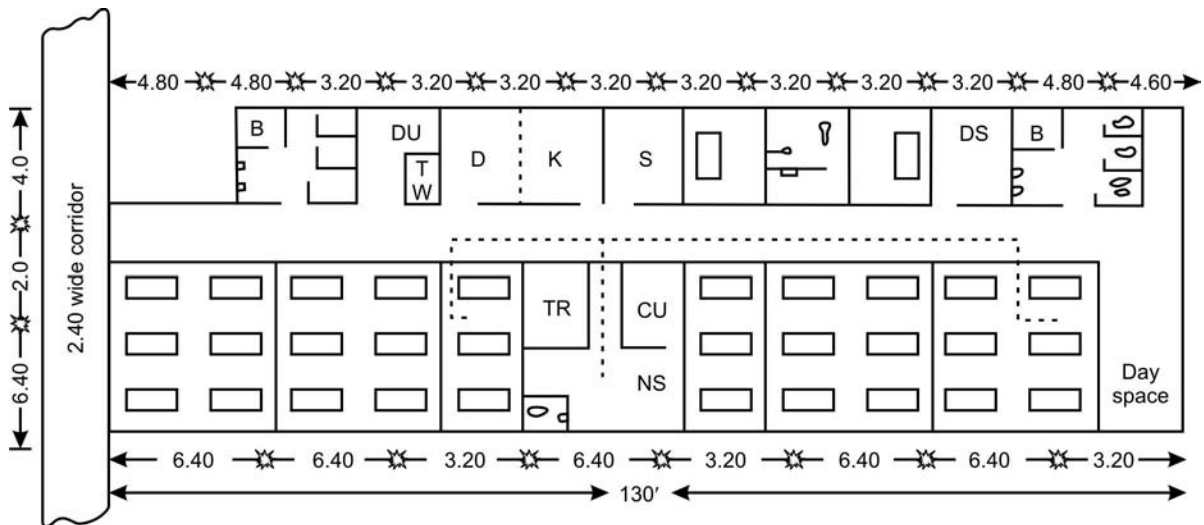
Simplicity Combined with Efficiency and Effectiveness

- Efficiency is the rate at which inputs are converted into outputs. The emphasis is on **quantitative** measurement, and the objective is to secure maximum output from minimum input.
- **Effectiveness** is the extent to which purpose goals are achieved. The emphasis is on **qualitative** measurement and the objective is meeting customer needs and delivering quality.

Type I



Type II



Abbreviations

- NS — Nurses' station
- DS — Doctor-cum-sister's room
- TR — Treatment room
- CU — Clean utility room
- DU — Dirty utility room

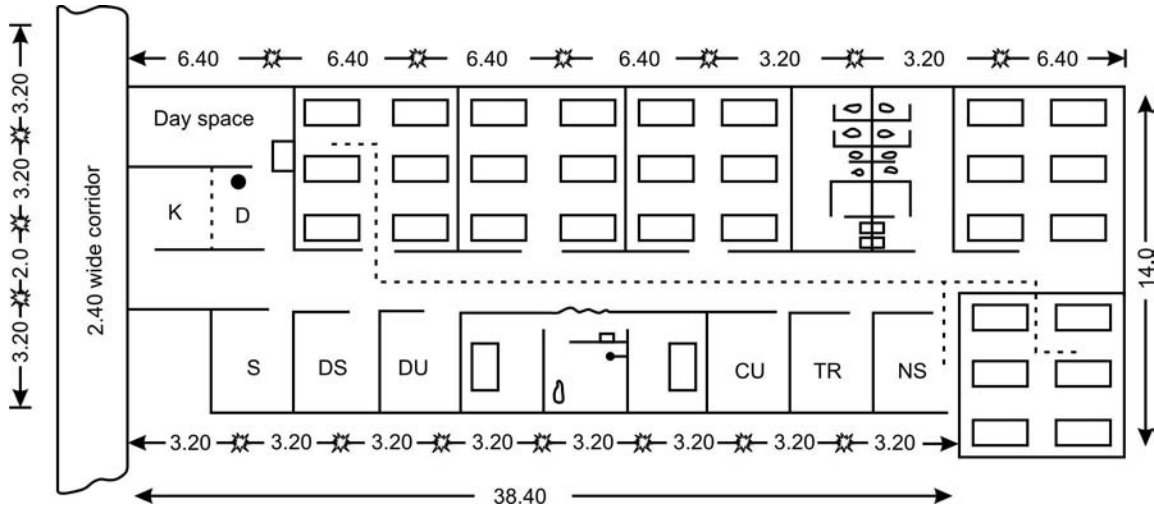
S — Store room

P — Pantry

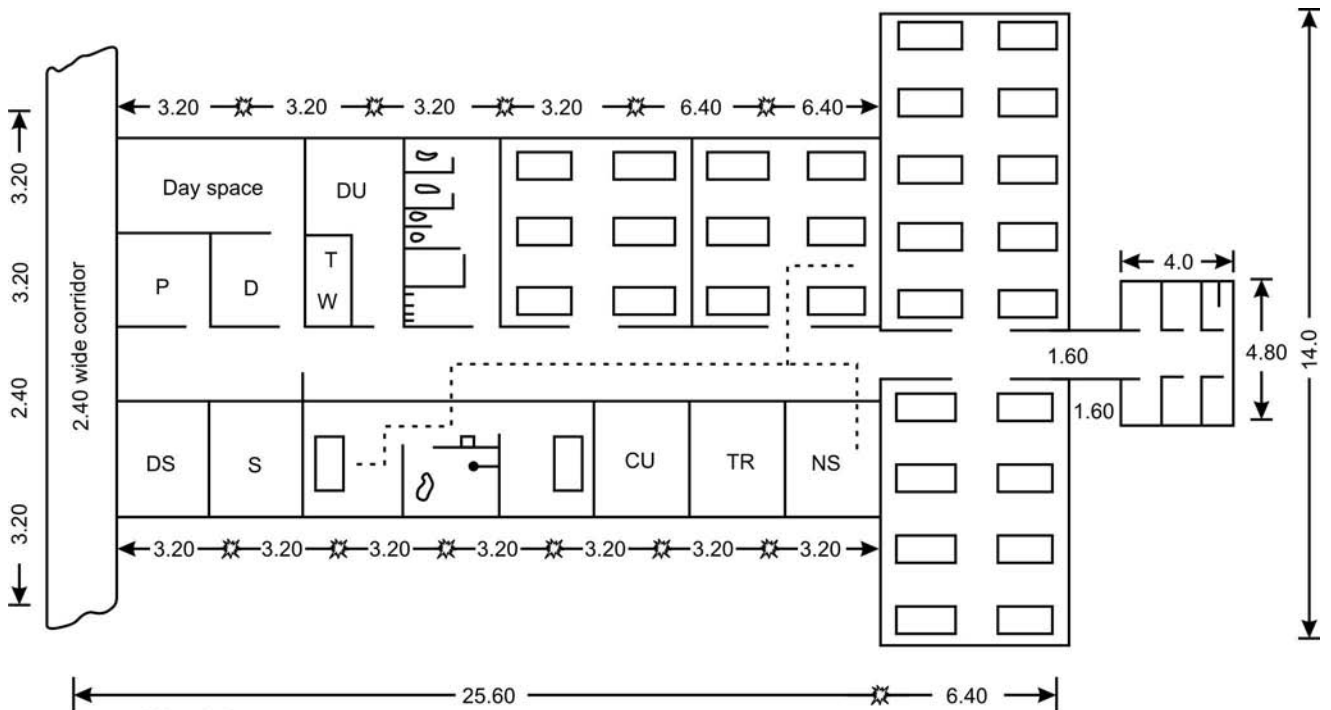
D — Dining

B — Bath

Type III



Type IV



Abbreviations

- | | |
|--------------------------------|----------------------|
| NS — Nurses' station | S — Store room, |
| DS — Doctor-cum-sister's room, | P — Pantry, |
| TR — Treatment room, | D — Dining room, and |
| CU — Clean utility room, | B — Bath |
| DU — Dirty utility room | |

Fig. 4.7: Layout study of wards—four different layouts

Because of a great need of hospital facilities in places far from urban centres, hospitals of the simplest design will continue to be constructed in the mofussil areas, and such hospitals may almost always have pavilion type wards. This is necessitated due to paucity of funds on one hand and lack of nursing personnel on the other.

Even where a pavilion type ward is inescapable, privacy for patients can still be obtained by simple innovation in design. In countries where lack of nursing staff imposes limitations, the layout may be modified by adopting a simpler arrangement, consisting of separate cubicles set up in a large ward and partly partitioned off. When properly executed, this type is less expensive to build and to run, and has the advantage of providing for later conversion into a regular unit. All that is needed to convert it into a more elaborate nursing unit is to complete the cross-partitions and set up a screen before each group of four beds.

NURSING STATION

Location of the nurse's station as close to the patients but as central as practicable is important for the cohesive functioning of a nursing unit. One of the greatest difficulties of ward planning is to achieve the correct balance between privacy for the patient and adequate supervision by the nursing staff.

The nurse's station is the nerve centre of the ward unit. Its position should be so that the nurse can keep watch on as many patients as possible. In the Rig's type ward, patients rooms on either side of the nursing station with provision of large glass partition for direct observation are usually earmarked for acutely ill and more serious patients requiring constant observation.

The nurse's station should be open to the corridor but separated from it with a counter which acts as a desk as well as a barrier. Basically the nurses station consists of the sister's room with attached WC, with table for preparation of medicine and injection trays and for preparing biological samples for hospital laboratory. The room has built-in cupboards for storage of drugs, dressings and instruments, a small separate room adjacent to the nurse's station can also be used as the ward medical store. Closet for narcotics and dangerous drugs and a refrigerator for storage of antibiotics and sensitive injectable should be provided.

The electric panel of the nurse's call station if provided must be so located that it is constantly visible to the nurse. Paging system and intercommunication system panel, if installed, will also be at a convenient spot in the nurse's station.

An innovation has successfully been tried to locate the nursing station in the corridor itself. In a ward in which

4-bedded rooms each with integral toilet facility have been located on both sides of a long stretch of central corridor, the nurse's station has been located in the corridor itself. It consists of a cantilever desk attached to the wall. Under the cantilever, sets of drawers are located, and over it supply closets attached to the wall. Each corridor can have a succession of such nurses' stations at regular intervals.

Doctor's Room

A separate room for use of resident doctor and others for examination of patients and consultations is required in a ward unit. It can also serve as a clinical conference room. It should have an examination couch, desk, chairs and a wash basin.

SANITARY FACILITIES

Apart from the toilet and bathroom provided in single-bed and two-bedrooms, it is necessary to provide toilet facilities within easy reach of other patients. This can be provided in the form of a lavatory block or sanitary annexe. Sanitary installations in hospitals can be kept better maintained when they are concentrated in one block.

WCs and Bathrooms

In practice, one WC per 6 to 8 beds has been found to be adequate in general wards. The type of WCs (Indian type or Western type) will be determined by the predominant class of the clientele in general wards of the hospital. Even where Indian type WCs are fitted, one in each sanitary block is recommended to be of Western type for patients who cannot squat. Minimum one bathroom per ten beds for a general ward is recommended.

Wash Basins

The nature of work in hospitals demands a high standard of hand cleanliness. Therefore, easily accessible wash basins have to be provided at appropriate places. A comfortable working height when standing is usually set at 91.5 cm at the wash basin rim. Wash basins should be placed in the corridor of the sanitary block. For patients, one wash basin per 8 beds is considered adequate. Besides this a wash basin is recommended to be fitted in 4 and 6 bedrooms. Wash basins used by wheelchair patients should be 70 cm deep with a narrow apron to allow knee room underneath, the maximum height at the rim being 80 cm for such patients.

Dirty Utility Room and House-keeper's Closet

Dirty utility: Facility for storage of single use containers used for collection of human waste, its subsequent disposal

and other associated activities and the temporary holding of used equipment, materials and refuge.

The room required for emptying and cleaning of bedpans, urinals and sputum mugs, and for temporary storage of stool and urine specimens is termed the dirty utility room. It should be fitted with a slop-sink or bedpan washer for emptying and cleaning of bedpans, and flyproof cupboards for storage of stool/urine specimens. This room can be a part of the sanitary block. The room must have a closet for keeping the janitor's (safaiwala's) implements such as brooms, buckets, brushes, mops and cleaning materials.

Some wards have separate rooms for storage of soiled linen before it is despatched to the laundry. A separate soiled linen room is not considered essential in a ward, its purpose can be served by a large soiled linen closet in the dirty utility room. Many of the linen items badly soiled with blood and other material require preliminary soaking and washing before being sent to the laundry. Location of the soiled linen closet in this room serves this purpose well.

The routes by which used, dirty and infected material of all kinds is removed need careful attention. In tall multistoreyed buildings, it should be possible to remove all such material by special lifts directly serving the dirty utility rooms. In one or two storey buildings, bundles or bins containing used and dirty material can be collected through hatches opening directly outside the buildings.

TREATMENT AND DRESSING ROOM

It is the room where dressings, minor treatments including special examinations, lumbar puncture, intravenous injection administrations, or other treatment and procedures which cannot be carried out in the patients' beds, are performed. If properly equipped, it can also be used for carrying out minor surgical procedures. Apart from other things, the room can be equipped with an instrument steriliser and sink.

Although one room for a ward of 25 to 30 beds would be ideal, one such room can be combined for use between two adjacent wards on a patient floor.

ISOLATION ROOM

If adequate safeguards are provided for protection of the patient and personnel, any patient room can be converted into an isolation unit. In most cases, a one-bedroom should suffice for the purpose. The room used for infectious disease patients additionally has a sink and bedpan washing arrangement. There should also be arrangement for putting on gowns just outside the door of this room.

WARD PANTRY

In most hospitals the dietary service is centralised. It is uneconomical to have kitchen for each ward floor. Although the main meals come from the central kitchen, it is desirable to have facilities for reception, warming up and distribution of meals on a ward basis. Food articles are apportioned here from the main food trolley for the floor and then distributed to the patients. The function of the ward pantry is temporary storage, preparation of meal trays, and preparation of between-meals nourishments and beverages.

It is conveniently divided into a *servery* where food is apportioned and trays set up, and *wash-up* room with large sink and drain board for cleaning plates, trays and utensils. It should be equipped with arrangements for hot water, refrigerator, crockery and plate storage, and hot case.

A dining room for a ward unit is desirable for about 60 per cent of the patients except, in intensive care ward. This can be provided for an individual ward basis or on a floor basis for all wards on that floor. The dining room in a ward unit should not be less than 12 m². If it is combined with the ward kitchen and pantry, the size of the combine should not be less than 25 m².

CLEAN UTILITY ROOM

Clean utility: Facility for holding and preparing all clean and sterile materials used in the treatment of patients and used for the safe keeping of drugs, medicines and supplies.

A room is required for storage and preparation of materials, equipment and supplies such as infusion fluids and sets, sterile packs from CSSD, dressing drums and for setting up of treatment trolleys and trays. However, these functions can be equally well-combined with those of the treatment room, with additional built-in closets for storage of clean materials.

DAY ROOM

An ability to move about at an early stage during hospitalisation has a beneficial therapeutic effect on patients. Called a *solarium* (literally, a place for enjoyment of sun's rays) in the Western countries where sunshine is scarce, a comfortably furnished room with recreational material is provided in the ward as day room for sitting and relaxing and for meeting visitors. The day room should be located at the end of the ward, away from all activity. A common day room can be provided for adjoining wards.

The day room can also be used as dining room if such facility does not exist in the ward. In case it is not possible to provide a day room, a suitable space—perhaps a

cordoned-off portion of a corridor or such similar area—should be earmarked as day space and sit-out area.

AUXILIARY ACCOMMODATION

A ward laboratory (clinical side room) to perform routine blood, urine and other tests by house surgeons and interns for quick results is required in wards of teaching hospitals. A seminar room for conducting clinicopathological conferences is also a specific requirement of teaching hospitals.

Other accommodation in the nursing unit includes the duty medical officer's room, the sister supervisor's room, staff rest room and change room for nurses. It is not necessary for each ward to have this set of rooms individually. They can be common between two or three wards or for each patient floor.

An open enclosure is required in each nursing units as a stretcher and trolley bay for parking of trolleys and wheelchairs and storage of stretchers.

MISCELLANEOUS FACILITIES

Arrangements for piped oxygen and suction to wards, supplied from a central manifold room are a requirement of large hospitals. The piping for oxygen and suction runs near the ceiling, with outlets mounted at convenient points on walls next to patient beds. This system obviates the need of maintaining suction machines and oxygen cylinders in the ward.

Other facilities include arrangement for supply of hot water, and piped gas for heating purposes in the ward kitchen and pantry.

PATIENT MONITORING

Electronic monitoring is being increasingly introduced especially in intensive care and postoperative recovery wards. The equipment varies from single units for individual patients to large complex system giving multiple patient observations on viewing screens and recordings and tracings on paper and tape.

Even with sophistication in medical electronics which has resulted in compact equipment small in size, space requirements for housing the equipment are considerable. The guiding factor is that the equipment and the maze of cables and tubes leading to and from it should not interfere with the free movement of medical and nursing staff, with space available for wheeling-in more equipment if required.

The area required in patient rooms for single patient monitoring systems would be larger by about 20 per cent than otherwise acceptable. For large multiple patient

observation systems, the planning, programming, design and installation of the equipment has to be done during the initial stages of hospital planning to cater for appropriate electrical and equipment cables as well as space requirements. Consultations with a hospitals engineer in conjunction with the engineer of the equipment suppliers will have to be held.

SPECIAL NURSING UNITS

Differences in the type of patients and peculiarities of nursing care necessitate changes in the design and facilities required in certain types of nursing units. Such units are the intensive care unit, infectious diseases ward, paediatric ward and maternity ward.

Intensive Care Unit

The most critically ill patients require the most concentrated nursing care, and the unit is designed with this fundamental requirement in view. Between 2 and 5 per cent of total hospital beds excluding maternity beds should be assigned to the intensive care unit.

Space requirement for each bed is planned on a more liberal scale than in general ward. But under no circumstances should it be less than 14.00 m² for single bed cubicle, 21.00 m² for two bed cubicle and 30.00 m² for four bed cubicle, to ensure free movement of staff and various types of equipment around the bed.

Each bed has arrangement for screening it off from others by screens hanging from overhead rails. The whole unit should preferably have central air-conditioning or individual room air-conditioners of suitable capacity.

The average duration of stay of patients in intensive care unit is short and their dependence on other so complete, that it does not need the toilet facilities on the same scale as provided in other wards. Therefore, there is no necessity to have a sanitary annexe. Dirty utility would remain the same.

Life-saving emergency equipment, drugs and supplies from CSSD have to be constantly at hand and readily available. Because of a continuous requirement of such supplies, the intensive care unit cannot do without a clean utility room.

The number of outlets for piped oxygen and suction should be liberal—one for each bed. Each bed should also have its own wall-mounted blood pressure apparatus. Sockets for electrical and electronic equipment will have to be on a liberal scale than a general ward. At least four power socket in addition to two standard sockets should be provided for each bed.

The nursing station is constructed to allow for maximum visibility from the nurse's desk through use of glass partitions. For this to be effective, the nurse's station should be located on an elevated platform.

For all the life-sustaining equipment to function at all times, the unit needs an alternate source of electricity. If this is not provided through a multiple grid power supply to the hospitals, either a UPS facility or a standby generator with provision for automatic switchover on failure of the mains is a necessity. Planning and organisation of an intensive care unit is covered in the next chapter.

Infectious Diseases Ward

The basic accommodation remains the same. The patient accommodation is divided into one, two and four bed cubicles. More than four beds to a cubicle is not desirable. However, each patient cubicle has its own sanitary facilities—a WC and bathroom—integral to it.

Before sending to the laundry, soiled linen will be required to be disinfected in the ward itself. Therefore dirty utility room should be more spacious to cater for large sinks for soaking infected linen and to have space for a steam disinfectant in an annexe of this room.

Space should also be provided in the ward pantry for a utensil steriliser.

A staff changing room where medical and nursing staff can put on protective clothing before entering the ward is required at the entrance to the ward. This room should also have attached bathroom, a cupboard for hanging clothes and a large receptacle for throwing in used protective clothing.

On discharge, the patients put on a fresh set of their own clothes or the same clothes with which they were admitted (after disinfecting these clothes in the ward's steam disinfectant). A room called the "discharge unit" consisting of a bathroom and changing room where the patients can put on their own clothes should be provided for this purpose.

Barrier Nursing

In nursing highly infectious disease patients, the aim is appropriate nursing care of the sick person, preventing spread of infection to others and preventing infection to medical and nursing personnel. All this can be achieved with barrier nursing. A placard announcing 'Barriered' is hung at a prominent place to warn the visitors and nursing personnel. A barriered cubicle is made up of the patient bed, bedside locker, cupboard, and a chair. The scale of accommodation suggested for barriered patients is 120 sq ft for a single

cubicle, 90 sq ft each for 2-bedroom and 80 sq ft each for 4-bedroom.

The two important fixtures in this unit are the disinfectant for clothing, blankets, and linen of the patient and a steam steriliser for patients' utensils. Adequate number of gowns, caps and masks and gloves for nursing and medical personnel are placed at the entrance of each barriered patient cubicle. A fresh set of gown, cap and mask (and gloves) has to be used every time someone enters a barriered patient's cubicle/room.

Other applications of barrier nursing are in premature nursery and neonatal ICU, maternity ward (septic abortion), open heart surgery cases, organ transplant and immunosuppressed cases, septic postoperative cases, acutely ill patients in intensive care areas, highly communicable or contagious cases, e.g. terminally ill AIDS patients.

WARD VENTILATION

Whereas natural ventilation is cheap, mechanical ventilation is costly and lacks flexibility. It is, for example, expensive to provide for an occasional blow-through solely by mechanical means, for to do so requires the installation of plant and ducting sufficient to give 10 air changes per hour, whereas for most of the time, only three are needed. Mechanical systems are so expensive that they are rarely employed, excepting in special circumstances, for example, in wards where the air must be filtered because of atmospheric pollution. If such a complete mechanical system is installed, it should be designed to give three air changes an hour.

Mechanical ventilation can either be by extraction or by input. Patient rooms should be ventilated by the input method if mechanical ventilation is essential. Conversely, ventilation of such rooms as lavatories and kitchen should be by the extraction method.

Natural ventilation has the great advantage of simplicity and economy, and the vast majority of hospitals depend on windows and fans for their ventilation. Natural ventilation is also more acceptable to the patients.

WARD LIGHTING

(The following is adopted from Indian Standards code for hospital lighting).³

Not enough attention is paid to lighting in hospitals and wards in general. More often than not it is opinion of the electrical contractors which prevails. Although the importance of natural lighting cannot be denied, no hospital

can function well if the lighting in its nursing units is not proper.

The lighting of patients' rooms and other areas in the ward has to satisfy the needs of the patients as well as requirements of the nursing staff. Additionally, the total lighting effect should be such as to contribute to the general decor and be free of glare to the recumbent patient.

Lighting installation in a ward calls for:

- i. general lighting
- ii. reading light
- iii. examination light, and
- iv. night lighting.

Desirable illumination intensities

Corridors	: 100 lux
General lighting in wards	: 100-200 lux
Doctors/Nurses work place	: 300-500 lux
For patient examination	: 500-1000 lux

General Lighting

'Lux' is a unit of illuminance equal to one LUMEN per square meter.

For the medical and nursing staff, the lighting has to be adequate to enable them to carry on their routine tasks. They should be able to "take-in" the room at a glance and also carry out such tasks as reading the thermometer or making charts at the bedside and elsewhere. A illumination level of 150 to 300 lux is considered normal for such visual tasks.

On the other hand, for patients the lighting should create a cozy and pleasant atmosphere and illumination levels of 150 to 300, lux will be too high resulting in discomfort. Some patients in the ward may like to sleep before the scheduled time of lights-out, and such a high level will also be uncomfortable for such patients. It has been found that a level of illumination of 100 lux is quite satisfactory for general lighting of the patient areas which will also meet the general needs of the nursing staff.

Reading Light

In addition to the general lighting, each bed should be provided with additional light for reading purpose in the form of bed head light brackets, on extension arm over the patient's head which can be switched on or off by the patients themselves.

Examination Light

It is never satisfactory to use the bedside reading lamp also as examination light. It becomes necessary at times to examine the patients on his bed itself for which an

examination light capable of providing 500 to 1000 lux will be required. Separate examination lamp at each bedside is not necessary even in an intensive care ward. A good solution is to have a mobile examination lamp that can be wheeled in and connected to a wall socket by the bedside.

In the Rig's type ward, four wall sockets will be necessary in 8 bedded room and not less than two sockets in a 6 bedded and 4 bedded room, on opposite walls. A single bed and 2 bedded room will require at least one socket for this purpose.

Additional sockets will be required if electronic monitoring equipment is planned to be used.

Night Lighting

After lights-out, the ward cannot be left in complete darkness. For each patient room, a night light which is not directly visible from the bed should be provided, with a control switch at the doorway. Lights of low wattage must also be provided at appropriate distances in the corridor to provide diffuse lighting.

Lighting in Corridors

Corridors in wards act as transitional areas between naturally lit and artificially lit rooms. They may also fall in the visual range of the patients.

In the single corridor type ward, where patient rooms and service rooms are on either side of the corridor, the service rooms in the evenings will need brighter illumination of about 200 lux, and the general lighting in the ward will be lower at about 100 lux. The corridor should have an illumination of 100 lux so that the staff moving between service rooms and ward easily adapt themselves to the different illumination levels. After lights out, the corridor should have night lighting arrangement. The service room lighting should also be reduced to half illumination of about 100 lux at night which will be just sufficient for the staff to carry on their normal work and will also reduce the excessive contrast between the brighter levels in the service room and lower levels in ward and corridor at night. This can be achieved by two light fixtures with individual switches in each service room.

In other type of ward plans where patients rooms are placed around the core of service rooms near the centre of the building with no access to day light, service rooms will require artificial lighting at all times. During day, the staff moves between patient rooms receiving daylight of 500 to 1000 lux to the interiorly placed service rooms artificially lit to a level of 200 lux. The corridor should bridge these two levels, and an illumination level of 150 lux should be provided in the corridors during day time. In the evening, ward

lighting will fall to 100 lux, and corridor lighting should also be reduced to the same level. After lights out, the ward and corridor will both have night lighting and service room lighting should be reduced to 100 lux.

Light Source

It is not advisable to use filament lighting for general lighting purposes in hospitals because of the heat output and glare produced by this form of lighting. It is advantageous to use fluorescent light sources which inherently have low heat output yet the added advantage of producing good colour rendering for medical purpose.

One of the most important factor in considering light is the effect of artificial lighting on natural skin colour of the patients. The colour appearance of skin depends upon the spectral quality of the light source. In the past most artificial light was produced by tungsten filament lamps, but greater efficiency of fluorescent lamps has led to its increasing use in all areas in hospitals, and lamps coated with specially developed fluorescent powders offering better colour rendition are available for use in clinical areas.

Light fixtures should also be easy to clean.

Light and Power Sockets

Five ampere light socket outlets and 15 ampere power socket outlets for various electrical gadgets including portable X-ray machine should be provided in the patients' rooms. Provision of the light sockets has been dealt with under examination lighting. Power sockets should also be provided on the same scale.

Call Bell

Call bell switches would have to be provided for all beds in the Rig's type ward, and at least for beds earmarked for serious patients in the pavilion type ward. Each call bell switch will be connected to a buzzer, indicator light and location indicator panel located at the nurses' stations.

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CHAPTER

5

Intensive Care Unit

INTRODUCTION

Timely and efficient management by doctors combined with concerted nursing efforts have revolutionised the management of critically-ill patients and brought down preventable mortality. During the last two decades critical care medicine has undergone rapid changes and has emerged as a discipline by itself.

With the persistent demographic trend towards an aging population nearing the age of 65 and above, the number of patients requiring Critical Care will rise. Many patients who might have had no chance of survival can now be treated successfully. On the clinical side, there seems to be a clear trend towards working in interdisciplinary teams under the leadership of an intensivist, who will be working with a continually changing mix of case types. The interdisciplinary teams will be working with new and improved technologies even while the continuous change due to medical advances will alter the type of patients and treatment protocols.

Critically-ill patients consume disproportionate resources in the form of manpower, specialised equipment, facilities, and expensive medications. In the past, all this was generally provided to critically-ill patients in respective wards in which the patient was admitted. It was realised that this arrangement was not conducive to efficiency, economy and reduction in mortality and complications. Development of the concept of centralising serious and critically-ill patients, many of whom are unable to communicate their needs, led to the formation of units designed for giving intensive care. Intensive care is the first element in the hierarchy of progressive patient care.

ROLE AND FUNCTIONS OF ICU

Critical care has been defined as the provision of sophisticated life support system, with appropriate medications for a wide variety of patients, in a setting of close monitoring. Intensive care unit is a nursing unit specially designed, equipped and staffed to manage critically-ill patients with potentially reversible lesions, requiring constant observation, irrespective of age, sex and diagnosis, and requiring extraordinary nursing care. It is a nursing unit where intensive monitoring, active life support, specific therapy and specialised nursing care is provided, where technical expertise and sophisticated equipment are concentrated for critically-ill patients. The aim is to support life in a crisis, prevent life-threatening conditions, and then try to remove the cause of dysfunction by specialised treatment and skilled nursing.

Contrary to popular belief, ICU is a place and not a form of treatment, as many lay persons tend to believe.

At present intensive care facilities are not available in all hospitals. Very few of even the Government district level hospitals have a proper ICU. However, the need for a ICU in all hospitals has been realised by clinicians and administrators alike.

Where it is not possible to provide a modicum of reasonable care for critical illness in medium sized intermediate level hospitals, say up to a district hospital level, then it can be achieved by providing a better staffed and better equipped high-dependency ward in every district hospital. These wards would not qualify as critical care units but could offer better care, with improved results at smaller cost.

Reason demands that well-equipped critical care units should be confined to medium and large hospitals which have the infrastructure to support such units. It would also be wiser and profitable to organise general all-purpose intensive care units in different specialities and subspecialities. A multidisciplinary ICU permits concentration of meagre resources with regard to staffing, equipment and technical expertise. Above all, it encourages a more holistic approach, so that problems in the critically-ill are considered in an overall perspective rather than in terms of disease affecting isolated organ systems.

A intensive care unit has its own advantages and disadvantages. The chief advantage is that it provides better and more organised care. The main disadvantage is of a holistic environment contributing to anxiety, emotional stress, loneliness, fear, and a greater risk of developing nosocomial infections.

Crises in ICU arise mainly because many people presume that every medical problem has a solution, and the expectation from the hospital to do everything possible, which unnecessarily raises the cost of ICU care.

ICU SIZE

The number of beds in a ICU is variable from hospital-to-hospital. In the early eighties, it was observed that 3 to 6 per cent of all cases being admitted in any hospital needed intensive care.¹ The 1968 report of the Study Group on Hospitals had recommended that 10 per cent of beds in teaching hospitals in cities with population over 10 lakh and 5 per cent of beds in district hospitals should be kept apart for emergency cases.²

In 1978 the Hospital Review Committee for Delhi Hospitals suggested 2 per cent as ICU beds.³ Due to increase in the number of accident cases, advancements in surgery, and increased awareness among people as well as medical professionals the percentage of intensive care beds has gradually risen. In UK one ICU bed for every 100 acute beds is recommended. In USA up to four times this proportion is followed and in Germany 5 per cent of total hospital beds are for ICU.

Although there are varying opinions regarding number of beds an ICU should have, an ICU of less than 4 beds, with less than 200 admissions annually, is uneconomical. On average, a 8-bedded ICU should admit about 600 cases in a year. Very small units have not been found to be viable in terms of economy of facilities and manpower. Large units have the danger of turning unwieldy and chaotic. For larger units the beds can be grouped as pods or clusters of about

7-8, grouped together to form a larger department under a single roof.

In Paediatrics, 8 per cent of paediatric beds should be earmarked for paediatric ICU. In Thoracic and Neurosurgery units the ICU beds to clinical beds ratio is about 15 per cent. An important factor in utilisation of beds is the unpredictability of demand and occupancy. Underutilisation cannot always be avoided entirely but it can be minimised by careful planning.

It is estimated that a 10 bed multidisciplinary ICU should meet the requirement of up to 300 bed district hospital. It may not be practicable to maintain a separate ICU for a small hospital, of say 50 beds or so. However, every hospital above 100 beds should have a fully equipped and staffed ICU.

Efficiently functioning critical care units in the foreseeable future will largely be confined to the big cities in our country. Promoting a modicum of better care for critical illnesses in the huge population of our country that reside outside the big cities can, for the present, only be achieved by providing a better staffed and better equipped **high-dependency ward** in every District Hospital. These wards would not qualify by western standards as critical care units, but could offer better care, with improved results, at a smaller cost.⁵

Because ICU beds are expensive to maintain no hospital can afford to create or maintain excess of beds. Some decision will have to be made to distribute resources so that no patient is deprived of necessary care. It is inappropriate to devote limited ICU resources to a patient whose prognosis has resolved to one of a vegetative state. A separate facility, adjoining the ICU, with better focus on care of dying patients resulting in reduction of unnecessary activities, can be a possible way out.

TYPES OF PATIENTS

A question common in the minds of those working in the hospital as well as those outside is, which type of patient should be treated in the ICU. The selection of patients appropriate for intensive care not only depends upon purely medical and organisational factors but also on financial, legal, ethical and moral issues.

The following are the main considerations for admission of a patient in ICU:

1. Physiologically unstable patients who require constant reaction to change in their condition and rapidly redefining therapy.

2. Patients may also be considered only for monitoring and observation for early detection and rapid response to impending complications.
3. It is questionable to devote ICU resources to a patient whose prognosis has resolved to one of a "point of no return".

In view of expectations of what medicine can achieve, intensive care must be provided for the first two categories. However, these distinctions are not always possible, and not necessarily desirable. It cannot be said with certainty that if a particular patient was not admitted to ICU he would have died, or if a particular patient was admitted he would have survived or recovered.

Infective conditions will not be treated in the ICU, neither is it intended as a halting place for terminal care of moribund patients. Random occurrence of catastrophic events or unpredictable clinical crises are a characteristic of most patients in ICU. Death may occur unexpectedly. Initial therapeutic success may not be sustained.

Sometimes it is sad to see intensive care units cluttered with patients who could unquestionably be better looked after in the ward or at home. However, some patients requiring only monitoring and observation, even if they are physiologically stable may be considered as appropriate cases, for the purpose of early detection of changing symptoms and rapid response to serious complications.

TYPES OF INTENSIVE CARE UNITS

While specialities in medicine or surgery are sharply focussed on a single organ system within the body, a general medicine or surgery critical care unit is devoted to the patient as a whole, recognising the overwhelming fact that there is a tremendous interdependence and interrelationship between various organ systems, so that a serious involvement of one strongly jeopardises the function of others. The approach to critical care medicine is thus simultaneously holistic, viewing the patient in an overall perspective, and yet focussed on one or more problems that constituted an immediate threat to life.

A good intensive care unit necessarily uses the infrastructure of a well-equipped general hospital, and has therefore the back-up and support of sophisticated investigations, imaging techniques, physiotherapists, specialists and superspecialists in different fields of medicine and surgery. In the western world, particularly in the United States, most large institutions have special ICUs for different specialties and subspecialties. Besides a medical and surgical ICU, an institution may have separate intensive care units

of trauma, burns, cardiac surgery, respiratory care, coronary care, and neurosurgery. In our country, generally all-purpose units are to be preferred. This allows for concentration of rather meagre resources with regard to staffing, equipment and technical expertise. Physicians and surgeons in all-purpose critical care units are more appropriately trained to fulfill the holistic approach to the ravages of life-threatening diseases, as compared to their colleagues working in specialty care units. A general exception to this could be a separate neonatal care unit.

Thus depending upon types of patients admitted, Intensive Care Units can be classified:

- MICU - Medical Intensive Care Unit
- SICU - Surgical Intensive Care Unit
- ICCU - Intensive Coronary Care Unit
- BICU - Burns Intensive Care Unit
- NICU - Neonatal Intensive Care Unit
- PICU - Paediatric Intensive Care Unit
- PICU - Pulmonary Intensive Care Unit
- OICU - Obstetrics Intensive Care Unit

Intensive care requirements of very young children and neonates need special equipment, facilities and expertise. Need for total isolation of burns patients also necessitates separate and independent units. Open heart surgery cases need specialised monitoring and care. Barring these, available evidence suggests that for all other cases, intensive care can be organised efficiently in a multidisciplinary ICU. The discussion which follows relates to such a general and multidisciplinary ICU.

PLANNING AND ORGANISATION

In the past, ad-hocism has been the rule in trying to create a special unit in preexisting ward areas, or where existing ones were upgraded.

Planning of ICUs has suffered from overemphasis on gadgets and spatial designs. It is best to form a committee to determine the need and scope of services, planning norms and functional requirements. The committee should be headed by the senior physician, with members from the clinical disciplines of surgery and anaesthesia and representatives of nursing services and hospital administration. The task of the committee would include:

1. Identify the type of clinical units likely to utilise the facility
2. Determine types of cases likely to be catered for
3. Study existing physical layout of the hospital
4. Determine the facilities and equipment needed
5. Determine the size (Number of beds) of the ICU
6. Determine staffing pattern.

The general physician or surgeon with a wide experience of medicine or surgery and suitable training and experience, which necessarily involves critical care, has the best aptitude and philosophy for planning and organising a critical care unit.

Location and Spatial Requirements

The ICU should preferably be located on the ground floor with convenient access from the operation theatre suit and emergency department and easy accessibility for wards. However, there is no bar on its location on upper floors, if other factors are suitable. Here, the hospital should ensure rapid vertical transport through fast-moving, promptly available elevators. The location should be away from the main hospital traffic corridors.

The ICU has a relationship with the casualty and emergency ward, with the laboratory, with radiology department, and with physiotherapy department. If the hospital has a step-down or a high dependency ward, the ICU must have a close relationship with such a ward. The importance of a fairly large high-dependency ward does not seem to be realised by many hospital planners. Such a combination enables the ICU to be reserved exclusively for patients who truly deserve critical care. It also enables a quicker turnover of patients and therefore results in a more economic, efficient and correct use of critical care.

Private ICU Room Vs Open Ward

There is a trend towards a higher proportion of critical care beds to be found in individual private rooms or isolation rooms. In the open-bay or ward type accommodation the premise is that the high level of observation and clinical intervention required offsets the risk and loss of privacy.

A higher level of privacy should be made available, where appropriate, with walls, doors blinds or curtains in an environment which features enough glass to ensure that clinical observation requirements can easily be met as necessary. A good design should be able to deliver the extremes of high observation and protected privacy as well as various intermediate levels of visual and acoustic privacy.

Traffic

Corridors around the ICU should only serve the traffic meant for the unit staff, and should not become a major thoroughfare for other hospital personnel and public.

Design and Layout

The design of the ICU should take into consideration the integration and smooth functioning of three areas, these are:

A. The patient area

B. The staff area

C. The support area.

The design should meet four basic requirements. They are:

1. Direct observation of the patient by nursing and medical staff
2. Surveillance of physiological monitoring
3. Provision and efficient use of routine and emergency diagnostic procedures and therapeutic interventions
4. Recording and maintenance of patient information.

An ICU has to be spacious and uncluttered so that the movement of staff and equipment is easy, free and uncramped. While designing a new ICU this can be easily achieved. However, in a renovated unit, the configuration of the existing structure often determines or restricts the design of the unit. Since most ICUs in the past were created by modifying some existing nursing unit, the design in a majority of them is rectangular. Later, other types of designs were developed.⁴

The following standards are for the common type of multidisciplinary critical care facility appropriate to the needs of a general hospital.

It is reiterated that the two fundamentals that have a bearing on the design and layout of a ICU are observability, and efficiency of operation.

ICU design still reflects the observation requirements for the practical reason that there is a limit to the number of high acuity patients for which a staff member may carry responsibility. Staff need access to all the various supplies, equipment and medications used in the delivery of medical care, and they need it to be close at hand.

A total area ranges from 350 to 500 sq. feet per bed which includes circulation area, nursing station, sanitary and ancillary accommodation. The shapes for these units include semicircles, boxes, horseshoes and linear or staggered configurations. A square shaped unit design is preferable to a rectangular one.

Patient Bed Area

The essential planning feature is a fully observable bed area with adequate space for positioning of equipment.

Each patient can be accommodated in a series of partitioned rooms or in cubicles separated by curtains. An ICU bedroom or cubical requires space to accommodate ventilator, cardiac monitor, pulse oximeter, suction machine, oxygen cylinder on trolley, procedure trolley, and mobile X-ray machine. Each patient bed area should have a minimum floor space of 150 to 200sq. feet in an open-bay design in which curtains on overhead railings suspended from the ceiling partition each bed area. If each bed is separated from the adjacent bed as a closed bay design, a larger floor space, 250-300 sq.ft. will be necessary.⁵ The partitioning between beds can be of thick particle-board, up to 4 feet height from ground level and transparent glass above it up to the ceiling. Thus, a patient in bed has no view of the adjacent room, but medical personnel working in a room have a constant view of the patient in adjoining room. Curtains provided for each glass partition can be drawn when necessary.

In spite of miniaturisation of equipment, it is believed that the room size will continue to increase. The ability to move equipment past the foot of the bed requires a head-to-foot room dimension of 15 feet (4.55. m). Providing access for staff and equipment in the work zone on both sides of the bed requires a width of 19 feet (5.90 m). A room of this size has an area of about 330 sq. ft. (33 sqm), considerably larger than the typical room size today.

There should be a minimum distance of 8 feet between beds. The advantages of the open bay design is the ability to utilise floor space of an adjoining bed just by opening the curtain when space for addition equipment becomes necessary. The major advantages of partitioned cubicles is it allows privacy. An acute crisis (for example dying or death) can remain more isolated, and not effect the emotional and physical well being of other critically-ill patients. Each room design should incorporate large windows that allow natural light. Windowless ICUs are important contributors to patient disorientation and stress.⁵

Each bed must have an oxygen outlet, a central suction outlet and a number of power outlets. As far as possible, oxygen outlets, suction outlets and monitoring equipment should be wall mounted. This saves space and allows more easy movement.

The most common arrangement of the life support system in use for critical care include headwall or headboard configurations, and ceiling-mounted systems to supply utilities from overhead.

The traditional headwall design has been the standard with medical gases, vacuum and power outlets mounted on

the headwall, behind the patient's head and usually distributed on both sides of the patient. Some installations include wall-mounted equipment such as blood pressure cuff and shelves for supplies. The monitor is normally wall-mounted, above the working zone, but with reachable controls for staff.

Headwalls can be custom-built, with the architect specifying the locations and mounting brackets of outlets. The problem with headwall design is the requirement to move the bed away from the wall. At the moment of crisis, when the team is actively administering intensive care, the bed must be physically relocated to allow access to the patient's airway. The staff must carefully step over the various lines and umbilical connections to life support systems and monitoring interfaces, in order to stand over the head of the bed to reach the patient.

The example of the operating room overhead connections to anaesthesia machines as a conceptual model has been applied to custom build overhead column for the ICU bed, where the monitor is mounted on the column, electrical outlets and gas connections available on its sides and bottom where they come from above the ceiling down to the level where they may be effectively used for the patient. However, these installations are not as changeable as headwall configurations. Among the advantages of the power column with its pendants is the ability to position the bed in a variety of locations around the column's position and the continuous, unrestricted access to the head of the critical care patient.

The practice of hand washing is followed very frequently by the doctors and nurses before or after examining or handling each patient. Therefore, there should be adequate number of washbasins appropriately placed in the unit. One washbasin to two beds is suggested.

The overall proportion of *circulation area* should not be less than 20 per cent of the total floor area of the unit.

Central Nursing Station

The central nursing station should be located so as to allow an unobstructed view of each patient. This is problematic if the patient beds are in straight line, and easier if the beds are placed along an arch opposite the nursing station. For this reason the nursing station can be located on an elevated platform at such a vantage location that all patients come under the gaze of the nurse sitting at this station. The distance between the nursing station and each patient bed should be short yet not be so short as to obstruct movement of equipment and personnel. It should provide seating arrangement for at least one nurse and one doctor. The

station should have adequate room for storage of records, forms, charts and supplies. A telephone at the nursing station is a must. Also, an alarm button should be provided here which can be activated whenever there is any dire emergency in the ICU. The alarm button activates a bell in the Residents quarters or elsewhere for additional help. A mobile emergency trolley carrying all emergency drugs required for cardiopulmonary resuscitation and also a defibrillator should be at hand at the nursing station.

Bed should be so oriented that the patients can see the nurse but not other patients. This area will have adequate space for storage of essential items, and counters for writing notes and for reception and interaction with other ICU staff. Its location is determined to maximise efficiency, with least mobility of personnel.

Portable X-ray machine, portable image intensifier, portable ultrasound machine and equipment for respiratory therapy should not clutter the patient area in front of the nursing station but should be kept in the nearby equipment store room.

The incidence of medication errors is obviated if the medication preparation area is undisturbed. Although the medication preparation area is separate, it should be close to the nursing station and patient area, located at a site where there is no visual observation by patients and no interruption by phone calls. Equipment in this area includes a counter top, a refrigerator, locked cabinet for narcotics and expensive drugs, and a washbasin.

The other accommodation in the ICU will include the usual ward facilities viz. nurses room with toilet, doctor's room with toilet, store room, clean and dirty utility rooms. A ward pantry will be an advantage. A sanitary area housing at least two western type WCs with basins should be provided.

The patient care area should be separated from the service area by a central service corridor.

Two layouts of ICU are shown in Figures 5.1 and 5.2.

Toilets for the ICU

A satisfactory solution for disposal of human waste in the critical care unit is a tricky problem in the design of ICU.

There can be rooms with or without toilets. When toilets are present, they may be individual, or shared between rooms.

In most cases, the toilets are used most often to empty the bedpans, rather than as a site for the patient to eliminate. The washing and spraying activity of disposal is a major source of aerosol and a source of infectious organisms.

A common alternative to a toilet is the mobile (or portable) commode chair. The ability to move the chair directly adjacent to the bed allowing the toileting to occur without disconnecting leads contributes to patient confidence. Sitting is always preferred by patients over using a pan while prone in the bed.

The best disposal method for bedpan, whether used in bed or a chair, would be a deep clinical sink with sufficient size and a bedpan washer to properly clean a bedpan. Selecting a toileting option remains one of the difficult decisions in critical care design because the options are few.

Clean and Dirty Utility Rooms

The clean utility room contains procedure trays, bandages, pads, linen, intravenous solutions, catheters, and other similar items.

The dirty utility room should be separate from the other work areas. Waste material, disposable, soiled material awaiting transfer to central supply, and soiled linen are all housed in this room. The room should have one or two large sinks.

Storage Room

An ICU has a large number of items of various equipment. It is necessary to have a large storage area to house equipment, stretchers, ECG machines and numerous other items of storage. The storage room should have an area of about 15-20 per cent of the patient area.

Equipment

The level of equipment will depend on the type of ICU. In a general, all-purpose intensive care unit, besides the equipment usually found in every acute care ward, a list of equipment desirable for a tertiary unit or a hospital reputed for critical care is given in Table 5.1.

Outline layout of ICU: Two suggested layouts of 14/16 bedded ICU are given in Figures 5.2.

Medical Staff

ICU Incharge

There should always be one individual incharge who controls and directs the activities of ICU.

His responsibilities should cover:

1. Continuity of care
2. Administrative matters

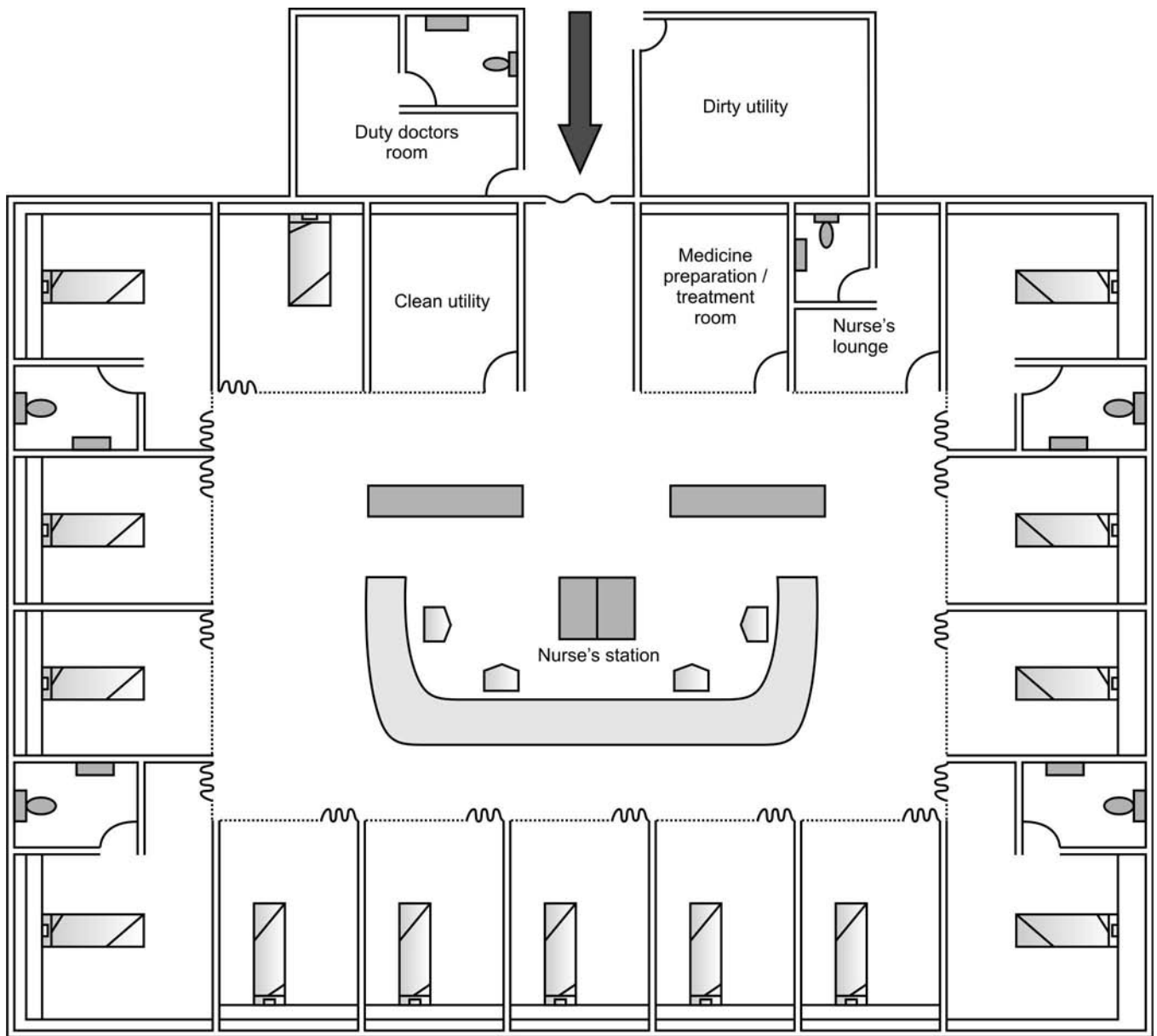


Fig. 5.1

3. Supervision, including training of junior staff like nurses, technicians and ward boys in patient care and handling of equipment.
4. Care and maintenance of equipment.
He should be a person respected by all for his tact as well as his clinical and administrative abilities.

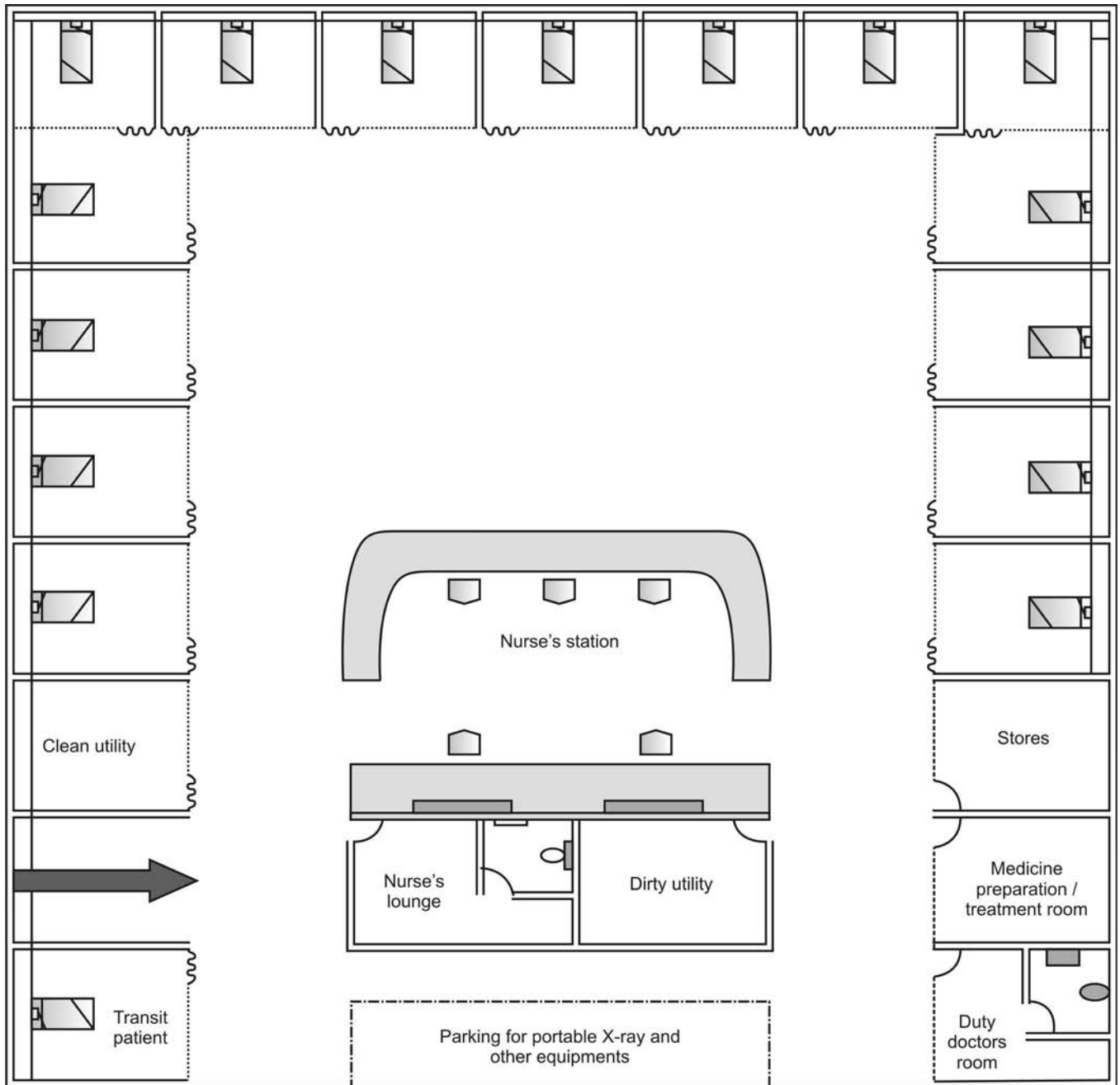
Senior Residents

This resident must be a physician with a postgraduate degree in general medicine. He will initiate and carry out emergency

treatment when necessary even without the permission of the admitting consultant. Generally the Senior Resident's duty shift is of twelve hours. At least two such senior residents will be required.

Junior Residents / House Officers

A Junior resident is generally a fresh medical graduate, in training for experience and higher knowledge and skill. At least two such junior resident will be on duty round the clock in a 10 bed unit. Junior residents can be turned over



Figs 5.1 and 5.2: Layout of an intensive care unit

on an eight-hour shift. However, in many ICUs the duty shift lasts twelve hours, to coincide with that of the senior resident.

The duties of the junior resident cover monitoring, maintaining patients' records, initiate immediate interventions, administer urgent life saving treatment before arrival of senior resident, and preparing case summaries.

Although critical care is a multidisciplinary approach, there should always be one individual incharge, who directs and orchestrates this multidisciplinary approach. Too many superspecialists, each in sole charge of one organ system in a critically-ill patient, can do more harm than good. In countries where critical care medicine has developed as a separate specialty, the overall head is usually such a trained

Table 5.1: Equipment for a tertiary unit

1. Monitoring Equipment
 - Beside and Central Monitors
 - ECG Recorder
 - Intravascular pressure monitoring devices
 - Pulse Oximeters
 - Spirometers and peak flowmeters
 - EEG monitor
 - Temperature monitors
 - Blood glucose meters
2. Cardiovascular Therapy
 - CPR trolley
 - Defibrillators
 - Temporary transvenous pacemakers
 - Infusion pumps and syringes
3. Respiratory Therapy
 - Ventilators
 - Oxygen therapy devices and airway circuits
 - Nebulisers
 - Intubation / Tracheostomy trolley
 - Ambu bag
 - Fibreoptic bronchoscope
4. Dialysis Equipment
 - For haemodialysis, peritoneal dialysis, continuous arterio-venous haemofiltration
5. Radiological Equipment
 - Portable X-ray Machine
 - Image intensifier
6. Laboratory Equipment
 - Blood gas analyser
 - Electrolyte analysers
7. Miscellaneous Equipment
 - Dressing Trolleys
 - Drip stands
 - Heating / cooling blankets
 - Pressure distribution mattresses
 - Sterilising equipment—Autoclave
 - Refrigerator

specialist. A physician with a wide background of experience, which necessarily involves critical care, who combines a knowledge of general medicine, Cardiopulmonary medicine, and anaesthesiology would be ideally suited to direct critical care operations in a tertiary unit. The unit should also be staffed (for a 10-12 bedded unit) by two or more other trained doctors who have the experience to handle all emergency situations. Junior doctors in training should also rotate through a critical care unit.

As an alternative model, under the overall charge of the unit head, two more highly trained doctors [for 10-12 bed

unit] look after the unit who can be assisted by 3-4 junior residents who can also manage the step down or high dependency ward or some other ward of the hospital.⁵ In this situation, doctors are always present in the unit when needed and can appear at a moments notice when called. They do not necessarily have to be within the unit on a 8 or 12 hour rota. This method is found to be economical, allows for excellent nursing which continuous to improve, and breeds a healthy rapport between doctors and nurses.

Nursing Staff

The nurse is the key to the success of the entire system of intensive care. To fulfill its obligation the nurse must be able to anticipate complications, quickly assess each problem as it arises, and above all, assume a decision-making role.

The ideal ratio of nurses to ICU bed is 1:1, in each shift. However, this may be impossible to meet in many cases. A lower ratio of one nurse for two patients in a shift has been accepted by some authorities as a compromise, and one seldom finds a 1:1 ratio in all shifts. On the basis of a time utilisation study of nurses in ICU carried out by National Institute of Health and Family Welfare (NIHFW), the number of patients that could be conveniently looked after by one nurse was as under:-

Morning shift	:	2. 4 patients
Evening shift	:	3. 2 patients
Night shift	:	5. 5 patients, plus one Incharge sister in each shift.

Nevertheless, it should be realised that many critically-ill patients may not be very dependant on a nurse. Conversely, a few patients who may be highly dependent on a nurse (e.g. stroke) are not critically ill.

There is a need for constant alertness because most patients are highly dependent for physical functions such as bladder and bowel functions and vital functions such as maintenance of blood pressure and respiration, gastric aspiration, electrolyte and fluid balance. Maintenance of vital functions and timely intervention is crucial and extremely demanding on the nursing staff.

A team of well-trained nursing staff is the core of a well-functioning unit. It is amazing how efficiently trained nursing staff can take quick management decisions in critically-ill individuals. A central core of very well-trained and dedicated nurses, together with two highly trained doctors, all being strictly supervised by the physician incharge of the unit has proved to be quite effective. The ratio of nurses to patients has to be invariably 1:1 and never

less than 1:2. of the total nurses on duty at any one time, half should be very well-trained, the remaining half being trainees.⁵

The central core of nurses and trainees must be headed and actively supervised by a dedicated sister-in-charge.

Auxillary Personnel

Scales suggested by different planners range from very meagre to very liberal. Sometimes, planners hope that a liberal scale of staff to ICU will increase its efficiency. However, large number of workers alone do not increase efficiency. It is the level of training, technical efficiency and motivation that is important in a department which is constantly in a state of alert.

Each person has a role to play in the care of patients. The personnel range from a knowledgeable Attendant / ward boy to a highly skilled technician. A plan of action is obviously necessary if the skilled people and the sick patients are to be brought into proper relationship with each other. The essential categories are ICU technicians, nursing orderlies [ward boys / female attendants] and sweepers.

ANCILLARY AND SUPPORT SERVICES

Air Conditioning

Ideally, the ICU should be centrally air-conditioned, and designed to provide 7-8 air changes per hour and a positive pressure to prevent re-entry of outside contaminated air. Adequate number of window type air conditioners with efficient filters (Less than 10 microns) is the next best option.

Lighting and Electrification

The overall lighting requirement in ICU is for subdued illumination for the patient bed, with capacity for increasing it in case of need. The main light at the bed-head should therefore be fitted with a dimmer switch.

Additionally a high-intensity emergency light or spot focussing light should also be provided. The bed-head must also have a emergency buzzer switch connected to the central buzzer and location panel at central nursing station.

Due to multiple electrical gadgets required to be used for the patient, each room or patient cubicle should have at least four or five power sockets on either side of the bed, two of which must be of 15 Amp rating, to plug on mobile X-ray machine or other high power equipment.

Although most modern electrical equipment has adequate protection against leakage of electric current, effective

grounding of all power sockets should be ensured. Frequent preventive maintenance checks of equipment by competent technician is advised for all electrical / electronic gadgets in ICU.

Diagnostic Support

A multidisciplinary ICU should have a round the clock access to radiology, imaging, laboratory services and physiotherapy.

Equipment Maintenance

In-house trained technicians to carry out preventive maintenance of equipment on a regular basis, and to promptly attend to breakdown of equipment, is of vital importance. This aspect is neglected in many units.

Stand-by Generator

A reliable alternate source of power is a must for ICU. The entire ICU must be connected to a stand-by generator. The hospital stand-by generator should be powerful enough to take on the full load of the ICU, including a large number of equipment. The generator should be capable of automatically switching on within seconds on failure of the main electrical supply.

Visitor Lounge

For relatives and friends, a visit to a patient in seriously ill condition is taken as a social and traditional obligation in our society. A visitor's lounge, where such people can wait their turn to go in for a brief period to see the patient thus becomes almost a necessity near the ICU. In an adjoining cubicle at the entrance, space can be provided for donning caps and masks, and gown if considered necessary.

ETHICAL PRINCIPLES GOVERNING CRITICAL CARE

Note: The following is reproduced, with kind permission of the author and the publisher from "Principles of Critical Care" by Dr Farokh E. Udwardia, published by Oxford University Press India. New Delhi.

There are three basic ethical principles in critical care medicine.

The first is beneficence, and its companion, non-maleficence. Beneficence directs the physician to do good by relieving suffering and restoring good health. Beneficence does not merely involve technical expertise and medical skill, it equally involves human qualities particularly in the care of critical illnesses. It is these human qualities which unfortunately tend to be forgotten or pushed into the

background, by the frontiers of advancing technology in medicine.

Nonmaleficence is the companion-in-arms of beneficence. It reminds the physician that above all, they should do no harm. Beneficence and nonmaleficence may at times in a critical care setting be in apparent conflict.

The second basic ethical principle governing decision making in critical care medicine is patient autonomy. This is the patient's right to self-determination—the right, after being properly informed, to accept or refuse medical treatment offered to him including life-support measures like mechanical ventilation. It is indeed the proper interpretation of the balance between the principle of beneficence and the principle of patient autonomy that governs decision-making and management in critical care medicine. This balance is indeed difficult because patients who are seriously ill may be unable to make proper decisions about their own care.

There are many factors which distort, prejudice or interfere with autonomous decisions of patients in critical care medicine. These include fear, anxiety, depression, panic, lack of information and abhorrence of invasive modalities of treatment which prompt them to decide (often wrongly) to “die with dignity”. The working ethical principle is that when confronted with a potentially reversible life-threatening illness, beneficence prevails over patient autonomy.

The third and final ethical principle is justice—to distinguish in patient care the right from the wrong. If, at times this is difficult or impossible to determine in absolute terms, one should determine what is more right or less wrong. In developing countries where resources are limited, justice dictates that treatment is administered to patients who are more likely to benefit from them. This often produces an ethical quandary. Physicians should unquestionably be involved in the ethics of resource distribution, providing equitable medical care to the society in which they live and work. Wisdom however, dictates that in all situations requiring protracted intensive care, the burden-benefit relationship should be carefully considered, and care be tempered with reason.

Ethical Issues in Terminal Illness

A terminal illness is one that leads to death in the immediate future, so that the physician concentrates not on cure, but on relief of symptoms and on moral support to the patient and his family.

At times a patient with terminal cancer or terminal advanced organ system failure is unwittingly admitted to an critical care unit. If such an admission does occur, one

should explain the futility and the crippling expense likely to be incurred, to the patient and his family. Nevertheless, an all-important provision in relation to terminal illness in critical care medicine is to constantly review the word “terminal”.

Such a situation should prompt the physician, to refrain from using medical technology and skill that merely prolong suffering or that make death excessively lonely, gruesome, dehumanised, perhaps even obscene, and ruinous to the patient and his family.

Withholding Life Support and Withdrawal of Life Support System

It is comparatively easy to withhold life support in a patient who will invariably die in a short span of a few hours, or even a few days. It may be difficult to withhold support when the time span of a terminal illness is more prolonged. The discerning physician learns to recognise the limits of care, knows when to draw the line, and recognise the futility, and often the cruelty of aggressive management in patients who are well past the point of no return.

At last the authorities that he have passed an act in Parliament recognising brain death and thereby permitting the withdrawal of life support in patients who are brain dead. Recognition of brain death, and the sanction to remove life support in such patients ends an agonising era of utter helplessness and mental agony and torture for both relatives and staff in critical care units.

Euthanasia

No discussion of ethics in relation to modern day medicine, including critical care medicine, can be complete without a short discussion on euthanasia.

In the west, a significant number of acutely ill patients who are about to die, as also patients with chronic but terminal disease express a desire to be killed or to be medically assisted in suicide.

Euthanasia Includes

- i. Voluntary euthanasia or intentional killing of patients who express a competent, freely made wish to die, because of the pain or suffering they experience.
- ii. Medically assisted suicide, at the patient's insistence and wish.
- iii. Homicide, following a surrogate decision on a crippled or handicapped patient, or a patient with poor or hopeless quality of life. In this case, the patient is not involved in the decision.

It must be understood that withholding or withdrawing treatment when it is certain that such treatment will be of

no benefit and when death is inevitable, does not constitute euthanasia (even though some prefer to call this “passive euthanasia”), because the intent is not to kill but to prevent prolongation of the act of dying.

To die with dignity and to legalise euthanasia are slogans often linked together, as if one needs the latter to achieve the former. Legalising euthanasia in our country, even in the most diluted form, could well open the floodgates to murder. Can most doctors claim to have the knowledge, experience, the Oslerian wisdom and perspective to be truly able to enlist themselves to the cause of euthanasia? These are pertinent questions which are difficult to answer. Finally, when one legalises euthanasia, claiming it to be a solution to a problem, would the good that accrues clearly outbalance the evil or harm that could possibly result from this legal sanction? This again is a question that physicians all over the world should seriously consider.

POLICIES AND PROCEDURES

ICU is a high tension place where catastrophic events and unpredictable crises are commonplace. Therefore, standard policies and procedures need to be laid down and understood by all. Failure to cope up in ICU is seen as a failure of the entire hospital. When everyone is aware about the functioning of various aspects of the unit the chances of misunderstandings, mismanagement and confusion become remote. Physicians, nurses, and workers at all levels must be made aware of the policy on every aspect of the day-to-day working of the unit and the procedures to be routinely followed.

The policies and procedures should cover the following aspects:

- a. Types of patients to be admitted
- b. Refusal of admissions
- c. Admission procedure
- d. Arrangement if bed not available

- e. Responsibilities of the admitting unit/consultant
- f. Duty schedules and rota of Residents
- g. Daily rounds of consultants
- h. Daily rounds of officer incharge ICU
- i. Documentation of patients (medical record)
- j. Medications, medication errors
- k. Discharge of patients
- l. Transfer of patients
- m. Length of stay
- n. Withdrawal of life support
- o. Cardiopulmonary resuscitation (CPR)
- p. Equipment maintenance, repair and replacement
- q. Turnover of nurses
- r. Student nurses
- s. Staff complaints
- t. Patient's / relatives' complaints
- u. Additional manpower in crises
- v. Stocking of drugs, medicines, supplies
- w. Visitors, visiting time
- x. Aseptic techniques, sterile supplies
- y. Disinfection
- z. Infection control.

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CHAPTER

6

Nursing Services

A hospital may be soundly organized, beautifully situated and well equipped, but if the nursing care is not of high quality the hospital will fail in its responsibility. —Jean Barrett

INTRODUCTION

Nursing service is one of the most important components of hospital services. Nursing service in a wider context is that part of the total health organisation which aims to satisfy the nursing needs of the community, the major objectives of which are to provide:

- i. nursing care required for the prevention of disease and promotion of health, and
- ii. the nursing care of sick patients — (a) in the interest of his or her mental and physical comfort, and (b) by reason of the disease from which he or she is suffering.

Nurses form a very important group—the largest single technical group — of personnel engaged in patient care in hospitals next to doctors, consuming approximately one-third of hospital costs.

Although there is a close historical association between medicine and nursing, as both of them are involved in direct patient care, one of the persistent problems is that of defining what nursing care should be, and what is distinctive about it. There are attempts at defining nursing in terms of procedures and techniques that emphasise skill at the expense of knowledge and understanding. Nursing have to function within unstructured as well as structured patterns of relationship, and numerous external factors affect the nurses' role. Some see nursing as a performance of tasks designed to help and comfort patients in a dependent role, carrying out orders of physicians, where the nurse is not perceived

to require much background knowledge in order to carry out her functions. However, another view—as seen by nurses themselves—emphasises a decision-making role which views nursing as a team effort interacting with the physicians and other health workers.¹ This school views nursing as separated into managerial (decision-making and leadership) and technical (cure and care services) activities. A synthesis of the above two, an interactive model that covers nursing assessment, intervention, instruction for patients and managerial tasks—in fact a total management of nursing—appears to be the most appropriate.

FUNCTION OF THE NURSING SERVICES

Seen in the above perspective, the functions of nursing services are as follows.

1. As a basic function, to assist the individual patient in performance of those activities contributing to his health or recovery (or to peaceful death) that he would otherwise perform unaided has had the strength, will or knowledge.
2. As an extension of the above basic function, to help and encourage the patient to carry out the therapeutic plan initiated by the physician.
3. As a member of the health team, to assist other members of the team to plan and carry out the total programme of care.

The organisation of nursing care constitutes a subsystem for achieving the hospital's overall objectives. Nursing care of patients generally takes three forms: (i) technical, (ii) educational, and (iii) trusting relationship. Whereas educational and trusting relationship have their own

importance, it is the technical form which is important to both the nurses and patients.

Nursing has traditionally been embedded within a hierarchy of authority and autonomy. The Indian Nursing Council Act places sharp limitations on the authority and judgement of the nurse, but in day-to-day situation, doctors fail to fully exercise their authority and judgement, and the nurse may have to exercise more than her legal bounds.

ROLE OF NURSING SERVICES

In addition to performing many other roles including promoting health behaviours of patients, the professional nurse in the acute care setting performs functions that are primarily curative and restorative in nature. The nurse's role includes diagnosis as a basis for planning, providing, directing, collaborating in, and evaluating direct patient care. As a helping profession, nursing's ideal characteristics includes the ability and commitment to respond with compassion to human needs and society's expectations for health care services.

The attitude of the head nurse towards her patients is of paramount importance—never for a moment is she or members of her staff are supposed to forget that they are dealing with human beings, not diseases. A disease or disorder affects each person in a different manner depending upon his attitude, his previous experience with hospitals as patient, and the sociocultural pattern of his life. To render understanding care the nurse must appreciate the factors which influence attitudes and the need of the patient for respect of his individuality. Patients, as a rule, wish to maintain a degree of self-dependence and resent having no choice but to accept whatever is being told to them.

Adults who have been accustomed to ordering their own lives and making their own decisions dislike being treated as children and being expected to accept without question that which the doctor or nurse chooses to do them. Explanation of medical treatment are not infrequently left to the nurse. Never should she command or by her manner make patient feel that he has no alternative but to comply.² During convalescence the patient needs something to occupy his mind, be it pleasant companions or even assisting with the work of the ward. He needs the sense of security that comes from a feeling that people are working together—doctors, nurses and others and not at cross-purpose. All this revolves around the work of the nurse.

DETERMINING THE NURSING STAFF REQUIREMENT

The problem common to all hospitals is the development of a method to determine the nursing effort by categories of nursing staff to meet the nursing needs of the patients in an effective manner. Empirically there are three methods of determining the number and types of nurses.³

1. Calculating staff needs based on the number of beds in the hospitals. The inadequacy of this method is that it takes no account of the patient's requirements nor of the fact that nurses are also required in OPDs, OTs and other departments. Using this system it is possible to develop formulae to calculate the number of staff required only in a given clinical speciality, say surgical department.
2. Estimating the number of staff according to the degree of dependency of the patients as determined on a scale. The advantage of this method is that it gives an estimate of the minimum level of staff necessary to provide safe care. The disadvantage lies in its emphasis on physical dependency as compared with the need for psychological, emotional, social and clinical support. This method can be enlarged to determine different levels of staff to meet the patient's needs.
3. The third method relies on observations of nursing activity. The correct nursing practices in different hospitals are observed and recorded and staff requirements are determined accordingly. This system is also not satisfactory since it assumes that current practices are meeting patient's needs without validating the assumption.

Calculating the staff requirement on the basis of patients' need, there has been a move towards considering potential ability rather than inability of the patient in relation to health functions in determining nursing effort.

However, the actual requirement of clinical nursing is dependent on the method of nursing that is practised in a hospital. Five methods have been in vogue, although in many situations a combination of one with the other will generally be observed.⁴

Case Method

The nurse provides all nursing functions for the patient. A one-to-one relationship of 'my patient my nurse' exists resulting in more individual care and greater work satisfaction.

Group Assignment Method

One nurse is assigned to a group of patient to provide total nursing care. This can be considered an enlargement of the case method described above.

Functional Assignment Method

Nurses are assigned to functions, e.g. TPR taking, medication, sponging, maintenance, duty and so on. Here, the nursing care becomes fragmented among many nurses, and impersonal. (However, for practical purposes some activities, e.g. serving diet, assisting doctor in dressing are assigned functionally).

This method has some advantages which make those accustomed to it hesitant to change it. In this method, more can be accomplished in a given period of time.

However, this gives the patient a service which is to some extent both unsatisfactory and unsatisfying—unsatisfactory because responsibility for the attention given to patient is arbitrarily divided between several people, unsatisfying because the attention itself is apt to be impersonal.

Team Nursing Method

Assignment of a group of the patients to a team of the nursing (2 to more) staff headed by a staff nurse. This method has resulted due to shortage of staff to give total care. Other nurses and nurse aides are incorporated in the team to take care of the load, as many parts of care do not require the technical ability of a highly skilled professional nurse. The assignment of duties is based upon analysis of functions to be performed, competencies available and supervision required. This approach is quite effective if properly organised and supervised.

However, here too nursing care is fragmented and nonpersonalised. The concept is based on the philosophy that a group of nursing personnel with graded competencies working together in a coordinated, cooperative way can meet all needs of patients more economically.

Primary Nursing Method

Primary nursing method is akin to the case method. The primary nurse assumes 24-hour accountability for the care, planning and evaluation. When on duty on a shift, the primary nurse herself assumes responsibility for providing total care. Other functions of primary nurse is the coordination of nursing activities with physician and other health professionals.

In determining the number of nurses required for a service in the hospital, it has to be understood that nurses have to carry out two types of actions in relation to patient care. They are as follows.

Direct nursing care activities: These are defined as those that are performed in the presence of the patient for the purpose of meeting his or her physical, emotional and social care needs.

Indirect nursing care activities: They are those actions that are not necessarily performed in the presence of the patient but are essential to effective nursing care. Such actions include the process of carrying out nursing assessment, formulating and writing nursing plans, and evaluating the effectiveness of each.

FACTORS WHICH INFLUENCE THE NUMBER OF NURSES

Whatever the method of nursing adopted in the hospital, the total number of nursing staff required to carry out effective nursing care is also dependent on many factors. They are as follows.

Type of Service

Each type of service such as medicine, surgery, obstetrics, paediatrics, etc. differs in the nursing hours required. For example, more nurses are needed for children than for adults, and isolated patients need more nursing.

Acuteness of Illness

The degree of illness affects the amount of nursing care needed. In some studies, acutely ill and therefore completely dependent patients have been known to require 430 minutes in the first (morning), 186 in the second (afternoon), and 124 during the night shift.

Experience of Nurses

Graduate nurses are usually more mature in judgement, more skilled and able to work more rapidly (efficiently). Student nurses in upper classes are more experienced and skilled than younger students.

Amount and Quality of Supervision

Nurses who are well-supervised learn to use their time more efficiently.

Availability of Nursing Aides

Nursing aides (variously called nursing assistants, nursing orderlies, etc.) can play an important role in saving time of nurses if properly trained. Nursing assistants/medical assistants, who are nursing aides take on many nursing tasks in military hospitals, thereby significantly reducing the nurse to patient ratio in military hospitals.

Teaching Function

Inexperienced medical students often need assistance and supervision from nurses. There are more treatments and tests performed on patients in a teaching hospital. More nursing staff is needed to meet these demands in teaching hospitals.

Plan of Nursing Units (Wards)

In an open type of ward, the patients are in full view of nurse, and it is easier to see what is happening. Therefore, supervision of the patients is easier. In wards where patients are housed in small units (Rig's pattern), more number of nursing staff are required.

Physical Facilities

Good functional planning of physical facilities minimises avoidable walking and waste of time of nurses.

Location of Equipment and Supplies

Time-saving equipments and their availability at nursing units saves nurses' time. A central supply department and flash sterilisers, are two examples.

Working Hours and Shifts

When the staff is able to work only certain fixed hours and days, the result is inflexibility, and more nurses are needed to adequately cover all parts of the day.

Hospital Routine

Although reports and record keeping are essential, more complex the system of record keeping and reporting, the more nursing time is consumed in clerical work. Availability of a less technical person to handle telephone communications, direct visitors, assemble charts and papers, and check supplies, etc. enhances nurses' time available for nursing.

Assignment Method

Other things apart, the functional method of assignment of work is more efficient than case or team method. The team method where the assignment of duties is based upon analysis of functions to be performed, competencies available and supervision required is a popular method and is quite effective if properly organised and supervised.

Standard of Care Desired

The attention given to comfort and safety measures and the emphasis on personalised rather than routine care (e.g. in private rooms) influence the number of nursing staff required.

Barrett et al³ have suggested that in determining the staffing pattern of a patient care division, the factors which should be considered are as follows.

1. The mean daily patient census
2. Daily patient turnover rate
3. Illness acuity of majority of the patients
4. Types of therapies and surgical procedures usually performed on patients and special nursing requirements of such procedures.
5. Proportion of time required per shift per patient for both indirect and direct nursing care activities.

Carrying out time and motion studies and activity analyses to determine the nursing time for various categories are an aid in this direction.

Whereas in a new hospital the staffing plan must be based on a mix of the experience of other similar hospitals, current staffing levels in a existing hospital can be studied for their adequacy by the method described below. To be practicable, the study must not club all the wards and different types of service (medical, surgical, obstetrical, etc.) together, as the intensity and level of nursing care in each must differ. A National Institute of Health and Family Welfare (NIHFW) study revealed that the minimum actual time needed for direct nursing care in four different types of wards was as follows.

- | | |
|--------------------|---------|
| 1. Surgical ward | 192 min |
| 2. Medical ward | 236 min |
| 3. Paediatric ward | 308 min |
| 4. Maternity ward | 158 min |

Limitations of such studies are obvious as their findings do not fit in other situations. However, they act as starting points for further studies.

STEPS IN DETERMINING NURSING TIME AVAILABLE PER PATIENT PER DAY

Step 1. Find out the average number of days worked by a nurse (i.e. 365 minus holidays, leave, sickness, etc.)

Step 2. Find out the average number of hours worked by a nurse (multiply average number of days by number of hours worked per day, usually 8 hours).

Step 3. Multiply the hours worked per year by a nurse by the total number of nurses in that ward to obtain total number of nursing hours per year.

Step 4. Divide the total number of nursing hours per year by 365 to obtain nursing hours per day (Remember, a hospital works 365 days a year).

Step 5. Divide the total number of nursing hours per day by the average daily patient census in the ward to obtain the number of nursing hours actually devoted per patient.

NURSING TIME UTILISATION STUDIES

Considerable amount of research has been done to devise ways of assessing the workload and calculating the number and mix of nurses required for a definite load. The nursing needs of the patients are directly related to the severity of his illness, and therefore, to the degree of patient dependence on nurses. In the study carried out by the NIHFV in the medical and surgical wards of a general hospital, the result showed that the average time taken per patient in different shifts varied from 196 minutes to 10 minutes for different degrees of dependency (Table 6.1).

Table 6.1: Nursing time by patient dependency

Patient category	Shift			Total
	Morning	Evening	Night	
I. Completely dependent (21%)	196 min	150 min	87 min	433 min
II. Partially dependent (44%)	97 min	55 min	83 min	235 min
III. Marginally dependent (Fully ambulant) (35%)	72 min	41 min	10 min	123 min

Based on the above observations, it was worked out that the number of patients in each category and in each shift that could be looked after by one nurse was as follows (Table 6.2).

Table 6.2: Shiftwise nurse:patient ratio

Patient category	Morning shift	Evening shift	Night shift
I.	2.4, say 3	3.2, say 4	5.5, say 6
II.	4.9, say 5	8.3, say 9	14.4, say 15
III.	6.7, say 7	11.9, say 12	45

A common observation of everyone working in hospitals is that nurses spend a lot of their working time (Nursing hours per day NHPD) in non-nursing activities. Another study conducted as NIHFV showed that only 56.7 per cent of all nurses activities were patient-centred, of which 31.3 per cent were in direct patient care. Patient-centred activities accounted for 42.9 per cent in the morning, 41.6 per cent in the evening and 23.6 per cent in the night shifts.

Such studies help the nursing administrator to estimate the total number of nurses needed and the staffing plan for a ward according to the categorisation of patients and degree of their dependence. Given the aggregates for all wards and departments, the number of total nurses required and the overall staffing plan must be worked out by the hospital administrator.

Wide variations have been found in nursing hours per day (NHPD) in otherwise comparable hospitals. Evidence of poor scheduling is apparent in many hospitals—they determine their staffing needs on the basis of number of beds rather than on type of the patients. And, contrary to the belief that sophistication in instrumentation and more mechanisation will reduce dependence on nurses, it has long been established that there is a direct correlation between sophistication and NHPD; the higher the sophistication, the greater the number of nursing hours.

TIME UTILISATION IN NONNURSING DUTIES

A substantial amount of nurses' time is spent on activities that could best be described as nonnursing. The staff nurses have to carry out certain jobs which can be carried out by less skilled personnel. These jobs are as follows—

- Charting
- Making diet lists
- Sample taking
- Arranging despatch of samples
- Bed making
- Supervision of housekeeping
- Sending patients to other wards or department
- Orientation of patient to ward and surroundings
- Attending to problems of visitors and relatives
- Exchange of articles from CSSD, stores, laundry, etc.

Notwithstanding the importance of certain administrative, clerical and record keeping duties of the nurse, it can safely be surmised that such tasks can be delegated to staff at a lower level of competence.

In one of the studies on nursing staff time utilisation, it was found that 92 per cent of available nursing staff was employed on direct patient care duties and the remaining 8 per cent on purely administrative duties. Of the nurses employed on direct patient care duties 20.7 to 44 per cent of even their time was accounted for by nonprofessional duties. The employment of the staff during the day was 83.3 per cent for the day shifts and 16.7 per cent for the night shifts which was totally disproportionate to the work load requirement in wards.

Many other studies abroad have also shown that nurses spend less than half their time in direct patient care activities. Staff nurses averaged 41 per cent of time in direct patient care activities, with 25 to 30 per cent of the remainder in planning and coordinating of care, and in communication. The head nurse spent only 15 per cent of her time and the nurse supervisor 7 per cent in direct patient care.²

If professional nursing time in the OPD is not well-assigned, outpatient department can account for a substantial wastage. In the OPD as little as 7 per cent of the qualified nursing staff time has been found to be spent on nursing work, with ancillary work accounting for 13 per cent, clerical work 28 per cent, administrative and supportive duties 16 per cent, cleaning 4 per cent and personal and waiting time 29 per cent. These figures suggest that generally outpatient departments may be overstaffed with highly qualified personnel, much of whose work could be done by lower grade professionals or even by non-professional staff.

Some workers have observed that the employment of a ward clerk or secretary could relieve the disproportionate amount of professional nurse's time devoted to clerical work and permit more attention to nursing care functions, resulting in economy. Addition of a ward secretary reduced the time of head nurse on clerical work from 38 to 3 per cent. Use of highly trained (and therefore higher paid) nursing personnel is inefficient and expensive. Clinical nursing costs account for 30 to 50 per cent of all staff costs in hospitals in Western countries. Reliable studies are not available on nursing costs in hospitals in India, but they are likely to be on somewhat lower side.

STAFFING NORMS

Studies have shown wide variations in levels of staffing; the range of total nursing strength varies from 56 to 114

per 100 patients in nonteaching hospitals. These variations are not wholly explainable by hospital characteristics. Whereas in western countries the bed: nurse ratio is up to 3 nurses per patient basis, in India the ratio is much poorer.

It is 0.4 nurse per bed in respect of nurses alone, and 0.6 per bed if the ANMs are also included.

The Indian Nursing Council has developed norms for the staffing of hospitals. It recommends one staff nurse per 3 beds in teaching and one staff nurse per 5 beds in nonteaching hospitals. For 60 beds, there should be 20 staff nurses in teaching hospitals and 12 staff nurses in nonteaching hospitals (Table 6.3).

Table 6.3: Nursing staff for wards, special units and OPD as recommended by Indian Nursing Council

Particulars	Nursing sister	Staff nurse
1. Gen Med and Surg wards	1:25 beds	1:3 beds
2. ICU/CCU/special units	1 each shift	1:1 bed (each shift)
3. Labour room	1 each shift	4 in each shift
4. OT	1 each shift	3 for 24 hours per table in each shift
5. OPD	1 overall 1 Gyne OPD	1 in each clinic of the department
6. Casualty and emergency departments	1 in each shift	2-3 depending on no. of admissions

Note: Add leave reserve 30 per cent in all categories.

The nursing department is responsible for nursing units (wards), operation theatres, recovery rooms, labour rooms and delivery suites, special care units, nurseries and the CSSD. The nursing service in each of these departments functions under the direction of a head nurse or supervisor who is responsible for administering the nursing personnel posted to each department.

ORGANISATION

Director of Nursing

Nursing service must function under a senior competent nurse administrator—variously called director of nursing, nursing superintendent, principal matron, or matron-in-chief. She is responsible to the hospital administrator for the overall programme and activities of nursing care of all patients in the hospital. The nursing programme is administered by her through appropriate planning of services, determining nursing policies in collaboration with hospital management and nursing procedures in collaboration with nursing staff, giving general supervision, delegation of responsibility, coordination of interdepartment nursing activities, and

counselling the hospital administration on nursing problems. She has a dual role: the first one is the administrative responsibility towards the hospital administration, and the second one is the coordinating of all professional activities of nursing staff with those of medical staff.

For a new hospital project, a senior nurse administrator is associated from the beginning of the project would be able to plan the pattern of staffing, viz. the case method, team method, etc. best suited to the architectural design and layout of ward units. Conversely, she will be able to offer valuable help in suggesting design and physical layouts suited from the nursing point of view.

The role of nursing superintendent starts in a new hospital from helping to establish the overall goals, policies and organisation, and facilities to accomplish these goals in the most effective and efficient manner. The functional elements of the role of the nursing superintendent includes the following.

1. Formation of aims, objectives and policies of nursing service as an integral part of hospital service
2. Staffing based on nursing requirements in relation to accepted standard of medical care
3. Planning and directing nursing care
4. Coordinating interdepartmental activities
5. Maintaining supplies and equipments
6. Budgeting
7. Records and reports.

Nursing Supervisor

Each department or clinical division, e.g. medical, surgical, obstetrical, operation theatres, outpatient department, nurseries, etc. should have a supervisor. As there may be more than one nursing unit in each division or department, supervisors have a general administrative and coordinating function within their respective division. However, supervisors will also have limited clinical functions.

It is generally accepted that a good nursing service depends upon strong supervision, no matter what type of nursing assignment seems best suited to the new hospital.

Head Nurse

A head nurse is assigned to a nursing unit, or ward, or a section of department. She works under the general direction of the supervisor of the division.

Staff Nurse

Staff nurses are employed at the "floor" level for carrying out skilled bedside nursing. This is the real work force of

the hospital upon whose competency, state of training and dedication depend the success of the nursing department.

Student Nurses

Student nurses cannot be employed on nursing duties except under supervision of fully qualified staff nurses. However, they are a factor in reducing the permanent nursing staff of a hospital. Repetitive and less skillful nursing tasks can be taken over by student nurses.

Motivation of Student Nurses

A well-managed hospital at peak professional efficiency motivates student nurses to develop a lifelong commitment to their mission of nursing during their close encounters with death and the success of life-saving measures. But the high mortality and disability rates tend to lower the morale of nurses in training. Therefore, there is a need for inculcating high degree of cheerfulness and developing stability of character during their training. The trainers and the hospital should capitalise on the fact that working in critical care areas under efficient and mature nursing staff develops a sense of achievement and fulfilment, and this further acts as motivator in their mission of nursing.

Hospitals having nursing training programme must standardise the work to be allotted to the student nurses. In some hospitals, allocation of duties is determined according to seniority and in others it is left to the discretion of the ward sister. Third year nurses are made mainly responsible for medicines, injections, and other technical procedures, and first-year nurses are responsible for toilet rounds, bed baths and feeding. The junior student nurses are an indispensable part of the ward work. Three quarters of the nursing is contributed by them.

There has to be a proper distinction between the work and responsibilities of the fully trained nurse and the nurse nearing the end of her training, who necessarily lacks experience. The fact is that nurses in training bear so large and important a share of the actual nursing to be done in the ward that their particular needs as students are sometimes passed over.

POLICIES AND PROCEDURES

In order that a good standard of nursing care be maintained, the nursing superintendent should develop written policies and procedures to serve as guides for nurses of the various units of the hospital. Important topics that should be incorporated are as follows.

1. Organisation
2. Status and relationship
3. Responsibilities
4. Staffing pattern, shift pattern
5. Departmental functions
6. Requisitioning of supplies
7. Utilisation, care and maintenance of equipment
8. Patient admission procedures including communication with doctors
9. Nursing procedures
10. Coordination with domestic services
11. Handling of patients clothing and valuables
12. Dealing with verbal or telephonic orders by medical staff
13. Handling and control of narcotics and dangerous drugs
14. Isolation techniques and communicable diseases
15. Control/prevention of hospital infection
16. Safety—hospital hazards, accidents and fire
17. Care and maintenance of furnishings
18. Standards of temperature, ventilation, lighting
19. Public relations, release of patient information to others
20. Visiting hours, dealing with visitors
21. Health education of patients, briefing of visitors and relatives
22. Transfer of patients
23. Records and reports
24. Private nurses
25. Use of restraints
26. Discharge procedures including communication to business office and others
27. Procedure for patients leaving against medical advice (LAMA)
28. Procedure following death of patients.

When nurses take upon themselves the responsibility of total care, their instructions require to be clearly specified—the nursing plan must provide for clear instructions on observations, tests, medications and all other specified nursing tasks.

Although nursing services take orders from doctors, they have a line responsibility to the hospital administrator. The support and administrative services (e.g. lab) have also a responsible focus on patient needs but have to work with physician's needs. These relationship impact on each other, with multiple lines of communication and multiple influences which should be clarified in the nursing policies and procedures.

Dichotomy in Technical and Managerial Responsibilities

The nurse has a distinct function of management in relation to planning of direct-care inputs. The needs of the patient for comfort, safety, understanding, etc. are in many instances as urgent as his requirement for intervention of a technical nature. Most nurses recognise the need for the senior nurse-manager to keep in touch with changing clinical practices in order to determine priorities for nursing management, also recognising that she may not participate in direct nursing care. Individual responsibility for the total nursing care of a number of patients during her shift involves planning, providing and evaluating the care. Such a nurse need not hold a position above the group members, but has a temporary, functional authority to coordinate the work.

Hospital administrators are not well-equipped for managing nursing services. But hospital administrators must share management information with nursing administrators. Often, nursing superintendents are not given adequate status in the administrative hierarchy as evidenced by the fact that they may not attend staff meetings.

Evaluation

The nursing department must be in a position to maintain nursing services at a high level of efficiency. For this, periodic evaluation should be undertaken to assess the changing needs due to altered policies, shifting emphasis in management of the patients, and introduction of new technologies.

Nursing as a profession is old but has only recently been able to attain a mouthpiece professional association in meeting the criteria of self-governance, source of professional and self-discipline, standards, ethics and cohesiveness. However, such professional associations should encourage self-evaluation at the hospital level.

Efficiency

The nurse can give her best service only if she is assigned to the service that is of greatest interest to her. Although this is not always possible, special consideration should be given to the nurse's personal choice of service, and she should be transferred to that service as soon as possible if she cannot be assigned to it at once. Assignment to a service should not, however, be limited to one ward. It is best to allow the nurse to become expert in the field of her choice,

but this does not preclude assigning her to another ward for several hours of assistance from time-to-time when absence of personnel or especially heavy workload of very ill patients requires the service that a well-trained staff nurse can give.

Growth of specialities also means the growth of specially trained nurses for ICU, OT, dialysis, neurosurgery, burn unit, neonatology, etc.

Job Satisfaction

Job satisfaction of nurses does not mean monetary satisfaction alone but also the joy attained from doing their work. This satisfaction has a relationship with good colleague relations, good service conditions, and the enjoyment gained from merely doing a particular kind of work.

About nurses opting for higher academic qualifications, there is diversity of thought on what should be the content of this long and disciplined educational process; collegiate nursing education is separated from direct patient care and

intensive patient contact as opposed to hospital-based nursing diploma course.

Long distances from home to hospital and consequent transport problems have tended to restrict the nurses employment preference for conveniently located hospitals. The opportunity of recruiting nurses living in the neighbourhood of the hospital should be considered, because constantly changing shift duties are an inescapable part of a nurse's career. Nurses living in the neighbourhood of the hospital have a better level of job satisfaction.

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SECTION

THREE

Management



CHAPTER

7

Effective Hospital Management

INTRODUCTION

Management has been defined in many ways by many authorities, but the original definition by Henri Fayol, considered the father of modern management, over eighty years ago still holds good, “To manage is to forecast and plan, to organise, to command, to coordinate and to control”.

The task of the management of any enterprise incorporates:

- i. determining the goal and objectives of the enterprise,
- ii. acquisition and utilisation of resources
- iii. instituting communication systems,
- iv. determining control procedures, and
- v. evaluating the performance of the enterprise.

PRINCIPLES OF MANAGEMENT

The role, function and tasks of general management have been codified as “principles of management”. These principles comprise of guidelines as well as commandments to the manager’s function. They aim to outline features which are common to the activities of managing organisations as diverse as a departmental store, a hotel, a shoe factory or a political party. But they are too mechanistic—they stress the machine—like character of management and leave out the vital human element. With the human element incorporated, management consists of deciding what is to be done, how to do it, in organising the material, technical and human resources required to do it accordingly, and then getting things done through people.

The principles of general management first developed by the French industrialist Henry Fayol in the early twenties,

came to be widely known only in the forties.¹ Noting that the principles of management are flexible, not absolute, and must be applicable regardless of changing and special conditions, the following principles are still useful for an understanding of management in general.

1. Division of Work

The work assigned to each worker should be clearly defined, and activities of the organisation precisely clarified. All work thus gets performed efficiently with gradual development of competence and skills. This is the specialisation which economists consider necessary in the use of human resource.

2. Authority and Responsibility

Authority and responsibility are inseparable, with the latter arising from the former. Without authority one cannot discharge responsibility. However, authority should be commensurate with responsibility.

3. Discipline

Considering discipline as respect for agreements which are directed at achieving obedience, discipline requires good supervisors at all levels. Managers and administrators should set the good example through their actions and behaviour.

4. Unity of Command

This means that employees should receive orders from one superior only. Each employee in the organisation must know who is his immediate boss and be responsible to him for his work.

5. Unity of Direction

Each group of activities with the same objective must have one head and one plan. As opposed to unity of command, unity of direction relates to the organisation as a whole. There should be teamwork and unity in the organisation. If people at various level are divided about objectives, there will be wastage of organisational resources.

6. Centralisation of Authority

This refers to the extent to which authority is concentrated or dispersed. It should be clear in the organisation as to who is to issue orders and the areas of authority. Otherwise, conflicting orders will create confusion in the organisation.

7. Scalar Chain

The chain of supervisors from the highest to the lowest ranks in the organisation. While this will not be departed from needlessly, it could be short-circuited at times only when to follow it scrupulously would be detrimental in a given situation.

8. Order

This is “a place for everything (every one) and everything (every one) in its (his) place”. As a principle of organisation in the arrangement of things and people, this will result in optimisation of the resources.

9. Remuneration

Equal pay for equal work. Each person should be paid according to his contribution, the remuneration and methods of payment should be fair and afford maximum possible satisfaction to employees and employer.

10. Stability of Tenure

Unnecessary turnover of employees is both the cause and the effect of bad management. The employee requires assurance about the permanent nature of the job, resulting in a feeling of security and involvement in work.

11. Delegation of Authority

Because managers manage through the work of others, there should be delegation of authority. Through delegation, subordinates get prepared for higher responsibility. The needs, training, and motivation of the delegater and delegatee must match.

12. Initiative

Initiative is the thinking out and execution of a plan. Employee should be given opportunities for use of creative ideas in their work. It is a means to job involvement and commitment to organisational goals—the keenest satisfactions for a worker to experience.

13. Subordination of Individual Interest to Organisational Interest

When the two differ, management must reconcile them. As the organisation is set up to meet the needs of society, the individual must sacrifice some selfish interests in the overall interest of the organisation and society.

14. Equity

Loyalty and devotion should be elicited from personnel by a combination of impartiality, kindness and justice on the part of managers, when dealing with subordinates. Subordinates must be treated without any bias for race, religion, sex and class.

The principles propounded by the classical school of management are still in wide use today. But attempts to apply these principles blindly to health services organisations can be unsuccessful at times, because of the highly personal nature of the service and the professional work-force which render the services. Nevertheless, an understanding of these principles becomes necessary for all administrators including hospital administrators.

Administration or Management?

The terms “administration” and “Management” have often been interchangeably used. Some people have tried to define administration and management as two distinct entities. To them, administration seems to connote some higher and broader function than managing. They continue to distinguish them without agreeing clearly on what the distinction is about. But management is not an academic discipline alone. It is a practical art and a science, calling for development of knowledge, skills and attitudes. Managing and administration make use of organised knowledge, i.e. the management science. Art is putting science to the best use of the enterprise. The science and art of management are not mutually exclusive, but complementary. In this chapter, for all practical purposes, administration and management are taken to refer to the same function.

MANAGERIAL ACTIVITIES OF A HOSPITAL

The following activities are common to the management of all hospitals.²

Determination of goals and objectives: This consists primarily with policy making.

Facility and programme planning: This classification refers primarily to the activities involved in remodelling existing services, organising new facilities, services and programmes.

Financial management: This relates to financial affairs of the hospital. It includes budgeting and costing.

Personnel management: This category relates to the selection, motivation and guidance of employees. It includes wage and salary administration.

Coordinating departmental operation: This category includes interdependent activities dealing with the internal functioning of all hospital departments. Frequent meeting with departmental heads would be one example.

Programme review and evaluation: The review and evaluation relates to the functioning of the clinical services and programmes, and is a continuous process.

Public and community activities: This concerns activities related to the development and maintenance of interaction with other health service institutions including shared-service arrangements with other hospitals.

Health industry activities: This classification refers to activities that are external to the hospital. It includes participation in hospital associations, third party payers (insurance companies, employers), etc.

Government-related activities: This activity is concerned with the legal problems of the hospitals and dealing with local, state and central government agencies.

Educational development: The category includes all teaching and lecturing responsibilities, continuing education of hospital personnel and participation in professional conferences and continuing medical education (CME).

THE GOVERNING BOARD

There are a number of important people in the hospital to whom a person wanting to see the 'chief' in a hospital may be led to. He could be led to the chief physician, or the office superintendent, or the medical superintendent, or the secretary of governing board, to mention a few. Most organisations have a chief, who is in charge of everything that goes on there. But who controls the hospital's activities and services?

There appear to be several people and several groups who all have something to do with controlling the above activities, but no single person or group appears to be in-charge of the whole set-up. The administrator, on the other hand, if asked as to what goes on in his office, might go so far as to say that it is the place from where the hospital is "run".

Excepting, a single-proprietorship hospital, there has to be a body of persons statutorily responsible for running the hospital. This body is variously called the "board of directors", "governing board", "board of trustees", "governing body", or "management board".

Can a group of persons, say the board of trustees or governing board be effectively in-charge of the hospital's administration? To answer this question, one has to understand how does such a board function. A governing board, as a body of persons, can make and guide policy but cannot, by its vary composition, "run" a hospital.

This task is carried out by the hospital administrator. As the board's chief executive officer he has overall charge of the affairs of the hospital. However, the extent of his control depends upon the following factors.

1. How he perceives his job.
2. How the board perceives the job.
3. How much freedom he is allowed in doing the job.

A typical hospital management board (or Board of Trustees or Board of Directors) is scarcely different from many other dissimilar organisations. Some boards may interpret their own role as of "running" the Hospital's day-to-day affairs. On the other hand, the administrator could be inhibited from showing his initiative. In the first instance, the general calibre of the administrator who is reluctant to assume responsibilities may be the reason for the Board's interpretation. In the second instance, the board itself may be unwilling to give him scope to do so. In certain hospital organisations, there is a failure to recognise the distinction between the role of the board and that of the administrator. This results in overdeliberation by the board, with trivial matters being debated in board meetings and the administrator reduced to an onlooker.¹ On the other hand, there are well run hospitals in which competent administrators have been allowed to take effective control, and the board understands that its own function is only to determine how it should be run.

HOSPITAL ADMINISTRATOR

Thus, at the hospital level the function of administration rests with the hospital administrator, variously called the

chief executive officer, medical superintendent, director (administration), hospital manager, hospital director, etc. Nevertheless managing a hospital always involves partnership with the medical and nursing staff apart from the Board. Therefore, the hospital administrator can never have quite the same degree of autonomy as his industrial counterpart. In many situations, it will be the medical staff who will be making many of vital decisions on operational policy, but they will have to exercise this authority in conjunction with the hospital administrator, giving him the support and help which he must have from them in the difficult job of providing efficient services.

The job of the administrator is to **plan**, to **organise**, to **direct** and to **control**—functions which are inherent to the job of every administrator. As a general manager, he represents the organisation to higher authorities and to the outside world. He is responsible for policies and procedures, the overall administrative structure, financial management, personnel management, reporting to the board, relations with the medical staff, overseeing medical care, maintaining the physical facilities, legal matters and maintaining good public relations.

Having to deal with multiple groups with conflicting interests, the demands on a top hospitals administrator are almost unending. He must be a generalist and a specialist combined in one, capable of understanding and interpreting medical, financial, economic, functional and logistic matters, and he must excel at personnel management.

Medical or Nonmedical Person?

Opinion is divided whether a hospital administrator should be a person with medical background or a nonmedical person. For too long, all types of hospitals were headed and administered by highly qualified medical professional who had hardly any time, let alone the background, to devote to administrative functions. Even though in some western countries nonmedical persons, trained in hospital administration are heading hospitals, there is now an increasing realisation that medical professionals, with training in hospital administration would be more qualified to head all types of hospitals without being burdened with clinical functions.

Hospital chief executives have to spend almost 100 per cent of their time on nonmedical functions and activities, far removed from direct patient care (Table 7.1). This precludes appointing senior practising doctors as chief executives. Medical doctors trained in health and hospital administration, who are alive to the medical care needs of

the patients also understand the needs of the hospital and professionals working in them, and are thus more suitable to head hospitals.

Table 7.1: Time distribution on administrative functions

<i>Activity</i>	<i>Percentage of time</i>
Planning	25
Directing and coordinating	48
Personal meeting people	11
Controlling	12
Organising	4

Health administrators face challenges in their professional inputs. Administrators trained in general programmes of hospitals administration without a good grounding in such subjects as economics, information systems, accounting, finance, marketing, regional planning and law will need to broaden their preparation for corporate roles. Such preparation would provide a definite competitive edge for individuals who have a formal training in health administration and some corporate preparation.

SURVEY OF PROBLEMS FACED BY HOSPITALS

Many committees appointed by Government of India and those by some other agencies have studied the problems faced by hospitals in India. As summarised by Sahni,⁴ an analysis of these reports shows the following major problems being experienced by hospitals.

Leadership in the Hospitals

Most of the administrators in the hospitals are professional physicians who waste 60 to 70 per cent of their time in routine administrative activities. Management of hospitals requires knowledge and competency in managerial and administrative sciences. Thus, most of the present leaders in hospitals have no training in management sciences, and yet are made responsible for the management of health institutions.

Lack of Funds for Hospitals Services

Most of the hospitals have not involved the community resultantly there is a continual problem of financing.

Adaptation to External Pressures

Most of the hospitals experience difficulty in adapting to external pressures such as government policies, trade unions and other political bodies.

Lack of Dedicated Professional Staff

Due to ineffective manpower planning, recruitment, compensation and development systems, there is high degree of job dissatisfaction among health professionals.

Controls

There are stringent financial and managerial controls exercised on the hospital administrative staff either by the department of health services in the case of public hospitals, or managing trustees in the case of other hospitals.

Ineffective Organisation and Allocation of Work

Hospitals have experienced difficulties in clear cut division of work, clear job description, consequently there is ineffective utilisation of manpower.

Problems of Motivation and Job Satisfaction of Employees

Most of the hospitals report problems of identifying motivated personnel and motivating the employees to provide adequate services.

ROLES AND FUNCTIONS OF HOSPITAL ADMINISTRATION

The following is a description of the various roles and functions of the hospitals administrator, and activities associated with them. Description of each function and role leads to a key element under that role. At the end of each such description, the key element is highlighted.

1. Working with People

The administrator has no direct clinical responsibility for any patients, that rests firmly on the members of the medical staff who have the clinical freedom to decide who shall be treated for what, by what means and for how long. Because doctors are responsible in this way, they are in a unique position to influence the work and development of the hospital. The physician's "management" of a case has an effect far beyond the clinic or ward situation, on the work of the other staff, and in the functioning of other departments remote from his sphere of action.

Thus, the clinicians to a very great extent call the tune for all the services which contribute to patient care—not only for nursing, pathology, radiology, and pharmacy, physiotherapy and the rest of the professions supplementary to medicine, but also for the cook who makes the salt-free diet, the technician who maintains the dialysis machine, the

ward boy who fetches the oxygen cylinder or the nurse who sets up as IV line.³

Dictum: Balance the goals of the hospitals by working with patient care teams where physician is the kingpin (who in turn works with others in rendering patient care). Understand workers, their motivations and aspirations, and knit them together as a team.

2. The Enabling Role

One of the prime roles of the administrator is to enable the doctors, nurses and patient-care team to do their job efficiently. He "enables", "sees" to and "ensures".

All this is part of his enabling job, but not the whole of it. He must concern himself also with creating and maintaining the nonmaterial conditions in which the professional staff can do their work best—morale, atmosphere, the sprit of the place are as much of his business as the water supply and electricity.

Dictum: Ensure the provision of necessary physical facilities and ensure that the supportive services are available in the right amount, of the right quality, and at the right time and place.

3. Hospital Administration and Staff

Running any hospital calls for a great deal of tact and ingenuity. This is because there are many types of staff who are specialists in their own sphere and departments, which function more or less as autonomous units.

Workers at the operational level, e.g. nursing personnel, feel that more than one authority controls them—firstly the head of the clinical service, secondly the head of the nursing department and thirdly the administration. This multiplicity of reporting and regulating authority is a source of constant trouble.

Dictum: Understand the staff and understand variations in styles of administration.

4. Staff Motivation

Expensive facilities and equipment do not necessarily make for a good hospital, it is the people who operate them that make the hospital go. This function is one of the most challenging functions of a hospital administrator. The staff needs to be motivated to give their best at all times even in trying situations. Many discouraging factors and stress situations, in which hospitals abound, tend easily to lead to erosion in motivation.

Dictum: Develop measures to keep up motivation of all categories of staff, and be constantly on the look-out for cases of dissatisfaction and conflict.

5. Facilitating Decision Making

A great part of the job of a hospital administrator concerns decision making. There are several kinds of decision making in a hospital. The most characteristic are the technical decisions about the treatment of patients, with which he is not directly associated, but which influence overall decision making, with which he is concerned.

Whether he recognises it or not, the clinician, no less than his colleagues who run the X-ray or pathology departments, is also a manager. The most common decision about which patient to admit and for how long should he be kept in hospital can be taken only by individual physicians. To them these may seem to be purely clinical decisions, but these are also management decisions. To admit Mr. A rather than Mr. B or to keep Mrs. C in hospital a few days longer, or to send Ms. D home early to free a bed for someone else, all these are decisions which influence use of resources.

Within a particular speciality the chief of that speciality exercises a sort of coordinating function. However, *between* specialities, there is some element of confusion. Various department heads may find themselves in a competitive relationship. Although each chief is entitled for help from the common services, and has a right to get it, this does not happen automatically.

Dictum: Provide appropriate inputs to decision making at the clinical departmental level, and coordinate decision making at the interdepartmental level.

6. Management of Resources

All decision making is limited by the human and material resources the hospitals has. The variety and quantum of the pressures and constraints on hospital administration is best seen when it comes to deciding between competing claims for manpower and financial resources. How does one compare the need for a new lift to replace a very old one with that for a set of ventilators for the ICU? Or the requirement of two data entry operators for the computer section with extra technician in the laboratory for a new oncology programme? The cost of some of them could be met from capital account, of others from revenue surplus and some may involve development expenditure requiring a decision of the board. The competition between them is not equal. But who decides this?

Decisions of this kind which together affect resources— decision to spend money, involving a choice among alternatives even where such choices are unrecognised must be made by the administrator. The hospital administrator as an expert in the art of getting things done does not arbitrate on this or that, but assimilates, reconciles and synthesises all the views of those who put up competing demands. Nevertheless, in making decisions, at times, he may have to succumb to what is expedient.

Dictum: His judgement may not necessarily be superior to that of the experts who propose the case, but his position is the most appropriate one from which to make it.

7. Negotiating

The administrator spends considerable time negotiating both with agencies outside the hospital and with staff members within, especially regarding their working arrangements and conflict resolution. This is not to be confused with negotiating with workers' unions which is a collective bargaining process. Administrators must negotiate with third party payers (insurance companies, employers) regulatory agencies, planning groups, equipment vendors and so on. There are also elements of negotiation in the hiring of personnel and salary determination.

Ideally, the administrator should strive for a positive problem-solving situation. This implies moving away from a win-lose (I win you lose, or *vice versa*) situation to a win-win (I win-you win) end result.

Dictum: Steer closer to "creative problem solving" situation, rather than turning to a "choice" situation. Emotions do play a part in negotiation sessions, but guard against them.

8. Containing Costs

Being in-charge of the "business" side of hospitals management, a hospital administrator is responsible for the conduct of all the "business" aspects. Although a hospital is not primarily a business institution, business matters are vital to its survival even though they may not be the reason for its existence.

With phenomenal rise in hospital costs, the administrator has to devote considerable time and energy to monitor and contain costs. The medical staff knows very little or nothing about the economics of hospital care. Therefore, it is necessary to make them cost-conscious, to reduce expenditure without jeopardising patient care. The hospital administrator achieves this through presenting them with

different types of costing data, and seeking their cooperation in containing costs.⁵

The administrator puts into practice his knowledge and skills in financial management to practical use in forecasting financial results as precisely as possible. If the budgeting has not been carried out correctly, funds allotted for specific activities can only be diverted to other activities at the peril of smooth running of the hospital.

Dictum: Exercise control over financial matters through costing, cost-control, budgeting and judicious investment of hospital funds.

9. Understanding 'Efficiency' and 'Effectiveness'

- Efficiency is the rate at which inputs are converted into outputs. The emphasis is on *qualitative measurement*, and the objective is to secure maximum output from minimum input.
- Effectiveness is the extent to which purpose/goals are achieved. The emphasis is on *qualitative measurement*, and the objective is one of meeting customer needs and delivering service quality.

The distinction between efficiency and effectiveness has been described as 'doing things right' (efficiency) and 'doing right things' (effectiveness). What this amounts to is that *efficiency is 'the rate at which inputs are converted into outputs' and effectiveness is 'the extent to which purposes are being achieved'*.

10. Dealing with New Technology

Hospital practice has become more and more dependent on high technology which can become rapidly outdated as the technological advance continues.⁶ Medical staff are subjected to sales pressure from manufacturers of newer items, and they may tend to seek what is new without regard to cost because of the glamour attached with newer sophisticated equipment.

Dictum: Strike a judicious balance between new technology and the hospital's needs, cater for training and retraining to catch up with new technologies, innovations and improvements. Organise such training at formal, informal, institutional and individual levels.

11. Establishing Managerial Climate

One of the key responsibilities of the hospital administrator is that of establishing a "managerial climate". Hospitals have their own "personalities" as people do. This personality springs from value held by those running the hospital and

the physicians who work in it, and governed by the sensibilities and impression of those who come in contact with the hospital. Administrators and other staff both play a major role in the development of these values. Tradition and past history also bear upon the values held by the people.

Dictum: Administrative personnel must be compatible with each other and with the organisation. Where a change in managerial climate is called for, be prepared to recognise the need and be capable of meeting it. Provide the lead in this direction.

12. Management Development

The administrator cannot manage the institution single handedly by himself. There is ample need to strive for better management in a hospital, which has few trained managers. Rapid changes are occurring which necessitate upgrading the knowledge, skills and attitudes in subordinate administrative positions. Therefore, a part of the educational activities has to be directed to training and retraining of the administrative personnel, and even medical staff, in supervisory and managerial positions. Management development is a continuing activity. Personnel are encouraged to attend various programme of courses and workshops to improve their managerial and leadership skills.

Dictum: The quality of patient care depends upon the quality of the hospital's human resources, which in turn is determined by the quality of the leadership at various levels. Facilitate this most critical input by planned leadership development at different levels.

13. Evaluation

The ability to evaluate people, programmes and the overall effectiveness of the hospital is one of the competencies the administrator has to develop. Evaluation includes evaluation of employee-clientele relationship and interpersonal behaviour. The judging ability of the administrator at times incorporates "intuition".

Dictum: Continuous, ongoing self-evaluation is a means of quality assurance.

14. Fact-finding and Investigation

Whereas the administrator makes decisions mostly based upon his knowledge and experience, some will be made only after much fact-finding and analysis. Managerial style is an important element in fact finding and investigation. Situations where consensus is important would call for

attention to the group decision-making process, as opposed to situations calling for immediate decisions that cannot be delayed.

Dictum: Fact-finding and investigation call for caution so that the workers sensibilities are not offended.

15. Social Commitment

The hospital administrator is a part of the society in which the hospital functions. His vision therefore must not be restricted to the hospital in isolation. He must be aware that he is a part of the wider health care system and serves the larger society through the hospital.

Dictum: Balance the conflicting requirement of looking after the business interests of the hospital with the social obligations towards society.

SKILLS OF EFFECTIVE MANAGERS

A question is often asked whether the effective manager in one situation or institution culture can also prove to be as effective in another situation or culture. If the skills, qualities and abilities of effective managers are all so very well-documented, are there any differences in these qualities, skills and abilities at various levels of the organisation? There are numerous example of some managers vitalising a badly run institution with a poor public image to a very successful one. There are also other examples of some successful managers having been removed from important managerial position either on change of ownership of the institution or for their failure to work under a different organisational culture.

After a lot of research, it has now been established that successful management rests on three basic skills—technical, human and conceptual. These three skills are not absolute and mutually exclusive, but interrelated.

Technical Skill

Technical skill is the understanding of and proficiency in specific type of activities involving methods, processes or techniques, e.g. those of an engineer or a doctor. It implies specialised knowledge in that trade and proficiency in the use of techniques and tools of the trade, and which can be easily observed and assessed.

Human Skill

All managers achieve the organisational objectives through the efforts of others in the organisation. Human skill is the skill in dealing with people (rather than things or objects). It

involves ability and judgement in working with and through people, including an understanding of motivation. This skill is demonstrated in the way the individual perceives his superiors, equals and subordinates, and requires awareness of their attitudes, beliefs and feelings. It also involves the ability to effectively communicate with others so as to influence their behaviour.

Conceptual Skill

Conceptual skill involves the ability to understand complexities of the whole organisation and how changes in any one part of the organisation affect others. This knowledge permits the managers to act according to the objectives of the total organisation rather than only on the basis of needs of the problem at hand. The success of decision depends on the conceptual skill of managers who make the decision. The attitudes and values of top manager make up an organisation personality which distinguishes good organisations from others.

Importance of the Three Skills

The mix of these skills varies as an individual advances in management from supervisory to top management position. At the lower levels of every organisation, technical skills are the most important. As the manager advances from lower to higher levels in the organisation, less technical skills tend to be needed. Although it is important at the lower level as well as the highest level, human skill assumes paramount importance at the middle management level. At the higher level, conceptual skill assumes more importance in policy decisions, strategy formulation and planning action. The chief administrator at the highest level may lack technical skills and human skills, and still be effective. But if he has poor conceptual skill, it is bound to land the organisation into problems.

While the amount of technical and conceptual skill needed at different levels of management varies, the common denominator that appears to be crucial at all levels is the human skill (Fig. 7.1).

COORDINATION

Every individual and group in the organisation contributes to the realisation of the organisation's goals, but none is able to realise them alone without working with others. Because of the division of labour and specialisation of

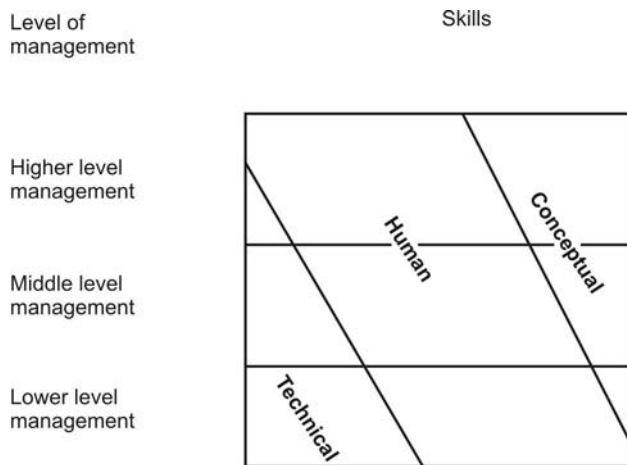


Fig. 7.1: Management skills

functions, the hospitals can achieve its objectives only if its part are coordinated into a cohesive whole. Thus, coordination is basic to practice of management at all levels, and pervades all functions in hospital administration. Because of the need for understanding the fundamentals about this very important, but often ill-defined aspect, the same is dealt with in more detail below.

The role of hospital administrator in this regard becomes that of a coordinator, a facilitator. A hospital is a crisis place, a trauma place, a place where people of all types come to seek relief, a place which is open at all times of day and night, and a place where technology and common services are put to use through people who vary from highly skilled consultant to unskilled workers of menial staff. The work of the hospital is thus characterised by the following.

- Heterogeneous groups of workers
- Specialisation
- Complex interrelationship
- Group work: individual merit is not noted
- Crisis orientation
- Round the clock functioning
- Objectives not clear, results not quantifiable
- Exhibits both authoritative and participative pattern of leadership
- Patients cannot express their needs.

Optimum performance in the hospitals cannot be achieved by each unit carrying out its role in isolation. Good aggregate result and outcomes are a product of a number of independent decisions. Trying to be “one-up” among departments and specialists which is not unusual in hospitals, can result in a disturbance in the system’s balance.

What is Coordination?

Coordination is facilitating different groups in an organisation and orchestrate their effort to achieve the common goal of good patient care and efficient hospital operation.

Coordination is a Mental Attitude

In an efficient system, its component parts must function in a synchronised manner so that the desired results are achieved with minimum wasted effort, with optimum utilisation of resources, and maximum benefit to the system. Coordination connotes bringing about a consistently harmonious action of persons and activities with each other, towards the common goal of the hospital.

The central problem in coordination is the human problem, because it involves diverse groups of professionals, paraprofessionals and lay personnel forced to achieve a cohesive goal. It is a mental attitude which has to be cultivated at all technical and administrative levels of the institution.

The three basic considerations in coordination are as follows.

1. It must start early.
2. All interrelated factors in a situation ultimately decide outcome.
3. Interpersonal relationship play a major role in coordination.

In hospitals there are no standard runs or mechanised work-flows. Because of changing patient needs, planning can rarely be far ahead. Coordination then depends on cooperation, improvisations by staff at all levels, and on the understanding which different individuals have of each other’s roles. Outside the administrative echelon, in emergencies in the ward at night for example, everything depends on the readiness of the people in different jobs to help each other. Here, coordination becomes self-coordination.

Coordination Vs Cooperation

The similarity in cooperation and coordination is that the attitude of cooperation or coordination cannot be forced by the militaristic practice of command. But what is the difference? Cooperation is a passive activity, assumed. Coordination is an active activity, deliberately planned and executed. Cooperation may arise spontaneously among members of a department. Coordination occurs only through effective leadership, i.e. coordination is one of the functions of leadership. In a OPD of a large hospital, the

OPD manager makes a generally chaotic place look orderly by resorting some order by doctors, nurses, receptionists, attendants, etc. to accomplish a task with economy and effectiveness. It is the essence of management.

In a good organisation characterised by clear lines of authority, well-understood allocation of functions and delegation of authority, coordination becomes that much easier.

How is Coordination Facilitated?

Administrators at all levels achieve coordination through many actions and methods. In fact, there may be as many methods and styles of coordination as there are administrators. However, certain common actions are evident. These are as follows.

Horizontal contact: This is achieved through making the authority—responsibility relationships clear to all. An understanding of job descriptions and interdependability of persons plays an important role when the coordinator makes regular personal contact with workers during his rounds.

Vertical contact: Contact with superiors is as important as horizontal contact.

Motivation: Staff desires personal as well as professional growth. Professional growth can be provided through good physical facilities and working environment. But acknowledging their worth and providing incentives for advancement facilitates it.

Participation: In addition to clear-cut lines of authority and responsibility, some amount of self-goal setting gives workers at various levels a sense of participation in management and promotes two way communication. Coordination becomes much more easier in this care.

Communication: Unhindered two way communication between departments is the most important aspect in coordination. Replacement of the traditional barriers to internal communication by open network of communications, have led to improving staff-patient relationship and better patient care. In practice, this transforms into a free use of informal meetings and discussions between different staff groups. Apart from this, suggestion schemes, house journals, newsletters, informal get-together are being increasingly resorted for keeping communications open.

Coordination of Change

Existence of various groups of professionals in the hospital also calls for coordinating their professional progress and

growth. Some units and departments develop, and progress, at a faster pace than others. Some expand beyond their intended limits, and others may drift into a change of character. Different professional groups in hospitals rarely come together spontaneously to discuss change. Howsoever one may progress for the better, to avoid chaos, change must be planned and coordinated, not haphazard.

Gradually there is an increase in specialisation. No more the generalist physician of the past who was a all-in-one doctor. He has been replaced by the paediatrician, obstetrician, ENT specialist, chest physician, gastroenterologist and so on. The nurse is finding specialised fields in paediatric nursing, cardiothoracic nursing, psychiatric nursing, nursing administration and the like. In the supportive services, we have the dietitians, physical therapists, perfusionists and the like—all specialists in their fields.

Thus, there is a transition of the hospital from a place with informal primary group relationships and general duty responsibilities to the larger and complex place characterised by more and more formal relationships and by persons known by the functions they perform (instead of as individuals). There is no stopping specialisation. If such specialisation has to add to hospital efficiency, hospitals administrators have a challenging job in coordination.

CHARACTERISTICS OF EFFECTIVE MANAGERS

Many factors are attributed to success or failure in administration. Situation, circumstances, social environment and social connections have all been put forward as factors affecting success, failure and effectiveness. There are a very large number of variables which determine the effectiveness of administrators. However, after studying the characteristics of a great many successful careers, certain common qualities, traits and characteristics of successful and effective administrators emerge.⁷

• Clear and Realistic Goals

They are very clear as to what they want, why they want, what are the strategies, and who will benefit— themselves, the society, the family or the world. The more clear and realistic goals are, greater the possibility of an individual trying to achieve those goals and more effective the individual would be to mobilise and effectively utilise resources.

• Professional Par-Excellence

These individuals always try to do their best and perform at their best. They believe in providing the best services keeping

the patient's, customer's, employees or public interest in mind.

• **Perceptual and Cognitive Flexibility**

These individuals are able to perceive the situations accurately, are able to forecast, look into the future, understand the environment, assimilate the environment and dare to be open in their knowledge and ideas, they have the ability to learn new ideas and make use of new knowledge in planning and programming.

• **Professional Growth**

These individuals continuously learn about their field, new ideas, new strategies, about innovations and applications in the field, learn from discussion with professional colleagues, reading books, attending conferences, workshops and other means.

• **Commitment to the Chosen Field**

In their chosen profession, they show high degree of commitment to their field. They are not ready to change this field even if any other field had greater attraction in terms of salary, prestige or other worldly compensations. As a result, they are deeply involved in their work.

• **Attitude and Confidence**

Effective professionals have positive attitude toward themselves, towards others and the system in which they work. Positive attitude helps in overcoming obstacles and in perceptual ability as well as cognitive flexibility. Professional competence, positive experiences and inner security give confidence for professional identity.

• **Communication**

Professional exchange of ideas on problems and issues helps in effective decision-making. They have oral and written communication abilities to communicate effectively.

• **Diversity**

Effective individuals undertake several specialities. They are able to apply their knowledge in various areas. This helps in cognitive flexibility and developing perceptual ability.

• **Creative Orientation**

These individuals are highly creative and analytical in their approach. They always think of new ideas, new practices, and new methods which they can use in solving problems. Positive attitude, perceptual ability, cognitive flexibility and motivation are necessary for creative orientation.

• **Motivation**

Motivation is the inner urge, desire, drive or momentum that compels an individual to engage in a task or service. Effective individuals are highly motivated. High motivation and commitment helps to overcome frustrations, dejections and failures.

• **Satisfaction**

These individuals tend to be satisfied with self and others and the environment. They derive satisfaction and pleasure from the work they do, which serves as a tonic to build up greater energy towards their work.

• **Self-esteem**

These individuals have high degree of positive acceptance and trust in self and accept themselves as whatever they are, aware of their strength and limitation and also aware of the reality or environment in which they have to function.

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INTRODUCTION

Planning, the foremost of management functions which enables the organisation to deal with the present and anticipate the future, is a process whereby management decides where it is at present, and where it wants to be at some time in the future. The process is one of forecasting,¹ because forecasting seeks to provide the manager with information about the future, and involves considering the six questions.

1. **What** we expect to do?
2. **Why** will it be done?
3. **Where** will it be done?
4. **When** we expect to do it?
5. **Who** all are going to do it?
6. **How** will it be done?

The primacy of planning is all pervasive because the other management functions, viz. organising, staffing, directing and controlling follow upon forecasts, objectives, strategies and programmes developed through planning.

The Purpose of Planning

The purpose of planning is to assure the most efficient utilisation of resources and economy of performance. The need for planning is felt because a particular situation presents an opportunity to do something and achieve something positive or, the need for planning is felt because a particular situation poses a problem and draws attention to that problem.

All managers engage in planning activities, the degree varying with their position in the organisational hierarchy. Given the scarcity of resources, hospital managers require

to establish long and short range plans in order to avoid haphazard utilisation of resources. While a manager can be assisted in the planning process by various staff groups, it should be noted by each manager that the ultimate responsibility for planning rests with him alone. The function of planning cannot be delegated.

Because the management of an organisation decides where it wants to reach (or what it wants to achieve) at some time in the future, planning involves the choice of objective along with policies, strategies, programmes, procedures and rules that are necessary for their accomplishment.

FORECASTING

Forecasting is inherent in planning. Whether it is forecasting the utilisation of a mechanical laundry, or demand for a new specialist service, forecasting is common to all types of planning. Therefore, planning requires making assumptions about internal resources needs and external environmental forces. In medical field, estimating the future involves addressing two important issues. One is how far in the future is it appropriate to estimate, and the other is how far into the past is it appropriate to go in order to forecast. The first issue determines whether short-term, medium-term or long term forecasting techniques are appropriate. The second will determine which forecasting techniques are feasible depending on the amount and type of past data available.

Forecasting—that is, estimating the future—will also have to rely on trends to a great extent, because how far in the future is it possible to estimate is limited by the data available.

Forecasting Demand

Forecasts of demand should be made as far ahead as the maximum lead time—the period of time it will take to implement a decision.

Since the past alone is an unreliable basis for predicting the future, especially in longer range forecasts, there is limited value in acquiring large amounts of past data. Future based forecasting techniques may require minimal data if simple correlations are to be used, or a large number of observations if a significant number of influential factors are to be employed. Quantity of data generally adds to knowledge about the present and past, and may not necessarily increase the accuracy of forecast of the future.

Forecasting Utilisation

In forecasting utilisation, it has to be determined what the future utilisation of a specific service will be. A change in utilisation in future may be expected or desired. Factors which are likely to cause expected change will need to be analysed. Strategies which will affect the desired change should be selected and implemented.

In forecasting utilisation, complex techniques such as multiple regression, simulation, multivariate equations and other quantitative techniques may enable the planners to deal with large number of factors affecting utilisation. However, such techniques in the Indian context may not always be accurate and may result in expensive scientific looking wild guesses. Apart from the change in the demographic characteristics, the changes in attitude and behaviour patterns of user population, changes in medical care patterns (e.g. ambulatory vs inpatient care, new technology), and changes in the concurrent factors affecting utilisation (e.g. medical insurance, employee health programme) must be incorporated in a utilisation forecasting.

STRATEGIC AND OPERATIONAL PLANNING

Planning in the health care field can be broadly divided into two categories.

1. Strategies planning
2. Operational planning.

Strategic Planning

Strategic planning carries a wider perspective for the whole of the organisation at the highest planning level. It is concerned with developing the main mission of the

institution, developing broad objectives, followed by determining the services required, and determining the means of fulfilling the same. This also incorporates strategies to group, expand and diversity.

Operational Planning

Operational planning, which is at the lower organisational level, generally focusses on programme formulation and implementation. It is concerned with implementing the strategic plan in all its components at the operational level. This part of planning can also be independant of strategic planning, because it concerns itself with systems planning at all levels of the institution—when a new service or department is added, when there is a need for upgrading of an existing service or department, or when a new system of organisation is being introduced.

PLANNING COMMITTEES

It has already been said in the beginning of this chapter than planning is the responsibility of managers. However, planning committees are of great help in many a problem in the health care field, because they can balance the views of the governing board, medical staff, administration and other key groups both inside and outside the institution. This lends and aura of formality to the programme decision, and important influences on implementation of strategies might become clearer.

The individual manager responsible for planning furnishes appropriate background information to the committee. With clearly focussed issues, appropriate information and knowledgeable inputs, this individual serves as a staff adviser to the committee and channelises their collective thinking. All possible help must be provided to bring up potentially useful ideas from all those representing various interests on the committee.

CRITERIA FOR EFFECTIVE PLANNING

Because they are a blueprint for decisions, plans are preferable to making decisions in a vacuum, which usually results in worst kind of decisions. Plans provide an opportunity for the institution to be proactive rather than reactive. The need to improve medical care services, and the rapid technological and socioeconomic changes call for short-range planning dovetailed into long-range planning.

1. Plans should be based on a thorough study of the end results desired

2. Planning should involve participation of the medical staff, other concerned service representatives
3. Plans should be comprehensive
4. Plans should be flexible
5. Plans should be continually updated
6. Plans should be realistic
7. Plans should be time phased.

Step by Step Approach to Planning

Planning (Fig. 8.1) involves the following steps.

1. Analysis of the situation
2. Identifying priority problem
3. Formulating objectives
4. Setting goals
5. Reviewing limitations/constraints
6. Laying down operational policy and systems
7. Writing down the plan.

Analysis of the Situation

Whether it is strategic planning with wide perspective at the highest organisational level or operational planning which translates the strategic plan into practice, and whether it is planning a new hospital, planning an expansion, planning for a new service, or planning to bring in new technology, the planners do have some idea of the problem they want to solve. Nevertheless, an analysis of the situation connected with the broader problem must be carried out. The analysis aims at addressing the questions as to what is the core

problem, and what opportunities does it present. Participation of all those who are concerned with the problem can lead to a wider and better understanding of the problem as well as their commitment to the plan.

What are the specific patient care services provided by the hospital? What is the quality of each of these services? What is the volume of each service? Is the volume sufficient to achieve economy of scale? Does the present equipment meet the requirements? Should any of the service be scrapped because of low volume or inadequate resources? Does major equipment in the hospital need replacement? Is there necessity for adding on new technology? Are the hospital's financial resources capable of supporting its functioning? Are there any problems with the medical, nursing, para-medical staff? These are only some of the innumerable problem situations which give impetus to the planning process and to overcome them.

Analysis of the situation leads us to all the facets of an institution's functions and resources. The problems which are highlighted may relate to the following.

1. Personnel
2. Physical facilities
3. Equipment
4. Finance
5. Information
6. Extramural factors.

One of the pitfalls in problem identification is to miss the woods for the trees. Causes or effects of the core problem are likely to be mistaken for the problem itself.

Identifying Priority Problems

It is impossible to plan for all the problems at all times simultaneously. After the general analysis of problems, the focus should shift to the important ones. What opportunities are essentially attractive? At what cost? For example, a hospital may have to correct X-ray department deficiencies to check unfavourable demand trend. Or it may have to institute cost controls. Or it may find necessary to prune the unskilled work force due to establishing a mechanical laundry.

In ranking the relative importance of each of the problem, certain factors need to be taken into consideration, listed below in the form of questions.

1. Is the problem situation in question really the one to be solved, or is it simply a part of a still larger problem which requires study?
2. Is there a good chance of achieving success, and what may be the extent and nature of the benefits to be achieved?



Fig. 8.1: Planning

3. What are the attitudes of personnel towards the exiting situation or procedure ? How much employee resistance or resentment may be anticipated?
4. Are there any management policies or professional requirements that might influence this planning ?

Formulating Objectives

Traditionally, hospitals operate on a set of implicit assumptions and beliefs, and loosely bound interrelationships. Having selected the problem, the next step is to formulate objectives. The hospital’s mission sets the direction for all other objectives. Long range objectives usually have a span of achievement of usually five years or more, and short range objective two to three years.

Short range objectives generally have a greater degree of specificity than long range objectives.

A hospital achieves its objectives through the various service departments. Therefore, each departmental head must establish his own departmental objectives, consistent with the institutional objectives. An understanding of the relationship between departmental objectives and individual objectives is essential to assess departmental accomplishments and shortcomings.

In any organisation, objectives form a hierarchy, as shown in Figure 8.2.

Objectives must be:

- i. relevant and realistic
- ii. feasible and achievable
- iii. observable and measurable.

In everything one does, one must ask oneself: is what I am doing or about to do getting us closer to the objective? Finding answers to this question may save us of a lot of useless activity.

There are three criteria for the attainment of objectives.

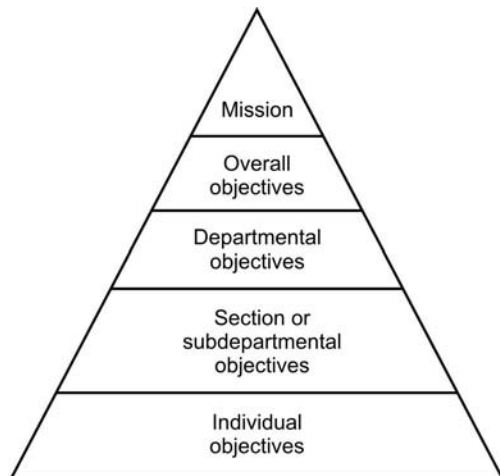


Fig. 8.2: Hierarchy of objectives

1. The first criteria for the achievement of objectives is that the person responsible for achieving the desired results understands and accepts the responsibility. He should feel that they are attainable, given the time and resources required.
2. The second criteria has to do with the achievement of results. Objectives should clearly state the results to be achieved or outcome to be anticipated. Therefore, in this context, it is also necessary to specify the measure by which it can be said that the objective has been achieved.
3. The third criteria is the time-frame in which objectives have to be achieved. Time constraint helps establish work priorities and enforce accountability.

Linking department objectives to institutional objectives:

For departmental objectives, institutional objectives provide the overriding direction. Each departmental head establishes departmental objectives, with the process pushed down the chain in the organisation from department, to subdepartment, to a section, to individual objectives. The most important aspect of this process is linking the institutional and departmental objectives.

Setting of Goals

Whereas objectives specify and operationalise strategies, goals articulate a specific strategy. The management team now prepare statements of goals, both short-term and medium-term. Some of the goals may be as follows:

1. Achieving recognition of the hospital’s residency programme by a university.
2. Operationalise the computerisation programme fully, by intergrating nursing management system in it.
3. Generation of 5 per cent additional revenue by the end of next financial year.
4. Completion of the new building for housing the CT scanner by end of the year.
5. Physical facility modification to phase out old X-ray machine and installation of the new one in its place.
6. Completion of a feasibility study for installation of mechanical laundry/glove processing unit in CSSD.
7. Orderly transition into new building upon its construction.
8. Increased bed occupancy to 93 per cent from present 86 per cent.
9. A 5 per cent reduction in operating costs in XYZ department.

Reviewing Limitation/Constraints

No goal setting can be accomplished without anticipating and giving adequate considerations to the obstacles which

may be encountered in meeting objectives and goals. The constraints and limitations can be in the form of personnel, equipment, finance, information, time, government policy, geographical and others. The full range of external forces affecting a particular plan need to be identified, and the potential impact of these forces needs to be assessed. This external assessment involves detailed examination of many critical relationship between goals and objectives and the environment. However, as important as external analysis is the internal analysis. A realistic internal assessment leads to identification of internal organisational weaknesses and shortcomings, and develop a balanced picture of the hospital's limitations, strengths and opportunities for corrective action. Organisational assessment is an essential element of internal analysis.

Laying Down Operational Policy and Operational Systems

Operational policy: It is a statement of objective and principle functions for each department. Basically an outline of the operational system, it provides the organisation ample choice as to how each department will eventually run. Operational policy and strategies lead to operational plans and system at each level until the institution gets down to "nuts and bolts" of its operations.

Operational systems: Once the operational policy and strategies are laid down, operational systems are designed to fit in the constraints set up earlier by the policy. The main purpose of operational system is to determine the way the institution will ultimately operate. Operational system will determine the equipment to be obtained, forms to be printed, and how different staff members will be deployed, among many others. It is a way of laying down the intended use of each department until every detail becomes clear.

Action plans reflect operational programmes and decisions. If they are not made to reflect desired departmental objectives and strategies, only vague hopes or useless statements of operating systems result.

Writing Down the Plan

A plan has no value if it remains only in the mind of the planner. There are many others in the organisation who will have to be associated in putting the plan into practice and understanding the rationale behind objectives, goals, limitations and resources in operationalising plans. Therefore, the plan must be written down and copies passed on to all concerned.

DECISION MAKING

Decision making—the selection from among alternatives of a course of action—is seen as the central job of administrators. Effective decision making results in a rational selection of a course of action. Decision making is often thought of as problem solving, the problem may be a state of confusion, uncertainty or chaos. The administrator must have:

- i. a clear understanding of the alternative courses of action under existing circumstances and limitations,
- ii. must have the information to recognise available alternative, and
- iii. be able to analyse and evaluate such alternatives (also realising that not all alternatives can be analysed) to make rational decision.

The ability to develop alternatives is as important as selecting correctly among them. In choosing from among alternatives, the more a administrator recognises factors which are limiting or critical to the attainment of the desired goal, the more clearly and accurately he can select the most favourable alternative.

In comparing alternatives in hospital management only concentrating on quantitative factors, i.e. those which can be measured (such as various types of fixed and variable costs) would be dangerous if intangible factors in the situation, which abound in hospitals, were ignored. There are unmeasurable elements such as the quality of employee relations, risk of technological changes, or patient satisfaction. Thus, the importance of giving attention to both quantitative and qualitative factors in the comparison of alternatives.

Quantitative Factors in Evaluating Alternatives

There are certain quantitative techniques which are useful in the evaluation of alternatives in quantitative terms. These are briefly described below.

Marginal Analysis

The technique of marginal analysis compares additional revenue with additional costs, especially where the objective is to maximise profits. However, the technique can also be used in comparing factors other than costs and revenues. On the whole, the analysis accentuates the variables in a situation and deemphasises averages and constants.

Cost Effectiveness Analysis

A variant of the above technique, cost effectiveness analysis is a technique of weighing alternatives where the optimum

solution cannot be conveniently reduced to rupee or some other specific measure, to identify a preferred choice when objectives are far less specific than those expressed in quantitative terms like sales, costs, profits, etc. are to be dealt with. The decision criteria may include achieving a given objective at least cost, attaining it to the extent possible with resources available, or providing for a trade off of cost for effective-ness.

It is not intended here to go into the details of how actually to use the above discussed quantitative techniques. The reader is advised to refer to any textbook of general or business management for the same.

Operation Research and Other Techniques

Operation Research

Operation research was defined as the application of scientific methods to the study of alternatives in a given situation, with a view to providing a quantitative basis for arriving at an optimum solution in terms of goals sought. The essential characteristics of operation research is the development of mathematical models, with all possible variable also developed in mathematical terms, and making this model workable within as small a margin of error as possible.

The other techniques that may be useful in selection of the alternatives are as follows.

- Probability theory
- Queuing or waiting line theory
- Linear programming
- Risk analysis
- Decision trees
- Preference theory.

Service of operations research experts is inevitable where these techniques are required to be used, as hospital administrators lack this knowledge. These techniques have also limitations because complexities of human relationship and reactions cannot be put into mathematical models, and lot of important decisions in hospitals involve qualitative factors.

Types of Decisions

From the value judgement angle, decisions can be of two kinds: (i) those that are expensive to change, and (ii) those that are not. The former should not be made hastily and without enough input. The later should be made fast, and be made by people who actually have to operationalise those decisions. The type of decision that all executives have to take can be as follows:

1. Considered Decisions

These are of great magnitude, requiring reflection and deep thought. They affect overall operations, require data gathering, and proceed from multiple alternatives. They also require time for consultation with others and to reflect on implementation problems.

2. Operational Decisions

These are the decisions that executives make practically every day as a routine either to solve problems or to prevent them. They have immediate impact and ensure smooth flow of operations.

3. Uncomfortable Decisions

These are the decisions that impinge on interpersonal relationships with subordinates and others, and make the decision maker uncomfortable. Also termed swallow-hard decisions² because of the certainty of dislike by subordinates of such a decision, the manager has to carry it out regardless.

4. Hurried Decisions

These are also the decisions made during daily operations. They require quick thought, the overriding factor being the pressure to make it quickly. At times, wrong precedents are set by such decisions while responding to problem situations that required quick decisions. In the daily grind of the hospital routine, there is an inherent tendency to make hurried decisions when actually there was a need for a considered or operational decision.

The Decision Process

The principal goal in decision making is to achieve maximum payoff at minimum cost. An understanding of the essential elements of decision will enable the administrator to coordinate his effort and arrive at decision more effectively. It is often difficult to distinguish the main decision from many supporting decisions that precede and follow the main decision. The correct perception of the decision-making process determines the success of decision-making.

A management decision model² comprises of five elements.

1. A clear idea of what is to be achieved
2. An appreciation of the resources available and required
3. An appreciation of nonresource constraints
4. An identification of risk factors
5. A comparison of payoff value with input costs.

What is to be Achieved?

The result to be achieved must be subject to some degree of quantitative measurement besides qualitative. Vague statements such as “maximise the quality of patient care” or “good inventory management” stated in purely descriptive terms do not lead easily to determine the result to be achieved. The administrator should answer the question: What is to be achieved, and to What degree? For example, (i) medication errors (what) are to be minimised to a level of 10 (degree) per month, and (ii) OT utilisation time (what) will be increased to six (degree) hours in a day from the present four hours.

In making this determination, market analysis, interviews, surveys, sampling techniques and other data gathering tools are helpful. Value analysis, simulation and systems engineering techniques may also be helpful.

Resources allocation: Quantitative and qualitative characteristics of the resources available, and required, should be studied. The resources must be calculated in terms of cost, quality, quantity and degree of substitutability. The relation of payoff (in terms of output) to what is to be achieved should be identified and analysed. The main question that should be answered is: what least expensive mix of resources will achieve a payoff consistent with the objective.

Linear programming, break-even analysis, discounted cash flow analysis and some other management concepts will be useful in this process.

Nonresources constraints: Many decisions will have some constraints which fall outside the category of resource constraints. Such constraints can be legal, social, or political or a combination of these. Such constraints must be estimated for their impact on all parts of the decision.

Risk factors: In spite of every effort, the constraints and chances of achieving the objective cannot be known with certainty. Therefore, the degree of risk in achieving the payoff of the activity or project should be determined as clearly as possible.

Comparison of payoff and inputs: The payoff must be equal to or greater than the cost of resource inputs. The decision maker must compare the payoff that might result from allocating resources to one project or activity with the payoff that might result from allocating the resources to another project or activity.

However, in this comparison, the probability of success can alter the balance between cost input and value output when there are two or more alternative decisions leading to the desired objective. If the probability of achieving an

objective by method “A” in six months is only 60 per cent with a particular mix of resources, while the probability of achieving the same objective by method “B” in ten months was 90 per cent with a different mix of resources, one may have to reconsider the choice of resource mix.

STRATEGIC PLANNING

Due to the technological, economic and social changes that are fast taking place all around, the environment within which the hospitals must operate is becoming increasingly turbulent. The approach to meet these changes effectively has been termed as “strategic planning”. In the context of the free market economy strategic planning has been defined by management guru Peter Drucker as, “The continuous process of making present entrepreneurial (risk-taking) decisions systematically and with the greatest knowledge of their futurity, organising systematically the efforts needed to carry out these decisions, and measuring the results of these decisions against the expectations through organised, systematic feedback”.

Three important features of effective strategic planning (as compared to master planning) are³ as follows.

1. *A shift in orientation from producing services.* Instead of asking what services does the hospital want to deliver, it needs to be asked as to “what services are needed”, and “who will purchase them”? A consumer marketing approach identifies customer constituencies and their needs.
2. *A statement of purpose is not the starting point of planning.* Assumptions can lead to planning for inappropriate roles in a context of unrealistic expectations. In strategic planning, the goal and role elements of a strategic plan are derived only after external assessments are completed, and the associated assumptions are fully tested. As opposed to general planning, creative strategic planning process chooses decisions from among realistic options based on quantitative judgements.
3. *Understanding that planning and management are concurrent.* Strategic planning is integrated within the hospital’s day-to-day management concerns. Therefore, unless representatives of all hospital constituents are involved in resources allocation decisions, strategic planning cannot become an integral dimension of management.

Strategic planning requires a refocussing of the planning activity, and a shift from the service-oriented (or facility oriented) master planning to market-oriented planning. By being market oriented, the hospital will be obliged to develop

programmes responsive to peoples’ needs, thereby, promoting and improving the hospital’s ability to be economically servivable.

One of the important reasons for strategic planning is shortage of capital, wherein investors perceive higher levels of business risks in health care field as compared to other industries. Shortage of funds necessitates that if funds have to be borrowed, then funds be invested to maximise returns on investment, keeping in mind the hospital’s liquidity requirement, risk preferences and investment expertise. Strategic planning is also necessitated by:

- i. the need for achieving economies of scale, increased access to capital markets (if the projects are judged as worthwhile by investors), or more efficient management of capital resources, and
- ii. need to create an ability to generate cash flows and redistribute it to high growth programmes and services.

Strategic Planning Approach

Strategic planning begins with an “external” and “internal” analysis. These analyses lead to identification of critical strategic issues, and emergence of strategic options from the analysis of issues. The development of goals and objectives leads to institutional strategies (Fig. 8.3).

1. **External analysis:** This assessment covers the actual and potential markets, identifying constraints, and studies how the competitors affect it. All this involves detailed examination of some critical factors which include:

- demographic forecasting
- regulatory aspect of government laws and professional regulations
- competitive assessment
- consumer needs, demands, preferences
- service delivery trends
- third-party payment systems, industrial employers’
- willingness for affiliation of workers with the hospital.

2. **Internal analysis:** A comprehensive internal assessment develops a balanced picture of the hospital’s limitations, strengths and opportunities for further development. This analysis covers:

- utilisation of hospital services
- types of cases treated
- admitting patterns
- physician characteristics
- financial performance
- equipment and facility inventory
- organisational assessment. Evaluation of the organisational structure is one of the most overlooked component of an internal analysis.

3. **Analysis of key issues and identification of strategic options.**

4. **Development of the institution mission:** A mission statement has to be broad enough to allow creativity and the development of a vision. By its nature it provides guidance to institutional leaders.

5. **Development of goals and objectives:** Goals articulate specific strategies, objectives specify and operationalise the strategy.

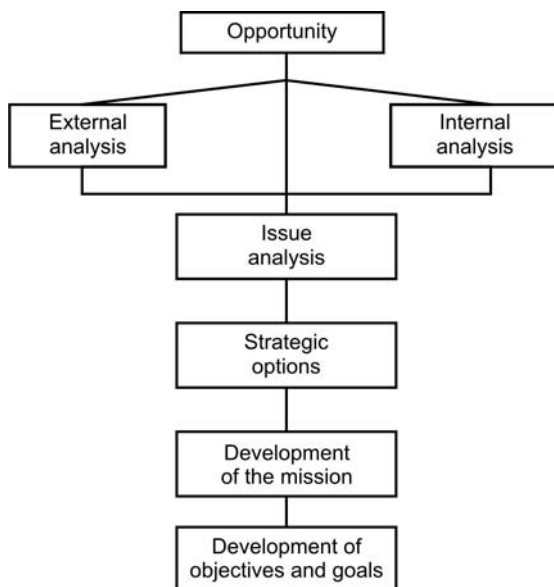


Fig. 8.3: Strategic planning process

Systems Engineering in Strategic Planning

Systems engineering techniques are useful in analysis, design and improvement of work systems and work centres, establishment of work standards and methods, and improvement of organisational structure. In general, it studies facility design and utilisation, and information flow, with the aim of reducing costs and improving quality of a service. It is divided into **operations analysis** (breaking down an operation into its component parts), **process analysis** (for purpose of developing a cost-effective process), and **systems analysis**.

Systems analysis is a broader application of the operations analysis procedure. System analysis and the design of the new system require expertise of persons trained in industrial engineering.

Planning for Growth and Diversification

Strategic planning appears to be most effective in planning for growth or for diversification. Strategies for growth and diversification are as follows:

Growth

1. Extending the area of service by creating or adding a new facility
2. Provide a new service in the hospital which expands the role of the hospital
3. Create community awareness by publicising special services, hoping it will increase the use of hospital facilities.

The above approaches serve to bring more patients to the hospital, and increase utilisation of services by those who need to be there but who would not otherwise have gone to the hospital.

Diversification

Diversification may become necessary for:

- generating capital from nonoperating sources of revenue for financing replacement, expansion or enhancement of technology
- surviving competition by offering a service not offered by competitors or other hospitals
- improving the hospital's long-term ability to serve.

Areas of diversification may be related or unrelated to the hospital's basic function. Investment of funds and capital, management of land and property and the like, are some examples of unrelated diversification.

Related diversification: Enlarging the product line, or offering more comprehensive level of health care through increased services can result in following possibilities.

1. Outpatient surgery unit
2. Birth centres
3. Health maintenance organisation (HMO)
4. Commercial laboratory
5. Emergency centre
6. Ambulance service
7. Hospice, day care centre
8. Industrial medicine
9. Sports medicine programme
10. Executive fitness programme, etc.

Decision Making for Growth and Diversification

1. While planning for diversification, application of marketing techniques for measuring the need for a specific

product becomes necessary in the decision making process.

2. It will also require a thorough financial study of the proposed diversification effect. Evaluation of the risk/return trade off among various strategies and a study of alternate sources of capital will be required.

The expense of providing the new product, projected operating results, cash flow from cost payers and third party payers, and the rate of return on investment should be worked out for a short to medium term of three to five years.

3. Pricing strategy will have to be carefully evaluated while planning, because pricing plays a vital role in the success of a new programme. The analysis takes into account the expected volume of workload, revenues, costs and cash flow.

CONCLUSION

Strategic planning process involves asking questions like where would the hospital like to be in ten years ? In two years ? How many beds ? What speciality programmes? What patient mix ? What payer mix ? How much outpatient care ? What other facilities? What other business? How would it respond to threats? What opportunities are available? What are the present weaknesses ? Can they be overcome? At what cost ?

The process should lead to preparation of a short range (2-3 years) strategy and long range (5-6 years) strategy. Successful strategic planning involves developing a process that provides for involvement of key members of the organisations, providing leadership, staff support and help of appropriate consultants with equal commitment of all. Effective leadership is very important in such an endeavour. Involvement of persons with expertise in their respective field, and employment of consultants ensure objectivity. This only can result in a workable strategy and operational plan for the institutions survival and progress.

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INTRODUCTION

Because of the diversity of agencies providing medical care services, there is no uniformity in the pattern of hospital organisation. Even public hospitals run by the states, central government and local self-government agencies (municipalities and zilla parishads) have no uniformity in hospital organisation.

In the nongovernmental sector, hospitals are run by charitable organisations, religious groups, private (family) trust and public trust, cooperative societies, and now corporate bodies. The organisational structures widely vary, and there is hardly any such things as typical management organisation of the hospitals.

However, the general pattern is discernible in non-government hospitals as far as higher direction and policy making functions are concerned. A body, variously called as board of governors, board of management, management committee, or board of directors (in corporate hospitals) is responsible for the overall direction and administration of the institution. These boards differ greatly in size and scope of their responsibilities.

ORGANISATION DEFINED

In a broader sense **organisation is a rational combination of the activities of a number of people for the achievement of a common purpose or goal, by devision of labour and function and through a hierarchy of authority and responsi-bility.**

Hospital organisation, then, would involve the systematising of all technical, administrative and contingent activities and personnel so as to affect satisfaction to

customers, employees and the agencies that make it possible to operate.

Organising is, thus, a process of grouping the necessary responsibilities and activities into workable units, determining the lines of authority and communication, and developing patterns of coordination.

The organisational structure is mainly determined by the size of the hospital. The chief executive or head is responsible to the board of management and his functions are to coordinate the work of the various departments, to act as a channel of information between the hospital staff and board of management, to advice the board on the hospital's general affairs, and to ensure that the board's directions are properly implemented.

The role of the top management is to direct and coordinate the activities of heterogeneous group of other subordinate managers engaged in managing the hospital's various services. Each of them exercises control over a unit. These "departmental managers" include at the upper end of the management scale the "line" managers of medical and nursing units (individual chiefs of medical or surgical teams, ward matron, matron-in-charge of operation theatres, etc. none of whom may consider themselves as managers at all).

The organisational process stems from the underlying premise.¹ that there should be a common goal toward which collective effort is directed, that the goal is spelt out in detailed plans, that there is need for clear authority-responsibility relationships, that power and authority factors need to be reconciled so individual interactions within the organisation are productive and goal directed, that conflict may be reduced through clarity of organisational relationship,

that unity of command must prevail, and that authority must be delegated.

IS HOSPITAL LIKE ANY OTHER ORGANISATION?

Realities of Hospital Organisation

How does the hospital's organisational structure stand up to any of the tenets of an effective organisation? The following differentiates the hospital as an organisation in comparison to other service organisations.

1. Every organisation has a "head". In every organisation there should be a clear line of authority for every individual. **In a hospital, there are a number of important people who consider themselves as heads.**

Bringing together highly skilled professionals to work in a bureaucratic organisation has in-built organisational conflict.

2. **The hospital organisation is besieged with absence of single line of authority and with two chains of command.** On the one hand, there is the chief executive or medical superintendent. This authority flows to the matron, housekeeping, accounts, etc. from the top to the bottom (scalar chain). On the other hand, there is the hierarchy of the doctors and consultants. The smallest gradation of rank and status in the hierarchical character of medical and nursing organisation is notorious.

3. **The hospital organisation is characterised by high interdependence.**

Because of the extensive division of labour and accompanying specialisation of work, practically every person working in the hospital depends upon some other person or persons for the achievement of his own organisational goal. Specialists and professionals can perform their functions only when a considerable array of supportive personnel and auxiliary services are put at their disposal at all times. For example, a surgeon cannot operate on a heart case unless catheter studies have been completed. Even before that, other investigations have to be available from the respiratory laboratory and biochemistry laboratory.²

4. The timing of the movement of patients through the systems is largely controlled by chance or by a set of uncoordinated, individual decisions.
- Organisation of universities and research institutions have some semblance to hospital organisations in looseness

of formal structure and in the degree of independence by their staff. In industry, the levels of authority, width of the span of control, ratio of managerial to total staff and indirect to direct labour can easily be determined. There is extensive division of labour in hospitals, but at the same time great interdependence of special skills. A hospital has been described by an industrialist as a "wildest kind of jobbing shop".

- However, two additional factors characterise hospitals and hospital organisation. As opposed to other organisations, the individual goals of staff coincide more with hospital goals, and most of the hospital staff will "identify" themselves with hospital goals.
- Hospitals organisation is both authoritative and permissive, highly formalised yet loose-knit. The reason is the very special nature of hospital work. The crisis nature of work demands from a number of people—collaborative performance. Hospitals are extreme cases of an organisation peculiarly dependent for effectiveness on people, although crisis nature of work demands collaborative performance in other industries as well (Technology and Equipment).
- To the sick, a hospital is a place where they will receive treatment. To the domestic staff, it is a special kind of hotel with rooms to be cleaned and meals to be prepared. To all the staff, it is a place of employment, and to the junior doctors and nurses, it is a temporary home. Hospitals may mean different things to different groups of people at different times. But to the hospital administrator, it is an organisation, a consciously designed arrangement for management of people, services and things for a purpose. From the organisational point of view, the question to ask "what is a hospital for", is more meaningful than "what is a hospital".

AUTHORITY RELATIONSHIPS

Like very few other service organisations a hospital has relationships that are external—concern for patients, consumer, community, client environment. But let us also consider the internal relationships in the organisational model in hospitals. The organisational process cannot be understood without an understanding of the nature of authority relationship obtaining in all organisations in general. The following are intimately connected with authority relationships in organisations.

1. Superordination/subordination
2. Authority and responsibility

3. Scalar principle
4. Functional authority
5. Splintered authority
6. Line and staff authority
7. Span of management.

1. Superordination/Subordination

- a. The hospital is expected to perform efficiently at all times and to produce automatic response regardless of turnover, absenteeism and workload.
- b. The performance (i) is partly attained through directive, quasi-authoritarian controls. (ii) As a formal bureaucratic organisation, the hospital also relies a great deal upon formal policies, rules and regulations for controlling work relationships of its members.
- c. This emphasis on directive controls manifests itself in sharp patterns of superordination/subordination, and in distinct status differences among organisational members.

2. Authority and Responsibility

In an organisational set-up, the authority vested in any individual must be equal to the responsibility assigned. This is the principle of parity of authority and responsibility. It assures that the person given an assignment or a job to perform can carry it out without let or hindrance, without provoking conflict over his right and duty to do so. At the same time, managers cannot delegate all their authority and then themselves hold no responsibility. The principle of absoluteness of responsibility recognises that all managers delegate authority, but the ultimate responsibility is retained by the manager. The manager who delegates authority remains ultimately responsible for the actions of the subordinates. From this concept, the manager receives the right to exercise the necessary controls and extract accountability from subordinates.

The degree of centralisation or decentralisation of authority depends on the management philosophy of the governing board. There has to be more centralisation of authority in small hospital because of their size. But greater decentralisation becomes a necessity when the size of the hospital's operations expand. In both the cases, it should be clear that there can never be complete centralisation or decentralisation. Centralisation or decentralisation is governed by policy, uniformity and size of the organisation.

3. Scalar Principle

Organisational hierarchy refers to the arrangement of individuals into a series of superiors and subordinates.

Individual workers are placed in a specific authority relationship to a superior, whose authority can be traced from the next level of authority, up to the top level of the hierarchy. This is the Scalar principle.

This flow of authority constitutes a chain of command, the chain of direct authority from superior to subordinate. Scalar status is associated with a position in a hierarchical system in which the position itself implies the authority. The uninterrupted line of authority from superior to subordinate results in units of command so that each individual reports to one, and only one, superior. The chain of command shows who reports to whom, who is responsible for the actions of an individual, who has authority over others, and results in a pyramidal organisational structure (Fig. 9.1).

4. Functional Authority

In certain hospitals, in the formal organisational chart the medical staff may not be shown as having any direct authority. Yet, the physicians exercise substantial influence throughout the hospital at nearly all organisational levels, enjoy very high autonomy in their work and have a good deal of functional authority over others in the organisation.

The functional status is the position held by an individual by virtue of the kind of work he or she performs. His or her work and performance are respected, and even revered, to the extent that he or she is regarded as high in status and thereby a person of authority commanding respect. This is the status associated with medical staff at certain levels. A great many patients believe that the doctor is the healing power. Consequently, this means inherent conflict within the hospital, essentially with lay administrators. Increased

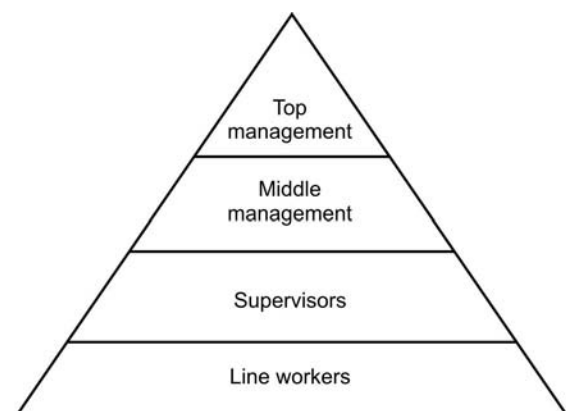


Fig. 9.1: Organisational hierarchy pyramid

professionalisation and specialisation have also had the effect of sharpening some of the status differences among the people working in hospitals.

Functional authority is the right which a individual or department has delegated to itself over specified processes, practices, policies, or other matters related to activities in departments other than its own.

Nature of Functional Authority

If the principle of “unity of command” were followed without exception, all authority should be exercised by line managers. However, reasons like lack of specific knowledge or experience, or danger of diverse interpretations of policies and plans explain why line personnel are not allowed to exercise this (functional) authority. It is not restricted to managers of a particular type of department. It may be exercised by line, service or staff department heads—more often the latter two. Functional authority is usually limited to the areas of how and sometimes when, but seldom to “where”, “what”, or “who”.

Methods of Exercising Functional Authority

1. Staff man (say, personnel manager) offers advice or recommendations to a line superior, who may issue them as instructions down the scalar chain.
2. Line superior (e.g. manager support services) delegates authority to the staff man (e.g. personnel manager) to transmit information, proposals and advice directly to the former’s subordinates (which saves the superior time and trouble and expedites the spread of information).
3. Line superior (e.g. manager, support services) allows staff man (e.g. finance manager) to consult with operating managers and show them how the information should be used or put into effect.

Pitfalls in Exercising Functional Authority

1. Failure of functional staff to understand their limitations—if they conduct certain activities for line managers, they tread on the line manager’s authority. Result—friction.
2. Danger of carrying functionalisation to the extreme. Result—destroying line manager’s job.
3. Doubt in understanding what should be controlled by the expert and what should be under the jurisdiction of the operating managers. At times there is a thin line separating these.

4. Multiplicity of command on the line manager by many staff or functional positions. Result—confusion, dispersal of responsibility, and conflict.

5. Splintered Authority

Managers cannot have unlimited authority. Because there are necessary limits on each managers authority, there is a greater need for coordination at various levels of the organisation. This results in splintered authority, i.e. splinters of the authority of some managers impinge upon the role and functions of other managers. Hospital organisation is quite characteristic of splintered authority giving rise to organisational conflicts.

The problem can be generally tackled in three ways:

- i. managers can pool their authority and make decisions,
- ii. the problem is passed on to a higher level where it is resolved by one manager with sufficient authority, and
- iii. reorganising to overcome recurrent situations of splintered authority.

6. Line and Staff Authority

Line refers to those positions and elements of the organisation which have responsibility and authority and are accountable for accomplishment of the primary objectives. The term “staff” has evolved in the military organisation which developed the staff assistant pattern as a means of relieving commanders to details of execution that could be handled by others. Staff elements are those which have advisory or service function to the line manager in the attainment of primary objectives. The staff assistant or specialist provides advice and technical support to the line manager, but no direct authority or personnel under him.

Where two or more people work together, the distinction between line and staff is a means of determining who makes decisions directly related to the attainment of the end results, and who provides advice and service in helping in the process. The essence of line authority is the direct chain (or line) of command, from the top level of authority through each successive level, called scalar chain. The line manger has the authority to accept, alter or reject the advice and technical expertise of an advisory or technical staff. But whether he accepts or rejects the advice, the ultimate responsibility for the end results is his alone.

It should be remembered that almost every officer who holds a staff position, i.e. in-charge of a staff department

(e.g. personnel or finances) also may have charge of several workers within his own department, and exercise line authority within that department.

The line and staff authority relationship is emphasised in organisations in which much reliance is placed on frequent conferences of heads of departments and specialists from other departments. Organisational charts and job descriptions should contain clear statements as to the nature of each position to avoid ambiguity.

In an organisation, a single position might serve as line, staff and functional at the same time but for different phases or activities. For example, the financial officer gives financial advice (staff) to the chief executive, supervises his own accounts department of a number of personnel (line), and sets specific accounting procedures for all lower levels with his own special authority (functional).

In spite of the confusion about line and staff, the distinction seems important. **Line and staff is a matter of authority relationships**, the activities do not characterise a department as line or staff. Line organisation is the backbone of the hierarchy. Staff and functional organisation merely supplement the line.

7. The Span of Management

This concept focusses on the recognition that there is a limit to the number of individuals whose activities can be coordinated and controlled effectively by one manager. Certain factors which influence the span of management for any superior-subordinate relationship are given below. However, it is not necessarily true that a smaller span results in better management or *vice versa*. There are too many underlying variables in a management situation to conclude that there is a particular number of subordinates which a manager can effectively supervise. The variables are—

1. *The nature and flow of work*: Work of a routine, repetitive nature allows a larger span of management. With complex nature of work and resultant greater degree of interrelationships, a great degree of coordination will need closer supervision, and therefore, a narrow span of control.
2. *Training and motivation of workers*: Well-trained and motivated workers do not need as much supervision as others. The span of management can be large in such a case.
3. *Organisational stability*: When the organisational climate is stable, the span of control can be wider. Rapid change, high turnover and general organisational instability necessitate closer supervision with a resulting narrower span of control.

4. *Dispersal of work units*: Dispersed work units over a scattered physical layout call for closer supervision for control and coordination of the work and therefore a narrower span.
5. *Managerial effectiveness*: Appropriate training and amount of experience of a manager enables him to supervise and control a larger number of subordinates, the span of control will be bigger for such a manager.
6. *Availability of staff specialists*: In selected support services department, availability of staff specialists can take a lot of time off the hands of a manager. In such a case, the span of management may be widened.

DELEGATION

A manager cannot do everything by himself. One of the important factors determining the effectiveness of managers is delegation of authority, i.e. how much freedom, scope and power is entrusted to subordinates to act on behalf of manager, utilising the resources of the organisation and for achieving desired results.

Authority is delegated when discernible is vested in the subordinate by a superior to make decisions and accomplish tasks or results.

The principal cause of heavy time burden on managers is to be found in confused organisation. There is a limit to the number of subordinates a manager can effectively supervise. When the span of management widens, a manager cannot effectively carry out his management functions without delegating some authority to subordinates. The most serious symptom of poor organisation is unclear authority delegation.

Principles of Delegation

Delegation according to ability: Authority delegated to an individual should be as per his or her ability to accomplish results.

Absoluteness of responsibility: The superior delegates authority, not the responsibility. Final responsibility for the decision still rests with the superior.

Parity of authority and responsibility: Delegated authority should be commensurate with results expected.

Definition of results expected: The more a position has a clear definition of results expected, activity to be undertaken and clarity of organisational relationships, the more effective is the delegation.

Unity of command: Delegatee should be responsible to one boss. Multiple subordination must be avoided.

Authority levels: Decisions within the authority competence of an individual should be made by him and not referred upward. The delegator should not permit decisions to be referred back upward to him.

Steps in Delegation

Selecting and Assigning the Task

There are a significant amount of tasks that a manager can delegate to his subordinates. List them and rank them according to the amount of your time which they consume and their importance. Preparing routine reports, answering routine correspondence, preparing duty schedules, serving on certain committee, meeting equipment vendors, and similar routine portion of managerial tasks are some examples.

A single function or as much of it as possible should be delegated to a single person. Try to delegate tasks which are of recurrent nature. Clarify the specific authority to the employee and clarify the limits of that authority. Fix a deadline or time-frame for completion of the tasks and make it clear to the delegatee.

Selecting the Appropriate Subordinate

The person selected, the delegatee, should have qualifications to carry out the assigned tasks. Overdelegating or too much challenge to an employee results in his or her failure and frustration. Delegation should provide a modest amount of challenge, a feeling of expanded usefulness and an opportunity for growth.

Assess the subordinate's capabilities. The person should be able to realise the importance of the task, must have the attitude, knowledge and skills to carry out delegated responsibility, and should have the time available for it.

Instructing the Subordinates

Delegation without adequate preparation is bound for failure. Instruct the subordinate the nature of task, method of carrying it out, the goals to be achieved or results expected, and the time-frame. If there are no instructions available because of the maiden nature of the task, then instructions or procedures may have to be prepared and committed in writing.

Maintaining Feedback and Control

Delegation is ineffective without feedback and control. Feedback is largely a matter of communication between superior and the subordinates. Progress should be monitored through periodic reports. When you are known to check

on deadlines, employees know you are on the lookout for results.

Overcontrol, all the time looking over subordinate's shoulders to see how they are doing, is as bad as under-control which may miss employees making costly mistakes along the way. Make sure subordinates know you keep a track and want timely results.

Some Basic Tenets of Delegation

1. A manager cannot delegate authority which he does not have.
2. A manager cannot delegate all of his authority because, in delegating total authority, he will then be giving away his prerogative to manage.
3. Delegation refers to operational authority only. Authority to make policy and technical authority cannot be delegated. In the organisational hierarchy, delegation is used only in the context of line operations.
4. Delegation of authority is not absolute and permanent. Delegated authority can always be regained (recalled) by the delegator, and the right of the superior to recover delegated authority is absolute.

What Should Never be Delegated?

There are certain aspects of a manager's functions which should never be delegated. They are as follows.

1. The power to discipline
2. Responsibility for maintaining morale
3. Overall control
4. Crisis situation calling for urgent solution
5. A technical task or matter
6. Custodianship of trust and confidence.

Why is there not Enough Delegation?

In spite of the immense utility of the principle of delegation, there appears to be ineffective delegation in many institutions due to two sets of factors—one related to managers and the other to subordinates.

Management Barriers

1. Unwillingness to give subordinates a chance. The manager feels he can do the job better and faster himself
2. Unwillingness to let subordinates make decisions
3. Fear of subordinates making mistakes
4. Unwillingness to trust subordinates
5. Unwillingness to let go power

6. Disinclination to develop subordinates
7. Fear of taking risks
8. Uncertainty over tasks
9. Failure to establish effective control
10. Lack of organisational skill—confusion about authority and responsibility.

Subordinate Barriers

1. Lack of aptitude for work
2. Feeling of insecurity, lack of self-respect
3. Fear of failure, of making mistakes
4. Lack of initiative
5. Lack of experience
6. Avoidance of responsibility.

Delegation is the most important parameter of managerial effectiveness. It enables the manager to enlarge his functional capabilities. Many of us give lip service to delegation, but few of us are inclined to delegate authority in important matter. The tendency to delegate only the unimportant work should be curbed. An effective manager delegates as many important tasks as he can, because that not only creates a climate in which subordinates grow, it also enables the manager to extend his effectiveness.

MULTIPLE PYRAMID OF HOSPITAL ORGANISATION

The salient characteristics of hospital is the absence of a single line of authority in the organisation; the authority does not flow along a single line of command as it does in most formal organisations. A dual and at times multiple pyramid of organisation because of the relationship of medical component to administrative component, is a peculiar characteristic of hospital organisation. The ultimate authority is vested in the policy making body—the governing board—which provides leadership and direction to the organisation. The board appoints the chief executive officer (administrator) as well as the chiefs of medical services, who are two different streams of authority. The chief executive officer (called superintendent, director, administrator or by some other title depending upon local preference) who is charged with the responsibility of effectively managing the administrative components of the institution in turn delegates authority to each department head in the administrative component. A typical pyramidal organisation, with a unified chain of command results within the administrative component.³

But a second conglomerate of organisational pyramids results from the organisation of the medical staff into clinical services, with each having a chief of service. Had this been also a pyramidal structure with one single chief or director of medical staff, it would result in only a second pyramid in the organisation structure. However, seldom is it possible to have a medical staff organisation where there is only one chief with other clinical service heads directly under him in the line of command.

At the same time, none in the administration hierarchy gives command to the medical staff. Often, doctors give command to those in administrative hierarchy, but this also is not direct. Therefore, full responsibility gets divided or blurred.

In matters of direct patient care, the physicians exercise professional authority, in matters of administrations the chief executive exercises authority. Thus, many employees (such as nurses) are subject to more than one line of authority. Line officers in the administrative units may find that their authority is limited in some areas because of the specific jurisdiction of the medical staff. The multiple pyramidal structure therefore calls for a lot of coordination. This is achieved through the extensive use of committees to bridge the gap.

In an effort to consolidate authority and clarify responsibility, the top administrative level of the hospital may be expanded to include some central officers, to whom both the administrator and the chairman of medical staff report.

The Difficulties

The absence of single line of authority in the hospital creates various administrative and operational problems. **Firstly**, it makes organisational coordination difficult. **Secondly**, it allows for instances where apportionment of authority, responsibility and accountability is unclear. **Thirdly**, it creates difficulties in communication.

- The administrator, feeling that doctors through their power and influence interfere in the discharge of his responsibilities, may actively attempt to circumvent the medical staff on various matters.
- The doctors in turn are likely to circumvent the administrator.
- The administrator may then resort to more and more bureaucratisation, and
- Increased bureaucratisation of organisational operations can further lead to resentment by doctors.

The controlling influence over a hospital is related to the goals, structure, technology and resources provision. Goals, structure and technology are internal factors. Resource is the only external factor. Those who influence the allocation of resources have a big say in controlling goals and technology and they dominate the structure. The four types of dominations in a hospital organisation are as follows.

Trustee Domination

Trustees represent the community. They raise funds and sometimes themselves contribute in a big way. They promote policies which contribute to community welfare. But in doing so, they may in reality be promoting their own names and their private interests. Their perceptions may not contribute for the development of the hospital.

Medical Domination

Trustees had to depend more and more on doctors as medical knowledge, technology and equipment developed. Doctors are able to dominate the organisation through their professional knowledge and standing. In doctor-dominated hospital, one may find high quality care, research and training. But they tend to form operative goals which are predominantly in favour of their personal goals.

Administrator Domination

With a large number of persons with various orientations, with interdependent nature of work and need for collaboration with other agencies and community, administration of hospitals has become more and more complex. All this calls for a professionally trained hospital administrator. In an administrator-dominated hospital, such an administrator may tend to block the communication between the trustees and the medical staff.

Multiple Domination

Here, the power is shared by trustees, doctors and administrators. No single group can control the action of others. This multiple domination gives little scope to assess performance. A clear division of work and power sharing should be maintained, with as much avoidance of conflicting goals as possible.

COMMITTEES AS PART OF ORGANISATION

“One of the most ubiquitous and controversial devices of organisation is the committee. Whether it is referred to as a

“board”, “commission”, “task force” or “team”, its essential nature is the same for, the committee is a group of persons to whom, as a group, some matter is committed. It is this characteristic of group action that sets the committee apart from other organisation devices, though, not all committees involve group decision making”.¹

The committees are in wide use in all types of organisation—they are a fact of organisational life. Various types of committees function in government, in education, in religious institutions, and in business and industry.

As in other organisations, committees play a very important role in hospital management. A committee may either be line or staff, depending upon its authority, but it is extremely difficult to make such clear-cut distinction in respect of various committees that are required to function in hospital situation. However, in general, if its authority involves decision-making affecting subordinates responsible to it, it is a line committee. If its authority relation-ship to a superior is advisory, then it can be considered a staff committee.

Committees can be formal, if established as a part of the organisational structure, with specifically delegated duties and authority (e.g. finance and development committee) or they can be informal, organised without specific delegation of authority and for group thinking on a particular problem. The essential character of the committee is that it is a group entrusted with dealing with a specific problem. Confering with departmental heads by the administrator is not creating a committee.

Why Committees Become Necessary

Some of the important reasons for using committees are as follows.

1. Group Deliberation and Judgement

Group deliberation can bring to bear on a problem a wider range of experience, a greater variety of opinion, and thorough probing, leading to clarification of problems and development of new ideas, thus, resulting in better judgement.

2. Representation of Varied Interests

When there is difficult internal problem involving various departments, the administrator can choose committee members in such a way as to give representation of the interested parties. This can actually ensure that such groups feel a sense of loyalty and commitment to the decision reached.

3. Coordination of Department Policies and Plans

Committees promote coordination among departments, and are useful for coordinating policies and plans, by providing to the concerned members a forum to obtain a picture of overall plans and their place in them, and to contribute suggestions for improvement of plans.

4. Sharing of Information

All group members affected by a problem can transmit and share information, the committee meetings providing immediate opportunities for classification.

5. Consolidation of Splintered Authority

A departmental manager at times cannot act without the authority of another department because he has only a portion of the authority necessary to accomplish a goal. This has earlier been discussed under “splintered authority”. A committee can deal with the problem by using the combined authority of its members to take appropriate decision. However, frequent necessity of consolidating splintered authority should point to the need for review of the organisational structure.

6. Avoidance of Action

As a negative point, one of the surest ways to delay taking a decision is to appoint a committee to study the problem. At times, committees and subcommittees are appointed to delay action indefinitely.

In spite of the occasional remarks of cynics that “a committee is made up of the unfit selected by the unwilling to do the unnecessary”, committees are inevitable in every organisation, including hospitals. However, the following drawbacks of committees should be remembered while deliberations and decision making through committees.

1. *High cost in time and money:* All the members have right to be heard and cross examine the points of view of others. It can be a waste of time for others.
2. *Compromise and watering-down of decisions:* The decisions of committees can be watered down, and committees often take innocuous decisions when they are required to come to conclusion or reach a decision.
3. *Indecision:* At times the difficulty in reaching agreement can result in adjournment and inaction, especially if the motives of some members are not honourable.
4. *Forcing the decisions:* In situations of indecisiveness, there is always the danger of chairman forcing the committee into a decision, especially if the committee

has sizeable number of yes-men of the chairperson. When the committee ceases to operate as a group of equals, the situation may lead to decisions which may be worse than compromised or watered-down decisions.

Effective Committee Management

Committees are a success when they are formally organised, have assigned specific jobs to do, have a leader acceptable to all members, keep written records of their deliberations, and know that recommendations are accepted. Committees fail when they are not wisely constituted, when their purpose is vague, when members are not well oriented and are not convinced that the result will be worth the effort, or when the preparation for the meeting is inadequate.

Checklist

To enable committees to function effectively and to overcome some of the disadvantages of the committee system, the following checklist is suggested.

1. *Purpose and scope:* Has it been carefully spelt out and defined? Unless this is done, the members may not know whether they are responsible for a decision, a recommendation or just an inconclusive discussion for the benefit of the chairman.
2. *Need:* Is the committee the best technique for accomplishing the defined purpose? Or would a meeting with a few subordinates in one session would do as well?
3. *Size:* Is the size of the committee appropriate? Is it large enough to include the breadth of experience required for the task but not so large as to foster indecision? Where larger representation is important, the answer may lie in constituting subcommittees, with the problems broken down for action.
4. *How often to meet:* A committee should meet as often as needed to fulfil its obligation. Some committees may be required to meet very often in the initial period, with the frequency of meetings lessening as time passes. For example, the drugs and therapeutic committee will require to meet almost every week when it is considering to prepare the hospital formulary. Once the formulary is prepared, once in a month and later once in a quarter review meeting may be sufficient.

For any committee, it is better to meet at fixed times, or fixed days, say the first Monday of each month at 4 PM. This helps the members to avoid conflict with other engagements.

5. *Committee members*: The members must be representative of the interest they are intended to serve.
 - a. Has he the capacity to work in group and does he relate well with his peers ?
 - b. Does he have the ability to look at the underlying causes of the problem?
 - c. Does he think critically ?
 - d. Can he look past his vested interest and examine all sides of the issue ?

Remember that not every one has the temperament, analytical ability and capacity for rationally working with others. Prevent committees from becoming the forum of the traditional dissenter, the rostrum of the ambitious climber, or platform of the committee bore.

6. *Subject matter*: Can the subject matter be handled in group discussion ? Has the agenda been prepared and circulated ? The way subject matter is presented is important. Even the well-informed committee member can hardly be expected to have a considered opinion on important matters without some notice of what to expect.
7. *The committee chairman*: The success of the committee will depend on the skill of the chairman. He sets the tone of the meeting. When the subject matter is open to contention, he leads the discussion so that members are not forced into a position. His skill is in integrating committee deliberation. Integration of ideas, as contrasted with compromise, builds a point of view.

Even if he is a superior in the scalar chain of the organisation, the chairman must handle the meeting firmly without imposing personal opinions or thwarting freedom of discussion. A nondirective approach creates the climate in which the individual can express his views without fear of reprisal or of being put in his place.

If the members and subject matter have been well-selected, the responsibility for assuring effective deliberations of the committee is that much easier. Conversely, even a skilled chairman can hardly make up for the deficiencies of a poorly constituted committee.

8. *Minutes and conclusion*: It is necessary to prepare minutes of the committee meetings, circulate them in a draft form for correction and issue the final copy after approval of the committee. Conclusion and recommendations provide for follow-up.

Hospital Standing Committees

A number of committees function in a hospital on a permanent basis. Some of the important medical staff committees are listed below. Besides medical staff committees, other committees function exclusively on the

administrative side, such as finance, personnel, public relations and other administrative departments.

Medical Staff Committees

Medical staff executive committee: The executive committee acts on behalf of the medical staff, coordinating activities of this staff. The chairman of this committee generally reports to the board of trustees on matters of execution of policy. He may be required to report to or consult with, the chief administrator on day-to-day matters depending on organisational pattern.

Joint staff committee: A joint committee of medical as well as administrative staff, this committee meets for joint deliberation when such a need arises.

Medical audit committee: The medical audit committee carries out retrospective medical audit or a full scale quality assurance review.

Utilisation review committee: The task of utilisation review committee is to review utilisation of hospital resources and facilities, and suggest measures for their appropriate utilisation.

Medical records committee: This committee overviews the entire record keeping function of the medical record department. The committee also approves introduction or deletion of various forms and their design.

Infection committee: It studies prevalence of hospital infection, detect shortcomings responsible for the same, and continuing education of hospital personnel in minimising the hospital infection.

Tissue committee: The tissue committee reviews reports of tissue removed in surgery, in order to detect whether tissue are unnecessarily removed without sufficient justification. This committee is supplementary to the hospital audit or quality assurance committee.

THE ORGANISATIONAL CHART

The organisational structure is generally depicted in a diagrammatic form (Fig. 9.2). The conventional organisation chart is a line or scalar chart, showing each layer of the organisation in sequence. In drawing the organisation chart, certain general conventions have to be followed. Generally, line authority and line relationships are indicated by solid lines and staff and advisory positions by broken or dotted lines.

There are two major kinds of organisational charts—the master chart and the supplementary chart. The master chart depicts the entire organisation, showing all departments

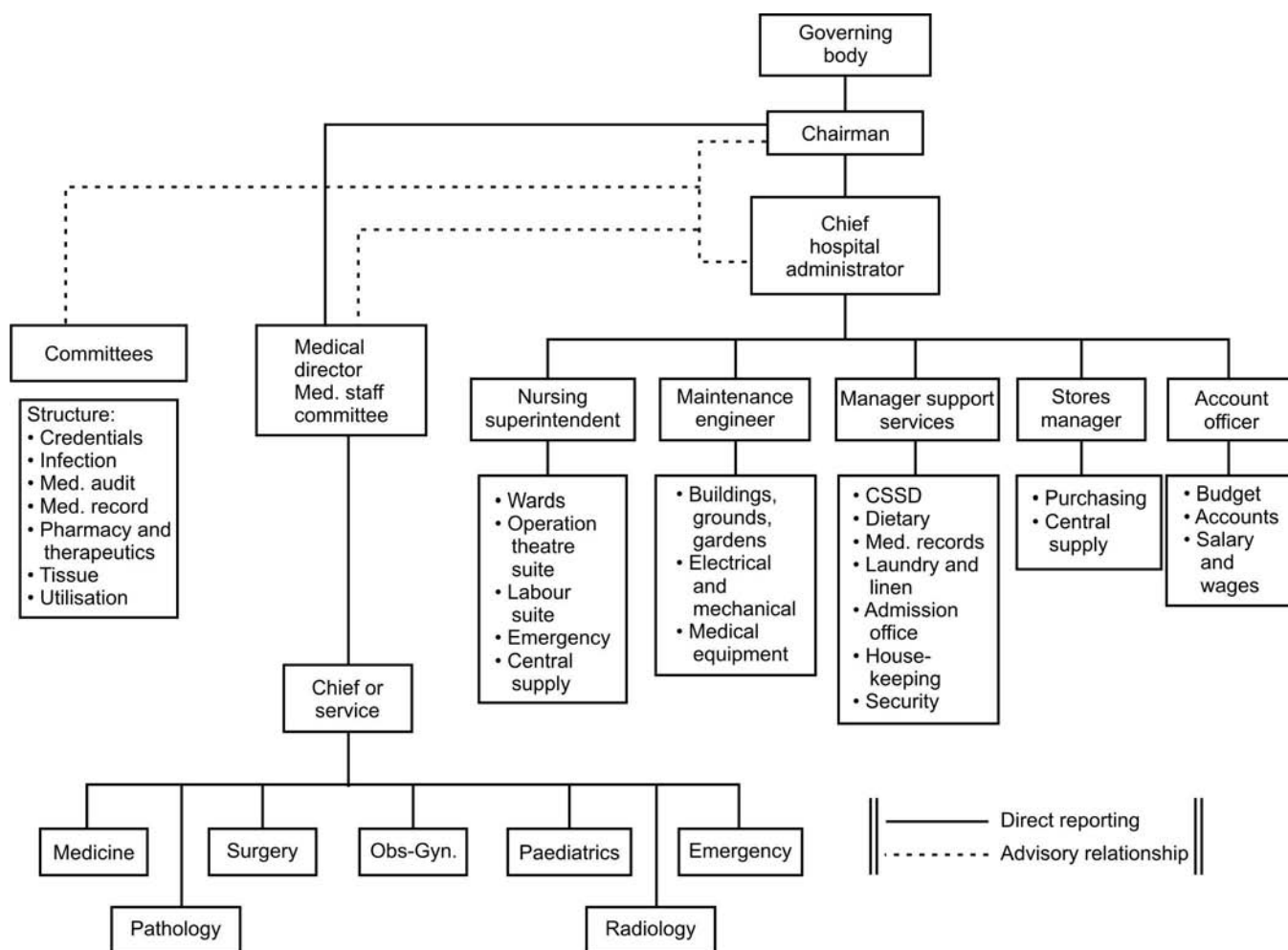


Fig. 9.2: Organisational chart

and major positions of authority. The supplementary chart for a department gives specific details for the organisational pattern for that unit, and the linkage of authority in the direct chain of command from highest authority to that derived by the department chief. An organisation will have as many supplementary charts as there are departments or units. The supplementary charts depict each individual job title and the number of positions in each section.

Advantages and Limitations of Organisational Charts

There are following advantages in using organisation charts.

1. Managers can review it to determine any inconsistencies and complexities in the organisational structure, as it depicts major lines of decision-making and authority.

2. An organisation chart may be used to orient employees, as to where they fit into the organisation, where each job fits in relation to other jobs in the department.
3. The chart is a useful tool in managerial audit; managers can review such factors as the span of control, crossed lines of authority. Managers can assess current practice with the original plan of job assignment and determine where the discrepancies now exist.
4. The chart conveys information about the chain of command, supervisory relationship, channels of communication, and lines of decision making.

Organisation is a dynamic concept. Therefore, there are also certain limitations in the rather stale structure presented by the organisation chart.

1. Besides the formal lines of authority, important lines of informal communication and significant informal relationships cannot be shown.
2. The chart may become obsolete easily if not periodically updated on occurrence of change in organisational pattern.

Nevertheless, the importance of organisational charts cannot be underestimated although some experts are not in favour of organisational charts. “Good organisations are living bodies that develop muscle to meet challenges. The organisation chart should never be formalised and printed because a chart demoralises people. When there is need to reorganise, such need would not be frequent, it should be undergone about with precision and speed of surgery—well-planned and swiftly executed”.⁴

Understanding an organisation is easier if there is an organisational chart describing the structure of the system, with authority-responsibility relationships depicted as clearly as possible, and written job descriptions prepared for all key functionaries.

MATRIX ORGANISATION

Looking at the differences in task complexity within the hospital, departments performing routinised activities (CSSD, laundry, kitchen) have more task-oriented workers, more formalised structure than those having different levels of task complexity (wards, ICU, laboratory) who are informally structured and more interpersonally oriented.

Experts in the hospital field have recognised that complex tasks and highly skilled professional workers call for a collegial participatory structure, while the repetitive tasks performed by semiskilled and unskilled workers call for a hierarchical formalised structure. At one extreme are the physicians with their loose organic structure and at the other end relatively unskilled workers of housekeeping, dietary, laundry and maintenance, with more hierarchical centralised supervision. Nurses and skilled technicians fall in between. The collegially structured medical staff structure, coupled with hierarchically controlled nonprofessional departments is fundamentally the appropriate form of organisation for a hospital, given the tasks it is faced with. Nevertheless, a difference of opinion still exists among two major schools of thought: (i) those who consider the formal organisation with its associated hierarchical authority structure as superior, and (ii) those who differ as to the degree to which procedures should be specified hierarchically and imposed on organisation’s members.

Contingency Theory

However, a third school of thought considers that a hierarchical or a participatory approach to organisational management should vary according to the circumstances, especially the complexity of the tasks being performed. Called the “contingency or situational theory of management”, the essence of the theory is that for simple tasks, having the workers report to one boss is efficient but boring for the workers and inflexible in adapting to changes; for difficult tasks a participatory approach is more efficient.

“Matrix organisation” is one such special kind of problem-solving organisation concept, designed to solve problems that cannot be solved by conventional subsystems and processes (Fig. 9.3). Drawing from the larger, formal parent organisation—the men, machines, procedures and techniques—this process integrates them into a temporary group or force with the objective of solving a complex problem that formal organisation and routine method cannot solve.⁵

Its chief characteristic is extra organisation, within the existing formal organisation that is ad hoc, temporary, single problem-oriented task force. The process groups together persons of multiple skills and disciplines. Upon completion of its task, the special group dissolves and its members revert to their normal functional activities.

Matrix organisation is defined as the existence of both hierarchical (vertical) coordination through departmentation and the formal chain of command, and simultaneously lateral horizontal coordination across departments (Fig. 9.4).

A cardiac emergency team is the simplest example of a matrix organisation in many a hospital and relevant to other medical and nonmedical responses in a hospital. The intern, emergency nurse, resident physician/cardiologist, medical assistant, ECG technician, cardiac emergency cart/eqpt all come together from within their designated locations, merge into a team, accomplish the task of resuscitation, and then melt away back into their respective task/departments.³

CONCLUSION

Organisational structures which are personality oriented so as to satisfy the egoistic needs of the owners and promoters can never prove to be useful in the long run. Similarly, it should not be fashion oriented, such as having only a certain number and levels of positions without justification of needs. It should be a means to an end rather than an end in itself, and should never be rigid because one type of organisational structure may be appropriate now but may not be so in course of time.

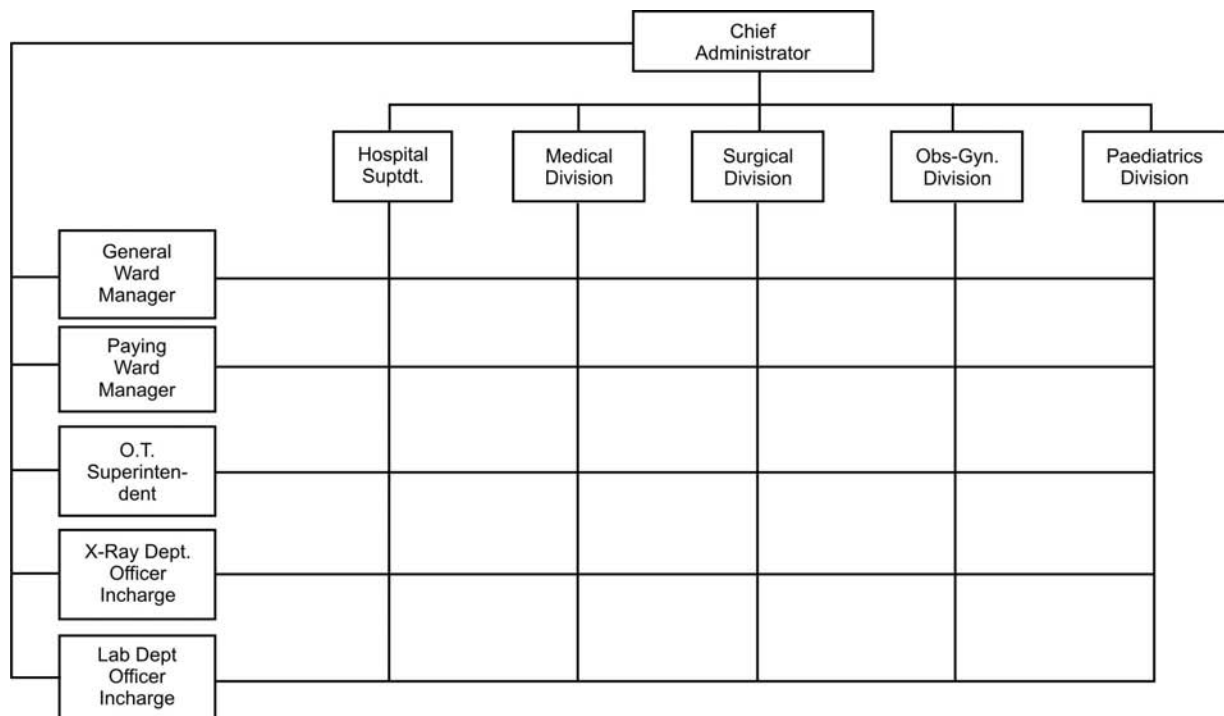


Fig. 9.3: Matrix organisation—a combination of hierarchical and horizontal coordination

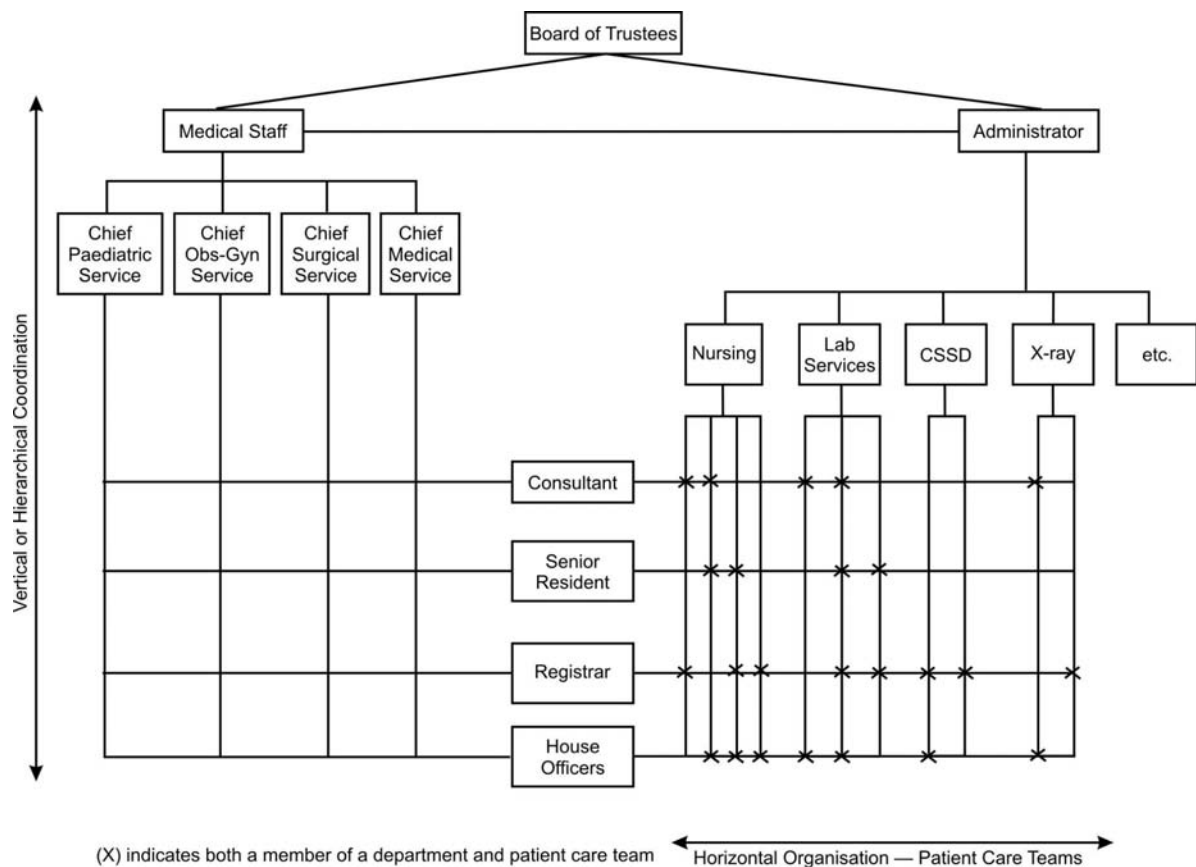


Fig. 9.4: Matrix organisation—a combination of hierarchical and lateral coordination

Table 9.1: Characteristics of Static vs Dynamic organisation

<i>Dimension</i>	<i>Static organisation</i>	<i>Dynamic organisation</i>
Organisational structure	Rigid. stickler for constitution, byelaws and tradition	Flexible: Temporary task force, readiness to change, depart from tradition. Matrix organisation
Objectives and goals	Hierarchical : Rigid chain of command Ill-defined in quantitative and nonquantitative terms	Linking : Functional collaboration Very clear, well-articulated. Employees understand, accept and committed to objectives
Organisational climate	Internally competitive Task centred: Reserved Formal: Cold, aloof	Goal oriented People centred: Caring Informal: Warm, intimate
Management	Controlling: Coercive power, centralised control Cautions: Low risk Errors: To be prevented Personnel: Emphasis on selection	Releasing: Supportive power, coordination Innovative: Highrisk Errors: To the learned Personnel: Emphasis on development
Attitude towards management	Negative or indifferent	Positive
Cooperation	Low: Territorial protection Team spirit: lacking	High: Feeling of involvement Team spirit: High
Decision making	High participation at top, low at bottom Clear distinction between policy making and execution Decision making by formal organisation mechanisms	Relevant participation at all levels Collaborative policy making and decisions Decision making by problem solving approach
Communication	Restricted flow One way: Downward Feelings: Repressed	Open flow: Easy access Two way: Upward and downward Feeling: Expressed
Motivation	Indifference to organisation's goals	High commitment to organisation's goals

Considering the difficulties of hospital organisation and numerous factors that influence it, the various dimensions of the organisation that characterise effective hospital organisation are summarised in Table 9.1.

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CHAPTER

10

Directing and Leading

INTRODUCTION

Whileas planning, organising, staffing and controlling are important facets of management, it is “direction” that synchronises activities and maintains momentum towards desired objectives. If employees at various levels are guided to do a job according to their own ideas, the end result may be a waste of effort if there is no meaningful direction to their effort. Therefore, a coordinated effort to accomplish tasks and objectives with economy and efficiency becomes necessary.

Direction initiates and guides action towards desired objectives. Many factors determine successful direction, but the important ones are delegation, communication, training and motivation.

1. *Delegation* provides subordinates the authority in fulfilling their responsibilities.
2. *Communication* provides them with necessary information in performing their tasks, and provides feedback.
3. *In-service training* provides the subordinates opportunities to improve their knowledge and skills for better performance.
4. *Motivation* provides satisfaction to the workers in meeting their social needs and propels them to do their utmost up to their full potential.¹

On one hand, an organisation has logical and well-conceived plan, carefully designed organisational structure, good staffing and effective control technique. On the other hand, there is also the need for the employees to understand the organisation, feel that it is their own, to be motivated, and to willingly contribute all they can to organisational goals. Leading is the function that fills the gap between the two.

Effective leadership is needed to cause people to perform in a desired manner.

Because effective leadership is vitally important to effective managing and because managing also involves creation of a cohesive environment, an analysis of human factors in an enterprise and a consideration of what motivates people is called for. Leadership, the key to effective managing, induces people to strive not only willingly but also with enthusiasm. Understanding leadership calls for understanding what motivates employees.

MOTIVATION

Motivators are those factors which induce an individual to perform well. Higher pay, a prestigious title, recognition by superiors and similar other things that give people reason to perform better are some examples of motivators. A motivator is something that influences an individual’s behaviour.

A widely referred theory of motivation postulated by Maslow² in the ‘50s is the theory of the “Hierarchy of needs” (Fig. 10.1). The needs identified by Maslow are as follows:

1. Physiological needs—needs for food, clothing and shelter
2. Security and safety needs—need for reassurance that there is no fear of loss of job, property, shelter
3. Affiliation or acceptance needs—need to belong, to be accepted by others
4. Esteem needs—need for power, prestige, status, self-confidence
5. Self-actualisation needs—need to maximise one’s potential.

As people advance in an organisation, their physiological and safety needs tend to decrease in importance, and the

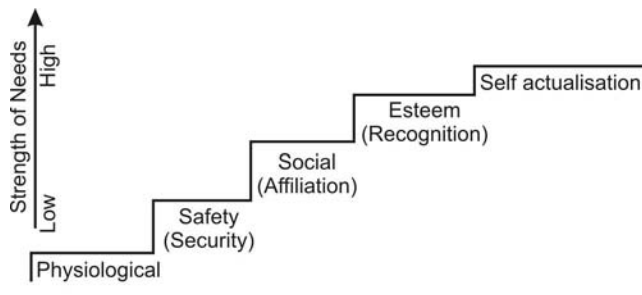


Fig. 10.1: Hierarchy of needs

needs for affiliation, esteem, and self-actualisation tend to increase.

Approaches to Motivation

Individuals have their own objectives and needs which are important to them, apart from the organisational objectives. Through the function of leading, managers help people to realise that they can satisfy their own needs and utilise their full potential at the same time, to achieve the aims of the organisation. This requires an understanding of the roles assumed by people, their individuality and their dignity.

People have different needs, ambitions, attitudes, desire for respect, responsibility, level of knowledge and skills, and potential. Without understanding the complexity and individuality of people, the generalisations about motivation and leadership may be misplaced.

The three approaches to motivations, and the assumptions on which they have been based, are as follows.

Motivations by Formal Control

A person has knowledge, attitudes and skills, in varying degree. But his performance in organisational situation also get affected by factors such as family, neighbours, school, religion, unions political association and fraternal groups.

Initially, the assumption that people are motivated only by economic incentives lead to the concept of 'rational economic man'. This concept postulated that people are essentially passive and can only be manipulated by satisfying their economic needs. This school of thought views that the employee is not keen to accept responsibility, cannot be trusted, needs to be controlled through fear of termination of his job and other kinds of punishments, and is motivated only through providing economic incentives and other fringe benefits.

This management style is based on the above sets of assumptions in a majority of organisations. These assump-

tions and the style of management resulting from it may work for some time, but fail to motivate employees on a long-term basis.

Motivations through Informal Organisation and Group Dynamics

The second concept was based on the observation that people are motivated not only by economic needs, but also by work groups of which they form a part. This concept found that there is dominant need for informal organisation in which employees feel comfortable, with close communication among group members. The interpersonal dynamics of the group to a great extent influence motivation and performance of the employee. The management approach used is to encourage formation of cohesive informal groups and group leaders, maintaining good interpersonal relationship, and good human relations.

Formation and maintenance of informal groups and maintaining desirable group dynamics being unpredictable, this approach is an uncertain, or at best a short-term, approach to employee motivation.

Motivation through Encouraging Full Utilisation of Workers Potential and through Internal Sources of Control

Later on, the concept of hierarchy of needs and of self-actualisation postulated that motives fall into hierarchy of five needs, ranging from simple needs of survival to the highest need for self-actualisation and maximum use of the person's potential. Abraham Maslow, among other researchers found that satisfaction and happiness at work come from maximum utilisation of one's potentialities and abilities in line with one's training and skills.

The work environment itself give opportunities for advancement of knowledge and skills. If there is proper selection and placement, if there is challenging opportunity for employees for demonstrating his or her performance, this will motivate the employee for maximum performance. If the work is self-reinforcing the employee is likely to be happy and satisfied on the job and achieve organisational goals effectively.

A Balanced View of Motivation

No single model is sufficient to explain the full range of individual and organisational behaviour.

It would be appropriate to believe that workers differ with respect to their perception of the organisation, their

level of aspirations, their experiences, their reference groups and their sociocultural backgrounds. In reality, people are complex and variable, and have many motives which combine into a complex motive pattern with ability to learn and add new motives. Economic rewards are important, but people often want more than money from a job. They also want to develop their capabilities, their competence, and their potential as well. Managers will have to take into consideration all the factors described above in deciding to use appropriate techniques while designing approaches to employee motivation.

“Employment is the means for satisfying man’s physiological and his safety needs, and so are wages, working conditions and benefits. By these means the individual can be controlled so long as he is struggling for subsistence or for security. The philosophy of ‘management’ by control and direction’ is essentially useless in motivating people whose dominant needs are social and egoistic.

People, deprived of opportunities to satisfy the needs which are now important to them, behave with indolence, passivity, resistance to change, lack of responsibility, unreasonable demands for economic benefits” (McGregor).⁴

Motivating Professionals

In hospitals and health care organisations, the professionals, i.e. doctors, specialists, technologists and researchers differ in the nature of their needs and the level of their need satisfaction than the rest of the employees. The professionals tend to be more committed to their profession rather than to the organisation. They are dedicated to their work and like to have freedom to provide self-direction. Their technical competence is the key to their status.

Motivating professional workers in hospitals, therefore, requires organisations which can provide opportunities as well as resources for satisfaction of the professional needs. “The professionals want opportunities where they can show achievement, can identify themselves with work which they are doing, use their knowledge and abilities, can grow in their profession and get feelings of accomplishment in what they do. This does not necessarily mean that economic aspects or working conditions should not be adequate. It is beyond those which matter in terms of motivating the professionals towards better performance and satisfaction”.³

LEADER BEHAVIOUR

The administrators at the helm of affairs of health care institutions need to be skilled in the art of leadership. This skill appears to be a combination of at least three major ingredients, viz. (i) the ability to comprehend that employees have differing motivating force at varying times and in

different situations, (ii) the ability to inspire, i.e. to enliven employees to apply their full capabilities, and (iii) the ability to act in ways that will develop an organisational climate for arousing motivations. Therefore, leadership can be considered as the activity of influencing people to cooperate toward achievement of some goal.

Leaders and Administrators

A question is repeatedly asked as to what differentiates a leader from an administrator or executive? Are all leaders administrators or executives? Conversely, are executive and administrators also leaders?

It is quite evident that not all leaders are executives or administrators. However, executives or administrators must have leadership qualities because they have to deal with people, for creating better attitudes, arousing enthusiasm, improving morale, and develop spirit of cooperation. Managers, as leaders, are a combination of two factors: personality, and the power vested in them by the organisation.

On entering the hospital or any other health care institution, one may come across workers who apparently seem disinterested in their work, uncaring, unhappy with their jobs, with dislike of their superiors. Patient and visitors satisfaction is low because of the overall atmosphere. On the other hand, on entering another institution one may come across a cheerful atmosphere, with employees happy and cooperative with you. There is high degree of commitment to whatever they are doing, effective communication, mutual trust, a high degree of concern for patient satisfaction.

Not discounting many other factors that make up the efficiency, effectiveness and “climate” of an institution, it is not an exaggeration to point out that the above two institutions represent two different styles of leadership. In the former case, the situation pervading all over is ripe for perpetuating conflicts. In the latter, the organisational climate reflects a participative or consultative leadership style.

Leadership Styles

Two sets of characteristics were described by McGregor which came to be known as theory-X and theory-Y styles of leadership.

Theory-X type of leadership was based on the traditional assumption that the power of leaders is derived from the position they occupy and about the nature of people, viz.

- average human beings have an inherent dislike of work and will avoid it
- most people must be coerced, controlled and directed
- average human beings wish to avoid responsibility, and want security above all.

Theory-Y type of leadership was based on a different set of assumptions that the power of leaders is granted by the group they are to lead, and that—

- people want to exercise self-direction and self-control in achieving goals to which they are committed
- people under proper conditions want to accept responsibility
- the intellectual and inner potentialities of the average human being are only partially utilised.

Theory-X style of leadership is autocratic and authoritative. Theory Y style of leadership is participative and consultative. Theory-X autocratic leaders can be effective where the tasks and activities are simple in nature and the employees unskilled, but theory-Y type of leadership is more effective in managing the human resources, by adjusting and adapting to constantly changing situation.

Is there a Best Leadership Style ?

So, then, which is the best leadership style ? The simple answer is that there is no single “best” leadership style. It depends upon the situation.

Styles of leadership authority are best displayed on a continuum, from the autocratic to democratic. Very seldom will “autocratic” style be effective in health care settings. In the “consultative” style, the manager presents ideas and attempt to sell the subordinates the decision. The “participative” style seeks subordinates opinion, the area for decision-freedom for subordinates being greater and use of authority by manager being smaller. Within a “democratic” style subordinates have relatively large area of decision freedom.

The above model basically reflects factors in manager’s decision making, but it is useful in understanding leadership behaviour (Fig. 10.2). All effective managers are also good leaders.

Based on various research studies in the West, the important ones being the Ohio State University and the management grid study the following four basic styles of leader behaviour commonly encountered in organisations emerge.²

Leader behaviour style 1 (Directing): These managers are highly authoritative, have little trust in subordinates, motivate people through fear and punishment with occasional rewards, engage only in downward communication, and limit decision-making to the top (exploitative—authoritative style).

Leader behaviour style 2 (Coaching): These managers have confidence and trust in subordinates, motivate with rewards and some fear and punishment, permit some upward

The Four Basic Leadership Styles

Style 1 : Directing

The leader provides specific instructions and closely supervises task accomplishment.

Style 2 : Coaching

The leader continues to direct and closely supervises task accomplishment, but also explains decisions, solicits suggestions, and supports progress.

Style 3 : Supporting

The leader facilitates and supports subordinates’ efforts towards task accomplishment and shares responsibility for decision-making with them.

Style 4 : Delegating

The leader turns over responsibility for decision-making and problem-solving subordinates

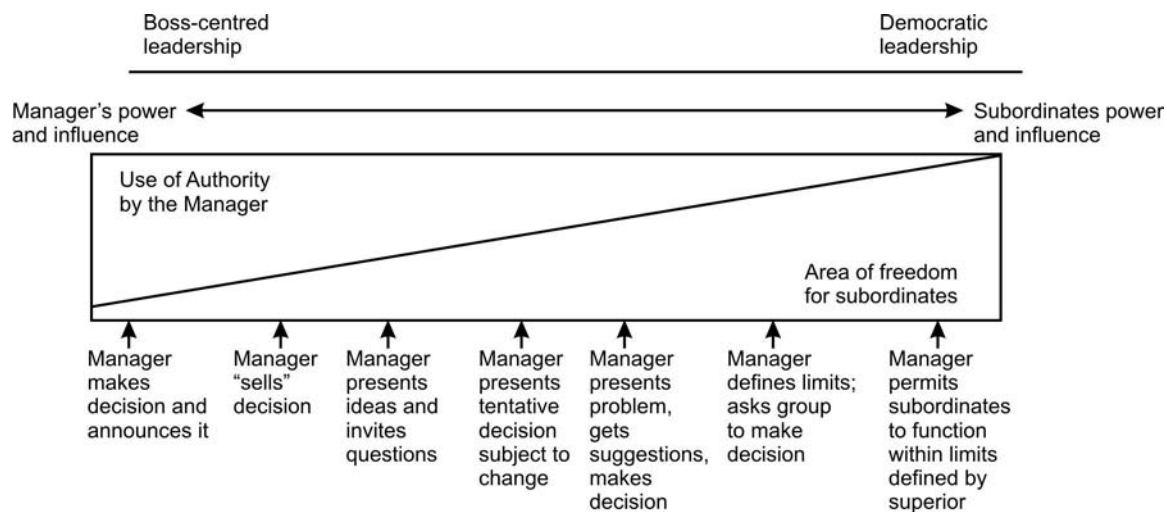


Fig. 10.2: Continuum of leader behaviour

communication, solicit some ideas and opinions from subordinates, and allow some delegations of decision making but with close control (Benevolent—authoritative style).

Leader behaviour style 3 (Supporting): These managers have substantial but not complete confidence and trust in subordinates, usually try to make constructive use of subordinates' ideas and opinions, use motivation rewards and some participation, engage in communication both down and up, make broad policy and general decisions at the top with specific decisions at lower levels and act consultatively in other ways (consultative leadership style).

Leader behaviour style 4 (Delegation): These managers have complete trust and confidence in subordinates in all matters, invite ideas and opinions from subordinates and constructively use them, engage in much communication down and up and with peers, encourage decision making throughout the organisation, and otherwise operate with themselves and their subordinates as a group (participative group leadership).

The above model was based upon the manager's concern for production (task oriented) and concern for people (relationships oriented). Having been basically derived from manufacturing and business organisations, it has limitations in its application to health care organisations because health care organisations differ in many aspects from other organisations, the most basic of the differences being commitment to the patients, and a varying mix of competencies that form the matrix of the organisation. The product of competency and commitment results into different development levels of followers, varying from D-1 to D-4. Substituting competence and commitment for "task" and "relationship" of the management grid, (Fig. 10.3) represents the leadership styles appropriate to various development levels of subordinates. In experience, those managers who apply style 3 and style 4 type of approach to their operations have the greatest success as leaders.

Leadership style is how you behave when you are trying to influence the performance of someone else. A desirable leadership style is a combination of directive and supportive behaviours.

Directive Behaviour

Involves : Clearly telling people what to do, how to do it, where to do it, and then closely supervising their performance.

Supportive Behaviour

Involves : Listening to people, providing support and encouragement for their efforts, and then facilitating their involvement in problem-solving and decision-making.

There are four leadership styles : Directing, Coaching, Supporting, and Delegating. But ... **There is No Single Best Leadership Style.**

Competence (High)	D-3 High competence Low commitment Supporting	D-4 High competence High commitment Delegating
	D-1 Low competence Low commitment Directing	D-2 Low competence High commitment Coaching
Competence (Low)	(Low)	(High)
	Commitment	

Fig. 10.3: Leadership style appropriate to various development levels of subordinates

INDUCTION AND TRAINING

Whether it is the new senior resident (who might have held a few appointments in some other hospitals earlier) or a newly appointed laboratory technician or a ward sister, all staff need some kind of induction or orientation to a new environment. A new entrant needs at least to be introduced to his colleagues and shown around the layout of his or her department. He or she will benefit from some understanding of how his or her particular job fits into the pattern of the whole organisation. Whatever be the form of induction—a talk, a tour around the hospital, tour of departments—the important thing is to assign this task to some person to carry it through.

Even though a department is hard-pressed for work, induction must not be put off or postponed. If induction is not done at the first instance, it is unlikely to be done the next day or the next week. The chance will have been missed of giving the new member the interest in his or her job that comes from a clear sense of belonging to an organisation of which he or she wants to become a part of.

Hospitals have been slow to recognise the need for either formal instruction or on-the-job training. Most staff members on appointment have traditionally been left to themselves to find out how they should do their jobs. Technologies and work methods change—for example, mops and pails have been superseded by floor washers and vacuum cleaners—but the worker is just "let-loose" on his or her business, regardless.

Many heads of the departments are well aware that their staff need proper training, but are not sure where the responsibility lies for ensuring that they get it. With constant

pressures for service, little or no time is left for organisation of the training which would help to ensure a more effective staff member.

There is no job in the hospital for which some sort of training is not beneficial. For example, pharmacists, nurses, technicians, have already acquired their basic craft training before they take up a job. Their immediate need will be to learn to adopt their knowledge and skills to the special requirements of the new hospital. Many of them, at intervals in their professional career, will also need refresher training and instruction in special aspects of their work.

This kind of training is now provided by various professional bodies. Now there are also available programmes or courses, conferences, and seminars designed to keep uptodate the knowledge and the skills of all types of workers. There are signs that hospital are learning the importance of training for all types of staff at every level, at several points throughout their working life.

But there is still a lack of training in supervision and management. During their service, workers move up into supervisory and managerial posts, largely on the basis of their superior professional skills, without any sort of preparation for their new role. The notion that running a department or section calls for appropriate attitudes, knowledge and skills is beginning to gain ground, but very slowly. There is also a strong case for introduction of training for hospital doctors in their management function at various stages of their career.

COMMUNICATION

Communication, although important in all aspects of management, is particularly important in the function of leading. Communication is defined as the transfer of information from the sender to the receiver with information being understood by the receiver. A hospital is a social system. Communication is the means by which social inputs

are fed into social systems. It is also the means by which behaviour is modified, change is affected and information is made productive. Communication is the force for influencing staff direction. Group activity is impossible without communication.

Purpose of Communication

In its broadest sense, the purpose of communication is to influence action towards the welfare of the organisation. The assimilation of information and actions in respons to it becomes more and more difficult as the size of operations enlarge.

Communication is essential for efficient internal functioning of the enterprise because it is needed:

- i. to disseminate goals and develop plans for their achievement
- ii. to organise resources in the most effective and efficient manner
- iii. to appraise and develop members of the organisation
- iv. to lead, direct, motivate and create a climate in which people want to contribute.

Communication is also essential for dealing with the external environment. Informational exchange permits health care organisations to become aware of the needs of patients and the concerns of the community. It is through communication that an organisation becomes an open system interacting with its environment.

Although every person in an organisation shares the responsibility for good communication, it is the organisational leaders who have a major responsibility to set the right direction and tone for effective communication.

Communication Process

Communication is a two way process in which every one is both an originator and receiver of communication (Fig. 10.4).

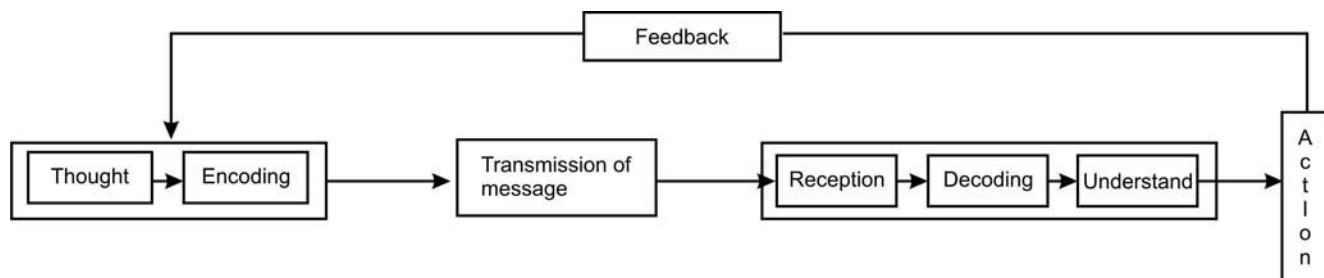


Fig. 10.4: Communication process

Components of the communication process are as follows.

Sender of the Message

Communication begins with the sender. He encodes a thought or idea in a way that the receiver can understand.

Transmission of Message

The information is then transmitted through different channels, viz. oral form, written memorandum, telephone, telegraph, fax or computer. Proper selection of the medium of media is vital for effective communication since there are many channels available.

Receiver of the Message

The receiver has to decode the information into thought for action. Accurate communication can only occur when both the sender and receiver attach the same or similar meaning to the message. Use of technical or complicated jargon may be misunderstood by the recipient of the message.

Feedback

To check the effectiveness of communication, feedback is essential. One can never be sure whether or not a message has been effectively encoded, transmitted, decoded or understood unless it is confirmed by feedback.

Communication Flow

In any organisation communication flows downward, upward and crosswise.

Downward Communication

(Flows from people at higher levels to those at the lower levels) During its flow from the top, information can often be lost or distorted as it comes down the chain of command. Since it has to follow the organisational hierarchy, downward flow of information through the different levels of organisation is time-consuming. Downward oral communication includes oral instructions, speeches, meetings and use of telephones. Written downward communication includes memoranda, letters, circulars, pamphlets, house journals, and bulletin boards.

Upward Communication

(Travel from subordinates upwards to superiors). However, this flow has a tendency to be hindered at various levels in the upward link. Usual means of upward communications

are reports and returns, the suggestion system, appeal procedure, complaint system, counselling session, group meetings, the practice of open-door policy and the “grapevine”. An effective upward communication system requires an environment in which subordinates should feel free to communicate.

Crosswise Communication

A great deal of communication cuts across the chain of command. Crosswise communication covers horizontal flow of information with people on same organisational level, and also diagonal flow with persons at different levels who have no direct reporting relationships. Many kinds of oral and written crosswise communication patterns are used to supplement the vertical flow of information. Oral crosswise communication ranges from informal meetings of various grapevine groups, formal conferences and committee meetings. Crosswise communication also occurs when members of staff, who have an advisory function, interact with line managers.

The type of written form of communication are the house-journal or magazine, published policies and procedures and bulletin boards.

Most of the communication in organisation is ineffective because it is usually one-way rather than two-way communication. One-way communication may have its own advantages like it is speedy, there is no fear of disagreement, it is impressive and business like, protects one’s power, makes work life simpler, but it is ineffective in the long run.

Communication Models: Written, Oral and Nonverbal

Written Communication

It can be read by a large audience, can promote uniformity in policy and procedure, and provides record. However, it has the disadvantage that it provides no immediate feedback. Consequently it may take a long time to know whether a message has been properly understood. A lot of effort is required for effective writing for communication. The communication matter has the danger of getting bogged down in complicated technical jargon.

Guidelines suggested for effective written communication are as follows.

- Use simple words and phrases
- Use short and familiar words
- Use short sentences and paragraphs

- Give illustrations and examples
- Use personal pronouns (such as “you”)
- Economise on adjectives.

Oral Communication

A large proportion of information, up to 70 per cent, is communicated orally. Oral communication can be face-to-face meetings. It can also be formal or informal.

The advantage of oral communication is it provides for speedy interchange, with immediate feedback. In a face-to-face interaction, the effect can be noted. However, oral communication does not always save time. Committees may be costly in terms of time.

Nonverbal Communication

It can reinforce verbal communication. This is achieved through gestures, facial expression and body-language. Frowns, disappointed looks, placing hands on hips represent gestures of super correctness of the authoritative — autocratic person. Attentive eye contact, active listening, a show of confidence reflect a mature person. Slouching, self-consciousness, laughter, wringing of hands reflect an immature personality. By these gestures and body-language, nonverbal communication may support or contradict verbal communication.

Written and oral communication both are often used to complement each other. In addition, visual aids may be used to supplement both oral and written communication. When a message is repeated through several media, it will be more accurately received, comprehended and recalled.

The Art of Listening

A good leader has to be a good listener. People want to be heard, to be taken seriously, to be understood. The art of listening requires reassessment of his listening habits by the manager. It is felt that many of us do not know how to listen well. Our biases enter into our listening habits. We may not like the way a speaker looks or his voice, and therefore, pay little attention to what he has to say.

Listening is a skill that can be developed. The following nine guidelines may improve an administrator’s listening skills.

1. **Physically show that you are ready to listen**, face the speaker and show attention.
2. **Ignore the speaker’s appearance or manner of delivery**: Be watchful of what people have to say, rather than how they say it or look.
3. **Watch your nonverbal communication**: Expressions, gestures and body-language convey or betray the

speaker’s sincerity and genuineness. Listen for underlying feelings.

4. **Keep your mind on what the speaker is saying**: Do not allow yourself to become distracted.
5. **Allow for your own bias**: You may not like what the speaker has to say. But you cannot always agree with everyone.
6. **Visualise the situation from the speaker’s point of view**: Try to see how the speaker has formulated his or her perceptions.
7. **Do not interrupt immediately if you hear an apparently wrong statement**: As the speaker continues this may not be so.
8. **Evaluate the logic and credibility of what you hear**: We can think four times faster than we can speak (or listen). Take advantage of this time-differential to simultaneously evaluate what the speaker is saying.
9. **Do not give your last word**: You need time to think about a problem from different angles before you communicate.

Guidelines for Effective Communication

Effective communication is essential to employee motivation, for desirable direction to organisational operations, for control and for direction. It is an important factor, influencing managerial effectiveness. The following guidelines will help managers become effective communicators.

1. **Clarify ideas before attempting to communicate**—gather your thoughts and collect facts.
2. **Eliminate unnecessary details**—make sure what is being communicated is necessary. Avoid information which people cannot use.
3. **Plan the organisational communications in consultation with all**—reporting facts needs a support from all.
4. **Establish two-way communication**—try to get feedback, ask questions, clarify doubts.
5. **Understand the other party’s frame of reference**—visualise the situation from their point of view.
6. **Follow-up**—appropriate action must follow every communication. Ensure it through feedback. Support communication with action.
7. **Be a good listener**—develop the art of listening well.

CONCLUSION

Administrators must know not only what is happening at various levels of the organisation internally and externally, but also why it is happening and its implications on organisation environment.

Effective communication will help in creating an internal environment and external relationship necessary for organisational effectiveness. In an atmosphere of open communication, the employees will be more committed to the organisation.

Promote a responsive communication climate where staff members feel comfortable in expressing their underlying reactions, attitudes and problems.

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CHAPTER

11

Controlling

INTRODUCTION

Controlling, one of the managerial functions, is the measurement and correction of the performance of subordinates in order to ensure that the enterprise objectives and plans are being accomplished. The responsibility for the exercise of control rests with every manager charged with execution of plans. Although the scope of control varies among managers, the top and upper level control is so emphasised that an erroneous impression is gained that little controlling is needed at lower levels.

Management control is defined as a process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of an organisation's objectives.

The primary purpose of control function is to ensure that the results, outputs, or organisational activity, i.e. the overall performance, corresponds to what is expected in each situation. It involves measuring the actual results against standards (expected results), and to take timely corrective actions if there are deviations.

Control presupposes two basic factors that are the prerequisites for any control system.

Controls are Based on Plans

Controls are based on plans. The more clear, complete and integrated the plans are, the more effective control can be. Managers cannot determine whether an organisational unit is accomplishing what is expected unless they first know what is expected.

Organisation Structure is Needed for Controls

One cannot know where the responsibility for deviations lies unless organisational responsibility is clear and definite. The more clear, more complete and more integrated the structure is, the control action is that much more effective. When controls are designed to reflect the level in the organisation where responsibility for action lies, when they will facilitate correction of deviation from plans.

THE BASIC CONTROL PROCESS

The basic control process, irrespective of the department or activity, is the same. It involves establishing standards, measuring the performance, and correcting deviations.

1. Establishing Standards

Basically, standards are criteria of performance, made to give managers signals as to how things are going without their having to watch every step. End results are the best measures of plan achievement, and therefore, excellent standards of control. End result may be stated in terms such as quantities of products, units of service, speed, volume of sales, costs, capital expenditure, or profits.

In health care, control standards can be broadly classified into "output controls" and "activity (or process) controls". Length of stay, bed occupancy, and number of outpatient visits per speciality are common examples. Other examples are revenue-to-expense ratio (to monitor financial viability), and utilisation of new service (to monitor growth). Standards can also be decided for programme implementation, resource

allocation and resource utilisation. Some examples of these are staff turnover rate, consumption of stores and material, equipment utilisation, inventory levels and payroll expenses.

Quality of care as monitored through quality assurance activities is an example of process (activity) control, reflective of the hospital's primary objective of quality patient care. Quality assurance is a critical control activity to ensure that patient care results are consistent with expectation and the processes associated with patient care are consistent with laid down procedures. Monitoring covers such parameters as utilisation review, lengths of stay, readmissions, infection control, surgery review, etc.

Intangible Standards

Where human relationships count in performance, it is hard to measure what is "good", "effective", or "efficient. Many managerial controls over interpersonal relationships must continue to be based upon intangible standards, considered judgements, trial and error and, on occasions, even hunch.

2. Measurement of Performance

Appraisal of actual performance becomes easy if means are available for determining exactly what subordinates are doing. In health care, there are many activities where it is difficult to develop accurate measures of performance. As jobs move away from routinised activities of the assembly line type (for example, mechanical laundry or CSSD), controlling then becomes more complex. Not only many standards are difficult to develop, but appraisal may also be equally difficult.

3. Correction of Deviations

Deviations in performance need correction. A negative deviation from standards is an indication that something is wrong, the cause of which should be examined. Correction of negative deviations in performance incorporates other managerial functions. Deviations are corrected by reappropriating organisational process through reassignment of duties, fuller explanation of the job, by additional staffing, or by better training of personnel. At times correction of deviations may need better directing and leading.

Apart from negative deviation, a positive deviation from standards may also suggest a problem. While this kind of performance may appear a happy matter, it is necessary to determine whether the positive deviation was a chance result or result of superior performance. Less than expected maintenance expenditure (and resultant budgeted saving)

may point to a capping of the preventive maintenance activities or not replacing sick equipment.

The control process is a combination of many actions in the management of an institution. The top management takes the following steps:

1. Get the entire staff to understand and agree to the objective and goals set up by the management. Provide performance standards to guide all personnel on a job-to-job basis.
2. Monitor current performance after objectives have been stated in measurable terms.
3. Compare performance results with objectives and goals.
4. Analyse causes of variance above or below the standards.
5. Decide corrective action where required. Management may decide to lower the objectives if objectives cannot be reached, or it may choose a different course of action to solve the problem and continue to fulfill the objectives.
6. Implement corrective action or new course of action.
7. Continue to monitor the results of the corrective/new action.

FORWARD ACTION

Many books on management teach that planning is looking forward, and control is looking backward. This is not necessarily true. To get a system back to its originally designed performance after correction of deviations may take a long time. This time lag in the control process demonstrates the need for future-directed control, if control is to be effective. What future managers will need for effective management control is a system of control that will tell them, in time, to take corrective action, that problems will occur if he does not do something about them *now*.

Managers recognise that they can exercise management control effectively only if they can see deviations coming in time to do something about them. For major problem areas, it should not be difficult to identify system input variables and to computerise the model. It would then be an easy matter to gather information on the inputs and ascertain periodically their effect on the desired end result.

CRITICAL CONTROL POINTS AND STANDARDS

In most operations, it is not possible for a manager to control through careful personal observation of the work being done, because of the complexity of operations and the fact that a manager has much more to do than personally observe performance.

The manager therefore can choose certain points for special attention. There are some critical points for the performance of the enterprise, which the manager watches and monitors to make sure that the whole operation is proceeding as planned. This is the principle of ‘critical-point control.’

In selecting critical points, the managers must seek answers to questions such as: what will best reflect the goals of my department? What will show me that these goals are not being met? What will best measure critical deviations?

Control and Management by Exception

The principle of “management by exception” is incorporated in the control function. For example, when the stores manager discovers that there is overspending on drugs and dressings by surgical department, he checks with the surgeon incharge to review it. There may be reason enough to justify it, for example, due to increase in the number of surgical operations than anticipated. If he can thus be alerted by signals to indicate when anything exceptional has occurred in any way the manager will at least know where to start looking to understand what might have gone wrong.

CONTROL TECHNIQUES

A variety of techniques are in use to help managers in their controlling function. It is interesting to note that all these techniques are also used as tools of planning. The task of control is to make plans succeed, and in doing so it reflects plans. Planning and control are being increasingly treated as an integrated system.

Some of the control techniques like the budget have been established for quite long and are quite traditional. There are others which are new but quite simple to use. However, some new generation techniques derived from the techniques in physical sciences, using mathematical and computing methods are quite complicated. A brief description of the techniques follows.

Budget: The Traditional Control Technique

Budget is Also a Plan

Budget, as a control device, is an extension of planning. After the planning and programming decision, the approved programme is translated into a totalled statement of monetary requirements and financial consequences—i.e. a budget package is prepared. As a planning function it can be used effectively in the control process, because a budget package:

- i. simulates a financial plan, and
- ii. acts as a standard to be referred to during the control process.

Concept and Purpose of Budgeting

Budgetary control is a way of checking that the hospital is not living beyond its means. It enables the enterprise to see on what its money is being spent, and whether on any particular item the expenditure to date is more or less than it ought to be. Evaluation of financial performance begins with an analysis of the operating budget plan (expectation) expressed in monitor terms. It is also used as a tool in controlling expenditure.

Many people do not understand how and why budgets must be based on plans. In fact, some enterprises, specially nonbusiness enterprises do attempt to develop budgets without knowing plans. But when they do so, money allocated to pay for salaries, office space, equipment and other expenses becomes a matter of negotiation between a top authority and managers in the enterprise. The usual result is that funds are not itemised and not allocated on the basis of what is really needed for accomplishing desired goals. Many of us have seen the kind of uncertainty and consequent “jockeying for position” in government and university budgeting. Only by having clear goals and action plans to accomplish them can any one in a top position of authority know how much money is necessary to do what is desired.¹

However, in many organisation, especially in the government sector, budgets are considered to be a necessary evil, to be prepared but not to be bothered about too much. An organisation’s financial health and in fact its ability to survive, is reflected in its adherence to the budget. The administrator should not only understand fully the budgeting process, but the budgeting process also needs his whole-hearted support.

Types of Budgets

There are many types of budgets and approaches to the budgeting process. These are classified into the following types: (i) revenue and expense budget, (ii) programme budgeting, (iii) zero based budgeting, and (iv) variable budgeting. (Also see The Hospital Budget on page 165).

Revenue and Expense Budget

By far the most common business budget, this budget spells out plans for revenues and operating expenses. It reflects the anticipated income from the sales of products and

services, by providing direct patient care. Although a hospital may get other operating and nonoperating revenues such as income from rentals, royalties or other miscellaneous sources, the revenue generated out of direct patient care furnishes the principal income to support operating expenses and yield profits. Patient service revenues generate from:

- i. providing “hotel” services, viz. bed, room, diet, housekeeping, etc.
- ii. providing professional and other support services, viz. X-rays, pathology, etc. to operating, and
- iii. providing professional and other supportive and ancillary services to outpatients.

Prediction of revenues can have an element of speculation even with good quality data. The net operating revenue is obtained by adding other sources of income to the net patient service revenue predicted. Patient service revenue is proportional to the volume of work anticipated.

Expense budgets can be as numerous as the expenses classifications in an enterprise, such as staff, labour, medical consumables, general stores, equipment, maintenance, rent, water, power, office supplies, travel, and many others. Sometimes the department head budgets only the major items, with other items lumped together in one control summary.

The process of developing expense budget requires an estimate of the department’s work load, and translation of the work load into resource requirements. The budgeting process should encourage department heads to offer the best estimate of the direct cost to operate their departments.

Revenue and expenses budgets can be prepared in relation to “responsibility centres” in the hospital. Examples of responsibility centres in a hospital are the various professional departments (medical, surgical, paediatrics, obstetrics and gynaecology, emergency, etc.), Supportive services departments (X-ray, laboratory, ECG, labour rooms, operation theatre, pharmacy), and ancillary services (dietary, laundry etc.). In a responsibility centre approach to budgeting, accounting systems have to be built around the responsibility structure of the hospital. Responsibility accounting is defined as “A system of accounting tailored to an organisation so that costs are accumulated and reported by centres of responsibility within the organisation”. Each of these centres of responsibility is charged only with the costs for which it is responsible and over which it has control.

Programme Budgeting

Programme budgeting is a means of providing a systematic method for allocating the resources in ways most effective

to meet the goals of the programme. By emphasising goals and the programmes to meet them, it overcomes the common weakness of being too tied down to the accounting periods. By concentrating on goals and programmes in the light of available resources, it puts stress on assessing costs against benefits in selecting the best course towards accomplishing programme goals.

Programme budgeting can be defined as a techniques for reaching strategic decisions on the institution’s programme structure, as well as on achieving a balance between the allocation of resources and the facility’s goals.’ For example, if an institution’s programme structure includes day surgery, management develops a budget for the identified problem and evaluates the relative costs and benefits of the several programme (day surgery) elements. After identifying the activities needed for each programme element, the management is in a position to allocate resources to achieve the goals.

Used primarily in government but applicable to any kind of enterprise, programme budgeting has not proved to be the great tool it was meant to be. The **first** reason for this is that many executives do not understand the philosophy and theory of the techniques, they only follow directives without really knowing what the system entails. The **second** hurdle has been the lack of clearly defined goals. The **third** difficulty is the lack of attention to planning premises; even with clear programme goals, the budgeter is in the dark without knowledge of critical planning premises. And **lastly**, accounting data are seldom consistent with programme budgeting, and there is lack of information in many areas to make meaningful cost- effective analyses. Accounting systems need modifications to fit programmes rather than line activities.

Zero-based Budgeting

Another type of budgeting which complements programme budgeting is zero-based budgeting. Zero-based budgeting differs from the traditional process in that it requires managers to defend their entire budget requests as opposed to the traditional budget approach, where managers are required only to justify the increased funding than the previous years.

The idea behind this technique is to divide enterprise programmes into “packages” consisting manpower and material goals, activities and the needed resources, and then to calculate costs for each package from the bottom up. By starting each programme budget from base zero, costs are calculated afresh. It obliges the managers to develop, evaluate and rank alternative approaches in achieving the goal of the unit for which they are responsible.

Zero-based budgeting involves three basic steps. In the first step, management identifies:

- i. the objectives and goals of the functional unit
- ii. the operational results required to achieve the stated goals
- iii. alternate approaches to achieve these goals
- iv. the outcomes and resource requirements associated with each approach.

In the second step, an evaluation of the approaches is carried out, by ranking of the alternatives, which in turn is based on cost-benefits or cost-effectiveness analysis.

In the third step, funding priorities are worked out by the management for each alternate approach, again based on cost-benefit or cost-effective analysis.

The initial ranking of expenditure alternatives is done at the level of managers responsible for specifying project parameters at the operational level. Thereafter, managers at successively higher levels of responsibility consolidate them and develop their own sets of priorities. Aggregating the subordinate's recommendation into final rankings of expenditure alternatives for the institutions is finally decided at the highest management level.

Variable or Flexible Budgeting

Flexible budgeting is a sophisticated method of budgeting which overcomes the shortcomings arising out of inflexibility in budgets. A **variable** budget is a budget that adjusts targeted levels of costs for changes in volume. These are designed to vary as the volume of service or some other measure of output varies.

A **flexible** or **sliding** budget is prepared where income and expenses may fluctuate greatly throughout the year. For a hospital, the budget is prepared for various levels of occupancy or capacity, for example, the income and expense might be budgeted for: (i) 60 per cent occupancy, (ii) 70 per cent occupancy, and (iii) 80 per cent occupancy. In such a budget, appropriate attention is given to fixed, variable and semivariable costs.

The variable budget is based upon an analysis of expense items to determine how individual costs should vary with volume of output. All costs are categorised into fixed and variable costs.

Fixed costs: Some costs do not vary with volume, particularly in a very short span. Examples of these costs are taxes, rental payments, depreciation, insurance, maintenance, and costs of keeping a minimum staff and other key personnel on a readiness to serve basis.

Variable costs: Costs that vary with volume of output range from those which are fully variable to those which are only slightly variable. Conceptual framework of variable budget is shown in Figure 11.1.

Before each category of cost can be related to volume, variable budget process must first determine a unit of measure (for example, percentage of occupancy) that reflects volume, to study the various categories of costs. Department heads are then asked to estimate the volume forecasts for the immediate future, from which is calculated the monetary amount of variable costs that make up the budget. Example of a variable budget for an out-patient department is shown in Figure 11.2.

Cost Behaviour

The *sine qua non* of variable budgeting is analysing the cost behaviour. The basic difference between variable and other budgets is that whereas other budgets are prepared at a given level of demand, variable budget permits management to evaluate the variance costs and demand, on an ongoing basis.²

The cost behaviour is analysed through:

- i. segregating the cost charged to various expenses into appropriate cost classification (i.e. fixed, or variable, and sometimes also semivariable). See Cost Finding on page 168.
- ii. statistical analysis of past data to determine how costs varied with volume in different categories of output.

Cost Accounting

In a standard cost accounting system, the costs recorded are predetermined or target costs. The standard cost system requires a process of comparison between actual with objectives (or targets), similar to that used in standard budgeting control.

In variable budgeting, the standard cost specification is the culmination of a series of cost analyses for varying volume of output and other studies to develop reliable standards.

The concept of fixed and variable costs in variable budget is explained in Figure 11.1.

The depiction in Figure 11.1 assumes that fixed costs will remain the same for an occupancy rate of 82 per cent or below. But in practice this may cover a range, say 75 to 85 per cent. If it was less than 75 per cent, a different variable budget would be required, with the level of fixed cost worked out suitably for the lower occupancy volume. If it were more than 85 per cent, another variable budget

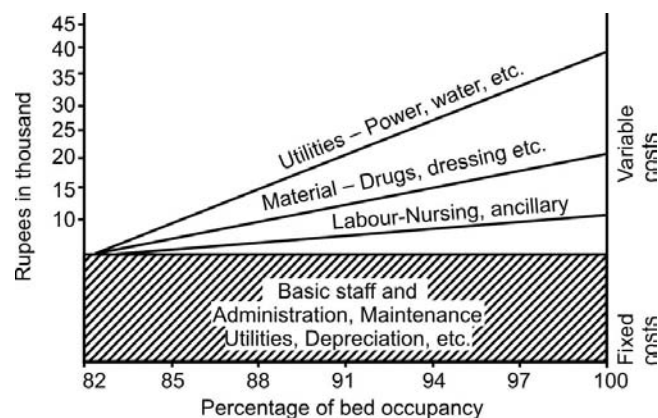


Fig. 11.1: Variable budget

would be necessary to reflect the level of fixed costs necessitated by a larger volume of operation. An example of variable budget resulting from such an analysis is shown in Table 11.1.

Hospital management must evaluate the advantages of variable budgeting programme before implementing the same. To start with, management may select one department as a pilot project, keeping in mind the fact that variable budgeting is only possible if the requirements mentioned below are fulfilled.

1. A well-documented organisation structure
2. Formalised delegation of authority
3. Effective responsibility—accounting system
4. An environment conducive to participative management
5. Effective communication among all management personnel.

Other Control Techniques

Apart from the budget, there are other control techniques some of which are used as a routine, the others being used in special circumstances. Among the first, statistical data and special reports are quite common. Break-even analysis and operational audit are the two other methods.

Statistical Reports

A clear presentation of statistical reports relating to the different aspects of hospital operations are important for control. Many hospital's operating indicators include number of admissions, patient days, outpatient service visits, departmentwise tests or procedures. Statistical reports that break costs, hours, etc. down to a workload basis are easy to relate to a unit of service (say a procedure, e.g. appendectomy), a patient day, or a test, (e.g. a complete haemogram). Other statistics that can be considered are major/minor procedures per patient day, salary expense per procedure, consumables expenses per procedure, or total expenses per patient day. The reports can be compared to similar reports of previous months, quarter or year.

Information presented on statistical reports should be tailored to fit the needs of the individual hospital. Most managers understand statistical data when it is presented in chart form rather than in tabular form. Needless to add, if data are to be meaningful, they should be presented in such a way that comparison to some standards can be made.

Special reports and analyses can help in particular problem areas as and when required. Their very nonroutine

Table 11.1: Example of a variable budget for outpatient department

Items of expenses	Monthly earnings from outpatient department								
	Volume of operations (No. of patients)								
	600	650	700	750	800	850			
Monthly earnings (Rs. 000's)	55	59	64	73	82	90			
Variable costs									
Labour (additional doctors, nurse, aides)	—	—	—	4	4	5	5	7	7
Dispensary, pathology, X-ray, injection room	—	—	—	8	10	12	14	16	18
Overhead costs	—	—	—	18	19	20	21	40	23
				30	33	37	40	63	48
Fixed costs									
Staff	—	—	—	12	12	12	14	14	16
Administrative costs	—	—	—	6	6	6	7	8	8
Maintenance	—	—	—	5	5	5	5	5	5
Total costs:				53	56	60	66	90	77
Profit from operation:				2	3	4	7	9	11

nature can highlight the unusual and reveal opportunities for significant improvement in operations.

Break-even Analysis

Break-even point analysis, an interesting control device, analyses the relationship between revenue and expenses in such a way as to show at what volume of output revenues exactly cover expenses. At a lesser volume of output, the institution (or department) would suffer a loss, at a greater volume it would generate profit.

- The use of break-even concept presupposes that all costs are classified as either fixed or variable. Break-even point analysis is generally depicted on a chart. Figure 11.2 shows a graphic representation of the break-even point.

In the example shown in the above figure, the level of revenue and expenses for each volume of output is depicted. Break-even charges are Rs. 1,50,000/- or 10,000/- output units. The hospital will break-even at 10,000/- units of output at Rs. 15/- per unit. At any lesser volume, the hospital would suffer a loss, at a greater volume, it will enjoy a profit.

- A break-even analysis is often confused with variable budget, because the charts look similar. The variable budget has as its purpose the control of costs, whileas the break-even chart has as its purpose the prediction of profit. This necessitates incorporating in it the revenue data. Secondly, the break-even analysis is used to

determine the probability of a given course of action as compared with alternatives.

- It emphasises the marginal concept, i.e. the effect of additional sales (or units of output) or costs on profit. Break-even analysis is useful in rate-setting, staffing and other market methods.

Carrying out break-even analysis

Break-even analysis is also known as ‘Cost-volume-profit’ analysis. The difference between the two is very narrow. Cost-volume-profit analysis includes the entire process of profit planning while the break-even analysis is the technique to study this process. Break-even point is the level of output (and sales) at which there shall be neither profit nor loss. In other words it is the point where revenue and expenditure balance each other.

$$\begin{aligned} \text{Break even point 'Q'} \\ &= \text{Fixed cost divided by selling price per unit minus} \\ &\quad \text{variable cost per unit} \end{aligned}$$

$$= \frac{FC}{P - VC}$$

where Q: Qty. produced and sold
 P: Sale price per unit
 FC: Fixed cost
 VC: Variable cost per unit

Costing of various services and departmental accounting is the base on which the structure of break-even analysis stands. A cost centre is the fulcrum for such analysis. Let us take the example of imaging department as a cost centre. With the number of investigations done (sonography test) in the imaging department the income is known. On the basis of departmental accounting the revenue and expenditure of the imaging department can also be ascertained. To find out whether the sonography section is financially viable, work out the fixed and variable cost of the section. By dividing the total cost by the number of investigations (sonography tests) done during a specific period we get the cost of an investigation, i.e. cost per unit. The selling price of an investigation is also known. From the above equation it is possible to know the exact point from where one can start making profit.

Let us assume the figures as: Fixed costs = Rs. 32,00,000; variable costs per unit = Rs. 200 and the selling price = Rs. 1000. Break-even point = 32,00,000 divided by (1000 minus 200) = 4,000 units. That means when the number of investigations reach 4,000 units (tests) the break-even point is reached. If the total number of investigations increase

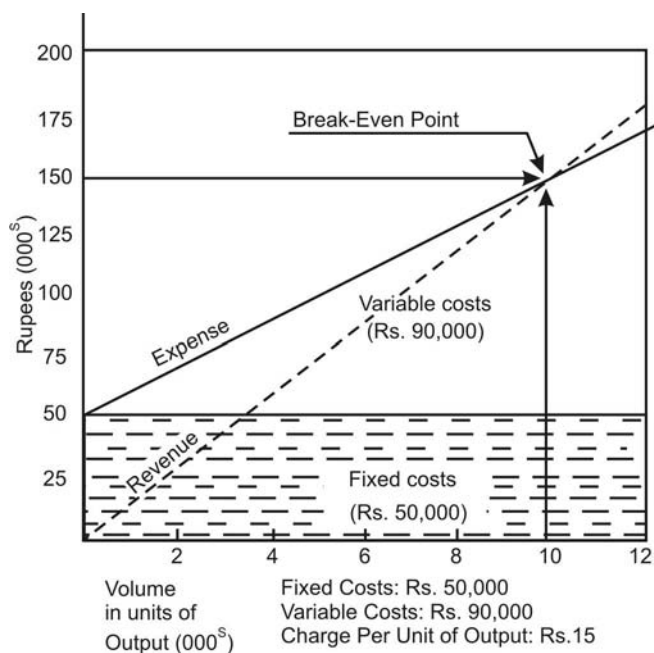


Fig. 11.2: Break-even analysis

beyond 4,000 then there shall be profit and if it falls below 4,000 then there shall be loss.

It will be easier to understand this from the Table 11.2. The bold row is the break-even point.

<i>No. of units (Sonography tests)</i>	<i>Fixed cost Rs.</i>	<i>Variable cost Rs.</i>	<i>Total cost Rs.</i>	<i>Revenue Rs.</i>
1,000	32,00,000	2,00,000	34,00,000	10,00,000
2,000	32,00,000	4,00,000	36,00,000	20,00,000
3,000	32,00,000	6,00,000	38,00,000	30,00,000
4,000	32,00,000	8,00,000	40,00,000	40,00,000
5,000	32,00,000	10,00,000	42,00,000	50,00,000

Cost-volume-profit analysis is a valuable tool for profit planning. It forecasts the level of profit quite accurately.

Operational or Internal Audit

One more tool used in management control is operational audit, also referred to as internal audit, which is the regular appraisal of the accounting, functional and other operations of an institution. Although mostly limited to auditing of accounts, operational auditing involves appraisal of all operations of the enterprise in general. Thus, operational auditors also apprise policies, procedures, use of authority, quality of management, effectiveness of methods and special problems.

Although internal auditing concentrates most on accounts, and brushes up other aspects of hospital operations in passing, there is no reason why the concept of operational auditing should not be broadened in practice. One of the limiting factors is the difficulty of obtaining people who can do such a comprehensive audit. Internal auditors must have a firm grasp on hospital administrative functions and responsibilities, to be able to assist administrators. The second limitations is that while personnel responsible for accounts have learn to accept audit, those who are responsible for execution of plans, programmes, policies and procedures have not so readily learnt to accept the idea.

Where the auditors are conversant with hospital management essentials and the institution's policies and plans, they have immensely assisted hospital managers by raising questions about operations which had never been raised by management because of preoccupation with routine work.

Internal auditors fulfil this function because of their professional experience and understanding of hospital administration, their independence and objectivity and ability to look across operational departments. Internal auditors

have the advantage of intimate knowledge of the organisation, the data sources, the people and the needs of decision makers. Being part of the organisation they can move freely checking the activities without creating much notice.

When auditors programme evaluators are from outside the organisation, the external evaluator's reputation may increase the weight given to evaluation findings. However, in their effort to "put their best foot forward" the staff may conceal some undesirable information. The staff needs to be mentally prepared first, to accept external auditing.

The areas of the applications of operational audit cover the following:

1. Appraising the soundness and adequacy of financial and operational controls
2. Appraising compliance by the workers with the hospital's policies and procedures.
3. Appraising the safeguarding of hospital assets.
4. Evaluating accuracy, reliability and completeness of information systems.
5. Appraising the quality of personnel and management's performance.

Since an internal audit programme appraise elements that exist in most departments and functions, auditors review the same points across departments. A list of the control checkpoints for internal auditing covers the following.

Organisation

- Is there any organisation chart?
- Are authority and responsibility relationships indicated clearly?
- Are interdepartmental relationships clear and satisfactory?
- Are departmental controls existing and being used?
- Do reports and records generated by departments meet management requirements.

Goals and Objectives

- Have clear goals and objectives been provided in writing?
- Are the goals and objectives understood at the operational level? Are they in harmony with those of the hospital's?
- Are departmental plans committed to writing and understood by all?
- Do the end results corroborate with goals and objectives?

Policies and Procedures

- Have policies been committed to writing and disseminated to all departments?
- Are they being followed in letter and spirit?

- Are the policies revised with changing needs?
- Are departmental policies in harmony with those of the hospital's?
- Have procedures for routinised work been committed to writing?
- Are procedures followed correctly?

Staffing and Supervision

- Are departments staffed with adequate number of employees to handle work?
- Are job descriptions laid down for different positions?
- How good is employee morale?
- Is there undue absenteeism or turnover?
- Are the workers qualified for each job?
- Are schemes for training and retraining of staff satisfactory?
- Is the work at operational level supervised adequately?
- Are there adequate supervisory positions ?

Physical Facilities

- Are the physical facilities adequate for location, space?
- Is the department adequately equipped? Are equipment in working order?
- Does the arrangement of workers and space for patients promote efficiency of operations ?
- Is maintenance of physical facilities and equipment adequate?

Programme Evaluation and Review Technique (PERT)

PERT evolved from the basic concept of using a time:events network analysis. Critical path analysis, or network analysis, is the generic term used for methods of planning and controlling projects, by use of a chart depicting a network of activities and events and their interdependence. By an elaborate definition of elements of the project and establishing the time necessary to achieve them, an accurate conclusion can be reached on the completion time, and factors that are critical to meeting the time schedule emerge from the network.

The main elements of PERT are “activities” and “events”.

1. An activity is a factor which takes time to complete, and usually demands resources. An event is a notional point in time at which one set of activity gives way to another.

2. The important point is that no activity subsequent to an event can begin, until all activities before that event have been completed.

The symbols used to indicate events on the chart incorporate the earliest and the latest dates on which the events can take place.

3. The longest pathway (in terms of elapsed time) between events is the critical path. It is used variously as a planning, scheduling, organising, coordinating and controlling technique.

Briefly, the PERT concept requires:

- Setting of objectives
- Designating sequence of events, or activities, to attain goals
- Monitoring and control over the progress of the entire project to ensure completion as scheduled

PERT, which is a planning, scheduling, organising, coordinating and controlling makes a number of important assumptions which form the basis for its successful adaptation:

1. Some activities must occur or be completed before others can start. (Before putting a roof on a new facility, the walls must be in place).
2. Some activities take longer to accomplish than others and therefore should start sooner. (It may take longer to get delivery of an equipment from abroad).
3. Some activities can occur concurrently. (Flooring, doors and windows can be installed at the same time).
4. It is possible to re-allocate or reassign some resources from one activity to another in order to avoid postponing the projected completion date. (Workers can be sent to pick up needed supplies rather than waiting for delivery next week).

The Figure 11.3 is a simple example of a PERT network prepared for planning a get-together function for a group of hospitals to felicitate outstanding hospital personnel.

In this example each step in the process is indicated by circled letters A to I. The first thing to do is to announce the start of the project. Once that is accomplished, a number of other separate sequential tasks can be planned – as shown by the three tracks, A-B-C-D-I, C-E-I, and A-F-G-H-I. The numbers that appear between the lettered steps represent the estimated time (in weeks) it will take to complete each separate task along that particular track. For example, the number 2 between A and B means that 2 weeks are allocated for selecting a time and site for the get-together function

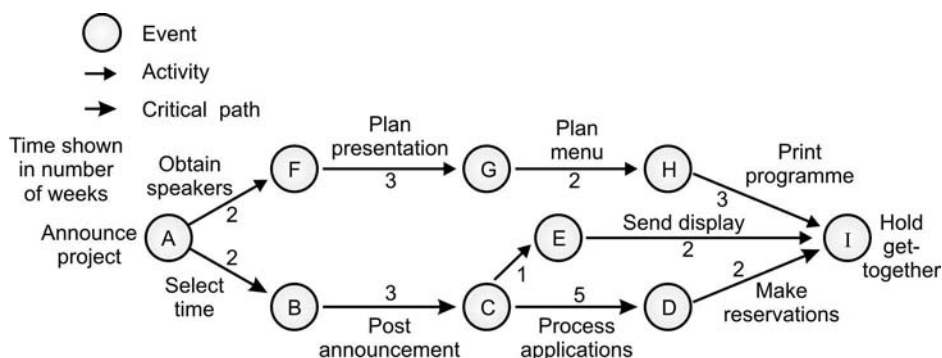


Fig. 11.3: PERT network

from the starting date of the project. Posting of announcements should be completed in 3 weeks, moving along from B to C. Because the track A through I takes 12 weeks and thus more than A-F-G-H (10 weeks) or A-B-C-E-I (8 weeks), it becomes the “critical path”. Any delay along this longest track will cause a postponement of the function (I). For instance, if the announcements are sent out on the fourth, rather than the third week, the whole project will be delayed by one week. Thus, in order to keep on schedule, the announcement must be posted during the third week. As noted above, A-F-G-H-I required only 10 weeks and therefore two extra weeks, called *slack*, are available along this track. This means the activities along this route or network can be delayed by as much as two weeks without affecting the date set for the function. Similarly H, which is scheduled for the seventh week, need not begin until the ninth week.

The flexibility or rescheduling capability for this PERT is shown in Table 11.3. By subtracting the “schedule time” from the “latest start time”, the amount of available slack time is determined.

Table 11.3: PERT activity

Activity	Scheduled time		Latest time		Slack time
	Start	End	Start	End	
A-B Select Sites	0	2	0	2	0
B-C Mail Announcements	2	5	2	5	0
C-D Process Applications	5	10	5	10	0
D-I Make Reservations	10	12	10	12	0
A-F Obtain Speakers	0	2	2	4	2
F-G Plan Special Presentation	2	4	4	6	2
G-H Plan Menu	4	7	6	9	2
H-I Print Programme	7	10	9	12	2
C-E Prepare Display	5	6	9	10	4
E-I Ship Displays	6	8	10	12	4

Another important aspect of PERT should be mentioned. In the event that a blockage causes a delay along the critical path, or for the matter any other track, it is not necessary to accept the condition and announce a new later completion date, or go into a crisis situation by hiring new resources or authorising double overtime pay. It may be quite possible to transfer or shift some existing resources from a networking having slack to the one experiencing difficulty. This procedure assumes that the resources are mobile and capable of performing the required functions. This kind of action includes moving people or equipment or both.

In summary, the following are the benefits of using PERT as a management tool:

- Provides logical and visible sequence of activities.
- Schedules activities in accordance with a predetermined completion date.
- Communicates the present status of a project and thus allows for evaluation and necessary remedial actions.
- Indicates the existence of available slacks time, which allows shifting rather than employing additional resources.
- Allows for coordination and integration of a number of activities toward attaining a common objective.
- Pinpoints responsibility and problems.

EFFECTIVE CONTROLLING

1. **The system of control fails in practice because either it is not comprehensible to the people or appears to be too complex.** If controls are of the type that managers and subordinates will not understand, then they will not be useful.
2. Managers receive or pass on information in the form of charts, graphs, and similar forms. **The important thing is to ensure that people get and understand the information they need.** Some computer experts fail

to communicate the meaning of their control data. Such information will not be used because it is not simple enough or adopted even to managerial needs.

3. In developing the structure and process for the control function, it should also be remembered that the **control system can induce undesirable behaviour patterns**, or have elements that may lead to unintended behavioural effect.
4. Managers may waste their times concentrating on trivials most of the time, **instead of concentrating on developing controls designed to point out exceptions. And while it is not just enough to look for exceptions, we fail to look for them at critical points.**

Attitudes Toward Control

The power structure in hospital is such that management often finds its hands tied. Many decisions geared toward

improving efficiency or ensuring compliance with standards often involves a perceived sacrifice by physicians and other professionals. Confrontation between administrators and the medical staff are often one-sided. Trustees may feel that administrators are easier to replace than medical staff. Since efficient behaviour is neither rewarded nor does the system as yet demand efficient management, the route of choice is often the route of minimum resistance. Without clear directives and support by hospital boards, this cannot and will not change.³

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CHAPTER

12

Financial Management

INTRODUCTION

Hospital costs to patient are rising to unprecedented heights, and the estimates of expenses always seems to be higher than the income generated. Even though in most hospitals the methods for efficient financial and cost administration seems to take a back seat, there is a gradual realisation to have them introduced for making the services more cost efficient.

Financial management is much more than the routine accounting or maintenance of books of accounts. Good financial management covers financial information, financial advice, cost analysis and cost control.

For the administrator, making financial decisions is not easy. He is the man in the middle, wedged between the trustees and the medical staff. The trustees hold him responsible for the solvency of the institution, and the medical staff holds him responsible for maintaining a state of efficiency that contributes to the quality of services. As a result, he is absolutely dependant on sound reporting from his financial officer. The financial officer's responsibility virtually parallels that of the administrator. The modern institution may have as many as 20 or 30 independently organised revenue centres. The financial system may have to track as many as 2000 billable items and maintain an inventory that runs to a several thousand items.¹

Responsibility of financial management covers:

- i. estimates of income and expenditure
- ii. methodical recording of income and expenditure (accounting)
- iii. stores records and accounts
- iv. inventory records and accounts

- v. cost accounting and value analysis
- vi. generate periodical reports and returns of accounts
- vii. budget formation and budgetary control
- viii. salary and wage administration
- ix. organisation of financial procedures
- x. maintaining creditors and debtors accounts
- xi. financial statistics and management information
- xii. establishment of cost and revenue centres
- xiii. review of new projects and investments.

Even though the primary responsibility of financial management rests with the finance officer, the basic knowledge about finance, capital, costs and budget is essential for the hospital administrator.

Financial Planning

Financial planning, a much talked about aspect of planning, does not receive the serious attention it deserves, as evidenced from the fact that a majority of hospitals have only the annual budget, but do not have long-term plans. Financial planning should begin with an analysis of trend. This analysis should cover both the external analysis covering actual and potential opportunities, and internal organisational analysis covering the hospital's limitations, strengths, utilisation and financial performance. In long-range planning, projections of future work loads and activities must be done as realistically as possible.

The hospital should ask itself—are the current financial resources and income capable of supporting its operations? How are the programmes likely to be operated in the future due to changing technology, service mix or clientele characteristics? Are there any anticipated external

happenings which will change what the hospital is offering now? Is the hospital willing to offer new services or reach new clientele groups? Would the hospital be willing to make the necessary changes in structure, programmes or facilities?

From observing the budgeting process and techniques of a large number of hospitals, it appears that they are not motivated to develop technically efficient budgets. The net results are widespread increase in costs without any type of effective regulatory mechanism. In many cases, no real review of existing programmes is undertaken. So the current budget represents a repetition of previous year's budget.

Capital

Financing of ongoing activities, expansion of existing services, acquiring new technology, and equipment and manpower financing are the broad areas—among others—where funds are required by hospitals.

There will be various sources for acquisition of capital required by hospitals. Capital formation is the process of securing long-term capital in the form of debt or as equity. It is a process involving a continuous assessment of the long-term sources of finance and the appropriate mix of investment options.

Current trends indicate that hospitals are increasing the capital intensity of their services by such measures as expanding the scope of outpatient facilities, upgrading the quality of intensive care services, modernising the facilities more frequently, and employing the latest technological innovations.

Besides the capital going into construction costs of new projects, almost 25 per cent goes for financial reserves for paying interests during construction and to meet the hospital's initial working needs. An understanding of the notion of "return on investment" which was lacking in the medical care field till lately, is now gradually building up. It has equal relevance in the nonprofit voluntary hospitals as in corporate hospitals. The surplus generated in the operations of the hospital is reinvested in new or expanded services, and a successful hospital is one that can demonstrate a long history of adding to the comprehensiveness of available services. This is as much a return on investment as paying dividend to stockholders in a business organisation. In this case, the return is in the form of services rather than money.¹

It is argued that the sale of medical care as a commodity makes it unavailable to the poor who need it most, and causes damage to the science and art of medicine by making its practitioners tradesmen instead of members of a liberal

profession interested in the wellbeing of man.² On the other hand, the State has been unable to fully bear the medical care costs.

Due to constantly rising costs of medical care, funding and financing is getting difficult. Would it be possible for the State alone? The budget needed to operate the hospital system alone may absorb up to 2 to 3 per cent of the GNP which almost equals the total budget of the entire health services. It is apparent that the funding of hospitals in future has to depend increasingly on nongovernmental sources. The sources would like—

1. To earn revenue just enough to cover total expenses—financially autonomous organisations running the hospital on no-profit no-loss basis.
2. To estimate costs and earn revenue over and above costs—financially autonomous concern making profit (services priced in advance).
3. Revenue collected by government authority which takes over the budget and covers deficit by subsidies.

There is a need to channelise the ability of a large part of the (urban) population to choose and pay for services. Private hospitals and nursing homes are exploiting this ability in most of the towns and cities, benefitting individual patients. Needless to say, the cost of care has to be high, and obviously those who utilise such services can afford to pay for them without assistance.

However, a great number of patients who are willing to pay for services would like their burden to be eased out to certain extent, possibly through pooling of costs or on a prepayment basis. Hospitals should try to explore the possibility of financing their operations through these methods for nonorganised sector of society.

Investor-owned companies are posing a challenge to nonprofit organisations and community hospitals in USA, where profit making companies who believe that medicine is a calling for businessmen as well as doctors, now own or manage more than 20 per cent of all US hospitals. Such companies are also moving into affiliated areas such as health maintenance organisations, satellite clinics and neighbourhood clinics providing services and procedures that do not require hospitalisation. It is of interest to note that the revenues of the Hospital Corporation of America, one of the biggest chains, is in the region of over \$ 8 billion and the profits of Humana, another corporate-owned conglomerate having 91 hospitals in 22 states, ran over \$ 200 million in profit.

Financial Feasibility

Financial feasibility means structuring a financial package so that an institution can secure full financing for a proposed

project and can then, over the useful life of the project, repay any debt incurred in constructing the project while, at the same time, meeting full operating costs.

Whenever there is a need for borrowing capital for starting a new hospital project or adding new services, a financial feasibility study becomes a must. The study should consider the market environment, and the market share that the proposed hospital can capture. The focus will be on whether the estimated utilisation/demand is sufficient to support the required level of debt the hospital is going to incur in financing the project, over the useful life of the project.

CAUSES OF RISE IN HOSPITAL EXPENDITURE

The general rise in market costs of almost all commodities and utilities has also had its effect on hospital expenditures. There are no signs of the rising inflationary trend being reversed. Apart from this around rise in costs, there are other reasons which account for growing hospital expenditures.

The Changing Character of Services

Where physicians could do with only a few tests in diagnosing and treating a case, the trend has shifted to ordering more investigations and workups. Hospitals not only add service, but they also deliver the existing ones more frequently. The number of tests and investigations have more than doubled both for inpatients and outpatients. Physicians, by virtue of their monopoly on decisions relating to type and intensity of care, ordering of investigative procedures and prescriptions and adoption of sophisticated technology have a significant role in cost aggravation.

Lack of Commitment

In government run hospitals, there is no commitment or motivation to lower the costs at any level. Few doctors have sufficient information as to whether services delivered by a hospital are worth their costs, or how much does it cost to provide a particular service. There are hardly any incentives for doctors and others to cut costs.

Technology Development

Adoption of “latest” technologies has also contributed to rising hospital costs. In many instances, new technology is often embodied in new services that are additional to, rather

than replacement for, existing services. Consequently, new technology often increases the utilisation as well as intensity of hospital care, two important factors in the growth of expenditure by hospitals.

Changing Health Status

If, on one hand, control of some of the communicable diseases has resulted in lower burden on hospital costs, on the other hand the “lifestyle” diseases like cardiovascular and metabolic disorders have brought in changes in the utilisation and intensity of medical care.

Increasing Proliferation of Specialists

The rate of referrals to specialists and superspecialists has considerably risen. Referrals are now ordered at the slightest pretext.

Defensive Medicine

With introduction of measures for consumer protection, the tendency for doing extra workups on patients has risen for fear of consumer action. While as the fear may only be imaginary.

Lack of Awareness of Economy and Productivity

Concept of service has been the dominant principle around which hospitals have traditionally developed. Economy and productivity have not really been major concerns.

Reimbursing Practices

Employers paying to hospitals for their workers’ medical care have no way to know whether tests and treatment are justifiably billed by hospitals. So is the case with patients covered under health insurance. In fact hospitals get tempted to over-investigate or overtreat patients for whom third party payments are received.

More Costly Facilities

Proliferation of new investor-owned hospitals almost invariably has costly facilities.

GLOSSARY OF FINANCIAL TERMS

Asset

What the hospital owns in the form of buildings, land properties, goods, machinery, equipment, vehicles, cash, investments and materials.

Account Payable

When supplies, materials or services are brought on credit by the hospital, the amount becomes payable at a later date. The amount due is entered into the “sundry creditor” account.

Accounts Receivable

When patients do not clear their bills on presentation, they have to pay the same at a later date. Similarly certain patients’ bills are paid by their employers or by the insurance company if the patient is covered by medical insurance. As the amount of bill is not received by the hospital immediately, the amount becomes “receivable” at a later date. If all patients pay their bills on discharge from hospital, this eliminates the need to maintain an accounts receivable ledger of discharged patients.

Accrual Accounting

To accrue means to bring together, come in addition.

Accrual accounting system recognises all revenues earned, even though cash is not received, and all expenses incurred during the time period, even though payment is not made. Accrual system of accounting provides completeness, accuracy and meaningfulness in accounting data, as against cash accounting.

Average Cost

The cost per unit of output (total costs divided by total number of units of output). Also known as unit costs.

Balance Sheet

Balance sheet is a document which gives a picture of the assets and liabilities and represents the financial position of an institution on a particular date. It reflects what the institution owns and what it owes. Total figures are given against each classification of main accounts.

Benefit-cost Ratio

Total discounted benefits divided by total discounted costs. The outcome should be greater than 1 for an investment to be potentially worthwhile.

Book Keeping

Book keeping is a systematic method of recording financial transactions in the “books of accounts”. The methods of book keeping in hospitals differs from that in other businesses

because of complex interrelationship of departments to each other. Proper book keeping enables the administration to ascertain at any time the financial position of the hospitals in relation to amounts owing to creditors, amounts by debtors, amount and nature of assets, the amount and nature of liabilities, amount of gains or losses during a given period, and the amount of its capital.

Budget

Hospital budgeting is the process of estimating proposed expenditures and the means of financing these expenditures. A budget is an operational plan (expectation) expressed in monetary terms. The budgetary plan incorporates the operating budget (estimates of monetary flow requirements and the sources of funds for the budget period).

Budgetary Control

Budgetary control is establishing checks and balances to ensure that the institution is not living beyond its means. It is the establishment of budgets relating to responsibilities of executives to the requirements of a policy, and the continuous comparison of actuals with budgeted results to secure the objectives or to provide a basis for revision.

Cash Accounting

Under the cash accounting system, revenues are recognised only when cash is received, expenses and assets items are not recorded until cash is disbursed for them. This system produces an operating statement which is a summary of all cash receipts and payments, and a balance sheet that does not reflect the correct position, since assets acquired and liabilities are not recorded. As such, the cash basis of accounting is misleading for reporting financial and cost data (See accrual accounting).

Capital Expenditure

Expenditure incurred for acquisition of assets of a permanent or long-standing nature.

Chart of Accounts

Chart of accounts is a listing of account titles with numerical symbols used for compilation of data concerning assets, liabilities, revenues and expenses. Its main purpose is to provide a planned segregation of business transactions.

Charge Slips

Charge slips are sort of bills for items or sources consumed by ward patients and pertain to drugs, X-ray, laboratory,

operations, etc. Charge slips are prepared by the ward and sent to the billing office in respect of every patient. These are then valued and debited to the patient's account every day.

Cost

What has to be given-up to achieve something. Either:

- a. the value of the benefits which are forgone in order to achieve something (the economic definition); or
- b. the total money expenditure required to achieve something (the accounting definition).

Cost Finding

Calculating the cost of service, procedure, or test for determining profitability of a specific revenue centre, and for rate setting.

Depreciation

A notional loss suffered by a fixed asset on account of wear and tear and ageing. This loss is reflected as an expense.

Income and Expenditure Statement

Income and expenditure statement reflects the state of hospital finances for a stated period. Only a broad classification of accounts is given. Income and expenditure can be worked out departmentwise or for the hospital as a whole.

Liabilities

How much the hospital owes. Liabilities are the second aspect of a balance sheet, the first being assets.

Marginal Cost

The change in total cost at a given scale of output when a little more or a little less output is produced. This concept of marginality can also apply to benefit, value, income, production, etc.

Operating Cost

Operating cost is also called recurrent costs—the cost of operating an enterprise or service, i.e. those costs of providing a service that vary with the level of output (e.g. drugs) in contrast to those which are fixed over a given time period (e.g. capital costs). Usually calculated on an annual basis.

Overheads

The costs pertaining to general services (e.g. administration) which do not necessarily arise from the operation of a given programme.

Prepaid Expenses

Payment made towards expenses such as insurance and taxes, covering a period beyond the accounting period. To the extent it does not relate to current year, it is treated as a prepaid expense and classified as an asset.

Revenue Centres

Revenues are recorded in such a manner that it permits identification with an organisational unit which produces the revenue. Revenue centres becomes the basis for establishing pricing structure and preparing patient charges. Revenue centres are broadly classified into routine medical care services (medical, paediatric, obstetric, etc.), Professional services (operation room, delivery room, emergency, etc.) and other services (radiology, laboratory, physiotherapy, etc.).

Revenue Expenditure

Expenditure incurred for goods or services for running the hospital (i.e. for earning the revenue), such as salaries, consumable materials, drugs, supplies, repairs, etc. is classified as revenue expenditure.

Standard Cost

Standard cost is an estimated cost, predetermined in advance of production or supply of an item or service. It is determined by correlation of materials and labour costs, and apportionment of overhead expenses.

REVENUE CENTRES AND COST CENTRES

Establishment of revenue centres forms the starting point of hospital accounting system. Patient revenues are recorded in a manner that permits identification with organisational units which produces the revenue, and can be divided into inpatient and outpatient. Revenue centres becomes the basis for establishing pricing structures and preparing patient charges. Identification of appropriate revenue centre is essential to good financial management.

Revenue Centres

In a hospital there can be numerous revenue centres, but these can be classified into:

- i. daily patient service—e.g. medical, surgical, paediatric, obstetrics, outpatients, intensive care, etc.
- ii. professional service—operating rooms, delivery suite, emergency and casualty
- iii. technical support service—laboratory, X-ray, blood bank, ECG, physiotherapy, pharmacy, etc.

Cost Centres

Purists in the cost accounting sphere view the cost allocation system in hospital as shaky, whereas the classical economists find it difficult to price a single product in a multiproduct service, viz. the hospital.

A cost centre is a centre of activity to which significant costs can be identified, and it is desired to collect the costs specifically and separately. Cost centres generally correspond to revenue centres, i.e. for each revenue centre, there will at least be one related cost centre (Table 12.1). However, there are usually more cost centres than revenue centres, because each cost is not always directly assignable to a single revenue centre at the time it is incurred. Cost centres generally follow organisational lines and at the same time they follow operational lines.

Table 12.1: Possible cost centres in a general hospital

1. Admitting office	12. House staff
2. Billing	13. Medical records
3. Coronary care	14. Medical supplies
4. Anaesthesia	15. Hotel and housekeeping
5. Delivery room	16. Operating room
6. ECG, EEG	17. Laboratories
7. Emergency	18. Radiodiagnosis/imaging
8. General supplies	19. IPD
9. ICU	20. Pharmacy
10. Neonatal ICU	21. Physical medicine
11. Nursing	22. Miscellaneous

The number of cost centres can run up to one hundred in a large hospital.

A cost centre may primarily exist for:

- i. budgeting purposes (for planning costs or for matching cost against plan), and
- ii. pricing purposes (for allocation to revenue centres).

STANDARD COSTING

Standard cost is an estimated cost determined in advance of production or supply. Preparation of standard costs and

their use is to clarify the financial results, by measurements of variance of actual costs from standard costs and the analysis of the causes of variance for the purpose of maintaining maximum efficiency.³

The principle purpose of standard costing is the control of costs, and not budgetary control. Budget applies to a department. Standard cost applies to an operation. Variations between standards of performance and actual costs are investigated to determine their causes and taking corrective action if necessary.

Standard cost is determined by the correlation of material and labour costs and apportioning of overhead expenses, and should be set with reference to the best attainable performance. The labour cost component of standard cost is determined by time and motion study.

COST FINDING

In many hospitals, charges for services are based on arbitrary decisions, primarily on basis of the annual deficit. They are increased from time-to-time on an ad hoc basis with the hope that the deficit could be bridged.

Costing or cost finding is determining the cost of a procedure or service, for example, cost of nursing care per patient day in a general ward and in ICU, diet cost per day, cost of particular surgical operation, cost of obligatory investigations for a maternity case; in OPD, cost per OPD attendance; in laundry, per 100 pieces laundered and so on.

The purpose of costing is for:

- i. determining profitability of a specific revenue centre, and
- ii. rate setting—establishing charges for various service components.

Before we proceed further, the meaning of various terms used in costing should be clearly understood.

Direct Costs

Standard costs are costs incurred in running a department or service for fulfilling the primary purpose of that department or service. They can be apportioned directly to the particular activity or procedure. Usually, these are expenditures incurred by the concerned department covering salaries and labour costs, and cost of supplies and stores in rendering the service.

As the concerned department generally has considerable control over these costs, these costs are also referred to as controllable costs.

Indirect Costs

Indirect costs are the costs incurred by other departments or service in support of the primary function of direct patient care. The same cost may be direct for one department but indirect for another. For example, maintenance supplies (say, spare parts) are direct costs to maintenance department, but indirect cost to CSSD or mechanised laundry.

Operating Costs

Operating costs are the actual overall costs incurred by a department to generate patient services and other functions of the department. These include the costs incurred on salaries, supplies and stores, maintenance, rent, utilities, and other related costs. Operating costs are a combination of direct and indirect costs.

Fixed Costs

Fixed costs are the expenditures incurred irrespective of the quantum of workload. The hospital must maintain a certain basic staff, physical facilities, plant and equipment, pay for water, electricity and other utilities, pay rent and taxes, cater for depreciation, and pay interest on borrowed capital. All this irrespective of whether it functions to its full capacity or half. Even when no patient care is provided, the hospital incurs these costs. Fixed costs do not vary with the volume of service.

Variable Costs

Variable costs are costs which vary in proportion to changes in volume of service (or goods produced). Variable costs include the portion of operating costs which themselves vary in proportion to the workload.

There is more or less a fixed relationship between the use of specific resources, say consummable supplies, and volume of service. Approximately, 30 per cent of all hospital costs are variable.

Semivariable Costs

Semivariable costs do not vary in proportion as the volume of service increases. A semivariable cost may increase or decrease continuously, but the percentage change in cost may be less than in the level of activity. For example, if the volume of service increases by 10 per cent, semivariable costs may rise only by 7 per cent (as a result, the corresponding cost per unit will decline). Use of additional manpower in providing general support services or to maintain physical facility, are examples of semivariable costs.

Cost finding determines the total cost for producing patient services of a department, and provides nonrevenue producing departments the cost of services their departments render in support of revenue producing departments. This information is utilised in establishing charges for patient services.

In order to calculate the total cost of revenue producing departments, the direct costs of all nonrevenue producing departments must be proportionately reallocated to revenue producing departments on some logical basis. Full cost consists of direct cost of the department and the allocated costs of the general service departments. Service departments comprise of housekeeping, laundry, dietary, CSSD, nursing, administration, general administration and the like.

Allocating Indirect Costs

The next step in cost finding is to allocate the accumulated costs of each service department to each revenue department to find the total costs of producing the service. There are two methods of allocating indirect costs.

1. Costs can be classified by departments, individual cost items are charged to the revenue producing departments to which they can be traced.
2. Costs can also be classified by objects of expenditure, e.g. supplies and materials, salaries, rent, insurance, maintenance, etc.

For the purpose of cost finding all departments are classified either as direct or indirect departments, depending upon whether they provide service directly to the patient or otherwise. The allocation of the costs of indirect (non-revenue-producing) departments to direct (revenue-producing) departments should reflect as nearly as possible the actual costs incurred by the indirect department in proportion of the service provided to direct department. Correct allocation of costs to a given direct department has an important bearing on pricing.

There are no hard and fast rules for apportionment of indirect or service costs. The basis of apportionment can be determined based on the organisational and special circumstances.³ Some examples of allocation of indirect costs are as follows.

1. Building depreciation allocation on basis of floor area
2. Lighting charges on basis of kilowattage
3. Depreciation of medical equipment on basis of hours of use
4. Air-conditioning allocation on basis of cubic feet area
5. Housekeeping allocation on basis of floor area

6. Laundry allocation on basis of kgs of clothes laundered
7. General administration—number of administrative personnel
8. Dietary—on basics of number of meals supplied.

Service departments also provide service to one another, and costs of one service department should also be allocated to other such departments, to which they are traceable. However, the effect of allocating costs of service departments to one another is so insignificant that it can be ignored for the purpose of rate setting.

However, an elaborate method called the “step- down method” is used for assigning costs of service departments to one another and then reallocating the accumulated cost of each service department to revenue proceeding department. The method starts assigning the costs in sequence of the departments which render most service to others (or which has the highest cost) but receive the least. A cost accounting expert should be consulted for this.

The medical staff must be involved in the study of costing information to ensure the best use of resources. This follows from the fact that the level of activity of many departments is largely influenced by medical requirements arising from case-load and the medical procedures adopted.

DEPRECIATION

Depreciation is an important concept in hospital finance. Depreciation is the notional loss suffered by fixed assets due to wear and tear and ageing. The value of the assets is reduced to the extent of depreciation charged, and this value is reflected in the balance sheet. Although it is considered as an expense, there is no cash flow. The amount charged is generally invested in a “sinking fund” so that money is available for a new asset when the present asset is completely depreciated. For taxable institutions, depreciation works as a “tax shield”.

There are basically two ways of calculating depreciation.

Straight Line Method

In straight line method depreciates an asset by a fixed annual amount for the entire lifespan of the asset. The disadvantage of this method is that the cost of repair and maintenance is very low during the initial years and the depreciation is disproportionately high, which goes on increasing during later years but the rate of depreciation remains the same. Also, the replacement cost will always be higher than the initial cost due to inflation and technological changes.

Accelerated Rate

In accelerated rate method, a higher rate is charged in the initial year, and the percentage amount of depreciation gradually decreases with passing years.

For high value medical equipments and which have a high rate of obsolescence due to changes in technology, the accelerated rate of depreciation is charged. For assets like buildings, plant, machinery, furnishings, etc. the straight line method can be adopted. The rates should be decided by the hospital administrator within statutorily laid down ceilings.

RATE SETTING

Users expect that hospitals should base their rates on direct patient care alone. But this approach cannot permit the hospital to survive on a long-term basis. Revenues of hospitals in the voluntary sector should not only cover the traditional direct patient care expenses, but must also contribute towards—

- i. providing sufficient finances to meet current obligations,
- ii. covering the cost of service to indigent patients, and
- iii. generating funds for upgradation and expansion of existing facilities.

The cost of producing a service becomes evident after cost finding studies. The departmental charges should be set at least to equal these costs.

Classification of hospitals into profit-oriented and nonprofit hospitals tells little about the differentiation between them. Some profit-oriented hospitals may produce little profit from the hospital operations, not because of inefficient management, but because profit from hospital operations may be a secondary consideration. Some hospitals are only places which are created to provide a workplace for doctors with the doctors themselves managing the hospitals. The type of management of such hospitals, where making profit is a secondary consideration, is not much different from those of nonprofit hospitals. On the contrary, some voluntary hospitals do follow the policy of creating an inspiring surplus, to generate funds for expansion, renewal and growth. The operational losses are made up in such hospitals mainly through differential payment scales for the hotel services provided. These are the basic differences between proprietary profit-making hospitals whose aim is to maximise profit and the nonprofit hospitals whose aim is to give quality care to patients many of whom may be unable to pay for it.

Approaches to Rate Setting

Four different approaches are in use for determining rates for different services, and are based on:

- i. relative values,
- ii. cost plus a percentage,
- iii. hourly or time-based rates, and
- iv. gradation of accommodation and facilities.

Relative Values

A procedure, or a unit of service consumes the time and skill of a doctor, nurse, or technician, besides consuming material resources. The rate per procedure or service can be fixed on the basis of time, skills and material involved.

Certain procedures, e.g. an appendectomy, cholecystectomy, herniorrhaphy, lumbar puncture, etc. require more or less the same amount of time of the surgical team. Such services or procedures are suitable for rate determination by this method.

Cost Plus a Percentage

This approach is applied to merchandising type of departments, viz. the pharmacy. As the maximum permissible rate of all pharmaceutical preparations and appliances are predetermined, the actual cost of the item to the hospital, plus a margin of profit added to it make up the rate of the item. However, the percentage of profit cannot exceed the maximum permissible price.

Hourly Rates

Rate setting for operation theatres, anaesthesia, ventilators, physiotherapy and a few other facilities or services can be determined by this method.

Gradation of Accommodation and Facilities

Room charges and additional nursing charges are determined by the type of accommodation provided—deluxe rooms, private, semiprivate or general wards—and the type of special and additional nursing requirements of the patient, based on fixed and variable costs as applicable.

There is no single best method for rate setting. One of the above methods or a combination of two methods can also be considered. The aim is that the charges must be reasonable yet sufficient income must be generated.

Once the cost data are known, it is possible for management to fix up different rates to special patients and general patients by weighted value computation, so that there

is no loss overall.⁴ Generally, the cost of free care is covered in the charges levied.

In fixing rates for accommodation, other hotel services and special facilities, the hospital must make up its philosophical and moral stance, because charging double or treble rates for nursing to a private room patient as compared to general ward patient may seem unethical to some and not to others. Should the hospital rob Jerry to pay for Tom? Not-for-profit hospitals may consider it perfectly valid to charge more to rich patients to offset the inability of many poor patients to pay.

THE HOSPITAL BUDGET

Different types of approaches are used in preparing budgets in government hospitals, nonprofit voluntary hospitals, corporate hospitals and other private hospitals. The basic reason for preparing a budget is to enable the hospital to effectively meet its financial requirements. An effective budget is a summary of the carefully conceived financial plans of all departments. Therefore, it should be clear to the administration as to what the hospital's financial requirements are going to be.

Financial Requirements of Hospitals

For any hospital, funds are required for the following:

1. Capital funding
 - For preservation, upgrading and replacement of physical facilities and equipment
 - For new technology
 - For expansion.
2. Operating needs
 - For working capital and operating expenses—salaries, materials and supplies, maintenance, utilities, etc.
3. Reserves
 - For emergency needs and unforeseen financial requirements.

Basic Inputs

An effective budget presupposes the following—

1. Clear understanding of the hospital's financial and service goals
2. An hospital organisation with clearly defined responsibilities for each department
3. A system of accounting designed to provide a measure of performance
4. Active participation of staff members in the preparation of the budgets.

Budgetary Process Covers Three Budgets

The budgetary plan results from the accounting plan, and includes:

- i. the operating budget,
- ii. the capital budget, and
- iii. the cash budget.

Forecasts of operating expenses and operating revenues get consolidated into the expense and revenue budget, also called operating budget. ('Forecast budget', 'Operating budget' and 'Revenue and Expense budget' depict the same meaning and are interchangeably used during discussions). However, the budgeting process becomes complete only when two budgets, viz. the capital budget and cash budget are also prepared. The operating budget process is described in detail after the capital and cash budgets.

Programme budgeting, zero-based budgeting and variable budgeting have been dealt in Chapter 11 on Control. It is forecast budget that is the main budgeting methodology of most hospitals.

Capital Budget

Capital budget is the estimated fund requirements for capital items needed for growth, for providing new facilities, and for replacement of worn out equipment, machinery, and furniture.

The decision on capital budgeting is primarily based on:

- i. needs of patients and existing alternatives available
- ii. upgradation of technology
- iii. effects of additional equipment on income and expenditure, and
- iv. availability of funds.

There will always be competing demands from various departments *vis-a-vis* the common requirements for the hospital as a whole, and funds are not generally available for meeting all the demands. Priorities for capital expenditure will therefore need VED analysis, and cost-effectiveness or cost-benefit analyses. (see page 179, 180).

The request of funds for capital assets are generally met from general funds if there is a surplus, by raising funds from outside, or obtaining capital from funding agencies. Therefore, it is desirable to identify the sources of funds for each item in the capital budget.

Cash Budget

Because enough cash must be available to meet financial obligations on day-to-day basis or as they arise, there is a need to maintain the right flow of cash. Cash budget is the

budget that records the forecasted cash inflows from various sources and also records the forecasted demands for cash. It translates the expense and revenue budget into a statement of cash inflow and outflow. Steady inflow of cash comes from settling the patient's accounts at the time of discharge. However, if hospital is unable to collect cash for services rendered at the time of discharge, accounts receivable are to be created.

Cash budget takes into consideration projections for cash receipts, disbursements and balances for a given future period of time. It enables management to predict the timing and amount of future cash flows, cash balances, cash needs, and cash surpluses. The cash budget is usually broken down by monthly or quarterly periods.

While forecasting cash inflow, seasonal fluctuations based on past experience should be taken note of. Keeping a safety margin, it would be worth investing surplus funds, if any, in term deposits—the period of investment depending upon requirement of liquid cash.

Operating Budget

A satisfactory budget is based on knowledge of past performance and experience, extended to future needs and requirements. Accurate statistical information is a guide to future needs and requirements. Internal as well as external factors influencing the operation of the hospital have to be studied. Any change in workload due to activities of other neighbouring hospitals or population trends will affect revenues. Internal constraints, policy decisions, paucity of funds to maintain modernisation and similar factors must be identified. Even with good quality data, the prediction of revenues is somewhat unpredictable although expenditure forecasts may be more realistic.

Forecast of operating expenditure: Operative expenditure is incurred on salaries, supplies, general utilities, maintenance and some overheads.

Salaries and wages: Manpower requirements are determined by workload. Staff to workload ratios must be reviewed yearly. Salaries and wages account for 50 to 70 per cent of the total expenditure. Additional staff requirements, if any, have to be grouped separately and justification for the same must be indicated. In addition to salaries, provision will have to be made for provident fund, gratuity or other personnel benefit schemes.

Materials and supplies: Food, drugs, dressings, and other consumables are directly related to workload or volume of service.

An example of the forecast of an item of materials and supplies is given below. Supposing that the hospital had spent Rs. 4,40,000 on surgical supplies and dressings during the previous accounting year, and the surgical department income totals Rs. 6,00,000. Its break-up showed that Rs. 4,20,000 came from inpatients and Rs. 1,80,000 from outpatients. Patient statistics reveal that the hospital had 14,000 surgical inpatient days and 8,000 surgical OPD visits.

Surgical Department Income

• Inpatient	Rs 4,20,000	i.e. 70%
• Outpatient	Rs 1,18,000	i.e. 30%
	<u>Rs 5,38,000</u>	

Proportionate Expense

• Inpatient	$4,40,000 \times 70\% = 3,08,000$
• Outpatient	$4,40,000 \times 30\% = 1,32,000$
	<u>Rs. 4,40,000</u>

Surg supplies and dressings expenses per surgical inpatient day = $\frac{3,08,000}{14,000} = \text{Rs. } 22.00$

Surg supplies and dressings expenses per surgical OPD visit = $\frac{1,32,000}{8,000} = \text{Rs. } 16.50$

Surgical supplies and dressings budget for coming year:

- (a) Rs. 22.00 × Projected inpatient days.
- (b) Rs. 16.50 × Projected surg OPD visits.

[Expenses for other items can be similarly worked out.]

Utilities: These cover expenditure items such as electricals, power, petrol, diesel, and other fuels, water, telephones and other services. AC plant, laundry, kitchen, CSSD, and incinerators account for a high expenditure on utilities.

Maintenance: Expenditure on routine maintenance of plant and equipment are generally well-predicted. Expenditure on breakdown maintenance should be curtailed as much as possible by preventive maintenance of plant and machinery, and by maintenance contracts for costly medical equipment.

While forecasting expenses on operation of plant and maintenance, additional factors to be considered are as follows.

- Effect on power consumption of any addition to plant or equipment
- Fuel consumption for additionally acquired vehicles
- Major renovations planned.

Other overheads: Interest expense, insurance, depreciation, taxes, rentals, etc.

Tables 12.2 and 12.3 depict the operating budget of three hospitals: two government teaching and one private nonteaching hospital.

Forecast of operating revenues: Forecasts of operating revenues is somewhat speculative even with good historical and recent data. Operating revenue income is directly related to the volume of services provided. The largest part of revenue in nongovernment hospitals is from patient services.

Operating revenue generates from:

- i. direct patient care
 - inpatient services—medical, surgical, obstetrics and gynae, paediatrics, cardiology, etc.
 - outpatient consultations
- ii. special professional services
 - operation theatre, labour rooms, ICU
 - physiotherapy, etc.
- iii. supportive professional services
 - X-ray and imaging
 - pathology laboratory
 - EGG, EEG, EMG, etc.
- iv. hotel service
 - room
 - food.

Income from other sources comprises of interest income from investments, and income from donations and grants, rents and recoveries.

Table 12.2: Operating budget of two large government teaching hospitals

	Hospital 'A' (1615 beds)		Hospital 'B' (870 beds)			
Establishment	7.16	Crores	60%	4.14	crores	60%
Contingencies	52	lac.	4.3%	38	lac.	5.5%
Equipment and appliances	24	lac.	2.0%	11	lac.	1.6%
Medicine and drugs	1.80	crores	15%	1.10	crores	16%
Instruments	18	lac.	1.5%	11	lac.	1.6%
Kitchen, diet	38	lac.	3.1%	23	lac.	3.4%
General stores	8.3	lac.	0.69%	5	lac.	0.75%
X-ray stores	30.0	lac.	2.5%	20	lac.	2.90%
Lab stores	6.6	lac.	0.55%	2	lac	0.29%
Clothing stores	8.0	lac.	0.67%	6	lac	0.87%
Repairs						
Building and roads	6.25	lac.	0.55%	1.55	lac	0.23%
Appliances	11.0	lac.	0.92%	3.60	lac.	0.52%
Special	11.1	lac	0.94%	2.40	lac	0.35%
Garden maintenance	0.1	lac.	0.01%	0.05	lac.	0.01%
Electricity	62	lac.	5.20%	25	lac.	3.95%
Transport	21	lac.	1.7%	19.06	lac.	3%

Cost : Rs. 202 per bed per day

Rs. 218 per bed per day

Table 12.3: Operating budget of a 350-bed nonteaching nongovernment multispeciality hospital

	<i>Rs. (in lac.)</i>	<i>Percentage</i>
Salaries	129.3	40.9
Consumable	71.46	22.6
Electricity	23.9	7.5
Stationary printing	9.58	3.03
Kitchen	10.4	3.30
Postage, telephones	1.18	0.37
LPG gas	0.47	0.15
Municipal taxes	1.22	0.39
Insurance	0.84	0.27
Legal and professional fees	0.86	0.27
Repairs	29.75	9.4
Laundry	4.75	1.57
Departmental expences	9.29	2.94
Miscellaneous	5.07	1.60
Depreciation	13.22	4.18
Equipment replacement	4.55	1.44
	3,15,93,420	100

84.19 per cent income was from patient fees. Remaining from rent, donations, interest and miscellaneous sources.

Steps in the Budgeting Process

As a shortcut to budget making, many times the financial performance of previous some months (for which accounting data would be readily available) is obtained, and a pro-rata figures for the remaining months of the year, and some percentage allowances for inflation are added to it to make up the year's forecast. This is the system generally followed in many hospitals.

The budget process needs to be very well-understood by the hospital administrator, even though a lot of it will fall in the domain of the finance officer. However, all departments must get actively involved in the preparation of the budget.

1. The **first** step in the budget process is for the hospital administrator to prepare assumptions, in statistical terms, about the kinds of services (outputs) the hospital expects to provide (produce), i.e. prepare a quantitative expression of the plans of the hospital, e.g. patient days of service, by specialties, number of procedures by departments like pathology, radiology, physiotherapy, etc. number of outpatient visits, and so on.

The purpose of budget assumptions is to share as much information as possible with all departments. The entire hospital will then be planning on the same track. Assumptions can include projected patient statistics, additional services, proposed salary revisions, economic factors, expense policies, etc.

2. The **second** step is for the hospital administrator to prepare the economic forecasts in respect of new developments, or other factors, that can affect the hospital's income or expenditure during the budget period, such as new services by neighbouring hospitals, specialists and superspecialists likely to join or leave the hospitals, inflation factors on materials and supplies, and any new government regulations.
3. The **third** step is for the hospital administration to outline the budget goals and policies as per the directives of the governing board or board of trustees and in consultation with the finance officer, which will constitute a tentative outline of the financial plan. These may include a financial strategy, targeted gain (or loss), and similar factors that may have a bearing on hospital finances.
4. The **fourth** step is for the Finance Officer to prepare a budget package incorporating written instructions regarding the framework for the budgeting process, procedures to be followed, accompanied by illustrative forms and calculations, also containing the goals and policies, assumptions, schedules and past data applicable to the department. He passes on the budget package to all department heads to enable them to prepare preliminary draft of their budget. The budget package should be collectively explained to the department heads in a specially convened meeting. The hospital administrator and finance officer can take advantage of this meetings in instructing the department heads in accounting techniques.
5. The **fifth** step is for each *department head* to analyse financial and statistical data generated by his department as well as provided to him by the administration or finance department, to critically assess the department's operations and performance, and develop indices for planning and control. He reviews the budget plan, develops departmental goals and objectives, and prepares the departmental expense budget.
6. A budget hearing is organised by the Finance Officer at the departmental level where the department head presents his or her draft budget. After a joint analysis and review by the hospital administrator and the finance officer, a summary of the departmental budget is prepared.

In the **sixth** step, the summary of each department's budget hearing records the commitments and statements made between the administration and the department head, and also includes observation of the Finance Officer.

7. The **seventh** step is for the Finance Officer to develop the department's revenue budget, summarise departmental expense budget, and forward the department's budget hearing summary to the concerned department head.
8. The **eighth** step is for the Finance Officer to prepare a preliminary operating revenue budget for the whole hospital, by summarising and collating the individual department's budgets. Finance officer also prepares a cash budget at this stage. If the expected revenue does not cover the budget expense, price increases may become necessary. If price increases are not acceptable, the finance officer may propose areas, functions or categories of budgeted expenses that can be cut.

In addition to the departmental budgets, the finance officer will budget for other items that affect the entire hospital such as depreciation, contributions to employees provident fund and benefits, interest expense and other administrative expenses.

9. The **ninth** step is for the Finance Officer to summarise the total budget (including capital budget and cash budget) into a proper budget format including statistical summaries.
10. In the **final** step, the budget is presented by the Finance Officer to the governing board or board of trustees or to the finance committee for their approval. The budget is then adopted by the board or the committee with revisions if necessary. It is later communicated to all department heads and other concerned persons.

The time taken to prepare a hospital budget can vary from some weeks to some months. Therefore, it is prudent to set up a budget timetable listing the time schedule of each part of the budget process, persons responsible for each part, and providing guidelines and explanation for the purpose of each part. The budget timetable then becomes a plan for the completion of the budget in time and to set deadlines.

Budget Control

Budget control can be achieved through:

- i. keeping a constant watch over the budget in action,
- ii. Periodically reviewing of actuals with the budget,
- iii. Analysing deviations in actual performance,
- iv. taking remedial action where indicated,
- v. revising the budget if conditions warrant.

The ultimate financial statements that result from budgeting and from the operations of the hospital are the Income and Expenditure statement and the Balance Sheet,

which reflect the financial performance of the hospital for the period and at the end of the period, respectively.

Income and Expenditure Statement

Income and expenditure statement reflects the results of the hospital's operations for a stated period. Only broad classification of accounts is done. Details are furnished in separate schedules. At times, functional indicators like income and expenditure per inpatient day, income per outpatient, etc. are given, and important statistics like admissions, discharges, fresh outpatients, repeat outpatients, patient days, etc. can also be given.

Usually, outpatient and inpatient income and expenditure are separately accounted. The income and expenditure of various departments are worked out departmentwise. This is essential for the purpose of evaluating financial performance of each department, and in determination of costs of providing each service.

Income: It accrues from the following sources.

1. Routine medical care service
 - Room, food, medical care, nursing care
 - Outpatients consulting, injections, dressings, minor procedures
 - Emergency and casualty services.
2. Special departmental services
 - Operation theatres
 - Delivery room
 - ICU
 - Pathology
 - Radiology
 - Physiotherapy
 - Pharmacy.
3. Other income
 - Fees for training programmes (nursing school, technical training)
 - Canteen, parking lot
 - Ambulance.
4. Nonoperating income
 - Donations
 - Grants
 - Property rentals
 - Bank interest and investment returns.

Charges for any free or concessional care should be maintained separately. This is necessary to satisfy government authorities or organisations which give grants or subsidy. Cost of free and concessional care is shown as a deduction from the operating income.

Expenditure: It is incurred for the following.

1. Operating expenditure
 - Salaries, including contribution to employee provident fund and gratuity
 - Supplies and materials
 - Utilities (electricity, water, telephones, etc.)
 - Maintenance
 - Administrative expenses.
2. Other expenses
 - On training programmes.
3. Nonoperating expenses
 - Depreciation
 - Interest on borrowed capital
 - Upkeep of properties.

Balance Sheet

A balance sheet represents financial position as on a specific date. It is a statement of assets and liabilities. It reflects what the hospital owns and what it owes to others. Only total figures are given against each classification of the main accounts. Detailed schedules can be annexed if required.

A hospital's assets and liabilities consist of, but not limited to the following.

Assets

1. *Fixed assets:* These are physical assets for long-term intended use.
 - Building—wards, departments, hostels, residential accommodation
 - Lands and grounds
 - Plant and equipment—boilers, sterilisers, AC plant, lifts, central oxygen and suction, mechanical laundry, etc.
 - Furniture—hospital furniture and general purpose furniture
 - Diagnostic and therapeutic equipment and machines
 - Vehicles
 - Constructions in progress.
2. *Current assets:* They consist of the following.
 - Cash in hand and bank
 - Deposits and investments
 - Accounts receivable
 - Other receivables
 - Inventory of supplies and materials in stock.
3. *Other assets:* These consist of certain specific purpose funds (like emergency/sinking fund, contingency fund, endowment fund, training fund, etc.).

Liabilities

1. Current liabilities
 - Salaries and wages payable
 - Accounts payable
 - Taxes, interest burden.
2. Long-term liabilities
 - Mortgages
 - Long-term loans.
3. Special funds
 - Emergency fund
 - Endowment fund
 - Training fund.

FINANCIAL CONTROL

Financial control is the means of ensuring the adequacy of financial management of the institution, and covers control of cash, accounting, receipts disbursements, assets, payroll, billing and other elements, if any, that have an impact on hospital finances.

However, no amount of control will become effective unless certain accounting and organisational requirements have been established. These requirements are as follows.

1. *A functional chart of accounts:* The accounts classification is made keeping in view the cost centres and revenue centres, with detailed explanatory note on each account head.
2. *An accounting manual:* A well-drafted accounting manual gives the details of accounting procedures in respect of receipts, payments, purchases, cash handling, inventory accounting of consumables, accounts receivable, accounts payable, patient billing, assets accounting, condemnation and scrap, etc. in fact, every aspect of accounting.
3. *A budget manual:* Which serves as the framework for the budgeting process, describing the budgeting process, method, scope of departments, duties, authority and responsibilities, and budget forms. Also describing detailed procedure for cash budget, capital budget and budgetary control.
4. A system of collection, and analysis of financial and service data for cost finding and allocation of costs.
5. A financial reporting system for internal control, and evaluation.

Financial Reports and Information System

A hospital administrator must be conversant with the financial status on a week-to-week and month-to-month

basis and in the long perspective. It is the duty of the finance officer to provide reports on financial performance and explain the situation on regular basis to the administrator.

The assessment of end results cannot be possible without accurate data provided on timely basis. Information about the actual outcomes should be available through the management information system in standardised format. Purposeful statistical data collection and reporting are essential for effective financial managerial control. Data processing services generate reports allowing monitoring of revenue and expenses, manpower control and services utilisation.

Daily Reports

1. Inpatient census, admissions, discharges
2. Outpatient visits—new and repeat. Department-wise
3. Tests carried out in laboratory, X-ray, etc.
4. Daily bank and cash position.

Monthly Reports

1. Monthly statement of income and expenditure with departmentwise break-up
2. Budget versus actual cash position—detailed comparison of actual to budget sources and the application of cash
3. Free and concessional care
4. Operating indicators—This includes number of admissions, discharge, patient days, outpatient visits, investigations, operation theatre utilisation, etc.

Quarterly Reports

Budget performance of all departments.

Yearly Reports

1. Balance sheet
2. Income and expenditure statement
3. Departmental income and expenditure statement
4. Cost analysis—Cost of services, unit costs.

A hospital generates considerable amount of accounting information. This information originates from the following sources.

Payroll records: They provide information on the amount of labour employed in each expense centre, wage rates, wages paid to each employee, and provides data on the use and cost of labour.

Records of the quantity and composition of consumables supplied, ordered, received and distributed to various expense

centres. They provide information on the acquisition and cost of consumable supplies.

Records of cost location and conditions of each major item of buildings, plant, machines and equipment, including depreciation information. They provide information on the value and utilisation of fixed assets.

Charge slips, service logs, discharge records and patients accounts: They provide data on revenues and accounts receivables, for services provided on deferred payment system (e.g. CGHS, insurance), account receivables are maintained separately.

Records of cash balances and payments: They reveal day-to-day financial transactions.

Cost data: It details the cost of providing services.

Points of Control

It is impossible for one person to check each and everything. But the following points shall need attention.

Cash Receipt and Payments

Cash handling is a vulnerable area for obvious reasons. Points of control cover—custody of cash, reporting safety precautions, daily balances checking, bank deposit procedure, authorisation for payments.

Purchases, Consumption and Inventory of Consumables

Here, opportunities for misappropriation are many. Checks cover—quotations, stock on hand, quantity, outstanding orders, inventory levels, inventory documentation.

Patient Billing

Patient billing has to be prompt and accurate to avoid missing charges. Checkpoints are—matching with patients records, matching with business records, quantum of errors, forms design.

Assets Accounting

Proper accounting methods provide correct figures of the current value of assets. Checkpoints include—depreciation method, distribution and location of assets, condition.

Accounts Payable

Prompt and accurate payments to suppliers ensure smooth flow of supplies and equipment. Checks for maintaining a

good system of accounts payable look into—controlling ledger, purchase requests, records of transactions, frequency of payments, supporting documents, accuracy of documents, system of availing cash discounts for prompt payments, handling of credit memos, control of advance payments, records of requisitions, orders, vouchers, cross-checking between purchasing, receiving and accounting sections.

Accounts Receivable

Accounts receivable are prone to several types of manipulations if not well-controlled. Checkpoints are—credit policy, cross-relationship between accounts receivables, credit section and cash section, controlling ledger, posting and reconciliation of cash receipts, accounts receivable time schedules.

Accounting of Scrap

Some amount of items become unserviceable, e.g. instruments in wards and departments, parts of plants and machinery, parts of vehicles, scrapped X-ray films and hypo waste. Their accounting and proper disposal can earn handsome revenue to the institution.

Accounting of Packing Material

A number of crates, cartons, boxes and similar items accumulate over the year. There should be a system for their accounting, storage and disposal so that the institution earns some revenue.

Vehicles

Chances of misuse of vehicles and fuel abound. Other than nominating an officer by name to authorise movement of vehicles, a constant monitoring and check of vehicle log books and daily running accounts of mileage and fuel establishes firm control.

Utilisation of Plant, Machinery and Equipment

Utilisable and utilised hours, downtime, analysis of downtime, maintenance expenses, obsolescence.

Payroll

Checking payroll calculation, overtime, disbursement system, attendance and leave records.

Missing Charges and Uncollectable Patient Accounts

Because nursing staff forgets to initiate charge slips or to send them to accounts departments, the hospital will suffer loss of revenue. Similarly, some patient accounts may become uncollectable. Checkpoints to prevent them are—patient documentation system, policy, authority to write off, reporting system.

CONTAINMENT OF COSTS AND IMPROVING PROFITABILITY

As in other fields, there has been a steady increase in the cost of medical care, but the rise in costs has been very rapid during the last one decade. In comparison to medical care provided by the government, it was argued in the past that for-profit, investor-owned and proprietary hospitals having profit incentives will control costs more effectively. One of the noticeable change in the health care field in the 90s is the rapid growth of investor-owned hospitals. However, containment of costs has eluded even in these hospitals. Every type of hospital and health care institution is concerned over the rising cost of patient care.

There are three elements in a cost containment process.

Cost awareness: Inculcate the awareness amongst all the hospital personnel, and the process available to contain them.

Cost monitoring: Provide a mechanism to identify, report, and analyse actual expenditures against budget and standards. Focus on where, how much and why excess spent.

Cost management: Establish a responsibility and accountability system for attainment of plans.

On analysis, generally three causes for differences between budgeted and actual costs emerge. They are as follows.⁵

1. Prices paid for inputs were different than budgeted prices.
2. Outputs level was lower than budgeted.
3. Actual quantities of inputs used were different from budgeted levels.

Within each of these areas, the problem may come either from budgeting or operations. A budgeting problem is usually not controllable, i.e. the only way is to provide for additional funds than budgeted. Alternately, the problem may come from operations and be controllable.

No cost control programme can be implemented in absence of adequate data on costs incurred. A good integrated hospital information system, materials management,

personnel data and quality control is a basic requirement for effective cost control activities. The information system relates to cost activities, functional units, personnel, materials used, process of medical care and possibly the outcome.

It is generally accepted that hospital costs could be contained with the following three approaches.

Reduce the Cost of Input Resources

Management has some ability to affect the negotiated price of manpower and labour, and consumables and other supplies. Management can bargain harder while negotiating for salaries and wages, and substituting expensive by less expensive manpower to the extent possible.

Reductions can also come through bulk purchases of consumables. Where practicable, resorting to group purchasing (by a consortium of sister hospitals) or shared service arrangements provide considerable scope for savings. Efforts for reduction in cost of inputs lie in efficient inventory management, value analysis, wastage control and manpower planning and control.

Improve Efficiency

Efficiency relates to output per unit cost of the resources employed. Resources are being used efficiently if a given output is produced at minimum cost or maximum output is produced at a given cost ("operational" efficiency). Economists also use the term in the wider sense of cost-benefit analysis ("allocative" efficiency).

Basically, the output to input ratio determines efficiency. Opportunities to improve efficiency of hospital operations are many. Eliminating avoidable steps, reduction of staff, scheduling of all hospital operations, removing bottlenecks, eliminating duplication and sharing of services and facilities are some possible steps. Every capital expenditure which adds to costs has to be reviewed thoroughly. Employee suggestions for improved methods should be solicited and financial incentives for increased productivity should be granted to boost staff morale.

The seemingly contradictory requirement of containment of costs and maintaining quality of care presents a dilemma. While agreeing that there cannot be top class care at low cost, hospitals will have to strive for quality care at affordable cost. The solution lies in a balance between containing costs and maintaining quality.

In addition to paying enough attention to saving money through reduction in capital expenditure, of equal importance

is planning and designing the facility and its systems so as to achieve reduction in operating costs through efficient levels of staffing, energy conservation and maintenance economy.¹

Volume Reduction

In public hospitals with greatly subsidised services, potential exists for reducing the use rate of hospital services. Measures that reduce the volume of inpatient services cover shifting services to a lower cost setting or curtailing unnecessary services. Such measures include preadmission outpatient workups, ambulatory surgery and discharge planning. All of which will result in reduced inpatient days. The responsibility for lower usage and to create an organisational climate that encourages cost-effective clinical decisions lies jointly with the physicians and hospital administrator. Proliferation of laboratory tests alone added greatly to the charges of patient care without producing an obvious commensurate gain in health outcome. A recent study has indicated that 8.6 per cent of all the total tests would be completely avoided without any effect on diagnosis, treatment or patient care and has highlighted the need for additional studies in all areas of the hospital.⁶

Use of Cost-benefit, Cost-effectiveness and Value Analysis in Cost-containment Strategy

Cost-benefit Analysis

It is a form of economic evaluation, where all the costs and consequences are expressed in money terms.

The cost-benefit analysis is a tool which is useful in setting priorities for various courses of action to meet objectives, and provide an estimate of the net financial value associated with each course of action (e.g. manpower and labour, material and equipment, facilities). All inputs and outputs have to be converted into monetary terms because all inputs (i.e. costs) and all outcomes (i.e. benefits) are valued in money terms. Benefit-cost ratio is the total discounted benefit divided by total discounted cost. The outcome should be greater than 1 for an investment to be potentially worthwhile.

Example of some outputs for cost evaluation are as follows.

1. Cost of a department (e.g. blood bank, ICU, obstetrical suite, operating room, medical nursing units, etc.
2. Cost per meal
3. Cost of emergency services
4. Cost of full time employees per bed

5. Cost of laboratory services
6. Cost of radiology services
7. Cost of laboratory tests per admission
8. Cost of linen per patient day
9. Cost of maintenance
10. Cost of nursing manhours per day
11. Cost of outpatient laboratory tests
12. Cost of outpatient radiology services
13. Cost of radiology procedure per admission
14. Direct expense per day
15. Inpatient cost per day.

The analysis consist of following steps.

1. A clear statement of objectives
2. Identifying all alternative actions that can achieve the objectives
3. Identifying all costs and all benefits with each alternative
4. Converting all costs and all benefits for each alternative to monetary value, and quantitative evaluation of costs and benefits of each
5. Selection of the best cost-effective approach.

Cost-effectiveness Analysis

It is a form of economic evaluation, where the costs are expressed in money terms but where some of the consequences are expressed in physical units (e.g. life-years gained, cases detected).

Cost-effectiveness analysis is the technique for choosing, from alternative courses of action, a preferred choice when objectives are not very clear in such areas as sales, costs or profits. In cost effectiveness analysis, decision criteria may include (a) achieving a given objective at least cost, (b) attaining it with reasonable resources, or (c) providing a trade-off of cost for effectiveness. Cost-effectiveness analysis is not an analysis for cost reduction—it is an optimisation approach to a specific set of goals.

After the objectives have been determined, cost-effectiveness analysis considers the number and type of alternatives available. After determining the possible alternatives, resources requirements for each alternative viz. people, money, equipment, and facilities are determined and converted to monetary costs. The analysis first determines the criteria to be used in determining the effectiveness of each cost factor and then prepare cost-effectiveness models for each alternative. Some of the criteria of effectiveness are as follows.

1. Capacity
2. Accuracy
3. Degree of physician acceptance
4. Quantity of output
5. Performability
6. Quantity of output

7. Mean-time between repair
8. Professional acceptance
9. Error rate
10. Flexibility
11. Inconvenience to other departments
12. Spill-over effects
13. Power consumption
14. Personal safety.

A cost-effectiveness analysis depends on use of a series of models (see Systems Aids under Planning). Cost models are developed to show cost estimates for each alternative, and effectiveness models developed to show relationship between each alternative and its effectiveness. Then, synthesising the models combining these results may be made to show the relationship of costs and effectiveness, for each alternative, for a given cost.

It should be noted that the least costly alternative may not always be the most effective alternative. When effectiveness is measured by various factors, among others, social costs may also have to be considered to a substantial extent. Social costs are those which the management decisions knowingly or unknowingly impose upon the society. For example, the partially burnt residues in a conventional wood-fired incinerator would become an environmental hazard which would eventually require repeated clean-up campaigns to avoid environmental degradation. The related costs of this campaign would be classified as social costs. At times, the best alternative from a hospital cost standpoint may result in a substantial social cost.

Value Engineering

One of the important approaches to cost reduction is value analysis. Value Engineering [VE], which was known as value analysis in the past, a unique systematic cost reduction approach in engineering industry could be equally effective in health care industry.⁷ *Value engineering is defined as a systematic step by step approach intended to achieve the desired functions of a product, process, system or service at an overall minimum cost without in any way affecting quality, reliability, performance, delivery or safety of environment.*

Value of a particular service is calculated as

$$V = \frac{\text{Needed performance (P)}}{\text{Overall cost (C)}}$$

Thus, V can be increased by:

- a. Reducing C while increasing P

- b. Reducing C while ensuring same level of P
- c. Increasing C and P, but increase of P is > increase of C
- d. Increasing P while maintaining same level of C.

Some people believe that cost is synonymous with high quality and therefore any thought of reducing costs upsets them.

However, it is generally believed that any service can have approximately 20-30 per cent unnecessary costs added to its actual cost, resulting in its diminished value. That is, you don't get value for your money. Value engineering is a systematic and scientific approach to contain cost without compromising the quality.

Steps of a VE Project⁸

1. *Orientation phase:* This involves understanding and training in VE, selection of project and selection of team leader. The project may be selected on the basis of an ABC analysis of all costs. Many departments, functions and areas in the hospital will be found to have scope for value analysis. However, the industrial type of activities lend themselves better to such analysis. They include dietary, housekeeping, plant operations, CSSD, laundry and maintenance dept. Other areas are nursing, radiology, laboratory, forms, documentation, utilities and inventory.
2. *Information phase:* Collection of all relevant data by the team. The team should consist of the line manager of the department or service, and the assistant hospital administrator.

The general method and procedure to be adapted should be explained to all the members. It would be wise to communicate the management intention to union leaders where applicable.

3. *Function phase:* Function of an item, process or service can be classified into Basic Functions and Secondary Functions. Function phase finds answer to the questions: What does it do? What does it cost? and What is its worth? (Worth is defined as the lowest cost to achieve the basic functions). After determining the level (Primary or Secondary), a cost analysis of that function is done, meaning that costs are ascribed to each function.

Right kind of searching questions will have to be asked while collecting information of this phase.

4. *Creative phase:* The team then tries to find answers for the question "what else could do the same function?" This generates multiplicity of ideas and ideal attributes of an item. Think sessions, consultations with experts, and direct observations lead to analysis of present situation and generation of cost saving ideas. As many ideas as possible should be generated and discussed.

5. *Evaluation phase:* Each attribute can be evaluated on a four point scale (0,1,2,3) and compared with others. Evaluating each idea in terms of rupees saved is the aim. Each cost reduction opportunity is ranked in order of its cost reduction potential. It is reemphasised here that cost reduction should not be achieved by compromising quality.
6. *Recommendation phase:* The team develops and refines the best suggestion. Presentation of the recommendations to the clinicians, nurses and other staff (users) should follow.

For every change, there is resistance. All units of the hospital affected by the service should have the chance to comment on the accuracy of risk evaluation and put up views on any aspect or idea that has not been adequately considered.

7. *Implementation phase:* After all the above considerations, the management decides which cost reduction opportunity should be implemented, and then carry out its implementation.
8. *Evaluation phase:* It is carried out as a Technical audit to assess the technical advantages, and as Cost audit to assess the actual savings, after a suitable interval after implementation of the project.

Approaches to Improving Profitability

The concept of "profit" had been an anathema for hospitals till recently. Barring government hospitals, no nonprofit hospital can survive without prudent financial planning and management. For corporate hospitals and other privately owned hospitals, profitability is the key to their continued survival. Therefore, there should be no need for hospitals to get embarrassed by any positive level of profit. Totally subsidised model of health care has been a failure because of overall resource constraints of the government. Although the fee for service concept has not been implemented in government hospitals in totality, the outlook of health services as total charity services has changed.

If a hospital cannot generate profit, the invariable result is dilution in the quality of care because of the poor resource support, and long-term viability of the hospital comes in jeopardy.

In improving profitability of hospitals, look into the areas of revenue generation and take appropriate measures in improving the efficiency of hospital operations. There are four elements in improving the financial health of a hospital.

1. Improvement in patient services revenue
2. Increasing other operating revenue
3. Increasing nonoperating revenue
4. Controlling operating costs.

Improvement Inpatient Revenue

Any change in workload and in the rate of scheduled charges will affect patient revenue. Since income from patient revenue, viz. room, nursing care, professional charges, investigations, operations represents the largest (up to 80%) part of hospital revenue, a rise in workload, widening the scope of services, and an upward revision of scheduled charges are the ways to achieve it. However, charges have to be within the paying capacity of the clientele.

Increasing other Operating Revenue

The sources of nonpatient revenue and other operating revenue are as follows.

- Fees from education and training programmes
- Rental of hospital space
- Cafeteria
- Gift shop
- Parking fee, etc.

It makes good sense to increase nonpatient operating revenue by efficient management of these assets.

Increasing Nonoperating Revenue

Nonoperating revenue arises from gifts, endowments and from investment income. Many health care institutions are thriving on sound financial philanthropic support. Funds set aside for depreciation, retirement benefits, and similar other available funds must be invested in a way that they yield maximum returns, by prudent investment strategy.

Controlling Operating Costs

Costs of operating the various services and facilities can be kept in check by a good materials management system with appropriate control over supplies, utilities, maintenance expenditure, reduction of wastage. Cost awareness must be inculcated into the minds of all hospital functionaries.

A CHECKLIST FOR COST CONTAINMENT

Any cost containment programme should be viewed as a continuing programme and one which should maintain the critical balance between quality and the cost of service.

Certain hospital costs are seen as being controlled more by the physicians than administration. Case-mix, admissions, scope of service, intensity and length of stay fall in this class. The basis of cost containment is by self-discipline (humanism, efficiency and morale) and financial discipline (capital control, utilisation control and budget control), by intensifying the organisational awareness by everyone—from the class four employee to the chiefs of various

services—of the processes available to contain them. The following is a checklist for cost containment to achieve improved efficiency with limited resources.

1. Reduction in staff by eliminating redundant positions
2. Budget control—Instituting a departmentwise quarterly budget variance report to review actual to budget comparisons and pinpoint problem areas
3. Computerisation of patient accounting and administrative records (payroll, accounts payable and receivable, budget)
4. Computerisation of inventory management
5. Streamlining paperwork
6. Reducing dependence on outside services by creating them in-house
7. Participation in shared services with other neighbourhood hospitals
8. Developing in-house servicing and maintenance facility
9. Control on stationary, forms, duplicating and printing
10. Shutting down electricity when not in use
11. Shutting down AC plant at night where possible
12. Market surveys for less expensive products
13. Plan-ahead purchasing
14. Eliminating wastage and pilferage
15. Good security and vigilance
16. Standardisation
17. Economy in supplies and expenditure
18. Motivational training for physicians and other staff.

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SECTION

FOUR

*Clinical
Supportive
Services*



Radiology and Imaging Services

INTRODUCTION

The practice of modern medicine cannot be undertaken without certain investigative facilities. Radiology or Radiodiagnosis is one such important departments of the hospital which contributes directly to the patient care. It provides, along with pathology, a vital diagnostic backup to all the specialities which cannot practice effectively without their support. Hence, the service becomes an integral part of all hospitals, with the exception of very small hospitals and nursing homes.

Radiology has expanded vastly in the recent decades. The term imaging now incorporates:

- X-ray
- sonography
- CT scan
- magnetic resonance imaging (MRI)
- digital subtraction angiography (DSA).

Both radiodiagnosis and radiotherapy have advanced to such a degree that it is not possible for one person to master both these specialities, which have little in common with each other. Radiotherapy has become a highly specialised service needing very expensive and sophisticated equipment. Such a department can only function in specialist centres, because they need specially constructed buildings, expensive equipment and highly trained radiotherapists, surgeons, physicists and technicians who have experience in cancer therapy and surgery. Oncology has become a separate discipline requiring team effort of pathologists, cell cytologists, surgeons, physicians expert in radiation medicine and chemotherapy, needing joint consultations between all these specialities.

The new wonder gadgets of radiological or imaging technology are radionuclide scanning (gamma camera), ultrasonography (USG), digital subtraction angiography (DSA), computerised axial tomography (CAT), and magnetic resonance imaging (MRI).

The term “imaging” which has lately been introduced is replacing the old “X-ray” or “radiodiagnosis”. We now have imaging departments in hospitals in place of the old X-ray departments. With the introduction of CT scanning, ultrasonography and now MRI, the scope of the erstwhile radiology department in the hospital has very much widened. However, CT scanning is generally a part of a very bigger hospital or an independent stand-alone facility serving a large group of hospitals. Economy of scale does not permit it to be a part of the general hospital. Because of its special requirement of structural planning, the MRI services have not been covered under this section except as a passing reference.

There has been steadily rising trend in the use of diagnostic X-ray examinations throughout the world, especially in the advanced countries, as shown in Table 13.1.

Table 13.1: X-ray examinations in advanced countries

	<i>Number of examinations</i>		
	1974	1984	1994
200-bed hospitals	16,000	40,000	56,000
400-bed hospitals	30,000	44,000	63,000
700-beds and above	55,000	70,000	89,000

In comparison, the current use of radiographic examination in India is far below than that of the advanced countries. Whileas there is one radiography unit for 1800

population in Western countries, the ratio falls to 1:13,000 population in Latin America, and to 1:70,000 in South Asia including India. The figure, however, may be misleading as the ratio conceals two important factors, viz. (i) most X-ray units are concentrated in large towns and cities, and (ii) up to 30 per cent of these are out of order at any one time in our public hospitals. Based on the film consumption data, almost 90 per cent of all radiological procedures are performed in capital cities, reflecting the unequal distribution of personnel, equipment and facilities. However, the mainstay of radiodiagnostic services are the medium-sized hospitals.

Planning for a good design for the X-ray department is a complex process, one which calls for much thought and knowledge. Association of a competent radiologist at the planning stage can help in this matter. Equipment for radiodiagnosis department is expensive, requires a great deal of care and maintenance and appropriate space central to the users. Therefore, it is important to understand clearly at the outset, as to what are we aiming at.

CLASSIFICATION OF RADIOLOGICAL WORK

The functions common to radiodiagnosis departments of all hospitals are as follows.

1. Routine X-rays like chest, abdomen, limbs, etc.
2. Special procedures like barium studies, IVPs, myelograms, etc.
3. Ultrasound work
4. Angiographies and interventional work
5. Teaching and research.

With screening for disease and teaching and research confined to some hospitals only, the type of work carried out in radiodiagnosis department at a general hospital shows the following trend. Although this is useful for planning purposes it is advisable to collect current utilisation data from other hospitals in the area (Table 13.2).

Table 13.2: Utilisation data from radiodiagnosis departments

1. 80–86%	Basic	X-ray of skull, chest, abdomen, limbs, etc.
2. 8–12%	Special	Cholecystography, pyelography, barium studies, etc.
3. 8–12%	Advanced	Pneumoencephalography, angiography, myelography, etc.

WORKLOAD AND MACHINE TIME UTILISATION

Statistics regarding the type of workload in relation to machine time widely vary from hospital-to-hospital. Large

referral hospitals may have disproportionately large volume of special examinations. The relationship between the type of examination and machine time in nonteaching general hospitals is shown in Table 13.3.

Table 13.3: Workload and room time utilisation

	Workload (Percentage)	Room time (Percentage)
General radiography	86	60
Fluoroscopy	10	25
Special	4	15

SITING AND LAYOUT

Siting

1. The department should be easily accessible to the OPD, casualty and the inpatient wards.
2. If the department is designed as a limb of the hospital building, conveniently approachable from the user departments, it meets the above requirement.
3. Therefore, it should preferably be sited on the ground floor.
4. It should not be sandwiched between other departments.
5. It should have some scope for expansion at a later date.
6. Radiation protection has no bearing on sitting (but has a bearing on the layout of radiographic rooms).
7. Flexibility, expandability and upgradability need to be kept in mind while siting the department.

Layout

Factors to be Considered

1. Adequate reception and registration area
2. Convenient patient flow with minimisation of crisscross traffic
3. Adequate waiting areas
4. Separate entrance for accident and emergency cases in a busy hospital
5. Provision of rooms for the technical functioning and auxiliary requirement:
 - Chief radiologist
 - Radiologists
 - X-ray rooms
 - Darkrooms/autoprocessing room
 - Film store
 - X-ray record room
 - Staff locker room and toilet
 - Viewing gallery and conference room

- Film drying room
- Barium room
- Recovery room for patients subjected to special investigations
- Ultrasonography room
- Toilets.

Space Requirement

Lack of adequate space results in needless waste of effort and time in efficiently scheduling examinations. An unsatisfactory layout is a handicap to both the hospital and the radiologist. This is particularly important to a small hospital which has a visiting radiologist, for it is to the advantage of the hospital and radiologists to schedule as many examination as possible during his visit.

Space requirements for a radiology department will vary from hospital-to-hospital depending upon its size, bed strength, specialities, and on teaching and research functions. Mc Glibony (1969) advocated that about 2000 sq ft were required for a 200 bed hospital, but above that every hospital would have to work out its requirements based on detailed study.¹ The area suggested by Committee on plan project (COPP) in 1964 seemed to be too meagre.² WHO has suggested the standard size of X-ray room at 20 m.² Based on this, plus one-third of the total usable area as circulation area and other ancillary facilities, approximate requirement of space for different size hospitals works out as follows.

- | | |
|------------|----------|
| • 750 beds | 800 sq m |
| • 500 beds | 650 sq m |
| • 300 beds | 370 sq m |
| • 200 beds | 175 sq m |
| • 100 beds | 65 sq m. |

As far as radiography rooms are concerned, the net area required for all radiographic rooms in a large hospital can be worked out based on the following formula.

Net area required in sq ft for all examination rooms

$$= \frac{\text{Number of the examination per year}}{\text{Number of examinations per day per room}}$$

The figure obtained from the above formula, when multiplied by a factor of 6 or 7 gives a total technical area for a teaching hospital of 500 beds or above, less circulation and other ancillary requirements.

Distribution of Space

In many instances radiology departments have been constructed with no regard to many important considerations. On the other hand, radiology departments of some medical colleges have lavish distribution of space for all

functions. Spatial distribution for such a department in a general hospital is somewhere in between. Generally, the space distribution on an X-ray department is as under—

Percentage

11.0	Control rooms and cubicles
16.5	X-ray rooms
9.0	Film processing and interpretation
20.5	Administrative
8.5	Teaching
5.0	Waiting and recovery
29.5	Circulation and wall area
<u>100</u>	

Reception and waiting: The administrative functions and business records of the department, scheduling of appointments, receiving of patients, typing of forms are handled at the reception. Reception desk should be generally near the entrance. This should be large enough with comfortable seating arrangements, well-lit and well-ventilated. From here the patients are either sent to the appropriate radiographic rooms, or an appointment is given for examination at a later date. Appointments at later dates may be occasioned by a waiting list for certain type of examinations or by the fact that the patients require certain preparation before the examination. The waiting area should have separate cubicle for ward patients who are seriously ill. Such patients needing medical/nursing attention can be kept here in privacy while waiting. It is important to have a soft spoken and well-behaved receptionist or clerk as the patients are usually frightened and uneasy in unfamiliar surroundings.

Radiography records: Radiographic films of inpatients are kept in some hospitals for up to 10 years. The limitation is the large shelf space required if a large number of X-rays are done annually. These films have to be filed in such an order that they can be easily retrieved when required. Help from the medical records departments of the hospital should be sought. Ideally, radiology department should ensure that all films are filed in such a manner that they can be easily retrieved when required.

In modern hospitals, with computerisation of medical records, radiographic images can now be stored on magnetic discs, tapes and floppy discs. This greatly reduces space requirement in addition to reduction in the time and effort required to retrieve the films.

Radiologists office: The office is conveniently situated near the radiology rooms and is not too easily accessible to the

public. The office has a series of viewing boxes where the radiologists examine radiographic plates and writes reports.

Darkroom: Next to radiography room, this is the next most important part of radiology department, as much of the efficiency of the department depends upon the darkroom and the people working in it. The darkroom should preferably be air conditioned. Otherwise the developing tanks should have a built-in temperature regulating mechanism, to avoid films getting spoiled in the tropical climate as ours, where the developer and fixer solution become very warm with melting or chaffing of the sensitive covering of radiographic films. Where the volume of work is high, automatic developing and fixing can be done wherein the exposed film is fed at one end and comes out automatically developed, fixed and dried from the other end of the machine within a few minutes. If the daily workload in a department exceeds 50 films, a small automatic processor should be installed.³ Various models are available with the equipment suppliers.

The darkroom is conveniently located between two X-ray rooms to facilitate handling of films, with film-transfer cabinet interposed between the radiography room and darkroom. Apart from the developing and fixing tanks, utility sink with a drainboard is provided in this room for mixing chemical solutions and handwashing.

The passage into the darkroom should be zigzag to serve as a lightlock between the darkroom and outside. Otherwise, a lightlock equipped with interlocking doors is necessary to allow entrance into the darkroom of personnel during film processing.

Radiography rooms: The most important part of the department is the radiography rooms. Their number will depend on the member of patients to be examined per day as outpatients, inpatients and accident and emergency services. Here, it should be borne in mind that the examination time and time of room occupation goes up if a large number of special investigations are carried out.

In X-ray units, loads up to 2,000 kg/m have to be borne by the floor—a fact that should be remembered when designing the floor in X-ray rooms.

Although there cannot be a standard or stereotype layout, study of factors considered in siting of the department, a study of gross space requirement and the spatial distribution within the department will progress towards deciding on the layout of the department. However, the “break and build” approach is not recommended because piecemeal addition, or alteration, to an existing small department are always unsatisfactory. It is better to plan the whole department at the outset, though actual construction can be phased depending upon the requirement and available fund.

There will be as many types of layout as there are architects and consultants. The three layouts sketched below can therefore serve only as examples (Fig. 13.1).

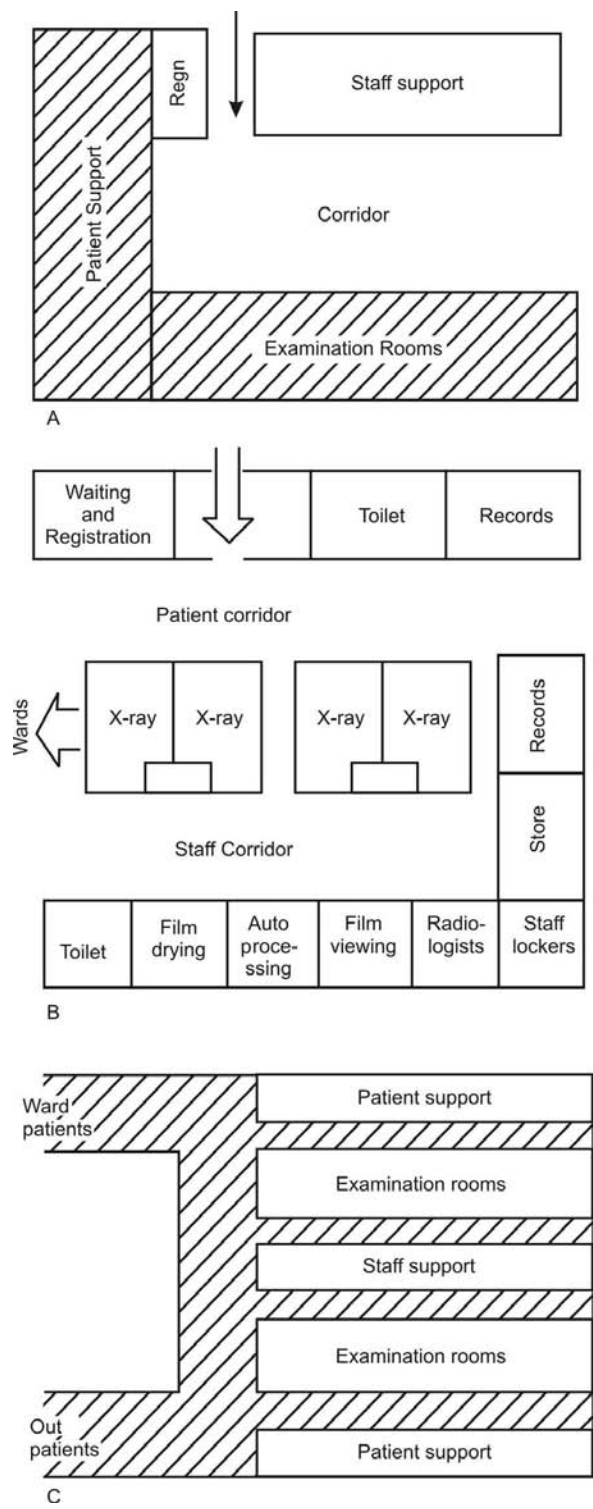


Fig. 13.1: Three different layouts of radiology departments

Location and Layout of Radiography Rooms

The functional requirements of the department are usually best satisfied by locating the X-ray rooms at the end of a wing of the building. In this way, the activity within the department will not be disturbed by through traffic to other parts of the hospital, and less shielding will be required because of the exterior walls.

1. The radiography rooms should be grouped with regard to—
 - i. efficient access to darkroom if a single darkroom is to serve a number of X-ray rooms, and
 - ii. most efficient use of protective lead sheeting.
2. The X-ray rooms should be rectangular and not square, with minimum 4.5 m on sides. The optimum size of an X-ray room is about 4.5 m by 6.0 m.

In the X-ray room, an overhead tube support facilitates X-raying a patient on bed or on a stretcher. For reasons of economy however, it may be desirable to equip one room with a floor-ceiling track. If an overhead mounted track is used, it may be supported from the floor by columns or may be bracketed from the wall, although a ceiling suspension makes a neater installation.

3. If radiography rooms are paired, one darkroom sandwiched between the two can serve both, resulting in economy of space and operations.
4. Minimum size of a room should be not less than 20 m².
5. There should be adequate waiting space for patients outside the rooms.
6. A change room must be provided within the X-ray room where patients, especially female patients, can remove their clothes and redress after the X-ray examination. Each dressing room or cubicle should be provided with a chair, clothes hook, and a dressing mirror. For the protection of patients valuables, the doors may be equipped with locks.
7. *X-ray machine:*
 - The X-ray tube should never point towards the control unit, darkroom or any window.
 - Control panel should be as far away from X-ray table as possible.
 - Radiation hazard to occupants of the X-ray room is inversely proportional to the square of the distance between the tube and the individuals.
8. The passage of film cassettes from the radiography rooms to the darkroom takes place through the hatch window opening into the darkroom. The hatch is to be adequately lead lined to prevent entry of radiation scatter into the darkrooms.

9. An important feature that is likely to be forgotten is that the doors and windows of the radiography room have also to be lead lined for preventing radiation scatter from the room.

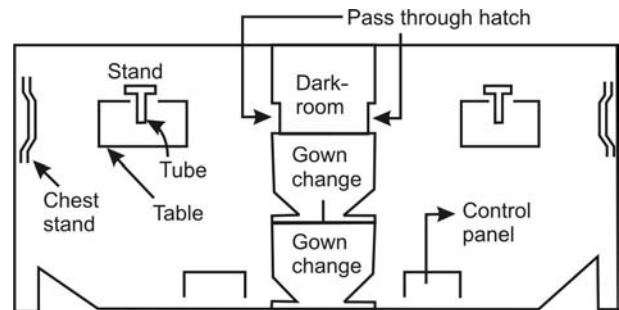


Fig. 13.2: Layout of a paired radiology room

10. *Control booth:* It is essential that the control booth be located as such a place that the patient may be observed even when the table is inclined. A door on the control booth or a baffle placed suitably is required to protect the technician in the booth from scattered radiation.

The control panel should be wired to a signal outside each X-ray room to indicate when the machine is on, to prevent other personnel from inadvertently entering the room. A red light bulb will be satisfactory as a signal.

X-ray Machines

Machines which operate at a higher milliamperage are better for taking X-ray of thicker part of the body with less exposure time, but they are more expensive. However, this is a simplification of a complex problem, wherein many other factors are involved. To illustrate the point, chest X-ray and X-ray of extremities can be done with 30 to 50 mA machines which are inexpensive, but better films of even these parts are obtained with a 100 or 200 mA machine which costs considerably more. Moreover, radiation dose to the patient goes down steeply with machines operating at higher mA, which is a factor responsible for the reduction of exposure time. However, examination of the skull, abdomen and special investigations are best carried out with machines working at 500 mA or above.

To put it simply, higher the mA, the cost of the machine rises steeply. Also the cost of maintenance, repairs and replacement of the worn-out parts becomes more expensive. Service charges may include cleaning, and replacement of minor parts only. Replacement of X-ray tubes is also very expensive.

Image Intensifiers

Radiography image intensifiers which greatly enhance the brightness of the normal fluoroscopic images, also reducing the dose to the patient, have become inescapable in modern hospitals. Image intensifier systems are distinguished by a C-arm suspended from an overhead support clamped between floor and ceiling on an upright metal column. Mobile units mounted on a wheeled basis, commonly referred to as surgical image intensifiers, reflect the particular requirements placed on them, viz. high manoeuvrability, versatility of adjustment, quick positioning, compact dimensions and ease of operation to satisfy the demands of the operating room. Different designs have been specifically adopted to meet the needs of their specialised applications.

A cost benefit analysis on the machines of various powers and make would help in selecting the appropriate one for the hospital.

Radiographic machines are preferably installed in air-conditioned rooms if they are to work efficiently under tropical conditions. This further adds on to the costs.

Special investigations and fluoroscopy together form only 14 per cent of all investigations, but these take up 40 per cent of the room time. Similarly, radiograph taken in wards with portable machines and radiograph taken in operation theatres take up lot of time of the radiographers. In general, if the total number of patients per day does not exceed 25, with two special investigations per day, then one 300 mA machine with fluoroscopic attachment or image intensifier, and one portable radiography machine will suffice for a small hospital. For a medium-sized hospital 2 to 3 major radiography machines are required so that in case one is out of order for a few days, (once a machine is out of order it may remain so for days, and may be for weeks at times, until it is repaired), the work of the department should not suffer. And, at least one of the machines should have an image intensifier or a spot filming device with screening and tilting X-ray table fitted with potter Bucky diaphragm for barium examination and intravenous urography, etc.

If there are three radiography rooms then two rooms can be used for general radiography. This room should have more than one changing cubicle as the turnover is at times high. While one patient is undressing in one cubicle, the other one is dressing up in the other after his or her examination.

The third room can be used for special investigations, e.g. barium studies. A special point to note is that this room

must have an attached toilet. In summer, air-conditioning of the room decreases the frequency of machine breakdown, in winter when the patient are lying almost stripped on the X-ray table, rooms should be kept warm.

Portable Machines

Though portable radiographic examinations are an essential part of the work of any department, it is important to realise the limitations of these examinations. Portable machines have to be truly portable so that one person can wheel it to the ward. Therefore, the mA of these machines are generally on the lower side. The patients are usually very ill and uncooperative. Therefore, good quality films except for chest and extremities are difficult to obtain. Moreover, these take up a lot of working time of the radiographers. Hence, these should be asked for if absolutely essential. Most patients can be sent to the department with a nurse, provided prior intimation has been given to the department. This will ensure that such seriously-ill patients are not made to wait.

OT Radiography

Radiography in the operation theatre has all the disadvantages as portable X-ray in the wards. In addition, because the areas have to be kept sterile, this further increases the difficulties of taking radiographic pictures in operation theatre. In hospitals where such radiography are frequently required in the operation theatre, special operation tables are needed where a cassette containing radiographic film can be put in a tunnel without interfering with the operation field. Instead of a 30 mA portable machine, a 100 mA radiographic machine which is not so light can be kept permanently in the operation theatre. If the workload so demands, a small darkroom can be installed in the operation theatre complex so that the films can be processed at once, and patient is not kept under general anaesthesia for unduly long periods.

All the radiography rooms are planned in such a way that the radiographer after positioning the patient, goes inside a radiation protected cubicle to operate the controls of the X-ray machine. Lead glass windows provide a view of the patient positioned on the X-ray table. Adequate number of lead aprons and hand gloves have to be provided in the fluoroscopy room for protection of the radiologist while screening of their patients.

Power Requirements

1. Mains
 - 220 volts AC, three phase
 - 50-60 cycles

- 25 Amps
 - Mains impedance should not be greater than 0.5 ohms.
2. For a steady current with least impedance, a separate power line exclusively for the radiology department is essential.
 3. Frequent voltage fluctuations give unsatisfactory results. Voltage stabiliser is necessary for each machine.
 4. Actual power consumption will be determined by the machine's power (mA) and number of exposures per day.

STAFFING

There appears to be a wide divergence of opinion regarding the staffing pattern of radiography department for various size hospitals. The requirement of staff can, however, be worked out on an empirical basis. For planning purpose, it should be remembered that:

- i. one radiographer can perform up to 40 examinations of routine nature such as X-ray of skeleton, chest, and abdomen which are the most frequently done X-ray, and
- ii. special procedures may take up to one hour each.

In addition to the radiologist, the radiology department needs radiographers (also called X-ray technicians), darkroom assistants, nurses, clerical staff and departmental orderly. X-ray technician is a highly technical paramedic with great responsibility who should be treated accordingly. The radiologist is completely dependent on the technical staff both in X-ray rooms and darkrooms. His own efficiency depends a great deal on the quality of radiographs on which he is reporting.

Radiographers

In a 200 bedded general hospital with the basis specialities of medicine, surgery, obstetrics and gynaecology and paediatrics:

Case Load

1. OPD: 300 daily (approximately)
 - 40 per cent new cases, i.e. 120 per day
 - 60 per cent old cases, i.e. 180 per day. Out of these:
 - i. 15 per cent of new, i.e. 18 cases/day
 - ii. 5 per cent of old, i.e. 9 cases/day
 24 cases will require radiographic examination.
2. *Inpatients*: Up to 15 per cent of inpatients, i.e. 30 cases are likely to require radiographic examination per day.

3. Total for X-ray: 54 cases per day.
 - Number of radiographers: 40 examination per radiographer = 2 radiographers.
 - Plus one for night/emergency shift and one as leave reserve.
 - Therefore, the minimum requirement of radiographers in this example is 4 including off duty reserve.

Other Staff

A nurse generally is not required to be assigned fully to the radiology department. However, in hospitals with large radiology departments (More than four radiography rooms), an administrative nurse positioned as incharge of coordination may be desirable.

The other staff in department will be

- i. darkroom assistants
- ii. reception clerk
- iii. record clerk
- iv. attendants/peons.

Recommended staff for a 500-bedded teaching hospital.

Radiologists	1. Consultant/professor: 1
	2. Senior specialists/asso. professor: 2
	3. Junior specialists/lecturers: 3
X-ray technicians (radiographers)	: 8 (including 3 shifts and leave reserve)
Darkroom assistants	: 4 (3 shifts)
Staff Nurse	: 1
Attendants	: 4 (3 shifts)
Record clerk	: 1
Receptionist	: 1

RADIATION PROTECTION

If radiology rooms are isolated and built so that people cannot come within one metre of its outside walls, no protection to walls is required. However, as this is not always possible, the walls of the rooms where radiographic machines are located have to be adequately reinforced.

Basis of Calculation of Wall Thickness

The unit of measurement used for this purpose is "mA second", which is the product of the current flowing through the X-ray tube and the duration of exposure.

- For a 100 mA machine, a wall thickness equivalent to 1 mm of lead is required.
- 1 mm of lead thickness = 12 cm of poured concrete
= 10 cm of sheet glass
= 5 mm of steel

- The appropriate wall thickness using different materials can be calculated using the following equation

$$\begin{matrix} \text{Thickness} \\ \text{of concrete} \end{matrix} \times 2.35 \text{ gm/cm}^3 = \begin{matrix} \text{Thickness} \\ \text{of other} \\ \text{material} \end{matrix} \times \begin{matrix} \text{Density} \\ \text{of other} \\ \text{material} \end{matrix}$$

As per recommendations of the radiation protection division of Bhabha Atomic Research Centre (BARC), Mumbai the walls of the radiography rooms have to be 9 inches thick concrete walls or 14 inches thick brick masonry walls which are sufficient for primary as well as scattered radiation. Where they are thin, lead shielding of walls is advisable.

- The places which need special protection are:
 - i. wall behind the chest stand in radiology room
 - ii. wall between radiology room and adjoining room.
- Personal protective measures, viz. wearing the lead-rubber apron while working and lead rubber gloves while doing fluoroscopy work provide adequate protection.
- Use of personal film badge/dosimeter and their quarterly submission to BARC.

ULTRASONOGRAPHY

From the time of World War I when ultrasonography was used with the deployment of SONAR for detection of underwater objects, its industrial uses expanded considerably. But the application of ultrasonography in the medical field started only in the early 70s.

Ultrasonography waves are mechanical pressure waves whose frequency (ranging from 2-10 MHz) is much higher than that of sound (20-16,000 Hz). An ultrasonography wave emitted by a transducer, containing a piezoelectric crystal, encounters a target organ and gets either reflected back or refracted. The waves reflected back reach the transducer and are converted into voltage wave forms, processed and ultimately displayed on a cathode ray tube (TV monitor) in a two-dimensional format.

Apart from cardiology where ultrasonography has been extensively used, the greatest benefit of ultrasonography in diagnostic imaging has been in diagnosing disorders in the abdomen and pelvis. In most cases, transabdominal sonography (TAS) is used. However, intracavitary ultrasonography or endosonography is widening the scope of ultrasonography. Transvaginal ultrasonography (TVS) gives far better resolution and therefore better distinguishes adnexal masses from bowel loops; it also provides greater detail of the internal characteristics of a pelvic mass. Endosonography of the lumen allows for detection of mucosal abnormality, delineation of the layers of gut wall and definition of

surrounding soft tissues to a depth of 8 to 10 cm. Thus, tumours hidden below normal mucosa, tumour penetration into the layers of gut wall, and tumour involvement of surrounding vital structures and lymph nodes may be well evaluated. Endosonography of the oesophagus, stomach, duodenum, rectum and anal canal is now possible with use of special probes.

Small parts ultrasonography of scrotum, thyroid or breast is making the early diagnosis and treatment of small tumours very easy.

Newer trends in ultrasonography involve the development of contrast agents to opacify the lumen of the bowel, veins, arteries, bile ducts and ureters. Ultrasonography contrast agents may aid in tissue-specific or tumour specific agents. Trials have already been completed with SH U 454 (Schering AG, Germany) which has shown improved detection of liver tumours in rats following hepatic arterial or portal venous injection.

The wider use of this modality is of great benefit in reducing the need for expensive and hazardous diagnostic procedures and, in future will be recommended as a primary method of imaging. Accuracy of diagnosis improves with increased experience, improved working methods and versatile equipment system. The combination of good sonography image and an examiner with sufficient experience can yield a sensitivity and specificity comparable with CT.

Whereas the cardiac structures and their motion are visualised with 2-D echocardiography, Doppler echocardiography studies the flow of blood within these structures. To obtain better spatial orientation of flow within the cardiovascular system, real-time colour flow mapping is done by the modern colour flow ultrasound (Doppler) system. Hard copy of the results can be obtained by a choice of devices—strip chart recorder, video printer, multiformat camera or colour camera. Qualitative and quantitative haemodynamic and anatomic information regarding valve defects and cardiac shunts are now possible with these versatile equipments.

Equipment, Physical Facilities and Staffing

Ultrasonographic diagnosis is entirely dependant on the quality of the ultrasonography machine. The factors that require careful consideration in selection of the machines are:

- i. type of work,
- ii. type of hospital, and
- iii. case turnover.

There has been a virtual technological explosion in medical electronics field during the last few years. The medical electronics field has now any number of manufacturers and suppliers who have entered the field, not all of them being reliable. For smooth functioning of the department, the machines and equipments should be selected from renowned and time-tested firms. The equipment should have the backing of an after-sales service capability and provision of stand-by machine. Accessibility of the service centre is important. For small peripheral hospitals, this becomes a real problem.

The standard size of an ultrasonography room should not be less than 16 m² which will accommodate the examination bed apart from the equipment. A toilet attached to the room is desirable.

The ultrasonography machines are handled only by a qualified ultrasonologist. Therefore, no additional technical staff is necessary except an attendant. Other administrative staff such as receptionist or clerk, etc. can be pooled from the staff of the radiography department.

POLICIES AND PROCEDURES

It is important to deliberate upon the policies on which the edifice of the imaging department stands. The following policies and principles should be given due consideration.

1. *Organisation*—This envisages the correct ways in which resources are used to produce satisfactory relationship between use of the resources and demands on the system. The organisation manifests in the system of giving appointment, allocation of work among various radiography rooms and darkrooms, for covering emergency work, reception of patients and for processing and reporting of films.
2. *Department timings*—The service are to be made available for all patients round the clock including accidents and emergencies.
3. Is there going to be more than one shift for outpatients?
4. *Waiting time*—Will staff and machines be enough to cover all patients during normal working hours without undue waiting time? Waiting for barium studies and IVU studies should not be more than a couple of days.
5. *Emergency and casualty cover*—Will there be a separate machine and darkroom for the casualty? If so, its staffing. If possible, accident and emergency cases should have separate entrance and waiting area.
6. *Urgent reports*—Will there be a radiologist cover to give reports on urgent radiograph round the clock?
7. Arrangement for wet film viewing and reporting.
8. Appointment system for ward patients—Should be so designed that inpatients do not have to wait unduly.
9. Should there be separate radiography room for inpatients exclusively?
10. *Special investigations*—Arrangement to give appointment to both inpatients and outpatients for special investigations.
11. *Despatch of results*—What will be the method for despatch? Will ward and departments collect them from radiology department or will it be delivered to them by radiology department?
12. Arrangements to give report on OPD patients.
13. Methods of coordination between other departments with radiology.
14. Preventive maintenance of machines and equipment by in-house technicians—their duties and responsibilities.
15. OT radiography—Level of physicians/ consultant ordering radiograph in operation theatres.
16. *Radiation safety*—Method of establishing checks of tubes for monitoring leakage of radiation.
17. Workers receiving more than the safe acceptable radiation dose in a given duration—methods of keeping off duty.
18. Recovery of silver from fixer and developer solutions.
19. Time utilisation of radiographers including relieving/emergency duties.
20. Precautions while examining female patients.
21. Gonads protection while taking repeated abdominal radiographs of infants and children to prevent radiation damage to gonads.
22. Modalities of instruction to patient on preparation for special examinations.
23. Procedure for requisitioning radiographs from other hospitals for assessment of progress of disease by radiologist.

COMPUTED TOMOGRAPHY (CT)

CT is a specialised X-ray examination. Every CT scanner consists of a (a) X-ray source (Tube and HT generator), (b) detectors, (c) data processing and display facility, and (d) scanning gantry and patient support.

The process consists of rotating an X-ray tube around the patient. X-rays pass through the patient and are captured by an array of detectors. The beam that reaches the detectors carries information about the internal anatomy of

the patient. This information is assembled to form a recognisable image by high speed computers and displayed on a screen. Rotation of the X-ray tube around patient's body ensures that samples are taken from many different angles and this makes the final picture much more accurate.

CT has become a routine procedure for examinations of the whole body, abdominal and thoracic organs and the extremities as well as for examination of body structures with various indications, and of course different detailed examinations of the brain and skull.

For the quality of CT image, parameters like contrast, special resolution, fineness or thickness of the imaged layer, dose and exposure time for the individual layer, and absolute accuracy of the computer-calculated attenuated values are of particular importance.

Spiral CT

Spiral CT is an improvement over the erstwhile CT technology. As opposed to conventional CT where the X-ray tube takes a half circle around the body and returns to its original position before making another half circle, in spiral CT the X-ray tube continuously rotates fully around the patient in a 360° circle giving an outstanding clarity to the images. In addition to clarity, scan time is reduced to less than a minute in most cases which is of importance in uncooperative, breathless or trauma patients and patients on life support where speed is of essence. Shorter scan time thus obtained also decreases radiation dose by about 40 per cent.

Its life-like 3D reconstructing of images by multiple computed reformats is of great importance for accurate reconstructive surgery after extensive multiple bones and joints trauma.

MAGNETIC RESONANCE IMAGING (MRI)

The new wonder gadget of imaging technology is MRI. In MRI, a patient is made to lie in a high magnetic field, and various radiofrequency pulses are put on and off repeatedly. The signals from human tissue are received and fed to computer which converts these signals into images on a TV screen.

MRI has the ability to detect lesions of 3 mm and less.

The images are very sharp and clear and shown in 3 dimensions. It produces excellent tissue contrast—the bones do not impede the images, thus, giving a clear picture of internal structures. Though MRI cannot replace CT, it can detect vital lesions that might slip out of CT images.

Beyond doubt MRI is the choice of modality in imaging spine and brain as, due to very high contrast resolution, MRI provides excellent white and grey matter differentiation. This has made complicated operations of the brain and spine more simple. Apart from the imaging of brain and spine, MRI has also been successfully used in the region of abdomen, pelvis, orbit, chest, musculoskeletal system, joints and in staging of cancers.

Instead of the conventional superconducting magnet system, permanent magnet systems are now available. Compact and sleek because of permanent magnets the newer systems have a low power consumption, operating costs are low, they have a nonclaustrophobic gantry aperture, magnetic shielding is not required, and which occupy only about 30 sq m space. These are easy to install and maintain even in existing buildings. The total space requirement for a MRI system including office and other administrative accommodation is a minimum 85 sq m.



CHAPTER

14

Laboratory Services

INTRODUCTION

The importance of hospital laboratory services cannot be overestimated because the practice of medicine today requires more and more laboratory examinations, and physicians have need for diagnostic facilities, whether they are private practitioners or hospital-based doctors. Undoubtedly, one reason for the concentration of doctors in cities and towns is the availability of such services, as contrasted with the lack of such services in rural and less densely populated centres.

A hospital laboratory service can be a high income generating service and an economic asset to the hospital. An efficient laboratory service for outpatients has a bearing on reducing the number of patients admitted solely for laboratory investigations, thus, reducing pressure on hospital beds. An efficient laboratory service also helps in reducing the average length of stay of admitted patients.

The basic function of a laboratory service is: (i) to assist doctors in arriving at or confirm a diagnosis and to assist in the treatment and follow-up of patients. (ii) The laboratory not only generates prompt and reliable reports, but also functions as a storehouse of reports for future references. (iii) It carries out urgent tests at any part of day or night and therefore provide service 24 hours a day. (iv) The laboratory also assists in teaching programmes for doctors, nurses and laboratory technologists.

Developments in medical sciences is leading to the emergence of hospital laboratory service as a medical speciality.

WORKLOAD

An admitted patient undergoes anywhere between 8 and 20 laboratory tests on an average during his or her hospitalisation period. In a 1990 study in a teaching hospital, laboratory tests averaged at 20 tests per patient in medical ward during an ALS of 10 days, giving a ratio of 2 tests per day, excluding radiographic investigations or other tests carried out in specialised laboratories. A 100-bedded hospital with a 10 days ALS will treat $365 \div 10 = 36.5$ (say 37) patients per bed in a year, or $37 \times 100 = 3700$ total patient in a year which means that the hospital laboratory will have to carry out $3700 \times 8 = 29,600$ tests to $3700 \times 20 = 74,000$ tests during the year.

There are over 350 tests on blood, faeces, urine, saliva semen and biopsy specimens covering enzymes and other specific proteins, hormones and intermediate metabolites. In the All India Institute of Medical Sciences, New Delhi, the number and type of tests available in clinical chemistry, haematology, microbiology and other specialised laboratories (excluding nuclear medicine) have risen from 125 types in 1973–74 to 236 types in 83–84.¹ This is an increase of almost 100 per cent in one decade in the number of tests available to doctors.

It has been found that generally only a small variety of tests account for the greater part of tests carried out in a hospital laboratory. Haemoglobin, total and differential leucocyte count and erythrocyte sedimentation rate (ESR)

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in haematology, and blood urea, blood sugar, serum sodium and potassium in clinical chemistry, and urinalysis are the most frequently ordered tests in general hospitals²(Fig. 14.1).

Table 13.1: Most frequent tests in hospital laboratories

<i>Name of tests</i>	<i>Percentage</i>
Hb, TLC, DLC	90
ESR	70
Peripheral blood smear	35
Blood sugar	80
Blood urea	82
Serum sod/pot	60
Urinalysis	56

Hb—haemoglobin, TLC—total leucocyte count, DLC—differential leucocyte count, and ESR—erythrocyte sedimentation rate

FUNCTIONAL DIVISIONS

A hospital laboratory is a conglomerate of many technologies and methods. The hospital laboratory work generally falls under the following five divisions.

1. Haematology
2. Microbiology
3. Clinical chemistry/Biochemistry
4. Histopathology and cytology
5. Urine and stool analysis.

FUNCTIONAL PLANNING

The planning and design of the laboratory in the hospital has been neglected to such extent that many hospitals today are facing overcrowded working conditions and a poorly functioning laboratory service. Increasing demand on diagnostic services should be an incentive for a more careful consideration of the function and requirements of this rapidly growing service in the hospital.

As in planning of any other specialised service, persons with expertise and experience in the laboratory field are needed to work as a team with the administrator and the architect, to develop a written programme for the laboratory. Development of the functional programme depends mainly on the current and projected number of tests required to be carried out, which in turn will depend on the number and types of patients to be served. Other factors to be considered are the types of tests and the style of working, like manual system and the extent of mechanical or automated systems.

This input is translated into effective floor plans, areas, spaces, equipment, organisation and staffing.

Functional planning covers the following activities.

1. Determining approximate sectionwise workload. Available empirical evidence and historical data tempered with experience will lead to anticipated workload.
2. Determining services to be provided (for inpatients/outpatients, for other departments, smaller hospitals and private practitioners).
3. Determining area and space requirement to accommodate equipment, furniture and personnel in technical, administrative and auxiliary functions.
4. Dividing the area into functional units, viz. haematology, biochemistry, microbiology, histopathology, urinalysis, etc.
5. Determining the number of work stations in each functional unit/division and deciding the linear bench space allotted for each work station.
6. Determining the major equipment and appliances in each unit. This is generally classified into:
 - i. Technical equipment peculiar to certain work stations
 - ii. Other equipment and appliances e.g. (refrigerators, hot air ovens, centrifuges) that can be jointly used by different work stations or units.
7. Determining the functional location of each section in relation to one another, from the point of view of flow of work and technical work considerations.
8. Identifying the electrical and plumbing requirements for each area/work station. Independent electric circuits are required for electronic equipment items. Location of sinks and wash areas are vital for efficient performance of work stations.
9. Considering utilities, viz. lighting, ventilation (forced or normal exhaust, air-conditioning and air hygiene) and isolation of equipment or work stations.
10. Working out the most suitable laboratory space unit, which is a standard module for work areas. A standard module facilitates rearrangement of work units with least disruption and minimal structural changes.

Microbiology

This requires a separate area that is away from the other areas. The area would be divided into sample receiving area, inoculation area, place for incubator, and media preparation area. The tests commonly done in microbiology include Gram staining, AFB staining and culture and sensitivity.

The work-table for microbiology must have a laminar airflow arrangement. Besides a general purpose refrigerator it would also have an incubator, oven and autoclave. A microbiology autoclave is used for sterilising culture plates and media. A gas burner is needed at the place where inoculation is done. This can be placed within the laminar airflow.

An area for media preparation is also needed. If higher-end microbiology is to be set up that will require a Rapid Culture System. This gives culture reports in one day.

Histopathology and Cytology

This work is usually done in laboratories that have a good amount of histopathological workload. Many laboratories out-source the samples to other laboratories that pool the samples from all laboratories and process them. The prepared slides are then sent back to the respective laboratories for reporting. This becomes more economically viable.

The main instruments that are needed for this include Rotary Microtome and Tissue Processor.

SPECIALISED SERVICES

Hormone/Tumour Markers (ELISA/RIA)

These are specialised services. Hormone assays, tumour markers, hepatitis and other infectious disease markers can be done in this lab. A RIA gamma counter is needed if the tests are done by RIA. If ELISA is to be done then the requirement is ELISA reader.

Molecular Lab (PCR, Flow Cytometry, Immunohistochemistry)

There are again highly specialised services and will need separate areas and highly specialised equipments. Understandably, these should be part of a referral lab. This requires sufficient amount of workload to make it viable. This can also be useful if the hospital has some research projects.

ORGANISATION

A centralised organisation where all the laboratory work is carried out in one centralised laboratory has many advantages, viz. routine tests can be done more economically by “batching”, and there is economy of manpower and equipment. On the other hand, the departmental set-up may be decentralised, with separate sections working independently, with sections established in several areas such as wards and emergency, and a satellite laboratory for

outpatient department or nursery. A decentralised laboratory set-up has the advantage of rapid availability of results, and having specific tests available where they are actually required. However, this is wasteful on manpower, equipment and materials resources. Lack of supervision and control can also lead to laxity in quality control.

The organisation should therefore weigh the pros and cons of centralisation and decentralisation, the determining factors being the size of the hospital, quantum of workload, specialist departments, quantum of OPD work, and “spread” of the hospital.

A single central laboratory service offers a more effective and efficient use of limited availability of resources, greater flexibility, easier supervision and better technical standards.³

SITTING AND SPACE

Location

It is preferable to have the hospital laboratory planned on the ground floor and so located that it is easily accessible to the wards. In smaller hospitals, where there is significant outpatient load on the laboratory, it should be situated in between the outpatient services and the wards. In a larger hospital, the number of outpatients crowding the laboratory for giving laboratory samples may clog the department. Truly speaking, there is no need of a direct contact of the laboratory with patients unlike in other diagnostic areas. Therefore, in a larger hospital, the entry of outpatients to the laboratory can be obviated by opening a sample collection counter in the outpatient service area itself.

Outpatient Sample Collection

Provision of a laboratory sample collection facility in the outpatient department of large hospitals may be necessary because of the high quantum of OPD investigations. The room should be located at a suitable place in the outpatient department itself. The design of this area should include waiting room for the patients, venepuncture area and specimen toilets separately for male and female patients. Provision should be made for containers with appropriate preservatives, for correct labelling of samples, and for keeping record of each patient.

In busy hospitals, a laboratory section itself may have to be opened in the outpatient department and equipped to carry out commonly ordered tests. However, this should only be done if the volume of tests justifies it.

Area/Space

In a small hospital, the laboratory facility may consist of a room in which all the routine urinalysis, haematology and

some clinical chemistry investigations are carried out. As the hospital size increases, the requirement of technical and administrative services also increases with the necessity for departmentalisation of the laboratory.

At times a false sense of economy is sought to be achieved by curtailing the space requirements of the laboratory by shifting it in an insignificant place in the hospital. Developments taking place in diagnostic laboratory methods necessitates expansions and change. Therefore, laboratory service should be planned with an eye on future alterations and additions.

The requirements depend on the extent of the proposed functions of the department, and its basis is that “adequate” working area for all activities carried out in the laboratory should be catered for. Technical and professional activities follow a pattern and have to be carried out with the help of certain gadgets, appliances, equipment or apparatus peculiar for each type of test. Primarily, space is required for these technical and professional activities. Secondary activities in support include patient waiting, specimen toilet, specimen taking, glass-washing, sterilising, stores, preparation, etc. Materials, specimens and personnel must also move between rooms within the laboratory. Therefore, the requirement of space for the laboratory consists of primary space, secondary space and circulation space.

Primary Space

Primary space is the space utilised by technical staff for the primary task of carrying out professional work. This space is expressed in terms of laboratory space units.

Secondary Space

Secondary space is the space utilised for all supportive activities. Administrative space, viz. offices for the pathologist and others, rest and locker rooms, staff toilets, etc. should be considered separately from secondary space.

Circulation Space

Circulation space is the space required for uncluttered movement of personnel and materials within the department between various technical work stations, rooms, stores and other auxiliary and administrative areas.

A laboratory service for a 100 to 150-bedded hospital requires the same type of technical units as one for a 200 to 300-bedded hospital. Only the space requirements for the technical work areas of the units are reduced, because the workload is less and fewer technicians are needed.

Laboratory Space Unit (LSU)

The basic unit of planning for hospital laboratories is the laboratory space unit (LSU). It is a module of space and all calculations for technical work areas and some auxiliary areas are based on the LSU. Determining the arrangement of benching for a single or a group of technicians and placement and arrangement of equipment is facilitated by dividing the laboratory space in LSUs. A number of LSUs can be combined to form large technical areas, or a LSU can form part of an open laboratory space in a variety of ways. A standard module also facilitates future rearrangement of the department without much disruption. As it can be partitioned off to carry out a specific technical function, it can also be subdivided as necessary to provide smaller workspaces.

Dimensions and Space of LSU

For allocation of primary space one of the most suitable size of a LSU is the one measuring 10' × 20' giving a LSU module of 200 sq ft (18.5 m²). These dimensions are determined by the limits of human reach and the clearance between benches required by workers. Although a LSU can either be in the form of an open bay or an enclosed room, a LSU does not represent the dimensions of a room but only the amount of space necessary for various laboratory functions.

As compared to square modules, a rectangular module is functionally more efficient because in the same overall space it can accommodate longer runs of benching due to its longer perimeter. On the other hand, a laboratory planned with rectangular modules will have deep bays.

DESCRIPTION OF ACCOMMODATION

Although the actual or projected workload and equipment alone can determine the size of various functional accommodations within the laboratory, general estimates can be made based on the experience of existing hospitals. Certain recommendations can be found in the recommendations for an area laboratory of the NHS of England, the report on General Hospitals of the Committee of Plan Projects, Government of India, New Delhi (1966), and the Scales of Accommodation for Armed Forces Hospitals for planning of hospital laboratories. An outline description for the accommodation for a general hospital (approximately 300 beds) is given below in Table 14.2. This is based taking into considerations some of the recommendations mentioned above, coupled with empirical studies and experiences at the operational level.

Table 14.2: Schedules of accommodation of hospital laboratory

Departments	Space required	
<i>Primary space</i>		
Haematology		
• General haematology (including special and general tests coagulation studies, electrophoresis, etc.)	2.5 LSU	
• Office desk/administration	0.5 LSU	
	3.0 LSU	55.50 sq m
Clinical chemistry		
• Processing and preparation	0.5 LSU	
• Special and general tests	1.5 LSU	
• Office desk/administration/reagent stores	1.0 LSU	
	3.0 LSU	55.50 sq m
Microbiology		
• General bacteriology	2.5 LSU	
• Media preparation	0.5 LSU	
• Office desk/administration	0.5 LSU	
	3.5 LSU	64.75 sq m
Histopathology		
• Specimen preparation	1.0 LSU	
• Section cutting and staining	0.5 LSU	
• Frozen section/special techniques	0.5 LSU	
• Cytology	1.0 LSU	
• Office desk/administration	0.5 LSU	
	3.5 LSU	64.75 sq m
Urine and stool		
	0.5 LSU	9.25 sq m
	Total	249.75 sq m
<i>Secondary space</i>		
Patient area		
• Waiting area	20 sq m	
• Consulting, examination venepuncture, etc.	10 sq m	
• Patient toilet(specimen toilet)	10	40 sq m
Office and staff		
• Pathologist office and laboratory	20 sq m	
• General office: assembling labelling and storing specimen containers, distribution of reports	30	
• Staff locker and rest room	10	
• Staff toilet	10	70 sq m
Supply and processing		
• Chemical preparation	15 sq m	
• Central glass washing	15	
• Sterilisation	20	
• Distilled water still	10	
• Store : general and glassware	10	
• Store: chemical	10	
• Disposal and cleaning	10	90 sq m
	Total	449.75 sq m
<i>Circulation space</i>		
• Approximately 30 per cent of the total of primary and secondary space		

Note:

1. Space for gas plant, animal house, conference room has not been included
2. In laboratories of teaching institutions where more sophisticated work like cytology, trace elements, radioisotope studies, genetic studies, etc. are undertaken, additional primary space up to 5 LSUs and secondary space of 4.5 LSUs should be catered for.

Layout

Departmentation of laboratory work into the four basic divisions may become less rigid due to increasing mechanisation and automation of many techniques. Continual developments in electronic equipment and techniques call for a structure that is sufficiently adaptable to accommodate these changes. A simple, basic layout of spaces and equipment which can be supplemented or modified to suit different requirements is likely to be more efficient. Laboratories of the future are going to require different type of space rather than more space.

The structure, equipment and finishes should permit the original space allocation and the layout to be changed while the building is in use, with minimum disturbance. Flexibility for use is needed so that areas can be converted from secondary to primary space and *vice versa*. In the interest of rearrangement for expansion or change. In an atmosphere of rapid technical change, structural flexibility can be achieved by use of movable or adjustable benching systems in association with an installation of service mains that has been designed to permit the repositioning of outlets. For instance, a few large sinks which are capable of being shifted without undue inconvenience are both more economical and more convenient than a larger number of small fixed sinks. On the other hand, a fixed layout of services and equipment can be designed to be conveniently used in a number of alternative ways providing that working methods can be adapted or modified to fit the layout. Such variations in working methods will in some cases be preferable to the provision of structural flexibility because of the administrative and physical inconvenience of making the alterations required. Open planning with a suitable arrangement of bays permits a higher ratio of usable bench length to floor area.⁴

Administrative and Auxiliary Areas

The administrative area is separated from the technical work areas so that the nonlaboratory personnel need not enter the technical areas. Administrative area is the central collection point for receiving specimens and is the reception and interaction area for the patients and the hospital staff.

Reception and Sample Collection

This is the area where the patient and his relatives will be coming. It should have a good pleasing atmosphere. It should be well-ventilated and well-lighted. It should have a chair where the patient can sit in comfort and his arm could be stretched for the phlebotomy. A bed where the patient can lie down for paediatric collection or aspiration cytology (FNAC) is also desirable. The area should also have a needle destroyer where used syringes and needles can be discarded.

Bar-coding System for Samples

Many big labs now use bar coding system to trace the samples. As soon as the sample is received in the lab it is bar coded and then sent to the processing area. This protects the patient identity. It also avoids confusion over similar names. Retrieving of archival data is also easy.

Specimen Toilet

A specimen toilet is provided for the collection of urine and stool specimens.

Pathologists Office

Pathologist's office is so placed that he can have easy access to the technical areas, particularly the histopathology unit. The office can be separated by a glass partition which permits the pathologist to observe technical work areas.

Glass Washing and Sterilising Unit

Very few things are reused in labs these days. Most of the things that are used are disposables. Syringes, needles vacutainers are not reused. Small labs collect blood in bottles that are washed and reused. However, washing area is needed for all glasswares.

The unit is partitioned into the washing and the sterilisation area. Within the unit are located a water still, pressure steriliser, sterilising oven, and pipette washer, and a large sink with drainboard. Storage cabinets and shelves are provided for glassware and other items. An exhaust removes the heat generated by the water still and steriliser.

Report Issue

This should be a separate area from the work area. A separate person well-versed in typing is desirable. The reports should be issued in printed format. Many electronic software are available that make the report typing fast. These automatically include the normal reference range of various lab parameters and the relevance of many specialised tests. The hospital

lab software can also be made as per the requirement of the hospital. Some hospitals have a software where once the reports are fed to the computer they can be accessed from anywhere in the hospital. These are specifically useful in large hospitals.

Laboratory software: There are numerous computer softwares that help on reporting. Many types of software can be tailor - made for the specific requirement of a laboratory. These help in better and fast reporting. The old data is also stored in the computer. This helps in better archiving of data with better data management for statistical analysis and publication.

Staff Locker Room and Toilet

Locker and toilet facilities should be provided separately for the technical staff.

Utility Services

Utility services include, water, gas and compressed air systems. The need for uninterrupted functioning of these systems and the probability of future expansion, calls for careful study in designing them for safety and efficiency.

Piping systems should be located where they will be easily accessible for maintenance and repairs with minimum disruption of work. A sufficient number of valves, traps and cleanout openings should be installed, and should be located so as to permit maximum use of the facilities during repairs.

Arrangement of laboratory benches at right angles to outside walls simplifies the arrangement of piping systems by installing vertical line in the outside wall and mounting the horizontal piping on this wall. Removable panels between the bench islands on the outside wall provide easy access to the main piping system for repairs. Branch lines may be carried from the horizontal wall piping through the centre of the island to serve the benches on both sides (Fig. 14.1).

For safety purposes and to facilitate repairs, each individual piping system should be identified by colour, coding or labelling. All waste piping from the laboratory should be of a noncorrosive material and should be carried to a point in the piping system where the discharge will be diluted by waste water from other areas.

Internal Design and Fitments

Work Benches

Technicians work while seated on revolving stools with or without back rests. The height of the work bench may

vary from 75 to 90 cm depending upon the height of the workers. However, the optimum height for work benches is considered to be 75 cm. Work benches could be in the form of a 'wall unit' (along a wall) or an 'island unit' (at right angle to the outer wall) (Fig. 14.1).

An optimum width of a laboratory work bench is 60 cm. This is sufficient to accommodate most of the commonly used equipment and permit the technician to lean over to work, adjust equipment or manipulate controls.

The length of work bench per individual technician or for particular processes or test procedure is generally optimised at 2.0 m. A continuous bench length of 6.0 m provides sufficient flexibility to accommodate 3 or even 4 technicians with associated equipment.

The haematology and bacteriology sections also require sinks for staining of slides. Separate staining sinks should be built into the work bench units at convenient points to avoid the necessity of using the large laboratory sink.

Lighting

A high level of natural lighting is desirable in laboratory. Natural light should be used to the fullest extent. The best arrangement of work benches from this point of view will be parallel with the windows. But if the preferred bench layout is not along the window, suitable lighting can produce required viewing conditions. Each work bench should be provided with adequate electric points. Fluorescent fixtures are preferred as they give uniform illumination and minimise heat.

Service Spine

The service spine is one of the important aspect of **laboratory benching in very large public hospitals** and consists of the plumbing, electrical and gas lines carried within the spine. To allow for appropriate working positions and underbench storage, the service spine runs behind the benches but completely independent of the benches themselves. This arrangement offers a great amount of flexibility in rearrangement of benching when necessary as shown in Figure 14.1.

Storage

Each laboratory bench length should have storage space for reagents, chemicals, glassware and other items. This is provided in the form of double tiered overbench shelving, underbench drawers and cupboards, or trolley storage, the

trolleys being capable of being pushed under the benches. Instead of open overbench shelving, wooden cupboards with sliding doors provide additional space for storage.

Partitions

Partitions may be required between some laboratory spaces. Such partitions should be capable of being demounted with a minimum of disturbance to services and benching.

Dust

Laboratories should have a dust-free atmosphere. Some authorities suggest windows without shutters on the ground floor and suitable measures to prevent ingress of dust (e.g. rubber lining) through the gaps between window frame and shutters on upper floors. Requirement of a forced exhaust should be given due consideration.

Air-conditioning/Exhaust

Formalin vapours accumulate in the histopathology laboratory. Although it would be preferable that the whole of the laboratory be air-conditioned, at least this section should be considered for air-conditioning. Otherwise a powerful exhaust system should be installed to remove formalin vapours on the histopathology laboratory. Air-conditioning obviates the necessity for opening windows in bacteriology section where air-borne bacteria are a source of contamination. Air conditioning increases the lifespan of instruments and the staff efficiency is increased.

Working Surface

The surface of work benches should be resistant to heat and chemicals, stain proof, and easy to clean and decontaminate. High density vinyl, industrial grade laminated sheets and stainless steel serve this purpose suitably. Polished granite is also a suitable alternative.

Flooring

Flooring materials in the laboratory should be tested with acids, strong alkalis, solvents and histological stains. They should be easy to clean, and not slippery. Flexible vinyl flooring is preferred for laboratory floor covering, because it is greatly impervious, resistant to acids and many chemicals. However, it is not resistant to all solvents. Vinyl floor coverings also help to reduce noise level in laboratory corridors.

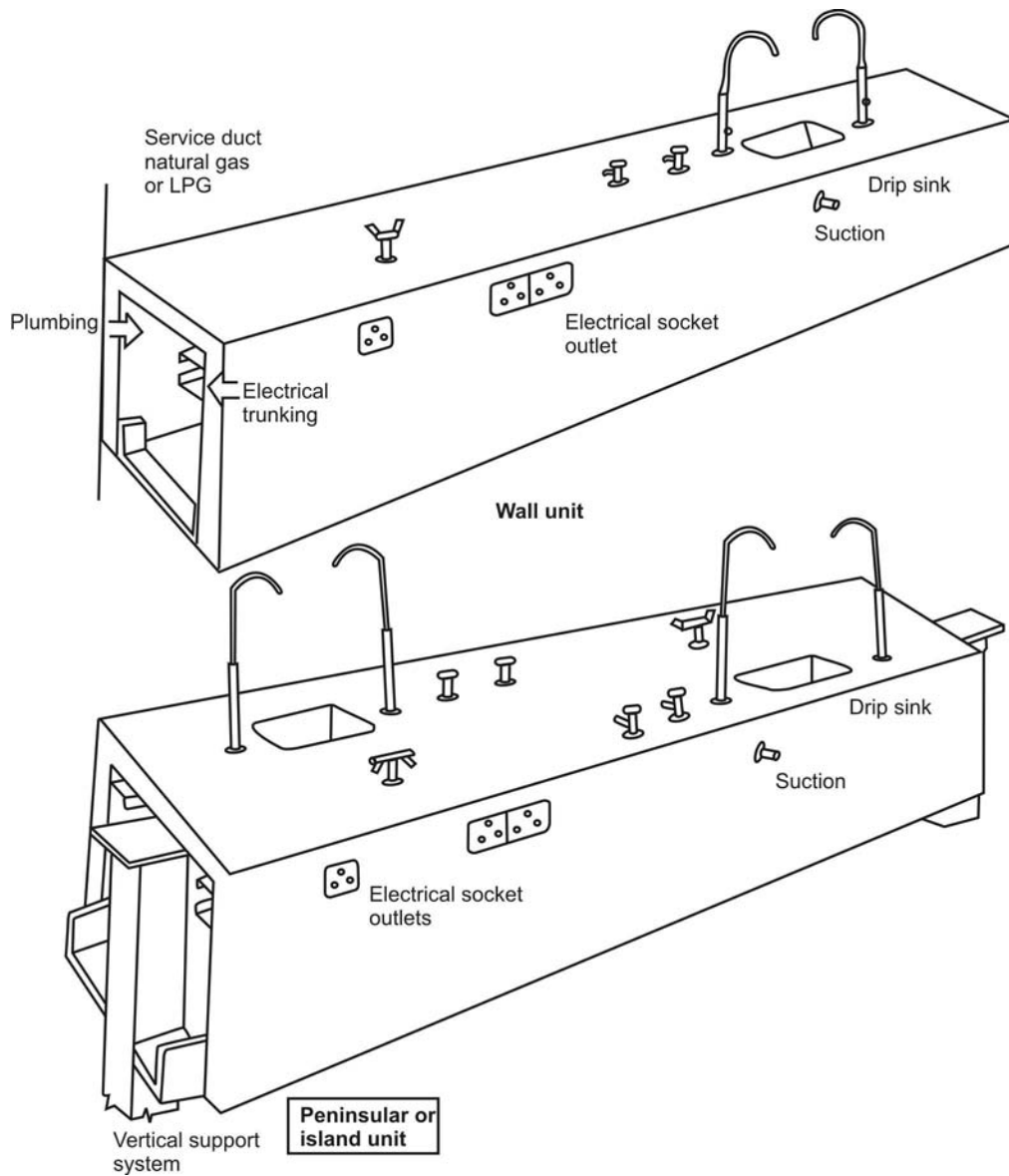


Fig. 14.1: Service spine for use with worktops

STAFFING

The hospital laboratory service should be under the control and direction of a doctor with qualifications in pathology or a PG degree in the new discipline of 'Laboratory Medicine'. He becomes the overall incharge of the laboratory with responsibilities of quality control, standardisation and administration. He should be a part of the regular medical staff of the hospital, and this would actually be the case in respect of large hospitals. The amount of work in smaller hospitals may not justify full-time services of a pathologist.

The other personnel that are needed are technicians, phlebotomists and attendants.

The number of medical laboratory technicians (MLTs) will depend upon: (i) the number of samples per day, (ii) the range of tests to be performed under various sections, viz. clinical chemistry, haematology, microbiology and histopathology (or other specialist laboratories), (iii) emergency service, and (iv) leave reserve. MLTs perform all technical procedures in various sections, prepare reports of completed investigations, check and maintain equipment, and requisition necessary supplies and materials.

MLTs are responsible for most of the routine technical work of the laboratory. The selection, training and experience of MLTs should instill confidence in the medical staff as regards the standard of their output. A committed person with basic qualification and experience can successfully handle various technical functions under the supervision of the pathologist even under adverse working conditions. MLTs in a section work under a technical supervisor who has special expertise and experience in that section. For large laboratories a supervisory/administrative person is needed who can take care of indents, records, stocks, technicians rotation, etc.

Number of Personnel

Staffing requirement of laboratory technicians can be worked out empirically on the basis of generally accepted norm, which was about 30 tests per day per technician. With the advent of automatic and semi-automatic specimen processing machines, it can be worked out on the basis of observed time.

For the purpose of development of guide material, historical data from 360 hospitals collected by American College of Pathologists in the 60s⁵ is presented in Table 14.3.

Table 14.3: Tests performed annually per medical technologist

Laboratory unit	Tests
Haematology	13,400
Urinalysis	30,120
Serology	11,520
Biochemistry	9,600
Bacteriology	7,680
Histology	3,840
Parasitology	9,600

A large hospital study showed that in a laboratory with 8 technicians, 2804 tests were averaged per technician per month, whereas the actual requirement of technicians based on time study and standard time was 14 technicians. A very high utilisation ratio may have negative bearing on quality control.

Nonproductive Activities

Studies have shown that a considerable amount of technician's time is spent on a variety of nontechnical activities like documentation, errands, and other administrative work, giving a ratio of technical to other work at 63:37. This adds to underutilisation of an already short technical manpower.

The endeavour should be to ensure optimum utilisation of technicians' time on the workbench in a efficiently functioning laboratory, with general duty personnel employed on nontechnical and administrative work.

Scheduling and Turnover

For the day-to-day working, staff scheduling should ensure that all technical staff are turned over between different sections from time-to-time. This ensures that all staff sharpen their skills on different analytical procedures, besides overcoming the monotony of carrying out similar tests all throughout. Adequate provision must be made for leave entitlements.

Avoiding Monotony

Laboratory technicians job is a long cycle, repeat task type of job, leading to early fatigue, psychological strain, poor time keeping, low productivity, and what is most important—poor quality. Efforts should be made to develop a balance between workload, working conditions and technical manpower. Regular in-service continuing education to keep abreast of the developments in techniques, instrumentation and quality control adds to the efficiency and commitment of the staff.

EQUIPMENT

The tendency towards more and more automation is leading hospitals to acquire sophisticated automated electronic laboratory instruments with a high level of investment. However, good equipment pays for itself over a reasonable period of time if the volume of work is appropriate to the capacity of the equipment.

Instruments

Some of the core instruments that are needed are listed below. Additional instruments that are needed will depend on the tests that are performed.

Colorimeters/Spectrophotometers: These were used a lot in the old days. They were particularly useful for end-point biochemistry tests. In kinetic tests that are faster they were not of much use. These have been replaced by the new autoanalysers these days. However, smaller laboratories still use them.

Colorimeters are based on filters. There are different colour filters that allow only light of certain wavelength to pass through. The wavelengths that are commonly used are 340, 505, 546, 578 and 620nm. Spectrophotometers on

the other hand are based on the principle of prism that refracts light into various wavelengths. In this a specific wavelength from 340 to 640 can be obtained. The light of a specified wavelength passes through a cuvette that holds the solution. The absorbance is then detected by a photodiode.

Autoanalysers: This is the core of any laboratory. This is the instrument that is used maximum for all the biochemistry work. Biochemistry is the major chunk of pathology work. There are autoanalysers of many makes. They include semiautoanalysers and batch autoanalysers. Semiautoanalysers require some manual pipetting before the reagents are fed to the machine. These instruments are based on colorimetric or spectrophotometer principle. The advantage they have over colorimeter or spectrophotometer is that they can take the light absorbance reading over a continuous period of time. This is essential in kinetic based biochemistry.

There are some analysers that use dry biochemistry for analysers that do not use liquids as reagents. They are based on strips impregnated with reagents.

A major advantage of autoanalysers is the speed with which they can handle large workload. The chances of manual error are also reduced.

Cell-counter: Labs now prefer cell counter to manual blood cell analysis procedures. This gives a more complete blood picture. The principle of the instrument is that the cells are made to pass through a thin capillary. A laser beam passes through the capillary and scatters the light. The scatter is based on the type of blood cell that passes. The light scatter is then detected. The RBC, WBC and platelet counts are more accurately measured in a cell counter. The RBC indices (MCV, MCH and MCHC) are also better calculated. The limitations are in case of leukaemia where the morphology on peripheral smear needs evaluation by an expert eye.

The following is a list of the important items of equipments and instruments in a general hospital laboratory.

1. Centrifuge
2. Microhaematocrit centrifuge
3. Refrigerators
4. Water still
5. Pressure sterilisers
6. Pipette washer
7. Flame photometer
8. Spectrophotometer
9. Colorimeter
10. Analytical balance
11. Incubator
12. Semiautoanalyser

13. Random access autoanalyser
14. Haematology cell counter
15. Sodium, potassium, calcium analyser
16. ELISA reader
17. Blood gas analyser
18. PCR equipment
19. Flow cytometer.

The above equipments are common to most hospital laboratories. As the level of technological sophistication increases, new equipments get introduced. The advantage with the modern technologically sophisticated equipment is that they are fully automated and programmed for all stages of test procedures, so much so that except for placing the sample on the machine no human element is involved, thus eliminating all human errors.

Automation ensures speed, accuracy, and less use of consumables and lesser manpower. Autoanalysers can take on a large number and vast array of tests at a very rapid rate. If the number of tests to be carried out is much smaller than this capacity, procurement of such equipment should be reconsidered. The cost-per-test on automated versus manual or less sophisticated mechanical method is generally the criterion which clinches the decision apart from other advantages of sophisticated equipment or instruments.

A judicious use of semiautomated equipment may well serve the purpose of a small hospital with limited workload whereas in case of large hospital, fully automated equipments and the possibility of interfacing with laboratory computer should be considered.³

Calibration and testing of automated equipment is a matter of high technology. Instructions of the manufacturers should be meticulously followed in the daily upkeep and maintenance of such equipment. For prompt attention to breakdowns or malfunctioning, there is no other way but to enter into annual maintenance contract with the manufacturers. For other simple mechanical equipment or instruments, periodic preventive maintenance should be carried out by the hospital's own trained technicians.

POLICIES AND PROCEDURES

Laboratory Samples

Sample to be examined by the laboratory fall into two groups, viz. (i) samples collected by nursing staff in nursing units or OPD and sent to the laboratory, and (ii) samples obtained by laboratory personnel from patients sent to the laboratory. All requests for laboratory examinations must be in writing.

Sample Receiving

In the reception area, all samples of blood, faeces, urine, pus, body fluids, swabs, etc. should be received at the reception window counter. Sufficient racks/shelves and a hand washing facility must be available in this area. Under no circumstances, samples should be collected from any patient in any room used as laboratory work area.

Specimen collection for fine-needle aspiration cytology (FNAC) requires a separate cubicle in the patient reception area or in the pathologist's office laboratory.

Request Forms

All request forms should be uniform in size and contain only pertinent information. A laboratory request form has two basic components, viz. (i) the patient's particulars including brief clinical details, and (ii) the laboratory test results. Unplanned laboratory forms have resulted in a waste of paper and effort. Very few hospitals have standardised forms. Use of structured request forms, with appropriate colour coding, standard size and appropriate design leads to time saving all around and a definite aid in quality control.

Time for Accepting Specimens

Establishment of a time schedule for accepting certain types of specimen will facilitate the operations of the laboratory, although emergency requests are accepted at all times and have priority over all other requests. Medical staff and nursing personnel at times develop a tendency to assign such priority when in reality they should have requested the examination much before. Laboratory personnel tend to lose respect for such emergency classifications.

Containers

All specimens sent to the laboratory should be in proper containers. Instructions on the time of taking specimens, minimum volume necessary, type of container, preservatives, etc. should be posted at the nurses station in wards, together with the list of commonly requested examinations and the time schedule for sending specimens to the laboratory.

Identification of Specimens

The laboratory personnel are responsible for the proper disposition of all specimens and requests within the laboratory. No specimen or request should be permitted to be left in the laboratory unless a laboratory representative is present. In order to properly identify specimens received, a

numbering system should be devised whereby the specimen and the request form is given the same number, and this number is also entered in the request register. This number becomes the sole means of identification of the patient's name with the specimen. Therefore, the patient's particulars should be double checked with the specimen label and request form.

Bar coding system for samples—This modern system of identification of samples has been discussed earlier.

Reports

Laboratory personnel should give reports only to authorised ward/OPD personnel and never directly to patients.

Records

A daily record register should be kept of all examinations performed in the laboratory in order to maintain a monthly and yearly account of the work done. Sufficient space is allowed against the name of the patient for noting the results.

The system of preparing two copies of request form and entering examination results on both copies can be obviated if the register is meticulously maintained. This becomes the permanent master record for reference at any time in future. The task of this register is now being taken over by computer.

Blood Bank Service

This vital service should be carefully controlled by the officer incharge and the technical supervisor. The control should ensure that all are aware of the establishment of written procedures for identification of blood samples, compatibility testing, HIV and HBs Ag testing, storage facility, etc. If the laboratory obtains blood for transfusion from other sources, only the storage facility for blood will be required. However, clear understanding with the supplying blood bank on the above factors should be established.

Outpatient Samples

Provision of sample collection centre in the outpatient department will be a necessity in larger hospitals where the volume of workload from outpatient department is considerable. A technician receives urine and stool sample and draws blood for haematology and clinical chemistry. The samples are then sent to the main laboratory for processing.

HIV

Necessary safety precaution should be understood clearly by all concerned while drawing blood samples from

sus-pected HIV and hepatitis patients, with disposable syringes and needles.

Liaison with Clinicians

Differences between laboratory reports as compared to the patient's clinical status may arise from time-to-time. These should be discussed in the medical audit committee. Additionally, meetings can be held by the officer incharge of the laboratory with the clinicians to pinpoint short-comings if any. Such meetings should be utilised for assisting the clinicians to understand the scope of available laboratory facilities and newer methodologies.

Technician's Motivation

At the technician's level, the officer incharge of the laboratory should discuss professional, technical and administrative matters concerning the laboratory during periodical meetings with technical staff. Such meetings need not be at a formal level because formal meetings generally do not encourage discussion.

Cross-training of Technicians

Laboratory policy must lay down that all technical staff is cross-trained to work in all the different sections of the laboratory. Training programmes should be organised if necessary so that the staff can handle any situation in case of exigencies of the situation.

Laboratory Waste Disposal

Histopathology and microbiology laboratory waste should be considered as hazardous waste and should be disposed accordingly. In fact, all waste material from all the sections of the laboratory can be treated as hazardous waste and should be disposed of by burning in the hospital incinerator.

Optimal Utilisation of Laboratory Service

Comparison of working hours to actual number of tests performed gives an indication of the productivity of technicians' and of the laboratory as a whole. Quality control is achieving a degree of excellence with effectiveness of communication. A high utilisation of technicians' time giving a sense of high productivity may miss the possible adverse effect on the quality of output.

Because appropriate utilisation of the laboratory service depends primarily on the clinicians, a constant emphasis is

needed on ordering only the appropriate tests required for diagnosis or prognosis based on clinical judgement and filling the required forms completely.

QUALITY CONTROL

Quality control is the sheet anchor for accuracy of tests carried out in the hospital laboratory. Quality control in hospital laboratory starts from the person who sweeps and cleans the premises through laboratory technicians and terminates at the level of the pathologist.

As a part of quality control function, standard operating procedures (SOPs) should be laid down by the incharge pathologist for each function and each functionary in the laboratory. Calibration forms a part of quality control for each equipment. For automated equipment, equipment suppliers have arrangement for periodical checking and calibration of each equipment at specified intervals. Calibrators are also supplied with some equipment like auto-analysers.

There is an internal and an external quality control that is recommended. The internal quality control is done in the lab itself. Standards are run at regular intervals. The national external quality control for biochemistry and haematology is run by CMC, Vellore. Some private companies also run the external quality control programme. If the lab is enrolled in this programme, a sample is sent to the lab and the various biochemistry/haematology parameters performed. Results are then mailed to the managing organisations where they are studied, evaluated and corrective action taken.

Medicolegal Issues and Insurance

All medical reports are documentary evidence in the Court of Law. The treatment that was given during the illness is based on the lab reports. Histopathology, Cytology reports that give a diagnosis of malignancy carry great importance. There are documented litigations even for simple things like pregnancy test on urine. It is hence important that all records be properly maintained and reports issued after due verification. Pathologists sign all the reports and hence the authenticity of the reports is his prime responsibility.

Some insurance companies also offer insurance for Pathology Labs which cover the liabilities upto a certain limit. This is more popular in the West than in India. Pathologists working in a big hospital set-up are covered by the hospital and may not be individually liable. Pathologists working in small labs may need to take a separate insurance on their own.

Accreditation

Getting accreditation with Pathology Boards is not a must in India. However, a National Board of Laboratories (NABL) exists and getting an accreditation is useful. The process is stringent and it requires external and internal quality control records to be maintained. The Board has also to certify the quality control records maintained. There are very few labs that are accredited at present.

ISO certification involves quality control checks and also staff behaviour. Getting an ISO certification is relatively easy as compared to National Laboratory Board accreditation.

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CHAPTER

15

Operation Theatre Suite

INTRODUCTION

The operation theatre suit of a hospital is a complex workshop and the most important facility of the surgical department. Operating theatres are expensive to build and equip, but the experience of many institutions indicates that the individual operating rooms or the operation theatre suite (OT suite) have been usually underdesigned. If the initial planning or use was for a multispeciality hospital, giving little consideration for future growth have landed some hospitals into problem situations.

In smaller hospitals (50-100 beds), a single operating room may have been sufficient to meet the need. For a larger hospital, departments of eye, ENT, Obstetrics and Gynaecology, and the superspeciality disciplines will also need the services of operation theatres.

In the general hospital, the trend is to have all major operating rooms as nearly identical as possible to facilitate scheduling of various surgical procedures in any one of them. Grouping of operating rooms into a surgical suite or OT suite has now been accepted as a solution for optimisation of facilities and economy of manpower. Grouping together of all operating rooms to form a common facility, the OT suite, has several advantages. The standard of air hygiene established for operating rooms demands a complicated and expensive ventilation system, which would be difficult to provide at a number of different points around the hospital.

It is obvious that optimum utilisation of operating rooms is possible if they are not reserved rigidly for use by a particular department or surgeon as a rule. The operating rooms should further be similar in design and character to

make it easy for all surgeons to use them without a new set of conditions. In some of the hospitals where a few operating rooms are allotted to Neurology, Urology, ENT, etc. and other rooms to General Surgery, the use coefficient of the operating rooms of the latter category was low as compared to that of the rooms shared by more departments. Reasons for demand of separate OT suits for different specialities should be thoroughly debated. There will always be a conflict of interest between the administrative and specialists point of view.

The relationship between the delivery suite and obstetrical and gynaecological surgery should be studied, if there is a demand for separate operation theatre with the delivery suite. So also, the desirability of having separate OT located in the outpatient department for performing outpatient surgery instead of carrying out all surgery in the main OT suite.

Nevertheless, most surgeons and administrators agree that one operating room should be earmarked for endoscopic surgery and a separate room for emergency surgery of accident cases, both potentially septic. A rigid separation of “clean” and “dirty” traffic for reasons of control of infection imposes limitations on the plan of the department, which usually needs to embody a two-corridor system, with three major circulation patterns: patients, staff, and supplies which is shown in Figure 15.1.

Whether a single operating room is being considered or an OT suite, it is essential to develop a written functional programme for the benefit of the architect. This document will incorporate all aspects for planning, like possible workload, number of surgical beds, air hygiene, sterilisation, artificial ventilation, zoning, workflow, future use and expansion, equipment and so on.

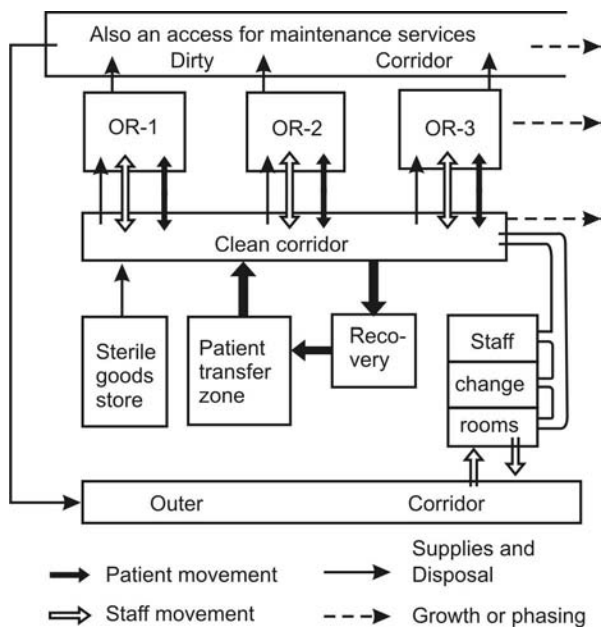


Fig. 15.1: OT suite circulation pattern

LOCATION

From the above discussion, it becomes apparent that grouping of all operating rooms in one central location in the form of an OT suite has many advantages. A central multiuse operating theatre suite results in:

- i. efficient use of staff and facilities
- ii. effective supervision of personnel
- iii. flexibility in scheduling operations
- iv. better operating room discipline
- v. round the clock service
- vi. improved aseptic discipline
- vii. better training of nurses and other personnel
- viii. economy in terms of engineering maintenance
- ix. problem of supplies of materials simplified
- x. can result in reduction of ancillary accommodation by upto 50 per cent.

In the past, surgical suites were located at the top floor of multistoreyed hospitals. There are advantages and disadvantages of locating OT suite on upper floors of multistoreyed hospitals, but the suite has now come to lower floors where it is possible to spread out and achieve the desired shape. Location of the suite must ensure that patients can be moved to and from surgery with a minimum of travel through other hospital areas.

The location of OT suite should not only be considered in relation to surgical wards but also to the outpatient department, if daycare surgery has to be catered for.

Approximately 37 per cent of hospital-based surgery has been carried out as outpatient surgery in many American hospitals. Their analysis indicated that more than 95 per cent of myringotomies, tonsillectomies, adenectomies as well as substantial proportion of carpal tunnel releases, lens extractions, sterilisations, circumcisions and inguinal hernia repairs were performed in outpatient settings as day care surgeries.¹ Surgical load on the operation rooms from outpatient surgery has gradually increased in all hospitals because of the many advantages to patients and relieving of the pressure on hospital beds in urology and orthopaedics.^{2,3}

The main points to be considered in the location of the OT suite on a hospital are:

- i. accessibility to
 - surgical wards
 - CSSD
 - emergency
 - blood bank
- ii. access to bed lift
- iii. internal hospital traffic flow
- iv. external traffic and disturbances.

The location of OT suite should ensure quietness, free from external disturbances and close to the surgical wards. Corridors leading to this unit should not be used as thorough passages. An important factor in the location is future growth. If expansion is envisaged in the future, the present location and plan must permit for expansion in an orderly fashion without upsetting the basic relationship of the internal organisation.

NUMBER OF OPERATING ROOMS

Low utilisation of operating rooms has been a problem in some hospitals and overwork a cause for concern in others. An operating room can be a bottleneck between the rapid inflow of surgical patients and their outflow.

The number of operating rooms depends upon the predicted number of operations per day, which in turn is related to the number of surgical beds, other surgical specialities like neurology, urology, thoracic surgery, etc. and the average length of stay (ALS) of surgical cases.

In a large general hospital, approximately 25 to 30 per cent of admitted patients are surgical, and approximately 50 per cent of all admitted cases undergo some sort of operation. If there are 100 surgical beds (all types including eye, ENT, gynaecology, orthopaedics, etc.) and the ALS is 10 days, there are likely to be 10 operations per day on an average. If it can be determined as to how many operations per day can be carried out in one operating room, the total number of operating rooms can be worked out.⁴

Time Utilisation Study

In a study on time utilisation of operating rooms in a large teaching hospital, the maximum utilisation was found to be between 10 am and 1 pm. Delay was caused by surgeons resulting in the operating rooms remaining idle to the extent of 105 minutes on an average. Out of the eight hours operating time available, only 5 to 6 hours were actually utilised. Ill-planned scheduling of operations and late arrival of surgeons were the main cause.⁵

Out of the available time, 54 per cent of the time was spent on actual surgery, 31 per cent for supportive activities for the operation, and 15 per cent waiting while the operating room was being made ready for operation.

The total number of operations in a year is given by the following formula:

$$\frac{\text{No. of surgical beds} \times \text{Occupancy rate} \times \text{No. of working days in a year (usually 260)}}{\text{ALS}}$$

ALS

The report on general hospitals of the Committee on Plan Projects had recommended the number of theatre units in various size hospitals as follows⁶ (Table 15.1).

However, the number of operating rooms being based on the number of hospital beds is considered inappropriate, as it does not take into account the variations which occur due to differences in organisation and types of surgery among different hospitals. The factors which have a bearing on the number of operating rooms in a hospital are:

Table 15.1: Size of hospital and operation theatres

Total no. of beds	No. of theatre units		OPD op. theatre	
	Major	Minor	Major	Minor
50	1	—	—	1
75	1	1	—	1
100	1	1	—	1
300	3	1	—	1
500	5	2	1	1
750	8	2	1	1

- i. load of work/number of surgical beds
- ii. number of surgeons
- iii. scheduling of operations
- iv. quantum of emergency cases
- v. outpatient surgery
- vi. work methods followed in the supportive areas.

Assuming that a surgical operation will last for an average period of one and a half hours from “knife” to “closure”, up to four operations can be carried out in a working day per operating room. With the time taken in preanaesthesia

preparation, positioning of patient, draping the patient, etc. before knife is put to his body, and after the operation for anaesthetist’s check and dressing, etc. before the patient is wheeled out of the room, on an average each case is likely to take two hours.

General predictions can also be made based on the judgement of the surgical staff of all specialities and to arrive at the estimated average time per operation.

An 8-hour working schedule per operating room can be expected to cater for a maximum of four major operations. Up to five cases can be taken up if appropriate “mix” of cases is scheduled for each room. Where there is a lay-up room for unpacking of all instruments and dressings and readying them on trolley, and where the patient is anaesthetised in a separate anaesthesia room, it is possible to perform a fair number of operations in close sequence to one another. The policy decision on whether the induction of the patient will be carried out in induction rooms or in the operating room itself is an important input in planning of OT suites. Induction rooms should permit quicker turnover in operating room usage.

No operating room should be utilised for more than 8 hours in a day, with one day in week totally off for maintenance and carbolysation.

OPERATING ROOM ACCOMMODATION

The optimum size and dimensions of the operating room must be governed by what is functionally essential. As structure must follow function, the size will also depend on the type of surgery. For example, cardiothoracic surgery with a plethora of machines and electronic gadgets will need a larger room than usual, and an eye operating room which does not need much space or equipment, may be smaller.

Advances in cardiac and neurosurgery have created a demand for one or more extra large operating rooms, because this type of surgery calls for a larger number of surgeons, nurses and technicians, plus a great deal of extra equipment such as heart-lung machine, hypothermia and electronic monitoring equipment.

An instrumentation room adjacent to or in between two extra large operating rooms to accommodate such equipment in cardiothoracic and neurosurgery has been found to be satisfactory answer. The floor of such a room is elevated about 2 feet above the operating room floor for a clear view of the patient and operating surgeon. Plate glass panels permit vision into operating room, and through-wall conduits accommodate wires and leads of various appliances in the instrumentation room to the surgical field on operation table.

Apart from the surgeon, his assistant and the anaesthetist, a minimum of two nurses is required for an operation, one

to scrub and one to circulate. Some operations require two scrub nurses. The circulating nurse requires assistance of operating room assistant or nursing aides. Nonprofessional personnel, technicians, aides and orderlies come in when required. The member of persons present at any one time during an operation in progress thus varies from 3 at the minimum to up to 14 at the maximum.

The operation room size in the hospitals in UK was optimised at 325 to 360 sq ft (30-33.50 sq m) as per their Ministry of Health recommendations in the past. It recommends an operating room of the size of 18' x 18' (324 sq ft/30 sq m) or 20' x 18' (360 sq ft/33.5 sq m). Operations in which extensive equipment is used will require up to 25' x 25' (625 sq ft/58 sq m). At least one such room for a large hospital (over 200 beds) and two such rooms in a teaching hospital have been recommended. Nevertheless, it is very necessary to limit the size of the operating rooms to just what is functionally essential. Large size rooms give rise to problems of air-conditioning and washing and cleaning. Free floor area of 18' x 20' at the minimum seems to meet most functional requirements of an operating room in general.

SCHEDULE OF FACILITIES IN THE OT SUITE

The actual patient area is only a small percentage of the total area of OT suite. Operating rooms themselves account for about one-fourth of the total area required for the suite. Analysis of various functional areas leads to the following schedule of accommodation given in Table 15.2.

Table 15.2: Schedule of accommodation OT suite

<i>OT suite</i>	<i>Area in sq ft</i>
Special operating room, 24' x 24'	576
Operating room (major), 20' x 18'	360
Operating room (minor), 18' x 18'	324
scrub-up	80
substerilisation	80
Orthopaedic theatre	
• Fracture room	240
• Plaster room	80
Reception/preparation room	160
Sterile storage	160
Equipment storage	240
Anaesthetist's room	160
Anaesthetist's store	80
Anaesthesia room	160
Instrument storage	160
Doctors locker/change room with rest room and toilet	120
Nurses——"——	120
Ancillary staff——"——	120

Contd...

Contd...

<i>OT suite</i>	<i>Area in sq ft</i>
Theatre superintendent office	120
General and linen store	120
6 bed recovery room	480 (6 x 80)
2 bed recovery bay	160 (2 x 80)
Mobile X-ray unit and darkroom	120
Trolley bay	80
Safaiyan's alcove	80
Relations waiting, with toilet	160
Day surgery	
Reception/Scheduling	100
Men's change/locker	120
Women's change/locker	120
Patient preparation	120
Gowned — waiting booth ²	80 (2 x 40)
<i>Additional: Area for circulation and corridors</i>	

Note: A structural grid on a column system at suitable distances in both directions should be decided by the architect to give large columnfree spaces for the operation rooms, and other hierarchy of sizes for other rooms.

The question of size, our circulation, lighting, safety precautions and signal systems and communication are common to all operating rooms. However, the following special features require detail consideration.

1. Fixed electronic equipment and monitoring system.
2. Service lines such as oxygen, suction, nitrous oxide and compressed air.
3. Provision of close circuit television cameras.

Major Equipment and Appliances

The following is a list of some of the major items of equipment used in OT suites, many of which will find a place in the operating room (Table 15.3).

Table 15.3: Equipments and appliances in OT suite

• Channel monitor
• Heart lung machine
• Anaesthesia machines
• Difibrillator
• Flash steriliser
• Deep freezer (for frozen section)
• Instrument trolleys
• C-arm fluoroscopy machine
• Operating tables
• Suction apparatus
• Shadowless ceiling lamp
• Shadowless pedestal lamps
• Close-circuit TV camera
• Electrical communication system
• Operating microscope
• Surgical diathermy machine
• Pulse oxymeter
• Ventilator

Minor OT

Although the nature of work carried out in minor operation theatre differs from that of major operation theatre, it is not worth making small variations in size in respect of minor OTs. The surgical procedures may be minor, but the size of OT should not. This arrangement will offer flexibility in their use and present familiar surroundings to the operating surgeons.

ZONING

The OT suite is a potential source of hospital infection in general and wound infection in particular. The suite has to be designed with the aim of minimising the risk of hospital infection being brought into the suite. Therefore, the whole OT suite is planned on the concept of four zones, predicted on the types of activities, patterns of circulation and degree of sterility to be maintained. These zones are the **disposal zone**, **protective zone**, **clean zone**, and **sterile zone**.

Criteria for Zoning

The aim of zoning is that when staff members, patients or supplies enter the OT suite, the risk factors of carrying the chances of infection with them get lesser and lesser, as they pass from the protective through clean to aseptic zone.

General Principles

1. Clean from dirty traffic-flow within the OT suite should be segregated as best as possible. Spaces in the suite should be arranged in such a way that while moving from one space to another, there is continuous progression of cleanliness from entrance of OT suite to the operating room.
2. Staff working in the OT department should be able to move from one clean area to the other without having to pass through unprotected areas.
3. Soiled materials and waste should be removed from the operating rooms without passing through clean areas.
4. OT ventilation should be independent of the air movement of the rest of the hospital. Therefore, the direction of airflow within the OT suite should be from cleaner to less clean areas.

Sterile Zone

The OT suite organisation revolves around the central aseptic work area, i.e. the actual operating rooms. Activities take place in this zone that require full aseptic conditions, such as exposure of living tissues and handling sterile instruments.

Here, the highest level of cleanliness and aseptic conditions are maintained.

Clean Zone

The clean zone is designed around the aseptic zone. This zone is only accessible to staff having changed their outer clothing in the protective zone and prepared patients transferred from the ward trolley to OT stretcher, and clean supplies. 'Patient holding and preparation area' is earmarked in the clean zone.

This zone contains storage space for clean surgical supplies, medical stores including parental solutions, and instruments. Anaesthesia induction rooms, anaesthesia stores and anaesthetists room are located in this zone.

A frozen section laboratory, if provided, and any darkroom facility should be located in the clean zone.

Protective Zone

Outside the clean zone is the protective zone forming a barrier between the clean area of the suite and the less clean rest of the hospital area. This zone contains the administrative elements including theatre nurse supervisors office, where stores are received, personnel enter the department, where locker and change rooms are located, patients are received and held. Patients wait here on trolleys if the operating room for which he or she scheduled is not ready. We all know of surgical corridors of large hospitals lined with occupied trolleys for want of adequate holding, preparation or induction area. Access to this area is entirely separate, as people enter and leave in their street clothes and should not penetrate into inner zones until after changing into OT shoes and clothing. Recovery room is located in this zone.

Disposal Zone

Disposal zone is the corridor from where used instruments and used linen and operating room debris is taken out. This zone must have an independent access to the outside corridor. Disposal zone has only one-way traffic, viz. from inside the operating room to the outside and never *vice versa*. This is achieved by a door or a hatch from operating room opening into the disposal corridor (Fig. 15.2).

FUNCTIONAL INTERRELATIONSHIP OF ROOMS

Scrub-up

The usual practice for surgeon and others needing scrubbing-up is to change in a changing/locker room from street clothes

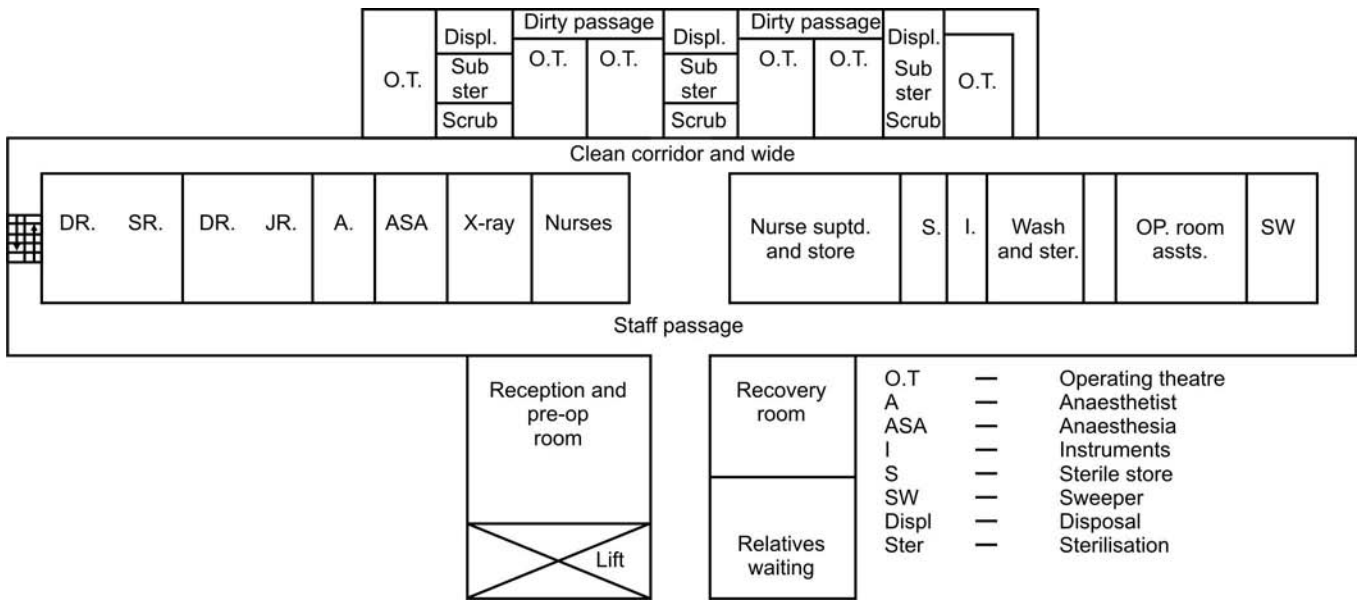


Fig. 15.2: Three-corridor plan with six operating rooms

into theatre clothes, waterproof apron and footwear and proceed to the scrub-up area. After scrubbing-up, they put on sterile gown, mask cap and gloves. Therefore, the scrub-up area should be in as close proximity as possible to the operating room and communicate with it through a doorway.

Space should be provided for two people to scrub-up simultaneously. The room should be so planned that gowning can be done without danger of contamination by splashing from the scrub sink. The taps at the sinks should be at least 3 feet apart to give each person adequate elbow room. Space should be sufficient to allow people to pass behind those scrubbing-up without crowding them.

Taps should be at a height of 4' -4' above floor level. Elbow operated taps are more convenient than those which are knee or foot-operated.

Anaesthesia Room

The advantage to the anaesthetist of a separate room for induction is that he can have close at hand all the apparatus and instruments he needs, and he and his patients are away from the bustle in the operating room while preparation for an operation is in progress. An area of approximately 160 sq ft is essential for the working space and equipment. Nothing should be kept in the anaesthesia room except the equipment and drugs necessary for anaesthesia.

Substerilising Room

Substerilising room is used both for washing used instruments and for sterilisation. In this case all laying up of trolleys is done in the operating room itself. Division of the room into two portions with separate doorways into the operating room preserves a distinction between “dirty” and “sterile” procedures. In such a plan, the substerilising room is between a pair of operating rooms with access from a lobby which also gives access to other rooms in the suite. The substerilisation room work should be kept to the minimum, generally restricted to flash sterilisation of instruments.

Anaesthesia Equipment Room

A separate room is necessary for the storage of anaesthetic gases and anaesthesia equipment. This room should be convenient to the operating room but should open into the corridor. It requires outside ventilation—either natural or artificial. A small amount of shelving will be needed.

Darkroom

The darkroom is furnished for spot development of films from operating rooms including fracture room. It should be equipped with a developing tank unit, film storage box, light proofing and sink.

Fracture Room

A fracture room is needed in the OT suite. Fixed equipment includes a stainless steel work counter for preparation of plaster bandages. Adjacent to this is a plaster sink with plaster trap. Viewing box is essential. A door with a minimum width of 4' to 6' (preferably 5') will permit passage of a stretcher with a patient having extended traction of a limb. It is desirable to have a splint and plaster closet connecting with the fracture room.

Locker and Changing Room

The locker rooms should be large enough to contain full length lockers for clothes and other belongings for as many people as need to change, and should include a washbasin and WC. In addition, racks for theatre footwear, hooks for aprons, and shelves for caps and masks should be apart from a dirty linen container for discarded OT clothing. A few easy chairs, a writing table and chair complete the furniture.

Locker rooms are separately provided for doctors (separate for male and female), nurses, and technicians and nursing orderlies. If the number of visitors to the OT suite warrants, it may be expedient to provide a separate locker room for them.

Instrument Stores

In the very small hospital, a separate instrument store may not be required as built-up cabinets in the corridors usually serve this purpose. In larger hospitals, a separate instrument store is almost a necessity. A minimum area of 150 sq ft should be provided.

Cabinets with glass doors are placed on each side of the room. The cabinets should have adjustable shelving not more than 15 inches deep.

Trolley Parking

A trolley parking area can be a recess at the entrance of the OT suite.

Cleaner's Closet

The sweeper/*safaiwalla* or cleaner, as he is called differently by different people, is an essential part of the OT suite, moving from operating room to operating room. He must be provided with a closet in the OT suite for storing his buckets, mops, brushes and cleaning materials at one end of the clean corridor.

Viewing Gallery

Observers' (viewing) galleries were quite common in teaching hospitals till the sixties. However, the view of the operating field was always unsatisfactory. The advent of closed circuit television has changed the situation now and viewing galleries in operating rooms have become a thing of the past.

Recovery Room

The advantages of a room/ward for observation and nursing of patients immediately following surgery, where they can be watched until the anaesthetist is satisfied with their condition are obvious.

Estimates of the number of beds to be provided in a recovery room vary. Anaesthetists cannot forecast beyond doubt which patients they may wish to keep in the recovery room until their physical condition is sufficiently satisfactory for return to the surgical ward. Ideally, the recovery room/ward should provide for the greatest estimated number of patients to be operated under general anaesthesia in one day. Failing that, the number of beds should equal the average number of patient operated upon daily. At the least, provision of one recovery bed per operating room would be inescapable.

Opinions differ as to whether an open ward or single bedrooms should be provided in a recovery unit. The practice to provide an open ward with curtains which can be drawn between beds has been found quite satisfactory. The recovery ward should be arranged in such a manner that all patients are clearly in the view of those who work around the nursing station with a good view of their faces. Layout of such a recovery unit with six beds is shown in Figure 15.3.

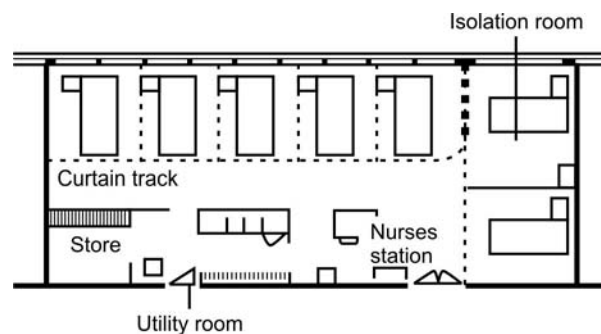


Fig. 15.3: Six-bed recovery unit.

Recovery room has accommodation for a utility room with sink, cupboard for instruments and drugs, and a desk. Oxygen and suction should be available at each bedside since either may be needed very quickly. If beds are kept in single rooms, the doors must be wide enough to allow beds and any special apparatus which may accompany the patient to pass through easily. Enough space should be left between beds for several people to attend to a patient simultaneously and use bulky apparatus.

Where insufficient space or other difficulties prevent the provision of a full-fledged recovery unit, it should be possible to provide a small recovery bay for at least two patients (2 × 70 sq ft).

OT Supervisor's Room

The operation theatre suite nurse supervisor is responsible for the administration and supervision of nursing service in the OT suite. The position is sometimes called OT superintendent, assistant director OT services, OT matron and assistant superintendent OTs, and the title reflects the extent and complexity of the administrative responsibilities.

LIGHTING, ELECTRICAL AND AIR-CONDITIONING

Development of air-conditioning and artificial lighting has made possible very comfortable operating environment for surgeons. Depending upon windows for light is no more feasible. The optimum conditions of temperature, humidity and lighting level can be controlled by mechanical means far better.

Lighting

The surgeon's requirement for light is that it should be powerful, cool, shadowless, and capable of penetrating to the bottom of deep cavities. An emergency lighting system which comes into operation automatically is also necessary in operation theatres to enable work to continue without a break if the mains supply fails.

Electrical Outlets

All electrical outlets should be "sparkless" fittings and be placed 5 feet from the floor, to be above the level of a possible concentration of inflammable anaesthetic gases. This is necessary even though a good ventilation system can reduce the concentration of explosive gases and adequate humidity reduces static. Sufficient number of plug points

have to be catered for, for the various electrical/electronics gadgets used in a modern operating room. Minimum six outlets are suggested, at least two of which should be for power equipment of 15 Amp rating.

Air-Conditioning in OT Suite

Full air-conditioning with filtered air supply is a necessity in operation theatres which tends to generate a need for greater floor to ceiling height than in other hospital departments. While perceptible air movement may be desirable in operating rooms for the surgical team, draughts, particularly at the level of the operating table, must be avoided. The air speed at which air movement becomes perceptible rises with temperature, and air-conditioning systems enable the rate of input of air to be related to its temperature in order to provide comfortable conditions.

Air Intake

Studies on positioning of the air intake show that samples of air taken at street level, at roof level and in the wards show that much advantage is to be derived from placing the intake at or above roof level.

Airflow

Positive air pressure has to be provided at the aseptic core which is ideally met with 16-18 air changes per hour, and gradually tapering off to 12 changes per hour at the nonsterile areas. In the modern operating room, laminar airflow system with side vents and exhaust system is the ideal. In the laminar airflow system, air velocity varies at 50 feet per minute at the foot level to 75 feet per minute at table height to 150 feet per minute at the ceiling level. High efficiency particulate air (HEPA) filters used in the system provide the highest level of air sterility by filtering out particulate matter of up to 0.3 micron which excludes almost all known sizes of micro-organism.⁷

HEPA filter: It is a dry type filter with a rigid casing enclosing the full depth of accordion type filter pleats. This is throwaway, nonreusable filter which is to be discarded after its recommended lifespan. Hepa filters remove 99.9 per cent of airborne particles which include dust, pollen, mold and bacteria of upto 0.3 micrometers (µm). Performance testing of HEPA filters is carried out by measuring the airflow resistance under test conditions only in a filter-testing facility using approved particle generating materials.

FLOORING, CEILING AND FINISHES

Flooring

With a number of electrical gadgets and appliances being used in the operating room, excessive build-up of static electricity has to be guarded against. Such static build-up may lead to a spark resulting in explosion of volatile anaesthetic gases enriched with oxygen. Therefore, the floor should be moderately conductive to be able to dissipate the accumulated electrostatic charge. The entire surface of the floor should provide a path of moderate electrical conductivity between all persons and equipment making contact with the floor.

Copper strips laid in the flooring have been in extensive use in the past, but newer materials have now become available to provide a partially conductive flooring. The floor should be conductive enough to dispel static and yet not so conductive as to contribute to electric shock. The minimum conductivity should be $1\ m\ ohm$ and maximum $10\ m\ ohm$.

Ceiling

All operating room lamps are ceiling mounted. Besides, the requirement of some other ceiling-mounted equipment, e.g. operating microscope and the air-conditioning ducting arrangements determine the choice of ceiling construction. All ceiling-mounted equipment requires careful consideration at the planning stage.

Wall Finishes and Colour

Wall Finishing

'Easy to wash and wipe' is the guiding principle in considering wall finish in operating rooms. All surfaces in operating rooms have to withstand constant cleaning. They should therefore as far as possible be jointless. The value of ceramic tiles is open to question because of the many joints, whose rough surface of grouting may entrap dirt and bacteria. Jointless mosaic surfacing for the wall is much more preferable. Internal corners in the operating rooms are rounded to facilitate cleaning.

Care should be taken that there are no shelves or other projections on the operating room walls.

Doors: A clear width of 90 cm is required for a staff dressed up in sterile gown to pass. The main door to the operating room should be wide enough to permit unobstructed passage of a patient trolley. Swing-open types of doors are best avoided for their follow-through action. Surface sliding doors are better suited for passage of patient trolleys.

Colour

The colours used on the walls, floor and ceiling of operating rooms should be light enough to ensure satisfactory integration of light by reflection, at the same time soothing to the eyes.

POLICIES AND PROCEDURES

By convention, OT suites in hospitals are under the overall charge of the chief anaesthesiologist who is generally designated as officer incharge of operation theatres. Even in smaller hospitals not having a permanent anaesthesiologist on its staff, a surgeon, or medical administrator, should exercise control over the functioning of operation theatres.

Each hospital should develop its policies and procedures in regard to the OT suite. Which should periodically be evaluated and kept up-to-date. The operating department or OT suite should develop a written manual consistent with general hospital policies covering operating rooms related activities. Such a manual requires the involvement of the chief of the surgical division, the anaesthesiologist, other departments concerned, and the operation theatre supervisor. Such a manual would contain guidelines, standing orders and procedures, viz:

1. Functions of the operating department
2. Duties and responsibilities of personnel
3. Staffing patterns, work hours, including emergency duties
4. Methods of scheduling of operations
5. Safety precautions for despatch of patients to operation theatre and return to nursing units
6. Methods of checking operating room readiness to receive patient including:
 - Essential personnel
 - Scrub room facilities
 - All appliances and equipment
 - Drugs, medicines, fluids
 - Sterile supplies, i.e. basins, catheters, drains, dressings, sponges, packs, gloves, drapes, sheets, towels, gowns, aspirating syringes, sutures, water, saline, instruments, etc.
 - Records and forms, including report of physical examination and consent for operation.
7. Technique for scrubbing hands
8. Mask, cap and gowning techniques
9. Instructions as to who may enter operating room
10. Duties of circulating nurses and attendants

11. Technique for assistants and unsterile personnel
12. Procedure for shock, massive haemorrhage, transfusion reaction or death of patient
13. Instructions on deposition of patients' valuables including rings, jewellery, dentures (although all these should be removed in the ward)
14. Methods of sponge selection, accounting and disposition
15. Record of operative procedures, anaesthesia
16. Care and disposition of tissue removed
17. Use of recovery room including staff, techniques, procedures and records
18. Methods of enforcement of aseptic technique before, during and following operation
19. Clearing of operating room following operations with particular emphasis on septic cases
20. Care, cleaning, repair and maintenance of instruments and equipment.
21. Frequency of fumigation, carbolisation and sterility checks.

Nursing Service

The scope and responsibilities of OT nurse supervisor are as follows.

1. The assignment of duties of the operation theatre personnel
2. Overall supervision
3. Maintaining schedules of operations for optimum safety and efficiency.
4. Requisition and proper utilisation of supplies and equipment.
5. Enforcement of aseptic techniques and procedures.

Safety Hazards

1. Methods of checking wiring and electrical equipment by engineers
2. Methods of checking correct climatic conditions, especially humidity
3. Checking air filters in AC system
4. Checking for anaesthetic and oxygen gas leakages
5. Control of fire hazards
 - Provision of fire extinguishers and their location
 - Directions for correct operation of each type of extinguisher
 - Familiarisation of all personnel with handling and use of fire extinguishers.

Emergency Equipment

1. Cardiac trolley readily available
2. Do all personnel know its location
3. Specific duties of each person in case of need.

Protection of Patients

1. Methods of patient identification
2. Restraining of patients during movement on trolleys/stretchers
3. Protection of patient on operating table. Method of checks for positioning regarding respiratory obstruction, pressure on nerves, and impairment of circulation
4. Procedure for sponge count and instrument count
5. Selection and use of sponges.

Bacteriological Practices

1. Proper wearing of masks
2. Masks changing between operations
3. Removal of mask on leaving operating room
4. Changing caps daily
5. Restrictions on visitors to OT suite
6. Handling and disposal of disposable syringes and needles, other disposables.
7. Daily cleaning procedure of operating rooms
8. Weekly disinfection procedure of operating rooms (modern aerosol formalin disinfectors achieve satisfactory disinfection in a short time and the operating room is available for use after six hours)
9. Weekly cleaning of ceiling of operating rooms
10. Procedure for use of mops
11. Frequency of changing of mops.

Recovery Room

1. Patient observation
2. Emergency procedures
3. Equipment in constant readiness
4. Restriction of visitors.

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CHAPTER

16

Pharmacy

INTRODUCTION

Purchase of drugs and maintaining a satisfactory inventory of drugs, chemicals and biologicals accounts for a substantial amount of money, next only to salaries and wages. Approximately 20 per cent of the hospital costs, i.e. more than half of the material budget are accounted for by medicines and pharmaceutical supplies.

Availability of the right drug at the required place at the time of need is the key to the hospital's existence. Delays can be disastrous, and the effects of nonavailability of the right drug at the right time can be horrifying in terms of mortality and morbidity. A high percentage of expenditure of the hospital on pharmaceutical stores and the harmful effects of a poor pharmacy service emphasise the need for very careful attention to the effect of pharmacy service on clinical services in the hospital.

There should be a properly organised pharmacy department under the direction of a professionally competent and qualified pharmacist.

Each large hospital will need a pharmacy, with a well-qualified pharmacist incharge providing it with all the services listed under the functions of pharmacy. Small hospitals may not afford a full-fledged pharmacy service with a fully qualified pharmacist because of economical considerations. However, the advantages of such a service for efficient operations of the hospital have been realised by medical staff and administrators.

FUNCTIONS OF THE PHARMACY

The functions of the hospital pharmacy service are as follows.

1. Provisioning, purchasing, storing and distributing drugs, medicinal preparation, chemical and pharmaceutical sundry items
2. Ensuring potency and quality of drugs during their storage in hospital
3. Dispensing prescriptions to inpatients and outpatient, making preparations to be used in dispensing prescriptions, ensuring quality control
4. Maintaining information regarding quality, cost and sources of supply of all drugs, chemicals and other items for information of medical, nursing and other staff
5. To investigate pharmaceutical problems arising in the use of medications
6. Ensuring adherence to the laws, acts, rules and regulations applicable to pharmacies and dispensing
7. To promote economy in the use of medicines and establishing accounting procedures for pharmacy charges and supplies
8. To keep a watch on the adherence by all concerned to hospital formulary.

Responsibilities of Chief Pharmacist

The pharmacist incharge of the department is responsible for the following:

1. The dispensing of drugs, chemicals and pharmaceutical preparations
2. Maintenance of an approved stock of antidotes and other emergency drugs
3. Dispensing of all narcotic drugs and ensuring proper accounting systems for them
4. Inspection of all pharmaceutical supplies at user points

5. Specifications of all drugs, chemicals, antibiotics, biologicals and pharmaceutical preparations
6. Establishing a system of records and book keeping in cooperation with the accounting department for patient charges and for control
7. Preparing pharmacy policies and procedures in consonance with the established policies of the hospital
8. Cooperating in teaching and training programmes for student nurses and interns
9. Implementing the decisions of the therapeutics committee
10. Preparing periodic reports and returns on the utilisation of pharmacy services.

DRUGS AND THERAPEUTICS COMMITTEE

Communication between medical, nursing, pharmacy and administrative staff about standards, methods of prescribing and availability is essential to reduce use of irrational drugs, misuse of drugs, date expired drugs and high prices. Therefore, for efficient functioning of the pharmacy service, it is necessary to have an advisory as well as decision-making group consisting of the medical and nursing staff who are the users of the service, the chief pharmacist who is the provider of the service, and the administrator.

Towards this end every hospital should have a Drugs and Therapeutics Committee.

The purpose of the committee is as follows:

1. The foremost purpose of this committee is to prepare the **hospital formulary** of accepted drugs for use in the hospital
2. Selection of manufacturers and suppliers
3. To act as an advisory group on matters pertaining to the choice of drugs to be stocked, or to be added or deleted from the list of drugs accepted for use in the hospital
4. Framing of the overall policy of the pharmacy service for information of all concerned and monitoring its implementation
5. Consideration of preliminary budget for the pharmacy
6. Development of drug information system.

Composition of Drugs and Therapeutics Committee

The committee should have representatives of all groups concerned with the service. At the minimum, it consists of the following.

1. Hospital administrative/medical Superintendent—Chairman

2. Head of medical department
3. Head of surgical department
4. Head of obstetric and gynaecology department
5. Head of paediatric department
6. Nursing superintendent
7. Chief pharmacist—secretary.

For a new hospital, the committee will have to meet very often in the beginning to prepare the hospital formulary which may take anywhere from three to six months. Once the formulary has been completed, it should meet at regular intervals.

In normal course, the committee should meet once every month to evaluate requests for addition or deletion of drugs in the formulary, drugs, to review stocking levels of drugs stocked at the nursing units, and discuss adverse reactions to drugs.

NEED FOR A HOSPITAL FORMULARY

There are thousands of drug formulations with over a thousand manufacturers in the public, private and cooperative sectors. Many of these drugs are useless, and some definitely hazardous. It is necessary to weed out such drugs and formulations and select only those which meet the criteria of:

- i. sound therapeutics,
- ii. good benefit-to-risk ratio, and
- iii. cost-effectiveness.

The drugs and therapeutics committee must take due care in the preparation of the hospital formulary keeping in mind that its **purpose is the rational use of drugs**. A hospital formulary serves three basic purposes: (i) it promotes rational therapeutics (ii) prevents unnecessary duplication, waste and confusion, and thus (iii) promotes economy to both the patient and the hospital. Economy in medication does not mean the use of inferior or low-priced drugs.

Guiding Factors in Preparation of Hospital Formulary

A formulary must be made acceptable to the medical staff on its merit—sound therapeutics, quickly obtained quality drugs, and economy.

The drugs and therapeutics committee should prepare written policies and procedures governing the hospital formulary. These policies afford guidance in the evaluation, selection, procurement, use, safety procedures and other matters relating to drugs in the hospital.

The committee may consider the policy of including drugs in the formulary by their generic (nonproprietary) names.

All nursing personnel must be informed in writing about the procedure governing the operation of the formulary system.

In forming policies and procedures, the terms “substitute” and “substitution” should be avoided, since these terms have been used to imply the unauthorised dispensing of an entirely different drug, neither of which takes place under a properly operated hospital formulary.

In the preparation of the formulary, the drugs and therapeutics committee should:

- i. review the existing list of drugs in the hospital and include only those which are useful, necessary and cost-effective,
- ii. consult the formularies of well-known hospitals and adopt them to its own needs, and
- iii. consult the WHO list of essential drugs.

The formulary is not complete without incorporating the indications, contraindication, side effects, adverse effects, and special precautions to be taken for each type of medication. The dose, duration of full course of treatment, and cost must also be included.

Once the formulary has been accepted, only the drugs included in the formulary should be stocked in the pharmacy.

The formulary should be printed in a style and format which is simple to refer to and understand. Simplicity of format and a convenient size are the hallmarks of a good formulary. A pocket-size and easy-to-carry hospital formulary is more frequently used by all.

The procedure for periodically updating the formulary or for additions or deletions should be laid down. Any requests for additions or deletions must come to the drugs and therapeutics committee in writing from any of the prescribers, giving valid reasons for a addition or deletion. Additions or deletion must be affected only on their merits and in the best interest of hospital patients.

A hospital formulary needs to be revised every two years.

INVENTORY MANAGEMENT

All material supplied through pharmacy should be subjected to all rules and procedures of materials management. (See Chapter 21, page 256).

Purchase

Whenever possible, pharmacy stores purchase and storage should be centralised. Such an arrangement allows staff, storage facilities and quantities purchased to be optimised.

On adoption of the hospital formulary and final decision about drugs to be stocked, the procurement action starts with a study of:

- i. ABC analysis, VED analysis, FSN analysis,
- ii. reorder levels,
- iii. possible lead times, and
- iv. stocking levels in operational units, viz. wards, OT emergency department, etc.

If the hospital is situated in a large city, supplies can be obtained at short notice because stockists, distributors or agents of almost all well-known firms are located in such cities. This can be of help to reduce the size of the inventory.

It is necessary to maintain a list of manufacturers, and suppliers. There may be only one manufacturer or supplier in respect of few items, but in most of the items there are a sizeable number of manufacturers and suppliers.

All orders should be placed in writing, indicating the terms of supply, specifications of items, quantity, cost, pack size, time of supply. Orders on suppliers should normally be completed in triplicate and one copy sent to the stores department if the purchase and store departments are separate. There will be occasions when life-saving and emergency drugs will have to be obtained at short notice on telephonic orders from local suppliers. In such cases, telephonic orders must be followed up with written supply orders as soon as possible.

Independent check of invoices should be done by the staff of the purchase and stores departments if they are separate. The check should cover such matters as prices, quantity, pack sizes and dates of expiry. Many of the drugs have a short life of six months to a year. The date of expiry assumes great significance if all the stock cannot be used before the date of expiry.

All items must be entered in the stock register noting all particulars as in the invoice. For short life items, an important requirement is to have a dated drug register or short life stock detail register. A routine monthly check of this register will obviate the possibility of inadvertently accumulating items that are nearing their date of expiry.

Size of Inventory

A general hospital with a number of specialties will have to cater for a large number and variety of items. Its turnover will also be greater as compared to a specialised hospital catering for one particular type of patients, like eye, maternity, orthopaedic, tuberculosis, etc. A general hospital located in a large city has the opportunity to reduce its inventory by taking advantage of the location of agents,

stockists, distribution and manufacturer's representative in such cities, and the availability of drugs and suppliers at short notice.

Turnover

In the pharmacy stores a system must be evolved which will ensure an adequate turnover of stock. Certain items have limited life and failure to use these before they are out of date can be very costly. The principle of first-in, first-out should invariably be adopted. It should be possible to load store shelves from the back so that old stock is moved towards the front from where goods are picked. Where items are stored in bulk containers, marking of the date of receipt clearly on the container so that it can be seen at a glance, helps to ensure a proper turnover. Efforts should be made to persuade users to accept old stock until it has been cleared, when a change of trend makes stock items no longer popular with the users.

There should be a periodic review of all slow moving stock to prevent deterioration and obsolescence. Items which are obsolete should be ruthlessly weeded out from the stores, and disposed off.

Storage Facility

It is important to ensure that the most appropriate combination of storage facilities is made use of. Fixed location racks with adjustable shelves offers suitable storage facility. If the inside surfaces of shelves are painted in a light colour, a better light reflection is obtained for clear identification of the marking on stocks.

Stock Location System

The 'sequence system' of stock location is most suitable for pharmacy stores. Items are located in alphabetical or numerical sequence without regard to issue frequency. In dispensing solely for outpatients, the 'popularity location' system is more suitable, where material are so placed that more popular items are located in the most advantageous positions.

Issues

Outpatient Prescriptions

Drugs will be required to be dispensed to both inpatients and outpatients. When drugs are dispensed directly from the pharmacy, this is usually done direct from the doctor's prescription or treatment card. The dispensing of "take home" drugs accounts for a big number of prescriptions

individually dispensed by the pharmacy. These should never be issued from ward stock.

Every prescription must be checked for correctness of dosages and strength and its validity by the doctor's signature. There are many drugs with closely similar names but entirely different actions. Dispensing should be done in proper containers—original packing if possible—or in paper packets with labelling and instructions. When a particular drug prescribed by brand name is not available and an equivalent in the formulary is available, the pharmacist should substitute it only after informing the treating doctor personally.

Wards

The range and quantity of drugs held by wards or departments should be agreed between pharmacy, medical and nursing staff. The basis of the ward stock will be the regularly used drugs without special storage problems. In each ward, there should be an up-to-date drug inventory.

Ward stocks should be appropriate for the needs of the ward and be subject to regular checking by chief pharmacist who should maintain close contact with nursing staff in the ward. There should be effective control of drugs kept inwards, each having a standard drug list which is kept under regular review. Supervision of drug stocks in user units by chief pharmacist is important for:

- i. ensuring that statutory and other requirements in relation to dangerous drugs schedule and drugs liable to be misused are complied with,
- ii. ensuring that stocks are kept in proper conditions,
- iii. determining, in association with the users, that stocks are adequate in range and quantity, and
- iv. arranging for the return to pharmacy of items which are no longer in regular use, and thus avoiding wastes and unnecessary hoarding.

Issues to wards and departments can be made with ease if a preprinted requisition form is used. No issues should be made without written indents. Another system of issue to wards is the topping system, wherein ward stocks are topped up at periodic intervals by the pharmacy staff. This minimises paperwork and loss of time of nurses and technical staff. The timing of the topping up round should be planned to cause least interference with the ward routine.

Emergency Drugs

It is necessary to place emergency cabinets, stocked with appropriate emergency drugs and antidotes ready for use

in each patient care unit. Particular attention needs to be given to intensive care unit, postoperative recovery and emergency/casualty room. It needs to be emphasised that unless it is checked daily by the ward sister and periodically by pharmacy staff, and kept under strict control, the contents tend to grow until it ceases to be simply an emergency supply.

QUALITY

With the pharmaceutical industry being opened to small scale manufacturers, many spurious and substandard drugs are passed as standard drugs in the absence of strict enforcement of quality regulations by the food and drugs administration departments of states. Quality of drugs not only depends upon the quality of raw ingredients but also on manufacturing practices, handling and packing. Quality may degrade between manufacturing and consumption. Therefore, any quality assurance should satisfy: (i) composition, i.e. the drug contains the correct ingredient, (ii) potency, i.e. the ingredients remain in correct quantities without deterioration, (iii) purity, i.e. no harmful or extraneous ingredients are used (e.g. colouring agent), (iv) uniformity, i.e. the ingredients are distributed in the drugs uniformly and also that there is uniformity from batch to batch, and (v) bioavailability, i.e. the absorption in bloodstream and required concentration of the drug in body tissues to give intended benefit.

Quality assessment of drugs supplied by vendor firms is not possible in an average hospital pharmacy. In fact, there will hardly ever be a necessity to do this by the hospital if the manufacturers are renowned companies who would not risk their reputation by following dubious manufacturing practices. However, in the unlikely event where it becomes necessary to assess quality, the following may have to be resorted to:

- i. inspection of the factory, and
- ii. laboratory analysis of the product by renowned analytical laboratory.

CHARGES FOR DRUGS

Methods of distributing drugs to outpatients and charging for drugs to both outpatients and inpatients should have been deliberated as part of the drug policy of the hospital. The policy guides the hospital's overall "schedule of rates and charges".

The charges for medicines and other supplies dispensed from the pharmacy should at least ensure that the cost and

overheads are covered. Determining charges to patients differ among hospital, with several methods in use.

Part-inclusive Rate

Certain specific items of ward stock are administered to the patients without charge, generally ordinary drugs stocked in the ward cabinet. This avoids irritating and time-consuming 'nuisance charges'. All others are charged.

Cost Plus a given Percentage

There can be several formulae. However, it is best to work out the cost as all-out cost, with a nominal profit as percentage of the cost added.

Cost Related to Maximum Retail Price (MRP)

Due to bulk purchases, the unit cost to the hospital is much lower than the MRP. Hospitals can afford to charge less than MRP and still make a profit.

For Items Prepared by Pharmacy

The cost is calculated as the all-inclusive cost of materials with a suitable margin added to cover spoilage, wastage, breakage, etc.

In case of the majority of items, the amount at which the hospital will be making the drug available to the patient should be determined. Copies of the approved rate schedule should be given to all members of the medical staff and to all wards and departments.

A well-organised pharmacy has proved to be revenue producing even in small hospitals. The medication cost per patient day can be reduced by proper management even when charges for medication to patients is established on a business-like basis.

PHYSICAL FACILITIES

As the pharmacy serves both inpatients and outpatients, its sitting and location needs careful consideration. It should be so situated that:

- i. outpatients have ready access to the hospital's pharmacy to collect prescription,
- ii. staff of wards and departments can access it without having to travel a long distance through other crowded areas,
- iii. collection of indents and dispensing of prescription for inpatients can be carried out in a central dispensing

area which is accessible to hospital staff when they come to consult the pharmacist or to obtain stocks for ward use, and

- iv. suppliers have an access to it from outside for unloading their wares.

From the above considerations, the pharmacy is conveniently located near the main internal traffic artery of the hospital, on the ground floor. In a high-rise multistoreyed building, other considerations like location of lifts, internal traffic patterns, location of main store and arrangement of wards on various floors will also influence the location of the pharmacy.

Space is required for:

- i. dispensing counters
- ii. a cash counter
- iii. drug storage, including dressings
- iv. cool and cold storage
- v. administrative office
- vi. circulation space
- vii. space for compounding and bulk preparation.

Arrangement of Shelves and Cabinet

All items have to be so arranged on the shelves, and the cabinets so located, that it is not inconvenient for the pharmacist to identify and pick up. The commonly used drugs should be easily accessible, with minimum amount of walking by the pharmacist.

Communication

Prompt communication between medical, nursing and pharmacy staff is necessary to reduce errors in prescribing and dispensing. The pharmacy should be provided with a telephone connecting all patient areas and the hospital administration.

The number of the dispensing counters will depend on the size of the hospital. For a 200-bedded hospital, at least three counters will be necessary. The minimum area for the pharmacy of the smallest hospital is not less than 250 sq ft. The estimate ranges from 10 sq ft per bed in a 200-bedded hospital, and 5 sq ft per bed in larger hospitals.

Equipments

The basic equipment for a pharmacy includes cabinets with shelves, work-tables, counters, refrigerated storage, and cabinets for dangerous drugs. Cabinets with proper shelving and drawers, and sectional drawer cabinets with cupboard bases are suitable for such use. Work-tables and counters are required for preparation of bulk solutions, mixtures and ointments, transferring contents from bulk storage con-

tainers to smaller containers and for checking orders and loading ward baskets. Apart from furniture the details of equipment are as follows:

1. Cabinets with shelves
2. Open shelves
3. Refrigerators with temperature recording device located outside
4. Bottles, jars, containers for preparation of mixtures, ointments
5. Filing cabinets
6. Chemical resistant marble table tops for work-tables
7. Large sinks for bulk preparation area.

STAFFING

The number of pharmacists and other staff needed for the efficient functioning of the pharmacy will depend upon the programme, policies, range of services, the size of the hospital and its workload. Apart from the chief pharmacist, there will be a requirement of one pharmacist for a 100-bedded hospital. The scale of pharmacists for various sizes of hospitals is suggested in Table 16.1.

Table 16.1: Estimated requirement of pharmacists

<i>Size of hospital (Beds)</i>	<i>No. of Pharmacists</i>
100	2
200	3
300	4
400	5
500	7
600	9

In the development of staff, the following factors should be borne in mind.

1. Technical work which does not need to be undertaken personally by a pharmacist should be carried out by pharmacy technicians under the direction and control of pharmacist.
2. Much of the semiskilled work can be carried out by inservice trained staff.
3. Clerical and store-keeping duties should, where possible, be carried out by correctly graded staff, not by pharmacists.

DRUG INFORMATION CENTRE

Medical representatives visits to members of medical staff, and circulation of a plethora of “technical” information

pamphlets to them by pharmaceutical companies and their agents tend to emphasise only the good points about their products. However, there is a need to collect and supply correct information regarding drugs available in the market to the users in the hospital. Many of the formulations available in the country contain banned drugs, hazardous drugs, irrational drugs or their combinations. One of the important functions of the pharmacy and the chief pharmacist is to assist in efficient prescribing by advising upon the nature and properties of medicaments.

The provision of a technical pharmaceutical information service is an important function of a pharmacy service and serves inter alia, as a means of keeping medical, pharmacy and nursing staff up-to-date with continuous change and developments on matters concerning drugs, e.g. dosage, formulation, method of administration, alternative preparations, possible side effects, compatibility, etc. A good library with the latest books and journals on the subject forms the nucleus of such a service. Scientific literature on pharmaceuticals contains information on recently introduced drugs in respect of their pharmacology, pharmacokinetics and bioavailability. Information regarding the nature of a drug, indications and contraindications, dosages schedule, side effects, routes of administration, special precautions and similar connected information is collected, analysed and appropriately filed by the chief pharmacist for retrieval and study when needed by anyone.

Information on incompatibility, drug interactions, cautions to be observed in renal, hepatic and other impairment and in pregnant, children and elderly patients must be available. Summary of all important matters regarding pharmaceuticals should be intimated to all concerned through a pharmacy bulletin.

Errors in medication are detrimental to patient care and an economic loss. The centre has a responsibility to document and evaluate all related factors in such instances so as to take active preventive measures.

Every adverse reaction to any drug should be investigated by a suitably composed committee. The issue and use of the concerned drug should be suspended forthwith, and the stocks of the drug should be withdrawn from wards/ departments, and the batch number and other particulars must be reported to the manufacturer and the drug controller in writing.

The responsibility to organise such a centre is best assigned to the chief pharmacists, under guidance of the drugs and therapeutics committee but under the direct control of the medical superintendent or hospital administrator. With the need to keep abreast of continuing developments in the pharmaceutical field, it is sound management practice to encourage pharmacists in advancing their professional knowledge.

MANUFACTURING

Pharmacies of some large hospitals are obliged to prepare mixtures, ointments, lotion and intravenous fluids. Preparation of special formulations and bulk preparations require stringent quality control, and to follow good manufacturing practices. Cleanliness, dust-free atmosphere, hygiene must be ensured, using only quality raw materials. The finished product must pass through all quality control steps with regard to uniformity, clarity, sediments, odour, colour, etc. followed by laboratory analysis. A random sampling of each batch is done to detect any flaw.

All manufactured products, as opposed to compounded or bulk prepared items which fall under the category of “assembled” or “compounded” items, are subject to the Food and Drug Act and require a licence to manufacture them. Any manufacturing activity in a hospital pharmacy becomes an object of closer security by FDA from a legal viewpoint. In general, hospital pharmacies cannot compete with the pharmaceutical industry in the economic manufacture of pharmaceutical products. Bulk preparation of drugs by hospitals should be undertaken only when comparable products are not readily available commercially or where there would be an appreciable saving in cost. In working out cost, the cost of supervisory staff, depreciation of equipment and wastage of materials should not be overlooked.

MANAGEMENT INFORMATION AND REPORTING

Pharmacy being a revenue-generating activity, simple management indices can be developed to assess the workload. A monthly statistical report should be prepared which can give an overall view of the functioning of the pharmacy. Among others, the report should include:

- i. total number and value of items dispensed for outpatients,
- ii. total number and value of items dispensed for inpatients,
- iii. frequency of emergency demands from wards,
- iv. number of outpatients prescriptions, and
- v. total volume of drugs dispensed through pharmacy.

Besides this, the pharmacy can develop two important management indices, viz. the drug cost per patient day and drug cost per outpatient.

The pharmacy annual report should incorporate any special activity undertaken, salient points of the report of drugs and therapeutics committee, number of drugs added to or deleted from the hospital formulary, and any other relevant or special information.

Central Sterile Supply Department (CSSD)

INTRODUCTION

Ensuring a high standard of sterilisation and disinfection to minimise the incidence of hospital infection has been uppermost in the minds of clinicians as well as hospital administrators. In the past, sterilisation of syringes and other items of routine use in wards and operation theatres were done by boiling or in low pressure steam sterilisers. However, the advantages of centralisation of all sterile supplies through one unit have been realised by all hospitals for ensuring sterilisation safety and quality control.

Standardisation of surgical dressings and centralising all surgical supplies from one point of origin were necessitated during the Second World War because of the requirement of a large number of casualties in different theatres of war. In order to cater to the needs of mobile surgical units operating in forward areas during the war, the concept of a sterile supply organisation, in the form of an independent unit or as one attached to large base hospitals came into being.

It was common practice till the recent past to plan and provide autoclaves, boilers, stills and sterilisers centrally for the main users, viz. operation theatres, with subsidiary equipment of lower capacity for nursing units. There was the ever present chance of tardy quality control because nursing staff could not devote full attention to these activities in addition to their direct patient care activities.

Therefore, sterilisation activities in a hospital are better centralised in one single department for efficiency and effectiveness. This department, called the central sterile supply department (CSSD) becomes responsible for processing, sterilising and dispensing of almost all items of sterile equipment, sets and dressings in the hospital.

Centralisation of sterilising activities in one department has resulted in many advantages. The chief among these are improved efficiency, sterile supplies available at all times of the day or night, economy of trained manpower, as it is no longer necessary for nurses to waste their time in sterilisation activities, sterilisation safety and quality control.

Functions of CSSD

Broadly, the functions of the department are as follows.

1. To receive and process used and unsterile supplies and sets from nursing units, OPD, operation theatres, labour rooms, etc.
2. To sterilise and dispense sterile articles to user units
3. To maintain an uninterrupted supply of bacteriologically safe supplies at all times
4. To undertake studies for improvement of sterilisation practices and processing methods to provide supplies economically
5. To impart training to hospital personnel in safe hospital practices
6. To participate in hospital infection control programme
7. To advice hospital administration on suitability of supplies and equipment from sterilisation point of view.

The planning of CSSD must conform to the sequence of work starting from the reception of materials to their despatch from the department. The sequence of events is as follows.

1. Materials are received into the department from various users (OT, wards, labour suite, nursery, etc.)
2. All used materials are cleaned—preliminary cleaning to remove blood, pus and other substances difficult to

remove when dried up should have been done by the users before sending the articles to CSSD

3. Clean materials are inspected, assembled and packed, ready for sterilisation
4. After sterilisation, they are either stored in a sterile storage area or distributed directly as required.

The CSSD flow process chart is given in Figure 17.1.

Location

The location of CSSD should be convenient to its principal consumers. These are the nursing units, labour suites and operation theatres. It should be so located that supplies and equipment are brought to and taken away by the shortest route.

The department can conveniently be located as part of the main service core of the hospital.

Space

A minimum of 7 sq ft on a per bed basis (with 100 sq ft for the smallest hospital) is considered essential for planning a CSSD with scope for future expansion and growth. The following area is recommended (Table 17.1).

The area will be divided into receiving and cleaning, clean work and processing, sterilisation, syringes and glove processing, sterile storage, and issue. Needs for space for each of these differ by availability of mechanical devices and modern facilities.

Up to 100 beds	10 sq ft per bed
Up to 200 beds	9-10 sq ft per bed
Up to 300 beds	8-9 sq ft per bed
300 and above	7-sq ft per bed

These activities comprise of the following.

1. Receipt of used supplies
2. Accounting
3. Washing, cleaning and drying
4. Sorting
5. Gauze cutting and assembling
6. Packing
7. Sterilisation
8. Sterile storage
9. Issue.

Physical Facilities

The direction of work flow and economy of labour determines the layout of the physical facilities. Articles should

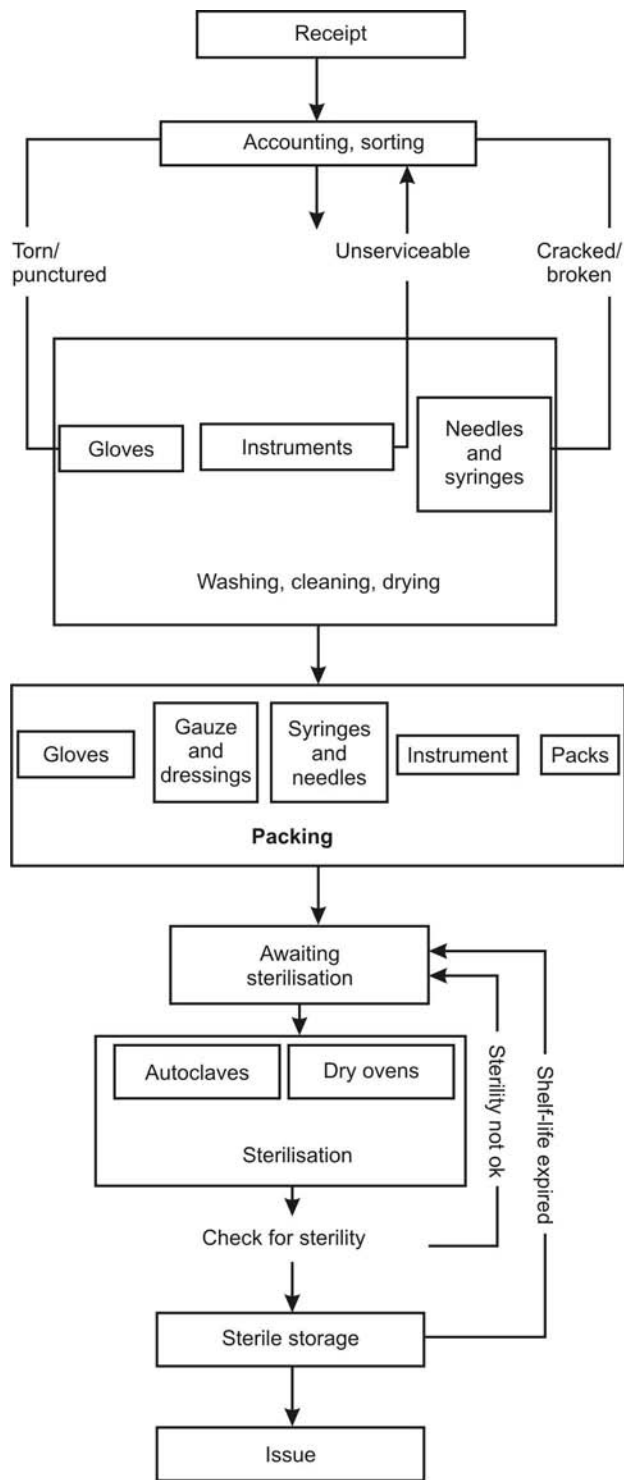


Fig. 17.1: Flowchart of CSSD

move only in one direction through receipt, washing and cleaning, drying, sorting, reassembling and packing, sterilisation and storage. The following areas will be essentially required in the department. Although they cover most of the requirements, special requirements of a particular hospital should be kept in mind during the planning process (Table 17.2).

Table 17.2: Special space requirements of a hospital

1. Receipt of used supplies	Reception counter for small items, parking place for trolley load
2. Cleaning and washing	Series of sinks with running hot and cold water, ultrasonic washer for instruments caked up with blood and for fine instruments
3. Sorting	Table space, next to washing area
4. Drying area	Table space, wires for hanging gloves
5. Gauze cutting area	Table space
6. Glove processing area	Table space, room for glove processing unit
7. Packing area	Table space
8. Storage area for items awaiting sterilisation	Shelves
9. Sterilisation	Autoclave room
10. Sterile storage	Storage room with shelves
11. Issue counter	
12. Change-room with toilet for workers	
13. CSSD supervisors room	

The nucleus of a CSSD may exist in every hospital in the form of a central autoclave room for sterilising ward dressing drums and operation theatre requirements. A further step is to add a central syringe department. The final step is taking on all other sterile supplies of all wards and departments.

Inputs for planning should be provided by a committee which should include representatives from administration, surgical staff, anaesthesiology, pathology and nursing. This committee should develop a written programme covering:

- i. the overall scope of the department,
- ii. departments to be served,
- iii. extent of services to be rendered,
- iv. process equipment to be procured,
- v. preparation of procedure manual, and
- vi. organisational and administrative structure of the department.

Staffing

There should be a properly qualified supervisor in charge of the department. The chief of the department, the CSSD

supervisor, has traditionally been a senior nurse. However, this need not be the case. The supervisor can be a person from any other stream of hospital personnel provided he or she has a grounding in the basics of patient care, bacteriology, principles of sterilisation and mechanical and administrative competence.

The routine work in the CSSD is of a repetitive nature. The other staff required are usually in-service trained CSSD attendants, semiskilled workers who can be called CSSD assistants, CSSD technicians and sweeper (*safaiwalla*). For the smallest department, a minimum of four persons will be required apart from the supervisor. A 200-bedded hospital with door delivery system to user departments would require 12 personnel. While working out the requirement of personnel, leave reserve and off-duty reserve should also be considered. A 500-bedded teaching hospital has the following staff.

- Technologists 5
- Technical assistants 4
- Nursing aides 4
- CSSD attendants 4

The number of workers will be influenced by the following.

1. Method of collection and delivery
2. Quantum of work—one shift, two shifts, or one shift with only emergency issue counter after normal working time
3. Hospital’s philosophy on use of disposables
4. Availability of mechanical aids.

The supervisor should be fully conversant with the activities and policies of all the user departments of the hospital.

Equipment

The main item of equipment in the CSSD is the autoclave. At least one additional autoclave other than the main one should be provided to cater for failure or extra workload. Various type of autoclaves are available. Manufacturer’s instruction for installation and operation must be clearly understood. Most modern electric autoclaves are designed to achieve a vacuum in the sterilisation chamber followed by injection of steam under controlled pressure to achieve desired temperatures for varying periods, and have recording devices. Walk-in type of autoclaves are available which are suitable for the requirements of very large hospitals. Other equipment in the CSSD includes the following.

- Dry oven
- Gauze cutter
- Ultrasound washer

- Needle flushing device
- Autoclaves
- Ethylene oxide steriliser
- Work benches with marble or stainless steel top
- Storage cupboards and racks
- Linen folding table
- Soaking sinks
- High pressure water jets.

Ultrasonic Cleaner

One of the essential items of equipment in CSSD is the ultrasound cleaner. Ultrasonic cleaner cleans by bombarding the item with sound waves. These waves while passing through the detergent solution produce submicroscopic bubbles which collapse on themselves, generating tiny shock waves that knock debris off nooks and corners of instruments that are not easy to reach.

An effective programme of preventive maintenance should be in place to minimise the chances of machine breakdown. If it is not possible to carry out such preventive maintenance by the hospital's own staff, there should be a maintenance contract with the manufacturers. Preventive maintenance should cause minimal disruption to the CSSD.

POLICIES AND PROCEDURES

Central sterile supply is most effective when it provides a limited basic range of articles for the greatest possible number of users. A periodical review should be made of the items processed by the CSSD to assess which ones can be modified to meet a wider range of needs and whether any can be dispensed with altogether. Once this basic need is catered for, any additional need can be met by providing supplementary packs containing particular dressings or materials.

The list of items and special trays commonly processed in the CSSD are as follows.

- Instruments
- Appliances
- Dressings
- Sponges
- OT linen
- Special packs
- Gauze and cotton materials
- Gloves
- Bowls and trays.

CSSD is one department where policies and procedures must be unambiguous and scrupulously followed in letter

and spirit. The smallest mistake or carelessness on part of the staff can have serious repercussions elsewhere in the hospital. The policies should cover the following:

Responsibility

The responsibility for supervision of sterilising tasks should be clearly understood and vested under one person. Due to repetitive work, workers may be tempted to be careless in sterilisation procedures and differentiation between sterilised and unsterilised packs. It is impossible to differentiate between similar looking contaminated, potentially contaminated or sterile packs packed in linen paper wraps. In case of doubt, it is a safe practice to treat all unused articles as contaminated, and re-process or sterilise them.

Disposables

The advantages and disadvantages of using disposables should be fully taken into account when considering the replacement of traditional materials by their disposable equivalents, remembering that some disposables give more value for money, while as some others have no specific advantages.

Segregation of Sterile and Unsterile Supplies

Sterile supplies and packs and contaminated articles should never be carried on the same trolley or by the same staff.

The term "sterile supplies" covers all articles which have either been sterilised in CSSD or disposable sterile packs distributed through CSSD.

Standardisations of Packs

Special trays and sets to be processed by CSSD should be standardised by the hospital. Surgical instruments and other related items needed for commonly practised surgical procedures generally do not vary from surgeon-to-surgeon. Such operations are appendectomies, cholecystectomies, exploratory laparotomy, cataract surgery, nasal surgery, ear surgery, hysterectomies, tubal ligations, etc. We should develop a composite pack for each surgical procedure, such a pack should contain all items the surgeon and nurses require for a procedure.

In standardising, the aim is to have a standard surgical pack containing all the items required for that procedure by the operating surgeon. This system has the advantage of having standardised sets ready at hand even for emergency operations, irrespective of special preferences of a particular

surgeon. Besides these, the other commonly used sets (or packs) of sterile instruments and materials in various other procedures that are generally standardised are as follows.

- Cut-down set
- Lumbar puncture set
- Sternal puncture set
- Catheterisation set
- Bladder wash set
- Liver biopsy set
- Fine-needle aspiration cytology (FNAC) set
- Paracentesis set
- Suturing set
- Thoracic aspiration set
- Incision and drainage set
- Tracheostomy set.

In order that the most economic method of providing the packs can be established, cost comparisons should take place from time-to-time, between packs available from commercial sources and those prepared in the CSSD.

The possibility of purchasing a standard range of dressing packs and materials from trade sources should also be kept under review.

Packing Procedures

Step by step packing procedure for each pack should be determined, and should specify:

- i. the quantities of materials required and their arrangement on the workbench, and
- ii. the sequence of the packing operation.

Fifteen sq ft of packing space is necessary on each workbench for assembly of simple packs with a high throughput, with some storage space above the bench. Workbenches should be so designed to keep packing movements to minimum, with storage of materials either on shelves or above the bench within easy reach of the packer.

Manual of Operations

A procedure manual listing all procedures followed in the CSSD for each process and their correct sequence is essential for effective operation of the department. It must be realised that more costly and sophisticated the equipment, more training and precision is required to operate it.

Packing Material

Packing material used as wraps for articles for sterilisation differs with the process of autoclaving or hot air oven. Linen and kraft paper are commonly used, paper being a

better bacterial barrier. In case of paper, it is desirable to have a double paper wrapping. Although kraft paper is usually used, but even newspaper have been effectively used. The wrap should be easy to open without spilling the inside items. If paper is used, it may be finally wrapped with linen or placed in a cardboard box for autoclaving. Articles for hot air sterilisation can be kept in suitable stainless steel containers. Syringes and needles are packed in paper wrappers. Gloves can be packed either in paper or linen.

AUTOCLAVING

Use of saturated steam under pressure is the safest and dependable method of sterilisation, in universal use for destruction of all forms of microorganisms. The higher the temperature the more rapidly is sterilisation accomplished. The minimum time and pressure for sterilisation by autoclaving process is 121°C at 15 lbs psi in 15 minutes. If the temperature is raised to 126°C, the time can be reduced to 10 minutes. At 134°C, it is 3 minutes, and only a minute at 150°C. The last process is utilised in “flash sterilisers” installed in some operation theatres for spot sterilisation of urgently required instruments during operation.

Incomplete penetration of steam can occur because of overloading the autoclave or incorrect positioning of packages inside the autoclave. There is no such thing as “almost sterile”. An object is either sterile or not sterile.

Quality Control: Sterilisation Checks

In spite of the process instruments fitted on autoclaves which give a graphic record of temperature and pressure, routine methods of check for sterilisation must be incorporated. Colour index strips available for this purpose should be kept in each pack being autoclaved. Manufacturer’s instructions must be followed scrupulously regarding loading of autoclaves, temperature and pressure levels and timings.

Sterility Indicators

Mechanical indicators which are monitoring instruments record time, temperature, humidity and pressure during the sterilisation cycle.

Chemical indicators are devices with a sensitive chemical or dye to monitor one or more parameters of a sterilisation cycle.

Biological indicators employ the principle of inhibition of growth of microorganism of high resistance to the mode of sterilisation. Subsequent failure of growth of microorganisms indicates adequacy of sterilisation.

Articles should not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclaving process. If not, the entire load of articles must be autoclaved again, until the required temperature pressure and residual time are achieved again.

No single method is capable of monitoring completely all parameters necessary for a fool-proof sterilisation. Recording instruments on the autoclave which give a progressive graphic record of temperature, pressure, etc. can be inspected immediately after a load has been autoclaved. In addition, chemical indicators change colour when conditions necessary for sterilisation have been met. These are available as tapes and strips, and are attached or implanted inside the packing material. This should be supplemented with periodical use of biological indicators to detect (which may take several days) failure of the autoclave. To achieve a high degree of certainty that the autoclave is functioning properly, biological indicators should be placed in the most inaccessible location in the load and then cultured. They provide positive assurance, albeit retrospectively, that each package has been subjected to proper sterilising conditions.

Shelf-life

The shelf-life of sterilised packs, i.e. the time for which it can be stored safely before use, should be determined by a committee of experts including a bacteriologist. If the pack is not used, during its shelf-life, it should be again put through the autoclaving process without being opened. Although a pack can remain sterile for up to four weeks on the CSSD shelf, experts are of the opinion that it should be reautoclaved without opening after one week.

Chemical Sterilisation by Ethylene Oxide

Ethylene oxide (EO) is a gas which is now commonly used as sterilising agent for heat-sensitive and moisture-sensitive materials like rubber, plastics and fibreglass. Effective sterilisation by EO depends upon the following.

Concentration of gas: 450 mg/litre or higher is essential for complete sterilisation.

Temperature: Exposure time can be reduced by increasing the temperature. Two temperature ranges are generally provided in the EO sterilisers 49° to 63°C and 30° to 37.8°C.

Humidity: In automatic sterilisers, steam is injected under vacuum before admitting the gas. In some a wet gauze or sponge is required to be placed. Other sterilisers depend on

ambient humidity, and compensate for lower moisture by a higher exposure time.

Packing: The type of wrapping used should be penetrable by ethylene oxide and water vapour. Polyethylene is commonly used for loose wrapping.

Period of exposure: In automatic sterilisers, the time ranges from 110 to 260 minutes. Up to 12 hours may be required in others.

Manufacturer's instructions must be followed meticulously as regards above parameters for effective sterilisation of different types of equipment.

Ethylene oxide sterilisers generally fall into two categories-manually operated and automatic. The source of the gas is provided by large compressed gas cylinders or by a unit dose cartridge sufficient for one cycle. Simple sterilisers carry out sterilisation at room temperature and ambient humidity, with single-use glass ampoule of ethylene oxide seated inside a gas-release bag. On breaking, liquid ethylene oxide vapourises and diffuses out of the gas-release bag into a larger bag in which the material to be sterilised has been placed. This bag performs the function of diffusing chamber and allows the gas to retain long enough to achieve sterilisation.

Sterilisation Process

After the steriliser chamber is sealed and the controls set, sterilisation process goes through the following phases:

1. Warming the chamber
2. Evacuating residual air to partial vacuum
3. Introduction of moisture to ensure that it penetrates wrappings and material
4. Introduction of EO
5. Raising the temperature (if required)
6. Exposure for the required time
7. Release of chamber pressure
8. Removal of the gas under vacuum (called the "Purge cycle")
9. Reestablishment of atmospheric pressure by introduction of filtered air into chamber.

CSSD Distribution System

Distribution system for sterile article should also be decided at the planning stage itself. The following four systems are in use. The last two are door deliveries.

Clean for dirty-exchange: A sterilised articles is issued at the CSSD issue counter on return of a used one at any time.

Requisition system: Articles needed are requisitioned by users on a daily or regular basis and collected by them at CSSD counter.

Grocery system: Each user's requirements for all items for a specific period are delivered at suitable interval irrespective of whether the contents have been used or not and the previous basket or container withdrawn.

Quota system: Predetermined stock levels (quota) of various items for each user unit are maintained by delivery personnel from CSSD through regular deliveries.

The choice of system will ultimately be dependent on local circumstances. A combination of the systems may be more appropriate in most hospitals.

Depending upon the size and requirement of each hospital, the department may have to work in more than one shift. If the department works on only one full shift, then provision for issues of required packs outside of normal working hour will have to be made. In smaller hospitals, this task may be assigned to the casualty or emergency department who would then be stocked at levels over and above its own requirement.

SECTION

FIVE

***Administrative
Services***



CHAPTER

18

Medical Records

INTRODUCTION

The need for appropriate, written documentation of facts related to patients' treatment in the hospitals cannot be brushed aside, because failure to maintain records means failure of duty towards the patient.

Medical records through which hospital statistics are generated serve as eyes and ears to the hospital administrator. Medical records are of importance to the hospital for evaluation of its services for better patient care. They also serve as a resource for education and training of physicians and others, also being the basis for clinical research. Research to be effective requires scientifically recorded observations as reflected in the medical record. And, the importance of accurate records for legal purpose is well-established.

In short, the necessity for maintaining proper medical records by a hospital can be broadly grouped as follows.

Patient's Needs

It serves as a story of the patient's passage through hospital, maintaining continuity in that story. From this is extracted the information required by the patient, e.g. a medical certificate of his hospital stay, diagnosis and so on. It saves time in avoidable investigations if patient is readmitted and may well influence the course of subsequent hospitalisation. Physicians now do not always have the time to get acquainted with the family life of a patient. For this reason, a written report of the family history and personal history are necessary. From an economic standpoint, use of medical record by other agencies representing insurance claims, union benefits, unemployment and industrial compensation

is of paramount importance to the patient. Information contained in the medical records is often the determining factor in providing the patient with financial support or subsequent medical care for the remainder of his or her life.

Physicians Needs

Medical record meets the physicians' needs as:

- i. Practice of scientific medicine based on recorded facts,
- ii. Continuity of medical care,
- iii. Evaluation of his own capabilities and short-comings, and
- iv. Effective communication for the medical team.

If adequate in content, records when properly classified, can be promptly retrieved for study and research. The progressive physician welcomes an opportunity to use such source material to survey the result of the treatment in a particular disease entity. Frequently a physician will wish to review all cases which he or she has had in the hospital during a given time. The doctor may have a patient who does not remember details of a previous hospitalisation, but by referring to the record of that hospitalisation, he or she may ascertain what organ or organs were removed at the time of operation. Also, the physician or the hospital may need to refer to the record for medicolegal purpose if he is called as a witness in the court.

Institution's Needs

The hospital benefits as the records help in:

- Generating hospital statistics
- Teaching and research

- Admission control
- Planning of services
- Improving quality of care
- Safeguard in tort suits. (Medico-legal cases)

Statistics gathered from medical records show to the hospital administrator whether or not the efforts of physicians supplemented by the hospital facilities are in accordance with reasonable expectations of modern scientific medicine. Liability suits involving hospitals have been on the increase. Therefore, the hospital should be able to bring before the court of law a complete, up-to-date medical record, fully documented, in regard to the patient's illness and treatment. Testimony based on recorded facts is given a greater consideration than testimony dependent on memory.

Health Authorities' Needs

The records are important to the public health authorities as they contain reliable information regarding morbidity and mortality patterns of dependent population. National and state health laws require that certain reports be made available regularly to them. Reports like births and deaths, infectious diseases, notifiable diseases, statistics regarding incidence of diseases, and types and number of family planning procedures are constantly required by the government. Without the aid of medical records, this is not possible.

Historical Background

Patients records are believed to have been kept in ancient India by individual physicians in emperor Ashoka's time (200 BC). In seventeenth century, St Bartholomew's hospitals in London first started to keep written records, which was later followed by some hospitals in USA. However, the impetus to the idea of proper written records came in USA from the American College of Surgeons and American College of Physicians in the beginning of the last century. In 1928, the Association of Medical Record Librarians was formed in USA. In India the Mudaliar Committee (1963)¹ first stressed its importance and the subsequent review committee² for health and hospitals (Jain Committee, 1968) lamented the poor state of medical records and strongly recommended establishment of proper medical record sections in every hospital. However, the progress in this matter has not been very satisfactory, with only lip service being paid to this aspect by most of the hospitals. Only some government hospitals have properly organised medical records department, besides some voluntary hospitals.

Medical authorities in India have been slow to realise the potential of good medical records in hospitals in improving patient care, or of the seriousness of problems that poor medical records create. One of the most important reasons why enough emphasis had not been placed in the past in development of good medical records systems is that there is no regulatory control on quality of care (medical audit) either by the central or by state medical authorities, neither are there any accreditation requirements from any of the professional associations in the field like Indian Medical Association, Indian Hospital Association, Indian Society of Health Administrators, to mention only a few out of many such organisations. Medical insurance that requires maintenance of good medical records had been almost non-existent till recently, and there have been very few malpractice suits against hospitals in India, thus, pushing the requirement of good medical records to the background. However, things have gradually changed over the past some decades wherein the importance of good medical records systems in hospitals are being increasingly realised.

Lamenting the lack of good medical records department and realising the importance of such departments in all hospitals, the central Ministry of Health organised a workshop on standardisation of medical records and reports for hospital management and development for district level hospitals at Bhopal in 1986, which made certain recommendation.³ The summary of these recommendations has been incorporated as appendix to this chapter. (Appendix IV).

Medical Record: Definition

McGibony⁴ considered medical record as a clinical, scientific, administrative and legal document relating to patient care in which are recorded sufficient data written in the sequence of events to justify diagnosis and warrant treatment and end results.

Medical records is defined simply as a systematic documentation of a patient's personal and social data, history of his or her ailment, clinical findings, investigations, diagnoses, treatment given, and an account of follow-up and final outcome.

A medical records document serves as:

a clinical document—listing the clinical history, physical examination, investigations, nursing records, etc.

a scientific document—because it is used to study the patient's condition and progress through scientifically practised medicine, and for research.

an administrative document—it helps administrative control, planning of services, budgeting, improving quality of care, hospital statistics.

a legal document—admissible under Indian Evidence Act in law courts in defending malpractice suits, in law torts in defence of hospitals and its clinicians.

Medical records is a personal document in so far as it is associated with an individual identifying him with his history of illness, findings, treatment, complications and so on. Being a personal document, it is a privileged communication, the information from which cannot be released without the patient’s consent. On the other hand, it is also an impersonal document, when its contents are used for research and training, without disclosing to whom the information belongs.

Characteristics of Good Medical Records

The problem of completing records is a very real one for the overburdened physician. Notwithstanding the busy schedules of physicians and others in generating records, the medical records must be:

- i. complete—sufficient data to identify the patient, justify diagnosis, treatment, follow-up and outcome,
- ii. adequate—with all necessary forms, all clinical information, and
- iii. accurate—capable of quantitative analysis.

Since the primary reason for record keeping is to improve patient care, there can be no disagreement that the patient in a small hospital is just as important as the one in a 500-bedded hospital. The three basic principles are that they must be accurately written, properly filed, and easily accessible. Otherwise, they become simply an expensive nuisance.

Forms

Many different types of medical record forms in many different designs and sizes are in use in different hospitals today. At times, forms have frequently been made up to satisfy individual physicians in one special branch of medicine. However, medical records department cannot function efficiently without standardisation of all forms in use in the hospital. Order, accuracy and brevity should result from the use of these forms, which should be of fixed format, size and colour. All forms should be of good quality paper to withstand frequent handling. The paper having the lowest initial cost may not be the cheapest in the long run. 8-1/2" × 11" is the most common size of an inpatient medical record used in nursing units.

Major Functions of Medical Records Department

The functions of the medical record department are:

- i. to develop a good medical records system,
- ii. to generate hospital statistics,
- iii. develop new record system in newer departments,
- iv. reporting to state and health agencies,
- v. training, and
- vi. quality assurance.

Whileas the above functions are limited exclusively to the medical records department, the inputs to the records are provided through the physicians and nursing personnel. Thus, there are three main sections in which the medical records function of the hospital is divided (Table 18.1).

Identification section (central admission office)	Medical and nursing unit	Record office
Reception	History	Assembling
Reservation of beds	Examination	Checking (deficiency checksheet)
Initiation	Diagnosis	Incomplete record control
Identification	Investigations (name index card)	Coding—ICD
Social data	Consultation	Indexing—Alpha <ul style="list-style-type: none"> • Disease • Doctor • Ward • Unit
Assignment (to wards)	Treatments	Analysis (medical audit committee)
Notification	Progress notes	Reporting (statistical summary)
Central admission and discharge register	Nurses notes	Filing
	Graphic charts	Retrieval discharge summary

Figure 18.1 depicts the flow of inpatient medical records. Four important things should be ensured in any medical records departments. They are as follows.

1. Prompt record service, for any information.
2. Convenient and adequate accommodation. It is ideal if both inpatient and outpatient records can be kept in one location. The department should be so located where it is easy for the doctors to come and go.

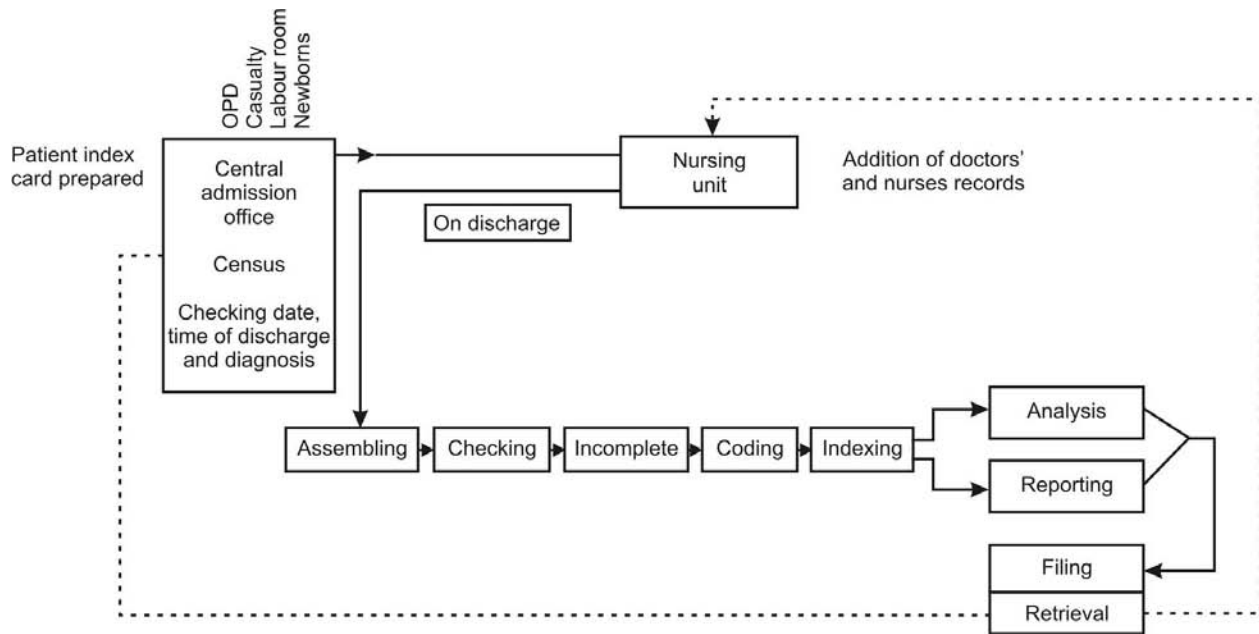


Fig. 18.1: Flowchart of inpatient record

3. Easy availability. Retrieval of record or ready availability of other data pertaining to patients.
4. Simple procedures.

Outpatient Record

The OPD medical record counter should be located near the entrance to the OPD. Adequate space to take care of a desk, chair, filing racks, index cabinets, etc. should be provided. An outpatient identification ticket with provision for name of the patient, registration number and date should be prepared here for the patient. The size of the OPD record card recommended is 9" × 6". In some hospitals, it is 8-½" × 11", the same as inpatient record. In the card, provision is made apart from patients name and identification data, for history and physical examination findings, provisional diagnosis, investigation and treatment, diagnosis and follow-up.

Filing

The longer a patient remains in hospital, bulkier the medical record becomes. And where the number of discharges is high, the quantum of records becomes high and enormous. Filing system of records, therefore, plays a crucial role in the smooth functioning of the department. An efficient system involves the following.

1. Properly organising the documents of each patient

2. Identifying each record. This can be indexed:
 - Alphabetical
 - Numerical
 - Serial unit
 - Terminal digit.
3. Placing the record file in cabinets/shelf
4. Keeping track when withdrawn from the cabinet/shelf.

Numbering

Various systems of numbering of the records are followed in different hospitals, the most common is the serial numbering.

1. Unit numbering
2. Serial numbering
3. Serial-unit numbering
4. Group digit and terminal digit numbering where the number of records is in lacs.

Where a unit system or serial system of record identification is followed, a means to link inpatient and outpatient records has to be found by linking inpatient discharge cards to outpatient records.

Medicolegal Records

There should be separate cabinets for such records, and separate indexing. They should remain in the personal custody of the records officers, and should be available at all times.

Incomplete Records

The problem of incomplete records is a perpetual problem with some physicians. Record clerks and librarians go to limitless ends to cajole physicians, particularly the senior ones, into keeping records current. Although this is often the best way to accomplish desired results, the staff member who is treating too many patients to have time for keeping adequate minimum records is probably too busy to be giving adequate care to his or her many patients. The medical records committee, hospital administration and the governing board must squarely face this fact.

On the other hand, to obtain correct data entails much paper work. This is often considered boring by physicians, but this can only be ascribed to a limited vision concerning their total responsibilities.

Medical Records Committee

The overall responsibility for efficient functioning of the medical records departments is that of the administrator. However, a committee consisting of members of the medical and administrative staff should be formed to overview the functioning of the medical records department. The function of the medical records committee is to evaluate the records for their correct maintenance which includes describing the condition and progress of the patient, therapy provided, results thereof, and recording of all actions taken.

The membership should consist of at least three members including the administrator, with the medical record librarian as its secretary. The committee should meet at least once a month. Patients records are checked to ensure that the following records are filed in the appropriate sequence and manner (Table 18.2).

Table 18.2: Filing of records in appropriate sequence and manner

• Summary sheet	• Operation record
• History	• Tissue report
• Physical examination	• Death certificate
• Laboratory reports	• Authority for autopsy
• Physicians' orders	• Authority report
• Progress notes	• Hospital infection report
• Nurses records and charts	• X-ray reports
• Labour record	• ECG reports
• Birth certificate	• Urology report
• Authority to operate	• Other graphic records and charts
• Anaesthesia record	• Any other, if indicated

The medical record librarian separates records into “complete” and “incomplete” groups. Deficiencies are noted in an appropriate manner for which the committee can develop worksheets for use in recording review findings. All incomplete records are reviewed by the whole committee which then forwards its comments and recommendations. The committee should periodically evaluate the entire record keeping function, and should have the authority to approve new forms, delete obsolete forms, modify existing ones and suggest improvement in design for better record keeping functioning.

Retention of Records

The length of time a medical record is to be retained should be determined by the existing law. However, there is no law in India which specifies such a period. In the absence of such regulatory requirement, the hospital administration will have to establish its own policy governing retention. Theoretically, hospitals should retain records for as long as there is a medical or administrative need for them, e.g. subsequent patient care, medical research, review and evaluation of professional and hospital services, or defence of professional or other liability actions.⁵

Apart from the above factors, the hospital should also consider the storage capabilities. The retention periods have been endlessly debated in various forums with some clinicians wanting to retain them up to 20 years.

Some of the senior medical records officers consider it desirable to retain them as under:

- a. Need of patient : Upto 7 years
- b. Medicolegal : Inpatient—7 years
: outpatient—5 years
- c. Teaching/research : Upto 7 years

It is seldom that records older than 7 years have been required to be retained. The American Hospital Association and American Medical Records Association have adopted a policy of retaining a record for a period of ten years.

Keeping records for such long periods consumes a lot of space. The two alternatives to retaining bulky medical records are:

- (a) Microfilming, and (b) Comprehensive summary.

Computerisation of Medical Records

Medical records department is one of the most suitable departments in a hospital for computerisation of its entire function. Since the department's entire operation deals with information and documentation handling, comprehensive

computerised hospital management system would have a significant impact on its daily operations. It would directly benefit medical records by:

- a. location monitoring of patient charts;
- b. automatic assignment of ICD numbers;
- c. improved procedures for generating admission, discharge, birth, death and other medical records;
- d. simplification of chart-abstracting functions.

As part of computerised hospital management system, documents usually typed in medical records department would be keyed into the system, edited at a computer terminal and entered in the patient chart. If the transcribed document is for a patient currently in hospital, the chart copy could be printed online at the patient-care unit itself.

The rules governing confidentiality of information in a computerised system are the same as those in a traditional record system. Unauthorised release of patient information by means of a printout at a remote computer terminal will have to be guarded against. Hospitals with computerised records system should have records confidentiality policy, and will have to include security devices in their computer programme to prevent unauthorised access to stored data.

Census and Discharge Analysis

- Collect the discharge casesheets, death certificates and birth reports from the wards as per the census report received from the wards and nursing superintendent's office.
- To hand over the death certificates and birth certificates to the person dealing with vital statistics.
- To make entries of all cases in the discharges analysis register, i.e. Central Registration number, age group—if case is newborn, put in column "Born in hospital" with sex and in column "Admission", type of admission, admissions date, discharge date, days of stay (count one day either date of admission or date of discharge) in the treated department's column. Mark in column of private ward patient the admitting staff member's name.
- Entry of case sheets due and received later be made in the same date of discharge.
- To take out the patient index cards of discharged patients from the in-house cabinet and put the date of discharge in the index card.

Assembling of Records and Deficiency Check

To assemble records in the following order.

- Face sheet, case summary and discharge records, history and physical examination, labour record, consultation

record, laboratory and other investigation reports, anaesthesia record, operation record, nurses record, temperature chart and OPD card.

- Tag the case sheets, keeping in view that the CR number is not missing while tagging.
- To check the complete and incomplete case sheets. The complete case sheets be filed in the proper filing area and incomplete case sheets be sent to doctor's room for completion. The incomplete records should be filed unitwise.
- Submission of list for incomplete records to hospital administrator periodically.

Patient Index

- Sort out the cards in alphabetical order
- File in the patient index cabinet strictly in alphabetical order
- Take help of this index if the CR number has to be found out only by name. Sometimes the patient does not remember the date of admission in the hospital.

Coding

- Classifying the record of inpatient by diseases using ICD coding system.
- Coding to provisional diagnosis (at the time of admission).
- Coding to death certificate.

Indexing (Diagnostic)

- Indexing of all cases with multiple code numbers.
- Put the year and code number on the top of the card—used, the first card as A1, back A2 and so on.
- Make entries of CR numbers, age and sex, complication, unit, duration of stay.
- Compilation of provisional diagnosis in code numbers, later on monthly basis.

Filing

- To file the case sheet according to serial inpatient CR number.
- To paste the slip on filing racks indicating the records, i.e. 1 to 300, 301 to 600 and so on.
- Always remove the case sheets by keeping a tracer card for knowing the movement, and care should be taken to withdraw the tracer card, while the case sheet is filed back.

Group Study

- To issue case sheets to professors, associate professors lecturers, pool officers, senior and junior residents or other consultants on demand
- To issue case sheets to sister incharge in case of readmission of the patient
- To make entries in the loan register and obtain signature. If a slip is sent by the medical officer, the same is to be filed in the authority file
- To prepare the tracer card for taking out the case sheets
- To put issue number on the top of the case sheet for easy location when the same is returned
- To receive the case sheets in the loan register when same is returned
- To prepare the reminders for the nonreturn of case sheets
- To submit the name to medical superintendent if the same are not returned in spite of reminders, periodically
- Diary, despatch, circulation file.

Vital and Health Statistics

- Entry of birth reports in the birth register
- Sending births report to local municipality within 7 days with a covering letter
- Issue of birth certificate on request (on payment of designated fee)
- Amendment in birth certificate on the basis of hospital record only. An affidavit may be requested by the applicant for change in the record and that should be on a nonjudicial stamp paper and attested by the first class magistrate
- A copy of the amendment should be sent to the local municipality
- Entry of death report in the death register. Sending death report to local municipality within 3 days with a covering letter
- Issue of duplicate copy of death certificate on request on payment of the designated fee by the applicant.

Compilation of General Health Statistics

Total patients discharged, days of care to patients discharged, average length of stay, total deaths, deaths under

48 hours, over 48 hours, percentage gross death rate and net death rate, total patients admitted, total patients days of care to patients in hospital, daily average number of patients, average percentage of beds occupancy, births in the hospital, operations conducted during the month in various disciplines, minor as well as major, compilation of unitwise distribution of admissions and discharges along with percentage geographical distribution of patients admitted, compilation of new and old cases attendance in OPDs and special clinics and compilation of data for annual report.

Correspondence

- Statistical data to be supplied to local municipality and directorate of health services on monthly basis and as and when data is required.
- Correspondence for patient care, i.e. hospitalisation certificate, original or copy of the record required by other hospitals, record required by the court of law.
- Receiving application for completing the medical attendant's certificate or certificate of hospital treatment by the treating physician in case of insurance policies and claims.
- To send the certificate after completion to insurance company with a copy of the covering letter to the party concerned.
- The medical record of the patient is of confidential nature. No record or the contents therein should be given to anybody without medical superintendent's permission.

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CHAPTER

19

Hospital Infection

INTRODUCTION

Hospital infection, also called nosocomial infection, is the single largest factor that adversely affects both the patient and the hospital. Patients are forced to stay long in the hospital because of hospital infection, which is further compounded by instituting all types of antibiotics to combat the original and hospital-acquired infection. The resultant increase in the length of stay and number of laboratory tests in turn result in increased hospital costs for the patient. Studies in various countries have proved that a tremendous cost is borne by the patient with nosocomial infection, as he has to undergo a large number of laboratory tests, prolonged length of stay, and loss of working days. The hospital suffers because of the loss of its effectiveness in terms of qualitative utilisation of hospital beds. This loss in hospital's productivity is capable of being brought down with appropriate measures.

The English word nosocomial is derived from the Greek *Nosokomeion*, both meaning "hospital". Nosocomial infection is the infection that develops in admitted patients after more than 48 hours of hospitalisation. Bacterial infections which appear within 48 hours of admission are considered as community acquired.

Various estimates have been given by various authorities—none of them based on controlled studies—on the incidence of hospital infections in our country. While studying the working conditions in hospitals in Delhi, the Rao Committee in 1968 reported that although it was difficult to assess the incidence of cross-infection, ample evidence was available to indicate the seriousness and magnitude of the problem.¹

Virulent pathogens are brought in constantly by new patients admitted with infections, in addition to those already existing in the hospitals' patient population. Hospitalised patient can be expected to be more susceptible to infection due to their underlying disease, or by injuries acquired outside or inflicted upon them by surgical procedures and instrumentations in the hospital.

There is an increasing trend of bacterial resistance to drugs and emergence of new strains, with harmless bacteria becoming pathogenic under certain circumstances. Complicated and lengthy surgical procedures and use of extracorporeal circulation provide microorganisms an increased opportunity of access. Further, the increasing use of cytotoxic and immunosuppressive drugs which result in lowered patient resistance, coupled with overcrowding in hospitals, shortage of efficient nursing and paramedical staff, and, in general, overutilisation of facilities all add to the complexity of the problem.

EXTENT OF THE PROBLEM

Estimates of the incidence of hospital infection widely vary. Even in western countries, it has been acknowledged that up to one-third of all infections seen in hospital practice may be nosocomial in origin.² A comprehensive US study of 82 hospitals of all types including teaching hospitals showed a median infection rate of 3 per 100 discharges, the range varying from a low of 0.8 to a high of 8 per cent.

In India, the prevalence of hospital infection has not been reliably estimated. Hospital infection may be present in up to 10 per cent of the clinically determined cases of infection admitted in hospitals. With a very large number of

outpatient attendants and visitors concentrating in hospitals for a few hours, it is difficult to estimate the incidence. Hospital infection occurs in every hospital, the difference being of degree only. But only occasionally does it become alarming. Estimates vary from 10 to 30 per cent, the least being about 3 per cent in the best of hospitals. Wound sepsis alone affects nearly 20 per cent of the postoperative cases, and evidence shows people rather than things as the most important incriminating factor.

Hospital infection is one of the most important factors that adversely affects the image of hospitals.

One per cent of nosocomial infections results directly in the death of the patient, and indirectly contribute to mortality in additional 3 per cent of the cases. Although not all such infections can be prevented, data accumulated so far indicate that under favourable conditions almost half of all nosocomial infections are preventable.

HOW INFECTION PERPETUATES

The factors which contribute to the development of hospital infection are the relationship between the agent, the host (patient), and the environment (Fig. 19.1). It is essential to understand this relationship for the success of any hospital infection control programme. The methods, process, policies and procedures adopted in day-to-day patient care have a very significant relationship to these factors.

Source of Infection

1. In a closed environment where many medical and paramedical personnel are in close attendance on patients in various stages of disability, it becomes very difficult to pinpoint the source of infection. The infection can be acquired as a cross-infection from other patients, from hospital personnel—medical, nursing and paramedical, and visitors.
2. The second source is the hospital's inanimate environment, independent of human contamination. The

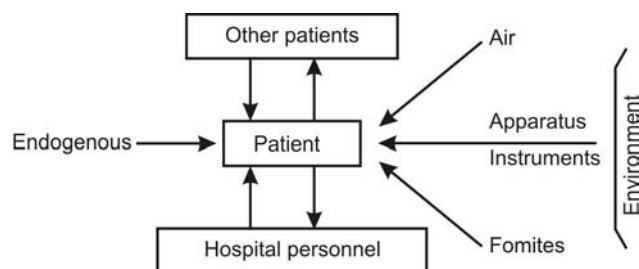


Fig. 19.1: Interrelationship of sources of infection

inanimate environment of the hospital provides for multiple drug-resistant bacteria. It also provides the means of transmitting microorganisms responsible for many epidemic nosocomial infections.³ In environmental infection, almost everything that comes in contact with the patient—bathroom and toilet fixtures, hospital furniture, crockery, linen, bedding, bedpans, etc.—are all capable of being the source of infection.

3. The third source is self-infection from microbes that were carried from outside by the patient on admission to the hospital but invaded his or her tissues subsequently, often as a consequence of a procedure performed in the hospital.

The Agent

Almost the entire spectrum of microbes—from bacteria to viruses, fungi and protozoa—have been incriminated in hospital infections, starting from the conventional pathogens that cause disease in normal persons in the absence of specific immunity, (e.g. *Staphylococcus aureus*, group “A” streptococci and Salmonella), to the conditional pathogens (e.g. *Pseudomonas*, *Proteus*), and opportunistic pathogens that cause generalised disease in patients with diminished body resistance (e.g. fungi such as *Candida*, *Nocardia*, *Aspergillus*).

Nearly 25 to 50 per cent of all hospital infections have been found to be due to gram-negative organisms, and up to 10 per cent of the infections are contributed by staphylococci. *Staphylococcus aureus* is one of the most important agents which produces unrelated forms of disease, from a variety of septic lesions to acute gastroenteritis. *Pseudomonas* has been generally responsible for secondary infection in burns, wounds and urinary tract infection. *Escherichia coli* has been found to be responsible for catheter-associated urinary tract infections. *Salmonella* is introduced in hospitals through food items by carriers and spread by faecal contamination.

A multihospital study in Europe covering 10,616 patients showed that the organisms responsible were as follows (Table 19.1).⁴

Table 19.1: Organisms responsible for human infection

Organisms	Percentage
<i>E. coli</i>	20
<i>Staphylococcus aureus</i>	11
Other staphylococci	11
<i>Pseudomonas</i>	9
<i>Klebsiella</i>	9
<i>Proteus</i>	8
Others/Mixed	32

Routes of Spread of Infection

Droplets route: One of the common routes of spread of hospital infections is the droplets route wherein the organisms spread through indiscriminate sneezing, coughing and nose blowing, when droplets so generated find entry into the susceptible host.

Contact route: The organisms transmit infection through patient-to-patient or nurse-to-patient direct contact and through indirect contact between patients, i.e. through the nurse or other staff via the medium of instruments, dressings and other similar items.

Environmental route: Environmental reservoirs consist of contaminated apparatus or instruments, water, and food.

Intravenous route: And lastly, the intravenous route, one of the most widely used routes through which fluids, blood and drugs are pushed into the body, is capable of causing inestimable damage but not paid enough attention. The incidence of hospital infection has been found to be seven times higher in patients with peripheral intravenous devices and 90 times in patients with central venous catheters.

MANIFESTATIONS OF HOSPITAL INFECTION

In the wards, hospital infections may manifest in the form of bacteraemia, respiratory infection, gastroenteritis, meningitis, and skin infections. However, surgical wound infections and urinary tract infections are found mainly after surgery. The highest incidence of nosocomial infection occurs amongst patients subjected to invasive technology, the vulnerable areas being critical care units and premature nurseries.

Staphylococcus, Streptococcus, E. coli and *Pseudomonas* are commonly responsible for bacteraemia, and *Klebsiella, E. coli* and *Streptococcus* in respiratory infections.

E. coli and *Salmonella* manifest in gastrointestinal infections, and *Klebsiella* and *Pneumococcus* have been more frequently held responsible for meningitis.

Infected surgical wounds are many a times found to be sterile in spite of repeated cultures probably as a result of instituting a wide spectrum of antibiotic therapy before operation, but streptococci, staphylococci, *E. coli* and *Pseudomonas* have all been associated with infected wounds.

E. coli and *Proteus* are generally responsible in urinary tract infections. Urinary tract infections constitute about 40 per cent of all nosocomial infections.

HIGH-RISK AREAS IN HOSPITAL

In every hospital, some areas carry a greater risk of hospital-acquired infection than others. The host-factors (extreme age, primary ailments complicated by other associated disease, diminished body resistance due to immunosuppressive drugs, indiscriminate use of antibiotics and steroids, and longer patient exposure through complicated and lengthy operative procedures) contribute to the greater risk of hospital-acquired infections. Such areas are as follows.

- Nurseries
- Intensive care unit
- Dialysis unit
- Organ transplant unit
- Burn unit
- Isolation ward
- Cancer ward
- Operation theatres
- Delivery rooms
- Postoperative ward.

HOSPITAL INFECTION CONTROL PROGRAMME

The main aim of the infection control programme is to lower the risk of an infection during the period of hospitalisation. The three thrust areas for the infection control programme are as follows.

1. Development of an effective surveillance system. Surveillance implies that observed data are regularly analysed and reported to those who are in position to take appropriate actions.
2. Development of policies and procedures to reduce the risk of hospital-acquired infection.
3. Maintenance of a continuing education programme for hospital personnel.

Basic Elements of a Control Programme

1. Providing a system of identification and reporting of infections, and providing a system for keeping records of infection in patients and personnel.
2. Providing for good hospital hygiene, aseptic techniques and sterilisation and disinfection practices.
3. Providing for personnel orientation and continuing education programme in infection prevention and control.

4. Providing for coordination with all departments and with medical audit committee in quality assurance.

The scope of an infection control programme will depend upon the specific need of the hospital, based on the magnitude of infection problem, hospital size, and types of patients. The best way to carry out infection control programme in the hospital is to establish an infection control committee.

Infection Control Committee (ICC)

For any control measures to be effective, it is necessary first to define the extent of the problem. Besides differing from hospital-to-hospital, the extent of the problem varies from one speciality to other in the same hospital. The need for establishment of a programme to study, monitor and effectively deal with the problem of hospital infection is now considered essential by all hospitals. The planning and implementation of the hospital's infection control programme is best affected through a committee made up of the representatives of various clinical and other disciplines.

Members

The infection control committee (ICC) will have the responsibility for monitoring the occurrence of hospital infection and recommend corrective action. Members of the committee should include representatives from the disciplines of medicine, surgery, obstetrics and gynaecology, paediatrics, pathology, administration, nursing staff, and microbiology section of the hospital laboratory. Representatives of the housekeeping staff, dietary department, engineering and maintenance department, pharmacy, operation theatres and central sterile supply department (CSSD) are called for on consultative basis when required.

It is important for the members of the infection control committee to be able to devote enough time for the programme.

Hospital epidemiologist: If available, a hospital epidemiologist—a specialist in preventive and social medicine—can help in moderating the infection control policies of the hospital. In addition, this officer will also be involved in investigating occurrence of clusters of cases and in investigating unusual cases of infection. The epidemiologist with his staff can be utilised in the development and implementation of in-service education of hospital staff in infection control.

Infection control officer: He is the de facto secretary of the ICC. The microbiologist of the ICC seems to be most suitable

to function as the infection control officer (ICO). However, a motivated clinician can also be quite effective in this assignment. He will work in association with a group of hospital staff including surgeon, physician, microbiologist, nursing and administrative staff.

Chairman: The chairmanship of the committee should be taken up by the hospital administrator, or should vest in an individual who has experience and interest in infection control. In the latter case, it is not necessary to have a bacteriologist or pathologist as chairman—a senior physician or surgeon will be equally suitable. The role of the chairman of the ICC is very important because upon him depends the success of the control programme.

Role and Functions of ICC

1. Determine the method of surveillance and reporting.
2. Lay down criteria for reporting all types of infections, including those related to the use of peripheral intravenous devices.
3. Review occurrence of clusters of infection, infections due to unusual pathogens, and occurrence of infection beyond the base line or clinically acceptable level.
4. Review of records of all infected cases. Coordinate routine sampling in such a manner that it can be used as an educational and training modality in demonstrating to the nursing and paramedical personnel good hospital practices.
5. Review results of trend studies in different clinical services and interdepartmental comparisons.
6. Approve proposals and protocols of special studies to be conducted throughout the hospital.
7. Review with medical audit committee the use of antibiotics.
8. Recommendations in relations to selection of equipment used for sterilisation.
9. Review of cleaning agents and cleaning procedures and recommendations in relation to selection of disinfectants.
10. Development of forms/data sheets used for collection and reporting of data for the infection control programme.
11. Prepare and periodically update procedure manuals of aseptic techniques used in hospital.
12. Determine the policy on immunisation of personnel working in high-risk areas against cholera, typhoid, hepatitis-B, and on screening of staff working on food handling duties to rule out carriers of organisms causing amoebiasis, typhoid and diarrhoeas.

13. Determine the policy on isolation of patients with communicable diseases and those vulnerable to infection.
14. Determine the content and methodology of training programme for training and retraining of personnel in prevention and control of hospital infection.

Role of Hospital Laboratory

Microbiology department of the hospital laboratory plays a significant role in analysis of data on nosocomial infections.

Through review of bacteriological counts and culture studies, and through review of culture and sensitivity reports of patients, it is possible to obtain a clear picture of the endemic prevalence of microorganisms responsible for hospital-acquired infections. The hospital administration gets alert if danger signals are noticed by the microbiology department, so that further investigations or appropriate timely measures can be instituted.^{3,5}

SURVEILLANCE

The most important aspect of the infection control programme is to develop a system of surveillance designed to provide systematic and continuous observations on the occurrence and distribution of infection within the hospital. The surveillance system will initially establish a data base which will give endemic rates of nosocomial infection. Being aware of endemic rates results in sounding a warning bell when infection rates rise above a calculated threshold.

The extent of information collection may vary from hospital-to-hospital, but certain identifying data will be essential. Such data includes name, age, sex, date of admission, patient identification number, ward, location, service, date of onset of infection, site of infection, microorganisms isolated, antibiotic sensitivity profile, nature of surgical procedure, operating surgeon, other invasive procedures (viz. Intravascular, urinary, respiratory tract or uteral instrumentation).

Infection Control Nurse

It is impossible for the ICO himself to directly carry out the daily monitoring and surveillance activities of an infection control programme. The day-to-day activities of surveillance can best be handled by a sufficiently senior and experienced full-time nurse, with special training in hospital infection control activities. In very large hospitals, there should be at least one infection control nurse for every 250 beds.

Tasks of Infection Control Nurse

She directly reports to the Infection Control Officer (ICO) and briefs him everyday on occurrence of a case and related matters.

Early and complete reporting is the sheet anchor of any hospital infection control programme. Therefore, the infection control sister must be authorised to report any actual or suspected infection immediately, to initiate a culture and sensitivity test, institute appropriate isolation procedure if it so requires, and notify the physician incharge of the patient.

She should also have direct access to the hospital administrator on matters of serious breaches of control practices discovered by her.

Her activities will include the following.

1. Daily visit to all wards and patient holding units
2. Checking ward sister's report register for tell-tale records suggestive of infection
3. Collection and tabulation of daily data of incidence of hospital infection. Recorded data of all infections should include the type of infection, the cultures taken and the results (when known), any antibiotics administered, and the identity of the physician responsible for the care of the patient.
4. Ensuring that samples of blood, stool, sputum urine, swab—as the case may be—are collected and despatched to the laboratory in time. Laboratory records are an important surveillance tool and data source. The data is gathered by the infection control nurse during ward rounds.⁵
5. Initiating the hospital infection control form while documenting for nosocomial infections, the registration form used should be different from the routine investigation forms, so that minimum time is wasted in getting the culture and sensitivity reports.
6. Compilation of wardwise, disciplinewise or procedurewise statistics
7. Daily visit to laboratory to ascertain results of previous days samples
8. Monitoring and supervision of infection among hospital staff
9. Training of nursing aides and paramedical personnel on correct use of hygiene practices and aseptic techniques
10. Assist in bacteriological studies of all cases.

EFFECTIVE CONTROL MEASURES

People

It is the people in hospitals rather than the physical environment which constitutes the reservoir of infection. Repeated studies confirm hospital personnel as significant carriers. The single most important factor in the spread of nosocomial infection is the failure of hospital workers to wash their hands often enough. Conscientious washing of hands between patient contacts effectively prevents spread of cross-infection. Adequate hand washing facilities must be available in all areas.

Aseptic Techniques

Strict adherence to aseptic techniques in various invasive procedures. Insertion and removal of catheters, surgical tubings, drainage tubes and packs need strict no-touch techniques even while they are done outside of operation theatres in nursing units.

Segregation of Contaminated Instruments

One of the simple measures in wards and departments is a check on segregation of contaminated instruments and items from others. There must be a system for keeping the contaminated pieces of linen, sputum cups, bedpans, urinals and similar items separately to minimise chances of getting mixed up with clean items.

Disinfection Practices

Different kinds of disinfectants vary in their reaction to different kinds of microorganisms. Phenolic compounds are active against gram-negative organisms, Quaternary ammonium compounds against staphylococci, streptococci, and Iodophores and hypochlorites have a broad spectrum of action. Selection of appropriate disinfectant for different purpose is important. The following should be checked.

1. Appropriate choice
2. Appropriate concentration
3. Appropriate contact time
4. Appropriate method of use.

Eliminate chemical disinfectants where sterilisation is the objective, where heat disinfection is possible, and where they are of doubtful value.

Sterilisation Practices

An efficient CSSD ensures supply of properly sterilised articles to all users in the hospital because sterilisation process are more effectively controlled. Each sterilisation must be

monitored through the use of heat-sensitive tapes. Sterilisation in flash sterilisers in operation theatre, if used, must be done meticulously by a trained person.

All steam and ethylene oxide sterilisers should be checked at least once each week with a suitable live spore preparation by the laboratory. Instruments which come in contact with mucous membranes but are disinfected rather than sterilised before use, such as endoscopes and anaesthesia equipment may be bacteriologically sampled on a spot check basis to ensure adequacy of disinfection.

Isolation Facilities

Isolation facilities for patients with communicable diseases and those vulnerable to infection. Such facilities must be made available in ICU, nurseries, burn unit, transplant unit, etc. Strict control on wearing of mask, gown and gloves must be exercised while attending to such patients. All articles taken for patient use must be treated appropriately.

Antibiotic Policy

The major problem is involvement of organisms showing multidrug resistance. Use of antibiotics must be monitored and controlled. Identification of bacterial isolates and antibiotics sensitivity testing should be done adopting standard techniques. The factors that influence antibiotic resistance in the hospital are as follows.⁶

1. Volume of antibiotic use
2. Extensive use of certain antibiotics
3. Proportion of prophylactic to therapeutic antibiotic usage in monotherapy or combination therapy. The medical audit committee must specifically look for this.

Precautions for Staff

Staff working in vulnerable area should be immunised against cholera, typhoid or hepatitis-B if indicated. All food handlers working in dietary department must be periodically screened for organisms causing typhoid, amoebiasis, and other intestinal parasites and must be checked for safe food handling practices. Persons with nose and throat infection must be temporarily removed from working in nurseries, ICU, or operation theatres.

Outpatient Department

In outpatient department separate arrangements for receiving and examining patients suspected of having significant acute communicable condition should be made.

Dietary Service

Storage of food articles and appropriate temperatures in refrigerators and deep freezers must be checked. Control of rodents and insects is a must to prevent contamination of stored food and supplies. Fruits and vegetables eaten raw must be thoroughly washed before consumption.

Careful Handling of Soiled Linen

All soiled linen should be considered as potentially infected and treated with care. Such linen should be packed in separate bags before transportation to the laundry. Linen likely to be contaminated with infectious microorganisms should be clearly labelled and handled with appropriate caution. In the laundry, soiled or infected linen should be processed separately. Water temperature above 70°C for 25 to 30 minutes will kill all microorganisms except spores.

Good Housekeeping

Cleaning of walls, floors, window panes, window sills, bedside screens and tables, curtains and fixtures including bathroom fixtures should be organised as a scheduled programme at predetermined intervals. Use of appropriate disinfectants must be made at such times.

Terminal Disinfection

Terminal disinfection of isolation rooms must be carried out thoroughly on the same principle as operation rooms before permitting the room for reuse. At such times, the staff must use the same precautions (cap mask, gown, gloves) used for nursing in such isolation rooms.

Air Hygiene in Operation Theatres

Clogging of air filters of the AC system renders the ventilation in operation theatres and such other areas ineffective. Air filters should be frequently cleaned. Periodical smoke studies should be carried out for air movement in operation theatres and checking that the AC system is achieving the desirable number of air changes per hour.

Developing a Sense of Awareness

Developing in all hospital workers a high sense of awareness, and training and retraining in the precautionary measures, prevention and control.

INFECTION CONTROL IN RELATION TO HIV AND AIDS

Increasing number of patients admitted to Hospitals for other disorders are being found positive for HIV. HIV-positive

patients and fully diagnosed AIDS cases will also be admitted in growing numbers to hospitals in future. This has necessitated proper understanding of HIV infection, AIDS and prevention and control of the spread of such infection by hospital personnel.

Classified as a lipophile retrovirus, the AIDS virus is most readily comparable with the hepatitis-B virus. As with hepatitis-B virus, aerogenic transmission does not take place, but blood and secretions must be considered infectious. When handling potentially infectious materials, the same hygienic precautions should be exercised as with hepatitis-B. Specifically, these are as follows.

- Prevention of direct cutaneous contact with blood and other secretions
- Wearing of protective gloves
- Wearing, where necessary, of protective goggles and facemasks
- Correct disposal of used needles and scalpels
- Use of disposables
- Careful disinfection of hands, skin and contaminated instruments.

AIDS and Disinfection

Like all retroviruses outside the host organisms, the AIDS virus quickly loses its activity. Due to its sensitivity, the virus is very quickly destroyed by virucidal disinfectants outside the body. Twenty-five per cent ethyl alcohol, 2 per cent glutaraldehyde and 0.2 per cent sodium hypochlorite have shown to be adequate for disinfection of instruments and contaminated surfaces.

Disinfection of Hands

In all problems associated with hygiene in the hospital, disinfection of hands is the most important step for prevention of infection, and this applies with AIDS also. The safest, simplest method and gentlest to the skin is alcoholic rubs. They enable hands to be disinfected, independent of washbasin and water tap. A suitable disinfectant for prophylaxis rubbed in a small quantity (3 ml) for 1 minute is shown to be quite effective.

Disinfection of Instruments

Used instruments must, in principle, be considered contaminated. Therefore, the rule to follow is as follows.

- First disinfect, then clean and finally sterilise or make final disinfection.
- For endoscopes—clean, disinfect, rinse with water.

Two per cent alkaline glutaraldehyde can achieve complete disinfection given sufficient contact time. Instrument parts containing rubber, plastic, fiberoptics and lenses can also be disinfected or sterilised by alkaline glutaraldehyde. It is necessary to thoroughly preclean and dry off instruments before placing in the solution, and completely immerse the portions of the instruments that contact the patient.

SUMMARY OF PRECAUTIONS FOR PREVENTION OF SPREAD OF HIV/AIDS INFECTION

<i>Test specimens</i>	should be dispatched only in sealed, watertight containers
<i>Gloves</i>	should be worn by all personnel who come into contact with blood, blood constituents, tissue, body fluids or excretions and potentially contaminated surfaces of HIV-infected patients.
<i>Gowns</i>	must be worn when there is possible risk of contact with secretions, excretions or blood of HIV-positive and AIDS patients
<i>Facemasks</i>	normally not necessary for patients, but coughing patients should wear a mask when leaving their room in the ward (risk of aerogenic transmission of <i>Pneumocystis carinii</i> infection). Visitors and nursing staff should wear masks in presence of AIDS patients
<i>Goggles</i>	some form of eye protection should be worn when spattering of blood, bloody secretions of body fluids is to be anticipated. This applies especially for dentists and for physicians, surgeons and nurses in bronchoscopy, endoscopy and ENT surgery, possibly also in resuscitation measures
<i>Hands</i>	should be disinfected before and after contact with patients
<i>Surfaces</i>	surfaces and furnishing which become contaminated with blood or other body fluids should be treated immediately with disinfectant
<i>Syringes and needles</i>	should be discarded into a firm sharps container. Use of disposables is pre-

Resuscitation

Disposables

Instruments

Accommodation

ferable, with final disposal by incineration

disposables for mouth-to-mouth resuscitation should be available at bedside of every AIDS patient

Contaminated disposables must be disposed in accordance with procedures for infectious wastes by incineration

Bedclothes should be transported to laundry in containers for infectious linens

optical instruments should be treated with ethylene oxide or other suitable disinfectant after every use

Breathing tubes must be cleaned carefully and disinfected after use by every patient. All instruments coming into contact with blood, secretions, excretions or body tissue must be sterilised prior to reuse, including for example laryngoscopes and endotracheal tubes

generally it is not necessary to place AIDS patients in single isolation rooms. Other patients with a disordered immune system or possible communicable diseases which might be dangerous for AIDS patients should not share rooms with AIDS patients.

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CHAPTER

20

Hospital Utilisation Statistics

HOSPITAL UTILISATION STATISTICS

Every hospital has to have a system which can provide management with information necessary to plan and control efficient patient care and efficiently manage the hospital. Such information will include trends and data that will improve decision making. Occupancy, patient mix, patient movement, and supportive services utilisation reports form the basic ingredients of the framework for decisions with long-term implications as well as short-term impact. Such information offers operational and policy alternatives to the administrator.

Many factors affecting utilisation help in identifying aspects of complex interdepartmental relationships that are sensitive to changes, by relating their linkages to utilisation. Different indices are used in the assessment of hospital utilisation but, taken singly, none of them can give a proper picture of the utilisation pattern.¹

The indices can be classified into the following.

1. Those related to the population under cover, or community indices
2. Those related to the hospital resources, viz. beds, diagnostic and therapeutic facilities and their utilisation
3. Hospital morbidity and mortality statistics—They relate to patients and diseases and are collected from medical records. They encompass personal characteristics of patients (viz. age, sex, occupation, marital status, etc.), and other data such as complications and outcome of hospital stay (viz. cured, died, improved, etc.).

The purpose of the review of statistics is to assess the quantitative adequacy and appropriateness of resources. Myriad data can be collected from records, but the main

problem is the compilation and presentation of the basic statistical facts in an intelligible form.²

COMMUNITY INDICES

Community indices relating to the population under cover give a gross picture of the health of the people. The object of calculating these indices is to know on a broad basis to what extent the population utilises the hospital services. However, this would only be meaningful when the geographical area served by the hospital or a group of hospitals is clearly defined, and the hospital or group of hospitals is within easy reach of this population. The three universally used community indices are: (i) the bed-to-population ratio, (ii) the hospital admission rate (also called hospital frequentation rate), and (iii) the per capita hospitalisation rate.

Bed:Population Ratio

Bed:population ratio is the ratio of hospital beds to the population in that area. It denotes availability of hospital beds per one thousand population. Although commonly used in discussions on provision and utilisation of medical care services, it is a controversial statistic because, per se, the ratio cannot be considered a true index of the utilisation or health status of the community, but simply as an indicator of the availability of beds. All developed countries have ratios ranging from 3 to 10 beds per 1000 population.

Most of the states in India have a bed:population ratio of less than one bed per 1000 population. The current national figure is 0.84 beds per 1000 population, but the disparities among various regions are revealing. Table 20.1 gives the ratio in various states, broadly divided into four groups.

Table 20.1: Bed population ratio in various states divided into four groups³

<i>States having one bed for 2000 or more population</i>		<i>States having one bed for 2000 to 1000 population</i>		<i>States having one bed for 1000 or less population</i>		<i>Union territories (UT) have the best ratio</i>	
<i>(States)</i>	<i>(Ratio)</i>	<i>(States)</i>	<i>(Ratio)</i>	<i>(States)</i>	<i>(Ratio)</i>	<i>(UT)</i>	<i>(Ratio)</i>
Bihar	1:2874	Andhra Pradesh	1:1612	Kerala	1:427	Pondicherry	1:286
M.P.	1:2788	Himachal Pradesh	1:1191	Gujarat	1:854	Daman and Diu	1:383
Orissa	1:2242	Manipur	1:1228	Sikkim	1:853	Delhi	1:485
UP	1:2593	Tripura	1:1680	Goa	1:383	Chandigarh	1:502
		Punjab	1:1310	Maharashtra	1:664		
				Meghalaya	1:961		

Hospital Admission Rate

Hospital admission rate denotes the number of hospital admissions per 1000 population per year.

$$\text{Hospital admission rate} = \frac{\text{Total admissions during the year} \times 1000}{\text{Midyear population}}$$

In calculating the rate, all admissions including readmissions for the same condition are counted. In advanced countries, the hospital admission rate ranges between 200 and 100. In developing countries including India, it is about 50.

Per Capita Hospitalisation rate

Per capita hospitalisation rate is the per capita days of hospital care given for a particular geographical area, during a particular period. It expresses the volume of hospitalisation in terms of number of hospitalisation days per person per year.

$$\frac{\text{Total number of days of inpatient care}}{\text{Midyear population}}$$

The range varies from 0.3 to 1.5. In India, it is approximately 0.3.

HOSPITAL UTILISATION INDICES (QUANTITATIVE STATISTICS)

One of the main sources of hospital statistics is the medical record. Therefore, a suitably designed medical record system combined with a good patient registration system must be

in place to suit these requirements. The collection of data can be tabulated daily from the case files of discharged patients. Then, this can be transferred to a standard hospital information sheet for carrying out quantitative analysis. This may need the help of a trained medical record librarian.

Any discussion on utilisation cannot be precise unless the terms that are commonly used are uniformly understood by everyone. To this end, the terms are defined below.

Definitions

Hospital Bed

Bed which is staffed and equipped for round the clock care of patients is called hospital bed. It includes observation beds equipped and staffed for overnight use, and beds used for sick and premature infants. The following are **not** counted as hospital beds.

1. Bassinets used for healthy newborn in labour room
2. Beds in labour room
3. Recovery room beds
4. Any other beds which are not equipped and staffed for overnight use.

Bed Complement

Bed complement is the number of authorised or sanctioned beds for round-the-clock care of patients. It includes all adult beds, bassinets in paediatric ward, incubators and staff sick beds. Bed complement of a hospital is sometimes confused with maximum bed capacity which is the largest number of beds that can be established in the hospital. Beds which are not normally available for full-time care are not

included in the bed complement. Such beds include recovery room beds, beds in labour room, observation beds in casualty, and beds located in diagnostic areas.

Admission

Admission is the acceptance of a patient for inpatient care either for investigation or treatment, or both. Healthy newborn babies are not considered as admissions, and it is universal practice to show data on babies born in hospital separately. However, premature babies requiring intensive care, and the diseased newborn should be counted as admissions.

This data on admission is compiled either from the central admission register or from the duplicate copies of admission record card.

Discharge

Discharge is the release of an admitted patient from the hospital. Discharges also include deaths in hospital.

Data on discharges can be compiled by analysing medical records of discharged patients.

Hospital Death

Hospital death is the death of any admitted patient during his or her stay in the hospital. Deaths occurring in the casualty department, or emergency room or in ambulance while on way to hospital are not considered as hospital deaths.

For purpose of calculation of death rate, it is divided into two categories, viz. **gross death rate** and **net death rate**. Net death rate, sometimes referred to as institutional death rate, relates to deaths occurring 48 hours or more after admission. Gross death rate includes all deaths in hospital.

Dead Bed Space

If there is a strict bed compartmentalisation between various specialities, beds may remain chronically unoccupied in one ward or speciality, whileas other ward or speciality may fall short of beds. Dead bed space refers to beds unoccupied in a hospital due to a rigid compartmentalisation of nursing units among specialities. Such space may be up to 15 per cent in large hospitals.

Daily Ward Census (Medical Census)

The daily census indicates the number of patients in the hospital on any day. Traditionally, it shows the number of

patients in hospital at the hour of midnight because of which it is also referred to as the '**midnight census**', prepared by the nursing staff on night duty. The period covered in the report is from midnight-to-midnight. It is compiled as midnight census perhaps because it is the quietest period in the 24 hour's operation of the hospital with least amount of patient movements.

Studies conducted on the difference between midnight and midday census has revealed a difference of less than 2 per cent. This is not large enough to warrent serious considerations of a change in the census time away from midnight. However, the difference between midnight and midday counts was more marked in some specialities than others. Midnight was an underestimate in acute surgical and acute medical specialities than in other acute and all other specialities.

Bed Days or Patient Days

Bed days or patient days is the unit of measure which denotes in days the service given to a inpatient. A full day is counted when admission is before midday, or discharge is after midday. It is generally accepted that the day of admission is counted, but the day of discharge is ignored in the counting. The annual bed days is the total of the daily census of occupied inpatient beds throughout the year. Data for healthy newborn is excluded from the figures.

Utilisation Indices

Average Daily Census or Average Daily Bed Occupancy

Average daily census denotes the daily load of patients over a given period, and is obtained by adding up the daily census for the period in question (say a week, or quarter, or year), and dividing it by the number of days in that period. It can also be calculated based on discharges, by adding up the number of days in hospital for each discharged patient during a period and dividing the figure by the number of days in that period. The difference in figures obtained by the two methods is insignificant. Average daily census indicates pressure (or otherwise) on hospital beds on a day-to-day basis.

Bed Occupancy Rate (BOR)

Bed occupancy rate indicates the relationship between availability and utilisation of hospital beds. It is expressed as a percentage by either of the following two methods.

1. Ratio of actual patient days to the maximum possible patient days during a given period
2. Ratio of the average daily census to the bed complement

$$\text{BOR} = \frac{\text{Average daily census}}{\text{Bed complement}} \times 100$$

Optimum bed occupancy rate for most hospitals is considered to be between 85 to 95 per cent, wherein the remaining 15 to 5 per cent beds are available for undergoing maintenance, change of linen and being generally readied for the incoming patients.

A high occupancy rate indicates stretching and over-utilisation of services resulting in a probable dilution of the quality of care, whereas a low rate is indicative of under-utilisation of facilities. Usually, smaller hospitals have lower occupancy than large hospitals. In many public hospitals, because of the perpetual shortage of beds, patients are put on the floor when a regular bed is not available in which case the occupancy rate goes even up to 110 or 120 per cent.

To find out the load of work in different areas, occupancy rates should be worked out wardwise, specialitywise and unitwise.

Bed Turnover Rate (BTR)

Bed turnover rate gives the number of discharges per hospital bed over a given period, i.e. how many times a bed was “turned over” during the period, say a year. It is directly related to the average length of stay (ALS) and bed turnover interval (BTI).

$$\frac{\text{Total number of patients discharged (including deaths)}}{\text{Bed complement}}$$

Bed Turnover Interval (BTI)

It denotes the average time in days elapsing between the discharge of one patient and the admission of the next on that bed, i.e. the time a bed remains vacant between admission. It is obtained by subtracting the actual number of hospitalisation days from the potential number of hospitalisation days in a given period, and dividing the resultant figures by the number of discharges (including deaths) in the same period. For example, for a 300-bedded hospital, the potential hospitalisation days in a year are $300 \times 365 = 1,09,500$. If the actual totalled-up hospitalisation days are 98,200, and the number of discharges (including deaths) during that year are 5,680, then

$$\text{BTI} = \frac{1,09,500 - 98,200}{5,680} = 1.9, \text{ which means}$$

that each bed remained vacant during the year for an average of 1.9 days between one discharge and the next admission on that bed.

The turnover interval will be zero when bed occupancy rate is 100 per cent, but will become negative when the occupancy rate goes over 100 per cent. Generally, if BTI is more than 2, it is considered very high and indicates low demand or defective admission policy. Ideally, BTI should be around 0.5 day. Too long or too short BTI are both undesirable. In order to be meaningful, BTI should be calculated separately wardwise and specialitywise.

Average Length of Stay (ALS)

Average length of stay (ALS) is the average period in hospital (in days) per patient admitted, i.e. the average number of days of service rendered to each inpatient.

$$\text{ALS} = \frac{\text{Number of inpatient days care (excluding healthy newborn) during the year}}{\text{Total number of discharges and deaths}}$$

The formula is quite satisfactory in acute general hospitals with quick patient turnover, but is unsatisfactory where there is considerable difference between the number of patient admitted and those discharged during the year, e.g. in chronic disease hospitals.

In calculation of ALS, the day of admission is included, but the day of discharge is excluded. The ALS is influenced by the following factors.

1. *Patient characteristics*: Such as sex, age and also educational and socio-economic status
2. *Disease characteristics*: Chronic disorders and certain other diseases will account for longer hospital stays
3. *Hospital characteristics*: Teaching and research hospitals tend to have longer ALS than others. Cumbersome admission and discharge procedures of the hospital also influence ALS.

In most acute care general hospitals, the ALS varies from 8 days to 15 days. Reduction of ALS from 15 days to 10 days in a 500-bedded hospital means that the hospital can service over 6,000 additional patients during the year. Wardwise, unitwise, diseasewise, doctorwise and speciality-wise studies of ALS are more useful than overall ALS for the hospital.

OUTPATIENTS AND OTHER SERVICES UTILISATION STATISTICS⁵

Outpatient Services

Outpatient services data is extracted from the registers maintained at the registration counters in the outpatient department, speciality clinics and casualty service. The data will be useful to the extent that these registers contain comprehensive information columns used statistics pertaining to outpatient services are as follows.

1. Number of new cases
2. Number of repeat cases
3. Specialitywise break-up of cases
4. Unitwise break-up of cases
5. Age and sex distribution of cases
6. Diagnostic statistics.

1. *Daily average outpatient attendance*

$$\frac{\text{Total number of outpatient attendance during the period}}{\text{Number of OPD working days during the period}}$$

2. *Average outpatient attendance per patient*

(Average duration of the spell of sickness treated in OPD)

$$\frac{\text{Total number of outpatient attendances}}{\text{Total number of new cases}}$$

Surgical Services

1. Total number of operations
2. Break-up of major and minor operations. There is still no unanimity among surgeons about the nature of operation, i.e. major or minor. Some hospitals consider any operation requiring general anaesthesia as major, whileas others consider the time duration as main variable in deciding whether an operation is major or minor. It is suggested that combination of both, i.e. the type of anaesthesia and the time duration should decide whether an operation is major or minor.

Laboratory Services

1. Total number of tests
2. Breakdown by types, viz.
 - Haematology
 - Biochemistry
 - Routine urine
 - Microbiology
 - Histopathology.

Imaging Services

1. Number of radiographs done – Inpatients and outpatients
2. Break-up of radiographs by sizes of the films
3. Number of special examinations, e.g. barium studies, urographies, etc.
4. Number of ultrasonographies
5. Number of CT scan studies.

ECG and EEG

1. Number of ECG and EEG
2. Number of emergency ECG.

MORBIDITY STATISTICS

Morbidity statistics relate to both inpatients and outpatients. Outpatient diagnostic statistics are based on the diagnosis established at the patient's first visit, and the data is presented according to the list of diagnosis in International Classification of Diseases—ICD (10th Revision).

Diagnostic statistics of inpatients are based on the diagnosis at discharge, because it is arrived at after all the investigations during hospitalisation. The accepted method of presentation of this statistics is based on the 'principal disease' or condition diagnosed, as classified in the ICD (10th Revision). 'Associated disease' or condition should also be mentioned. The preliminary data are compiled from the disease recorded on the medical record. Final data are compiled by the medical records department from the diagnostic index cards prepared after the disease recorded on medical records are coded according to ICD.

MORTALITY STATISTICS

Mortality statistics are indirectly related to the management of hospitals. Deaths occurring in the emergency room in the casualty or in the ambulance while on way to hospital are not included in hospital mortality statistics.

1. *Gross death rate*

$$= \frac{\text{No of all deaths in a period}}{\text{No of discharges including deaths in the period}} \times 100$$

2. *Net death rate*

$$\frac{\text{No of deaths occurring 48 hrs or later}}{\text{No of deaths and discharges}} \times 100$$

3. *Postoperative death rate*

$$\frac{\text{No of postoperative deaths in a period}}{\text{No of patients operated during the period}} \times 100$$

All deaths either attributable to, or precipitated by a surgical operation such as due to haemorrhage, shock, infection, embolism, etc. and occurring within the post-operative period up to 10 days are classified as post-operative deaths.

4. **Maternal death rate**—These are the deaths of mother attributable to pregnancy, child birth or its complication including death resulting from abortions.

$$= \frac{\text{No of deaths of obstetrical patients}}{\text{No of discharges (including deaths) of obstetric patients}} \times 100$$

5. **Infant death rate (viable infants about 28 wks)**

$$= \frac{\text{No of deaths of infants born in hospital}}{\text{No of viable newborn infants (including deaths)}} \times 100$$

6. **Neonatal death rate**

$$= \frac{\text{No of infant deaths within 28 days or birth}}{\text{No of viable newborn infants discharged (including deaths)}} \times 100$$

Other Statistics

1. **Autopsy rate** This relates to autopsies carried out on patients who died in hospital. It excludes stillbirths, cases

dead on arrival/brought in dead, and medicolegal cases.

$$= \frac{\text{No of autopsies}}{\text{No of deaths in hospital}} \times 100$$

2. **Consultation (written only) rate**

$$= \frac{\text{No of patients receiving consultations}}{\text{No of patient discharged (and dead)}} \times 100$$

3. **Caesarean section rate**

$$= \frac{\text{No of caesarean section performed}}{\text{No of births}} \times 100$$

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Materials Management

The function of materials management is that coordinated function responsible to plan for, acquire, store, move and control materials to provide customer service in accordance with organisational goals. Materials management attempts to get the **right goods**, at the **right price**, at the **right time** to maintain a desired service level at minimum cost.

Materials costs in hospital vary from 30 to 40 per cent of the total hospital costs. Containment of materials costs therefore has a tremendous potential in making the hospital costs bearable to patients and potential to influence hospital profitability.

There are many charges levied against materials management in hospitals including the one that anticipated results have failed to materialise. The failures have mostly been due to only lip service being paid to this function, with little planning than desire. Some managements thought they must have a separate Materials Management section but they had no goals or planned programmes to properly introduce, utilise, and evaluate the function. Other failures can be traced to a desire for immediate results. Disorganised introduction of the materials management function cannot be expected to achieve the goal.

Operative Goals of Materials Management

Materials management function must achieve a number of basic objectives. The aim is to develop a system that will ensure right quality of stocks at all times, properly stored, easily retrievable, and available whenever required to meet the ultimate goal of good patient care in an effective, efficient and economical manner. The goals include the following.

1. **Optimum materials acquisition:** The purchase of materials must be governed by the most effective purchase, storage, handling and usage practices.
 2. **Optimum inventory turnover:** Inventories of all items must be maintained at the optimum level.
 3. **Good vendor relationship:** The organisation's relationship with its suppliers have a direct bearing on its ability to procure materials on the best possible terms.
 4. **Materials cost control:** Materials purchase process must be economical. There must be a continuous cost reduction programme.
 5. **Effective issue and distribution:** The system of issues and distribution must cater to economical holdings at the point of usage with no possibility of accumulation of large quantities of stock.
 6. **Elimination of losses and pilferage:** Wastage and pilferage should be controlled by a system of internal audit.
- To summarise, the materials management function caters to planning for materials, its demand, estimation, procurement, stocking, and issue to ensure availability of
- Right material, in
 - Right quantities, at
 - Right time, at
 - Right price, from
 - Right sources, at
 - Least cost.

ORGANISATION

The wider function of materials management comprises of two basic functions. These are the purchase function and the stores function. Some institutions have integrated the

purchase and stores function into one department, whereas many other institutions have separate sections or departments of purchasing and stores.

Separate Stores and Purchase Departments

In government organisations and in large medical institutions, these two functions are carried out independently through a separate purchase department and a separate stores organisation. Separate department for purchase and stores, which are intrinsically different in nature, ensures specialisation of the two independent of each other, with minimisation of the chance of collusion.

Integrated Stores Purchase Department

The two functions may be integrated into a single stores-purchase department in smaller institutions, whereby coordination between the two is achieved and a single authority can be held responsible for the availability and control of materials. Coordination of the two functions under a single authority lends to better insights into the quality, quantity, variation in demand and standardisation, leading to better inventory control, lesser paperwork, speed of transactions and administrative economy.

MATERIALS MANAGEMENT PROCESS

The process of materials management involves the following.

1. Demand forecasting and planning
2. Purchasing
3. Receipt, inspection and stores
4. Inventory control
5. Issue and distribution
6. Disposal and condemnation
7. Minimising losses and pilferage.

DEMAND, FORECASTING AND PLANNING

Development of the long-term materials plan includes translating the workload statistics into materials requirements, and projecting other data necessary to determine capital funds.

A large variety and number of diverse materials are used for patient care in hospitals. An inventory in a government hospital runs into a few thousand items. In nongovernment institutions, the inventory is likely to be much lower. For example, with no less than 15 or 20 different antibiotics prescribed, classified into injectables, tablets, oral suspensions, topical solutions and drops, the antibiotics category

itself reaches a substantial figure. Three or four different types of disinfectants are used in hospitals, each one available under different brand name and concentration. So is the case with glassware, dental stores, rubber goods, etc. In 1963 a committee appointed by the Ministry of Health had identified 3,200 surgical instruments, equipments and appliances in hospital inventories.

Demand forecasting should, therefore, take into consideration the concept of standardisation.

Standardisation, i.e. grouping together items of similar specifications, use or application enables a hospital to choose one of the many acceptable for the purpose. Standardisation ensures:

- i. nonduplication of inventory,
- ii. variety reduction,
- iii. economical purchase costs, and
- iv. efficient use of materials.

If long-term planning and forecasting can establish definite units of service, capital equipment, consumables and supplies can be projected departmentwise for the year, which then becomes the materials budget.

In any inventory, a small percentage of items represents the majority of the inventory investment. These high-cost or high-usage items should receive the greatest degree of forecasting attention. There are also a great many low-cost or low-usage items that represent a small percentage of inventory investment. For such items, crude forecasts supplemented with large safety stock are sufficient. Forecasting emphasis should be placed on those items that represent a significant investment in inventory.

A forecast is an estimate of demand expected in the future. Demands for materials could be certain or predictable, and uncertain or unpredictable. Certain and predictable demands are easy to forecast. It is the uncertain demands which pose the most problems in materials management. The forecasting techniques used in manufacturing industries are, among others, trend line, regression analysis, exponentially weighted moving average, economic models, simulation, etc.¹ It is doubtful whether use of these techniques will benefit the materials forecasting function in a hospital.

The methods most suitable and simple to use in hospitals in forecasting of demands are the *last period method*, the *arithmetic average*, and *moving average*.¹ The last period demand method simply forecasts for the next period the level of demand that occurred in the previous period.² The arithmetic average simply takes the average of all past demand in arriving at forecast. The arithmetic average

method works well in a stable situation where the level of demand does not fluctuate; it will not adequately respond to trends in demand, and it neglects seasonal fluctuations.³ The moving average method generates the next period's forecast by averaging the actual demand for the last *n* time periods. The choice of the value of 'n' should be determined by experimentation. The objective of the moving average is to include a sufficient number of time periods so random fluctuations are cancelled.

The moving average method gives more weight to the more current time periods. If the demand rate is steady, the moving average will respond with fairly constant forecasts. The moving average dampens random effects, responds to trends with a delay, and does not compensate for seasonals.

PURCHASING

Purchasing acquires materials as required to meet quality and time schedules. The fundamental activities include selection of acceptable vendors and negotiation of terms, placing purchase orders considering economic levels, and expediting deliveries to meet inventory requirements. The aim of the purchasing department is procurement of items of acceptable quality, in appropriate quantities, at the minimum price, at the right time.

In most institutions, centralised purchasing is the rule, i.e. all purchases are centrally made by the purchase section as opposed to each individual department of the hospital making its own purchases (decentralised purchasing). In some hospitals, it is the practice to provide for departmental purchasing by the pharmacy for drugs and dressings, and centralised purchasing of all other items by the main stores purchase section. The advantages of centralised purchasing are:

- i. lower purchasing costs because of consolidation of orders,
- ii. quantity discounts,
- iii. lower inventory costs, and
- iv. better management control.

Limits of high value items of inventory are decided by the management even though the user department must be consulted. Once top management has given specific and quantified norms for procurement of various items, achieving of procurement targets is the responsibility of the materials manager or stores purchase officer.

Purchasing Procedure

Purchasing involves the following steps.

1. Drawing up specifications
2. Inviting quotations

3. Preparing comparative statements: such a statement incorporates basic price, freight charges, taxes, quantity, payment discounts and delivery period
4. Shortlisting
5. Issuing purchase orders.

Value Analysis

Regardless of how good a product already is, value analysis searches for a less expensive means of providing desirable quality and acceptable performance. A successful appraisal of value analysis involves finding answers to the following five questions. If any question must be answered in the negative, further inquiry is made.

1. Does its use contribute value?
2. Is its cost proportionate to its usefulness?
3. Is there anything better for the intended use?
4. Does the cost justify its quality?
5. Will another supplier provide it for less?

Value analysis takes into consideration the quality of the material in relation to its functional value and price. It not only helps in taking a decision about what is actually required and what should be paid so as to derive maximum benefit but also pay the minimum for the same function. For example, where a CFL lamp is specified for purchase, its cost is Rs. 45/- and the life three hundred hours. Another lamp is not specified, but on enquiry the purchase department comes to know that though its cost is Rs. 85/-, but its life is not less than eight hundred hours in any case. A value analysis, reveals that the second one is initially costlier, but it gives better value for the money. Hence, the purchase of the second lamp is more beneficial.

Purchasing of various items of the store is not a one-time activity. Repeat and periodical orders continue to emanate from the purchase section. Apart from one-time orders for a fixed quantity within specified dates, contract for a fixed quantity at specified intervals and contracts for purchases on annual basis may have to be entered to ensure supply at the predetermined price. In such types of contracts (committed volume contracts), because vendor firms are assured of the offtake of their goods over long periods, they offer a concessional fixed rate irrespective of all other considerations.

Rate Contracts

These are the most important contracts offered through the DGS and D as far as government institutions are

concerned. The firms supply stores at specific rates, no fixed quantities are mentioned. All government institutions are bound to purchase from the rate contractor all stores under the contract. The list of direct demanding officers (DDOs) is an integral part of the system. DGS and D monitors the progress of rate contract performance through various committees. The system of purchase through rate contracts offers maximum flexibility in ordering specified quantities of materials, and helps to maintain optimum inventories.

Before procurement action, remember to:

- i. plan the purchases, based on correct forecasts, to avoid stock-outs
- ii. avoid emergency purchases
- iii. negotiate for quantity discounts
- iv. draw up product specifications to avoid rejections.

An important factor in purchasing decision is the offer of discounts linked to purchase of specific quantities. The problem in this case is whether the saving achieved by buying larger quantities are greater than the cost of holding the additional stock.

Purchase Order

It is important to incorporate in the purchase order all the conditions of supply including time schedules, and to seek an acknowledgement of the order from the vendor firm. Acknowledging the receipt of purchase order binds the vendor firm legally. A complete and legally valid purchase order should include the following.

- Purchaser's order reference number and date
- Supplier's name and address
- Quotation reference
- Description of materials
 - i. Specification
 - ii. Brand name
 - iii. Size
- Quantity
 - i. Number of units
 - ii. Pack size/weight
- Packing—special packing if any
- Price and total value
 - i. Unit price
 - ii. Quantity discounts
 - iii. Sales tax, excise, etc.
 - iv. Total value
- Freight charges and despatch
 - i. Free on board (FOB), clearing, inspection and forwarding (CIF), freight to pay, insurance

- ii. Despatch-mode and name of railway station, port, post office
- Inspection at receiver's site
 - Acknowledgement
 - Mode of payment—Draft, cheque, cash
 - Warranty—Undertaking for replacement of defective items.

Effective Purchasing

Consider the following points in affecting various purchases.

1. Local suppliers are preferable to outstation suppliers because of ease of personal discussion and settling disputes.
2. Prepare a list of vendors for each item based on their reputation.
3. When possible, procure directly from manufacturers rather than trading firms.
4. Avoid suppliers who insist on advance payment.
5. As incorrect supplies cannot be rejected after taking delivery of the consignment, do not accept supplies through VPP and negotiation of documents through bank.

RECEIPT, INSPECTION AND STORAGE

All the stores must be received, verified that they are as per orders, and stored until required or otherwise disposed. Receipt of stores is the first physical step in materials management. This is the point where internal control begins. Improperly prepared receiving records are the first and often the major factor in inaccurate stock records and misstated inventory levels.

Receipt and Inspection

The following guidelines should be followed.

- Receive the materials at a specified receiving area.
- At the point of delivery, check each item physically and count against suppliers invoice or packing challan.
- Check physical condition of materials. Tearing down unitised load and restructuring them make handling and storage time-consuming. So, in case of bulk orders, random sampling is sufficient. If packings are damaged, insist on "open" delivery.
- Visual damage inspection must be as extensive as possible.
- If damage is detected, the transporter and vendor must be notified immediately, the load must be left intact for their review.

- Carry out a check against the purchase order. Notify purchase section of any discrepancies immediately.
- Carry out basic documentation immediately, i.e. day-book and inward goods register. Other documentation follows later.
- The receiving corridor should be wide enough to allow uncrating and unpacking some of the goods before they are taken into the storeroom. Ten feet is suggested as a minimum width. Occasionally a delivery will have to remain in the corridor until it can be disposed of properly and there must be room enough for other traffic in the mean time.

On final verification of the materials and their acceptance by the stores section, bills accompanying the materials are sent to the accounts department for payment action. Suppliers appreciate prompt payment and often offer discounts to such hospitals.

Stores

Central stores generally excludes kitchen day-stores, refrigerated food storage or fuel storage. It does include space for bulk pharmacy stores, facilities for the storage of hospital beds, large orthopaedic equipment, furniture, extra equipment and for all supplies and replacements to be issued for use throughout the institution.

In planning a central stores, the pharmacy store room and anaesthetics store room should be independent of the main storage area, although adjacent. The pharmacy stores are handled by the pharmacist and not by general stores personnel. When pharmacy stores are kept separate, it has separate access independent of general stores.

The factors determining stores location are security, and ease of receiving supplies and easy despatch towards all departments. Stores must be a 'Restricted Area'-unauthorised persons must not have access to materials. Security should be one of important factors for the design and layout of stores. A separate area for receipt and inspection of materials and a separate area for issues should be provided on the stores premises, with adequate office space.

Accommodation: The location of the stores should preferably be on the ground floor to facilitate receipt of stores from suppliers. Accommodation for vehicles delivering the materials should be separated from normal patient and ambulance routes. It should be of sufficient size to accommodate all the supplies. A detailed assessment must be made of what needs to be stored, and what the maximum level of each stock item is to be. Some items like dressing

materials and textiles require large amount of space, whileas lesser amount of storage space will be required for others. Within the stores, separate areas should be earmarked for receipt of materials, their inspection, and issue. A sizeable area must be earmarked in a central position to provide for an 'order assembly counter' and for holding the made-up materials prior to their collection by departments.

In all storage area, pay attention to the following.

1. The atmospheric conditions appropriate to some special category of materials, e.g. chemicals, radiographic films, sera, vaccines, some other injectables rubber goods need to be stored at temperature between 20° and 10°C. Many other items are required to be stored at cool temperature below 20°C. Cool and cold room conditions should be available in all medical stores, and strict monitoring of temperature should be regularly done.
2. Lighting—Poorly placed lighting can create shadows and make identification of stores difficult. In low intensity lighting, dark corners tend to become dumping grounds clustered up with obsolete or unwanted stock.

Hospital stores is a high fire-risk area. Stores which are inflammable, e.g. oils, paints, paraffin, radiographic films, spirit, etc. should be separately stored, and it should be possible to isolate this area in case of fire. Placing chemical fire extinguishers (foam type) in this area should be planned besides a fully equipped fire point at the stores entrance.

Layout of Stores

Stores in a large hospital can be a maddening place both for the stores staff and for the user departments, if the layout of stores has not been properly organised. In searching for some method in this madness, attention should be paid to the following.

Making effective use of space: Adjustable, fixed location racking system (slotted angle frames) with shelves provide the most suitable storage facility for majority of the items. Racks can be open-or close-ended, and with closed or open back in a variety of widths. Shelves should be easily adjustable in height. Whether shelves should be backed or close ended depends on the nature of goods being stored. If there is little likelihood of items slipping out from one shelf to another, there is little point in providing backing or endpieces.

Many of the small items, especially spares, are best held in bins. Bins are available which can be readily fitted into standard racking frames.

Using an Effective Stock Location Method

Each item on inventory of the stores is best identified by a code number which can be based on the generic name of the item or its application. For example, "cotton" which may have a classification number 17, will have subclassification as cotton absorbent, cotton nonabsorbent, either in standard packing of 500 gm or 50 gm, with each item having a distinctive identification number unique to its own.

Specific areas should be allocated for different commodities, e.g. textiles and linen, crockery and glassware, cleaning materials, stationary, provisions, etc. A good stock location system will increase the efficiency of store-keeping staff by minimising time and effort in storage and stock picking process. Two systems can be made use of.

Sequence system: Items are located in alphabetical order without regard to issue frequency, size or volume. From the issue frequency point of view, it should be remembered that in general, 90 per cent of the activity in stores comes from approximately 20 per cent of the items. In this system, the frequently issued items may, therefore, not be located in the most central locations.

Popularity location system: In this system, emphasis is placed on frequency of demand, and materials are so placed that the more "popular" (frequently demanded) items are located in the most advantageous position from the point of view of handling and issues. The central portion of the stores is used for small popular items, upper shelves for light-weight and least popular items, and the lower shelves for heavy items. By dispersing the stores items in this way, congestion is relieved in the order assembly and issue area. This system satisfies the requirements of majority of the hospitals and produces the best results.

Stock Turnover

A system must be evolved to ensure proper turnover of stocks. The principle of first-in first-out should invariably be adopted. For short-life items, the newly received stock are stored at the rear of the shelf, and the balance on shelf is moved forward. Entering the date of manufacture and shelf-life of each consignment on the stock detail register and weekly check of this register will help proper turnover.

Stock Verification

Stock verification, or stock taking physically reconciles the stock by checking ground balances with figures shown in stores ledger. Monthly stock verification (as carried out in

all military hospitals) may turn out to be perfunctory due to its frequency, but stock verification should be carried out at least every six months. In case of high turnover items, it can be carried out quarterly. Stock verification is better carried out by a person detailed from a department other than the stores department.

One way of enabling the whole of the stock to be checked during the year is continuous stock taking, i.e. carrying out stock taking of a number of items each day or each week. This is a useful way of simplifying what is otherwise a major time-consuming task. By the unexpectedness of checks of few items selected at random each day or week and by directing special attention to more valuable items, a more effective control in stores administration is achieved.

Bin Card

There should be a bin card for every item in the inventory. The name of the item, its code identifying number, accounting unit (no., litre, kg, sq ft, etc.) are printed at the top of the card. Transactions, i.e. receipts (invoice number and date, and quantity), issues (indent number, and date, requisitioning department, and quantity) and balance are recorded in vertical columns in the bin card as and when each transaction occurs. Bin cards are placed with the bin of each item or hung in suitable frame at the location of each item. The usefulness of bin cards becomes apparent only if they are updated at each transaction. Use of bin cards has been criticised because they duplicate store ledger entries, but their usefulness cannot be denied since they help to reconcile current physical stock with the available records. Besides, they are useful to indicate re-order levels.

INVENTORY CONTROL

Inventory, in general parlance, means a stock of goods. The classical definition is that it is an idle resource of any kind having an economic value. Higher inventory levels of any drugs, dressing, equipments and innumerable other items saddle a hospital with avoidable costs. It costs money to 'hold' stocks in terms of storage space, personnel, insurance, security, deterioration and obsolescence. It may be more economical to purchase an item on demand than to maintain an inventory. At the same time, a certain minimum amount of each item must be held to minimise the chances of total stock-out. Inventory control helps in maintaining an optimum level of the idle resource at least possible cost. The purpose of inventory control is to determine appropriate levels of holding inventories, the ordering sequence and the quantities, so that the total costs incurred are minimised.²

The management and control of inventories incorporates certain concepts and techniques as follows.

- ABC analysis
- VED and other analysis
- Ordering cost
- Inventory carrying cost
- Economic order quantity
- Lead time
- Safety stock
- Reorder level
- Stock turnover.

ABC Analysis

Expensive inventories and their control are costly, but inventory shortages and lack of control can be equally costly. Economics of materials control is a matter of self-preservation in today’s competitive environment. Since materials control is a matter of rupee control, it is axiomatic that stringent controls must be placed on higher-value items, although this should not be construed as licence for less control on lower value items.

The ABC principle: A small number of items represent a large percentage of the cost value. Conversely, a large percentage of the items represent only a small portion of the cost value. The procedure adopted to determine varying levels of control is called the ABC analysis.

Procedure of ABC analysis: The list of all items in the store and the current annual consumption cost (in rupees) of each item are noted from records. These records will be available from the stores (total consumption quantity) and from the purchase department (total annual value, or number of units multiplied by unit cost of each item). The items in the list are then rearranged in the **descending order of annual consumption cost**, beginning with the item of highest value at the top and ending with the item of lowest value at the bottom. It is advantageous to deal with items of general stores and consumable, and medicines, drugs and dressings separately.

Even a cursory analysis of the list reveals that the first 10 (or thereabout) percentage of items account for approximately 70 to 75 per cent of the annual consumption cost. These are categorised as “A” items. The next 20 (or thereabout) percentage of items account for approximately 20 to 30 per cent of the value. These are categorised as “B” items. And last 70 (or thereabout) per cent of items account for only 10 to 15 per cent of the value. These are categorised as “C” items.

The range of ‘A’ item may range from 10-20, ‘B’ item from 20-40, and ‘C’ item from 65-80 in different hospitals.

Control: Lower value items require a lower investment cost even with enhanced level of safety stock. Larger quantities of such items can be purchased, and because of the higher stock levels the physical inventory can be lengthened. Conversely, higher value items require a higher investment cost. Therefore safety stocks should be as low as possible, and minimum economical purchases should be made, and closer controls are called for. Without ABC analysis, the ordering policy may be to order all items once a quarter or on as required basis, and the position may become chaotic.

The position is summarised in Table 21.1.

Classification	Percent of Items	Percent of rupee value	Controls
A	10	70	High level, low safety stocks, frequent physical verification, minimum EOQ orders, close control and review.
B	20	20	Controls not as tight as for “A”, but more than for “C”.
C	70	10	Inexpensive items, purchase in large quantities, at lesser interval, minimise clerical effort to control, large safety stock.

The ABC approach helps in selective control. It is impossible to give equal attention to all the items in the inventory. The principle of selective inventory management recognises that it is impossible to manage and control every item in inventory holding in the same way and still meet the objectives of inventory management.

VED Analysis and Other Classifications

Depending on their **criticality**, and thereby their importance in the operation on the hospital, most of the items on the inventory of the hospitals can be classified, as vital, essential, and desirable (VED). Those items the absence or shortage of which even for a short period can seriously hamper the work of the hospital are classified as Vital items. Essential items are those items, the shortage or absence of which cannot be tolerated for more than a day or so. Many items which are definitely needed, but the work can continue even without them for a substantial period of time, are classified as Desirable. Obviously “V” items will require sufficient safety stock than the other two.

On further analysis of the unit cost of items, rate of consumption and market forces, all items on the inventory can further be classified into: (i) high cost, medium cost and low cost items (**HML analysis**), (ii) fast moving, slow moving and nonmoving (**FSN analysis**), and (iii) scarce in market, difficult to procure, easy to procure (**SDE analysis**).

The level of control, frequency of purchase, purchasing strategy, economic order quantity, lead time considerations, stocking level and safety stock are all influenced by the VED, HML, FSN and SDE analysis in addition to the ABC analysis. The manner in which these analyses can be used will depend upon the materials management strategy of the hospital.

Table 21.2 summarises the basis and purpose of various classifications of the stocks.

Table 21.2: Methods of stores classification		
Classification	Basis	Purpose and use
1. ABC (A items, B items, C items)	Annual consumption value	Degree of control: stricter control over "A" items, minimum on "C" items and intermediate on "B" items
2. VED (Vital, essential, desirable)	Criticality of items	Determining stocking levels based on stock-out cost. "V" items require larger safety stock, "D" items hardly any safety stock, "E" items in between
3. HML (High cost, medium cost, low cost)	Unit cost of item	Purchasing control, purchasing strategy
4. FSN (fast moving, slow moving, non-moving)	Rate/speed of consumption	Controlling obsolescence. Reduce chance of obsolescence of nonmoving item-periodical review of "N" items.
5. SBE (scarce to procure, difficult to procure, easy to procure)	Procurement difficulty, market availability	Lead time analysis, purchasing strategy, higher safety stock of "S" items

A matrix of ABC and VED analysis: Findings of the ABC and VED analysis can be combined, and further grouping can be done as shown in Figure 21.1 to involve a priority system of management of stores. The grouping will essentially decide the strategy of the management.

	V	E	D
A	AV	AE	AD
B	BV	BE	BD
C	CV	CE	CD

Fig. 21.1: ABC and VED classification matrix

Finding of ABC and VED analysis can be grouped as in Figure 21.2 for the purpose of control. Items of high value ('A' items) are falling under classification Vital, Essential and even Desirable; items of medium value ('B' items) falling under classification Vital and Essential; and even items of low value ('C' items) but falling under the classification Vital – these all will require a close watch as a management function by the hospital administrator himself under inventory management.

	V	E	D
A	AV	AE	AD
B	BV	BE	BD
C	CV	CE	CD

Fig. 21.2: ABC and VED classification matrix

ABC and VED analysis can also be combined or grouped in a slightly different manner, as in Figure 21.3. Which grouping to make or follow will depend upon the strategy of the management.

	V	E	D	
A	AV	AE	AD	Priority Group I
B	BV	BE	BD	Priority Group II
C	CV	CE	CD	Priority Group III

Fig. 21.3: ABC and VED matrix

Priority Gp. I items: Of high importance; require control at the highest managerial level.

Priority Gp. II items: Of intermediate importance; controlled by office-in-charge (Stores) may be appropriate.

Priority Gp. III items: Not of significant importance; control can be by lower staff.

Economic Order Quantity

The most prevalent method used to determine the quantity or units of each item to be ordered (or reordered) is the

economic lot method. Economic order quantity (EOQ) is that quantity at which the cost of ordering of an item and the inventory carrying cost are nearly equal, i.e. when the sum of the two costs is the lowest. It seeks to strike a balance between purchase costs and the cost of holding inventory.

For keeping the inventory and inventory cost low, it is necessary to procure the item in as small consignments as possible. But this can mean placing larger number of orders at shorter intervals and higher overall ordering cost. This conflicting situation is solved by the EOQ method. The EOQ methods facilitate the fixation of ordering sequence and the quantities so as to minimise the total materials costs.

For a complete understanding of economic order quantity the following two costs must also be considered:

Ordering Cost

The cost to process, issue and control an order is many a times hidden as “overheads”. They are the costs incurred to get the materials into the inventory of the hospital. Ordering costs include many variables and are not easily measurable. These costs comprise of:

- i. salaries and wages of involved personnel,
- ii. postal, telephone, telex and other similar bills,
- iii. advertisements,
- iv. stationary,
- v. entertaining the vendors/ suppliers, and
- vi. travel of stores personnel.

It is tedious to work out the ordering cost of each order placed on vendors. Neither is it of any great value to work it out each time. As a thumb rule, Rs.15/- to 40/- can be safely taken as ordering cost per order without a serious chance of being in the wrong. An order for a supply of items costing a few thousand rupees will cost more or less the same as an order for a consignment of a hundred thousand rupees.

Inventory Carrying Cost

This is the cost associated with keeping/maintaining the materials in the stores.

It is logical to assume that physically holding excessive inventories will result in an increase in costs for storage space, maintenance, electricity, insurance and other holding charges plus the opportunity cost of money tied up in holding it. Conversely, there is the intangible cost of carrying too little inventory. Inventory carrying costs, also known as holding costs, arise primarily out of the following.

- Cost of storage (rental, power, security)
- Salary and wages of stores personnel
- Insurance
- Stationary, forms, paperwork. Besides these, other invisible charges arise out of the following.
 - Loss of interest on money deadlocked in inventory
 - Deterioration and obsolescence
 - Losses due to pilferage.

Inventory carrying cost is expressed as a percentage of the average investment in inventory.

Inventory carrying cost accounts for up to 25 per cent in industrial undertaking, but there are no reliable estimates for hospitals. The total inventory carrying cost may range from 1 to 5 per cent of the total inventory cost of a health organisation. The cost for an item is only a matter of guesstimate, and working out this cost for each individual item is only an academic exercise.

The EOQ Formula

The total inventory cost in a year is determined by the following formula:

Total annual cost = (purchase cost) + (order cost) + (holding cost)

$$TC = RP + \frac{RC}{Q} + \frac{QH}{2}$$

Where,

- R = annual demand in units
- P = purchase cost of an item
- C = ordering cost per order
- H = holding cost per unit per year
- Q = order quantity in units.

In effect, the total cost equation determines the annual purchase cost by multiplying the annual demand by the purchase cost per unit. The annual order cost is obtained by multiplying the number of orders per year (R/Q) by the cost of placing an order (C). The annual holding cost is the average inventory (Q/2) multiplied by the annual unit holding cost (H). The sum of the three costs (purchase, order and holding) will be the total inventory cost per year for any given purchased item.¹

Solving the above equation for Q, we get the **EOQ** formula:

$$Q = \sqrt{\frac{2CR}{H}}$$

Example: Never-Die Hospital purchases 1,600 pairs (units) of surgical gloves each year at a unit cost of Rs. 15.00. The

order cost is Rs. 100.00 per order, and the holding cost per unit per year is computed at Rs. 8.00. The economic order quantity Q will be :

$$1. Q = \sqrt{\frac{2CR}{H}} = \sqrt{\frac{2 \times 100 \times 1600}{8}} = 200 \text{ units}$$

2. The total annual cost = RP + HQ = (1,600 × 15) + (8 × 200) = Rs. 25,600/-

3. The number of orders to place in one year when the lead time is 2 weeks

$$\frac{R}{Q} + \frac{1600}{200} = 8$$

The Economic Order Quantity can be tabulated as depicted in Table 21.3.

Table 21.3: Tabulation of economic order quantity

No. of orders per year	Order size	Average in inventory (50% order Qty)	Annual carrying cost	Annual ordering cost	Total cost
1	2	3	4	5	6
1	1,600	800	6,400	100	6,500
2	800	400	3,200	200	3,400
3	540	270	2,160	300	3,460
4	400	200	1,600	400	2,000
5	320	160	1,280	500	1,780
6	270	135	1,080	600	1,680
7	230	115	920	700	1,620
8	200	100	800	800	1,600
9	180	90	720	900	1,620
10	160	80	640	1,000	1,640
11	146	73	584	1,100	1,684
12	132	66	528	1,200	1,728

The above table indicates that the hospital will have to place a total of 8 orders during the period of one year. Each order will be of 200 units at which the total of annual holding cost and ordering cost is the lowest at Rs. 1,600 at the eighth order. **The economic order quantity for the item is 200 units.** In spite of everything, it must be realised that fixation of order quantity is nevertheless subject to availability of funds, space for storage, variation in pattern of consumption, economy packaging, government regulations, and seasonal availability.³

Factors which Influence Order Quantities

Lead time: Lead time is the period in days that elapses between placing an order and receiving the stores.

Lead time incorporates internal lead time and external lead time. Internal lead time is the time required for preparation for issue of tender, obtaining quotations, making

comparative statements, initiating purchase orders, time for it to reach suppliers. External lead time is the time taken by the supplier for getting the material ready, its dispatch, transportation and actual delivery at the hospital. Internal and external lead time together constitute the lead time in this discussion.

Any strategy to control lead time must pay more attention to high consumption value items. In spite of the requirement to reduce external lead time, internal lead time constitutes a considerable part of the total lead time. Efforts should be made to contain it.

Minimum stock holding: While as holding of maximum stock of an item is a matter of investment, minimum stock is a matter of operational necessity. Although there should be minimum stock of all items held in the inventory, the cost of stock-out in relation to direct patient care becomes high in the case of some vital items.

The guiding principle is that high value items should have very low stock (in which case orders are closely followed up, with weekly review of the stock position), low value items can have high quantum of minimum stock, medium value items fall in between. In case of short-life items, the quantity held can be very small. Shelf-life affects the minimum stock holding of an item to a great degree. Obviously, for items of short shelf-life of 6 to 12 months, e.g. some reagents), the very minimum will have to be held, with a system for faster reordering.

Safety buffer stock: This is the quantity of stores that one must set apart as an insurance against variations in demand and procurement period, for unforeseen reasons, and to avoid stock-out situation. It is calculated by multiplying the difference between maximum and average consumption rate per day/week/month with the lead time for the item. It is the level at which fresh supply should normally arrive.

Ordering Systems

Reorder level: Reorder level means the balance stock level of an item at which a fresh supply order has to be placed to avoid a stock-out situation.

$$\text{Reorder level} = (\text{Average consumption per day} \times \text{Lead time}) + \text{Buffer Stock}$$

Reorder point: Reorder point is the point in stock level at which an order is initiated. The reorder point is reached when the stock comes to a level which is equal to the minimum stock plus requirement during lead time. When the stock position reaches the reorder point, an order will be placed for Q units, which is the economic order quantity.

There seems to be a confusion in the minds of some readers about Reorder point and Reorder level. It is clarified that Reorder point and Reorder level are one and the same thing. However, Reorder Quantity is a different entity altogether.

In principle, orders should be placed at frequent intervals in case of items whose annual consumption is high, so that the inventory level is kept as low as possible. In case of items whose annual consumption is not so high, orders can be placed less frequently and sufficient stocks can be held in the inventory. In deciding when to place orders, there are two methods generally followed. They are the *Cyclic system* and the *Two-bin system*.

Cyclic system: Also called the “fixed order-interval” system, under which the physical position is reviewed at fixed intervals. The size of the order will vary with fluctuation in consumption. Orders are placed depending on the stock on hand and rate of consumption, i.e. the ordering interval is fixed, but the quantity ordered varies each time.

The review interval depends on the lead time and criticality of the items. The stock before the next review should not be allowed to fall to a level less than the usage rate during lead time. For example, if the average daily consumption of an item is 300, and lead time 20 days, the stock should not be allowed to fall below $20 \times 300 = 6000$ units. If the review time is every 30 days, the stock in hand should be $(6000) + (300 \times 30) = 6000 + 9,000 = 15,000$. If the buffer stock is say 4000, adding the buffer stock to the above quantity gives a ROL of 19,000.

Cyclic system with its frequent review is suitable for “A” and high value “B” items. For a given risk of stock-out this system will require more of safety stock, with need for strict control.

Fixed order quantity or two-bin system: In spite of its name, two separate bins are not physically used in this system. But the concept is: sufficient stock to meet consumption before placing of next order is held in one bin, and the other bin contains stocks sufficient to meet probable consumption during the period of replenishment, i.e. before the actual receipt of the order.

An order for the appropriate quantity is placed as soon as the first bin becomes empty. As opposed to cyclic system, the order quantity is fixed, but the frequency of ordering varies.

Frequency of ordering is determined by fluctuation in consumption. Multiplying the lead time by consumption per day and adding buffer stock to it gives the reorder level. For example, with the lead time of 20 days, daily consumption 300 units and buffer stock 400, the ROL

$$= 20 \times 300 = 6000 + 400 = 6,400.$$

Fixed order quantity system of ordering is more suitable for “C” items and low value “B” items. Since the reorder quantity is fixed in advance, initiating action for reorder can be delegated to lower staff. There is no need for strict control on these items, and physical stock verification can be at larger intervals.

Stock Turnover

It has to be ensured that items are used up before their dates of expiry or estimated shelf-life (ESL) by proper turnover of stocks. A Stock Detail Register or Dated Drug Register containing the date of expiry or ESL of each consignment will help in guarding against holding outdated material on the shelves, and a control on turnover of items with short shelf life. As a rule, the principle of first-in first-out should be followed by the store and a strict vigil by the sister incharge of the ward/departments. All-out effort must be made by the stores officer to deploy the stocks of short-life items within the expiry period by personal liaison with wards/departments if necessary.

Stock turnover is distinct from turnover of inventory, which is the number of times the total inventory value is issued and replaced, i.e. turned over.¹ Inventory turnover rate is calculated by dividing the total annual value of stores in rupees issued by the stores by the value of closing stock at the end of the year. Although this concept is more appropriately applicable to industrial and production undertakings, where a turnover of 10 is considered satisfactory, its application to hospital stores including pharmacy is not without merit. Inventory turnover rate can be increased by eliminating surplus stocks, reducing slow-moving items, reducing the amount of safety stock, increasing the turnover of “A” items, and reducing lead times.

ISSUE/DISTRIBUTION

The traditional requisition and issue system—whereby a requisition is forwarded to the store, which keeps it for some time (unless for urgent requisitions)—processes the requisition, segregates and arranges the items at the order processing counter, from where the indenting department collects the stores—may not be the most effective way of issuing materials. This is the system followed in all public hospitals. A system has to be evolved which can relieve the nursing and technical staff of clerical and errand work.

Materials should be issued only with an authorised requisition, on a periodical (say weekly or fortnightly) basis or as and when necessary. Frequency of demand should be

regulated to produce even flow of work, which calls for a programme of issue to each department. Alternately, different categories of stores can be issued on specified days or dates—this not only facilitate storekeeping but also reduces the work of maintenance of stock records. The as-and-when required system of issue should be reserved for expensive consumables.

Properly designed containers can save time, efforts and space in collection of stores. They should be light and easy to handle, easy to stack, and be strong enough to withstand rough handling.

Three systems of issue and distribution are possible.

1. Each ward/department keeps track of its inventory levels. When the ward or department stock becomes low, a requisition for the required materials is forwarded to stores, which issues the materials.
2. In the topping-up system, the maximum stock level for each item for each ward/department is predetermined based on their usage. At specified intervals, the stores personnel visits the ward/department, checks the stock in balance, and replace the depleted stock.
3. A modification of the above is that the stocks of the ward/department are held in a cart, and a similar cart is also kept full in the stores with predetermined level of all items for the ward/department. At predetermined intervals the stores personnel take the full cart from the stores to the ward/department and exchange it with the depleted cart of the ward/ department.

Adequate control by the stores officer over issues and distribution will ensure that wards and departments are not allowed to hoard supplies. In many hospitals, the tendency to build up the private unofficial inventory in the ward must be curbed. Wards will normally not resort to this tactics if the inventory control system is working efficiently. Special attention in respect of “A” items and “V” items should be paid at the stores level and this can be achieved by stores office by monitoring the consumption levels of each ward both in units and in rupee value. By comparison of the supply and usage of materials to work load, effective control is possible. At the ward level, the kingpin in organising control over materials and minimising misuse is the sister incharge of the ward. Motivate her.

DISPOSAL/CONDEMNATION

In case of nonconsumables like capital equipment, instruments, linen, furniture, etc. excess stock may build up in user departments for want of adequate controls. It should be possible for a user department to return the excess stock

to the stores as soon as it is detected. The store takes it back on charge for issue to other user departments. It is necessary to make the administrative staff of the user department responsible to periodically inspect the complete range of stores held in the department.

An occasion where consumable items are required to be inspected for write off, should arise only exceptionally. The very fact that date expired items of consumable stores remain in shelves in the main store or in departmental substore points to a lackadaisical system of inventory control. If despite all efforts nonmoving and other items accumulate, such items should be reviewed by a Condemnation Board.

Many items have a scrap value. Bottles, IV bags, used linen can be sold as scrap. Some other items are required to be destroyed by burning or destroyed beyond recognition, to prevent reuse. It may be possible to use some parts of condemned equipment. Cannibalisation of parts, i.e. removing usable parts of irreparable equipment for fixing the same to some other equipment to make it usable—may be possible.

A condemnation board should be convened at least once in a year, or more, to centrally review all used as well as surplus materials and make recommendation for their disposal.

MINIMISING LOSS AND PILFERAGE

Pilferage is a phenomenon closely associated with materials of all types. Stores may be pilferaged by the transporter, receiving clerk, other stores personnel and users in wards/ departments. To minimise thefts from stores, access to all stores buildings and storage should be limited. Locking and unlocking of stores and the handling of keys should be strictly controlled. Intense vigilance is required by all materials personnel.

Intensive vigilance is also required to prevent frauds involving purchasing personnel in collusion with vendors. Commissions under the table and kickbacks may induce stores personnel to compromise the interest of the hospital, especially in case of emergency purchases. Inflating prices, accepting substandard goods, and making fraudulent payments are sometimes utilised by stores personnel in collusion with suppliers, especially local suppliers. A system of internal audit as part of the control process can point out possible loopholes in the system that may lead to pilferages and frauds. All such loopholes should be plugged with appropriate organisation and methods and policies and procedures.

Effectiveness of the Materials Management Department

Materials account for a substantial portion of hospital budgets, and contribute to a great degree to patient care. Evaluating the effectiveness of the materials management department is therefore necessary, and should be carried out at least once in a year. The various methods of evaluating the effectiveness of the materials management system are as follows.

Supply performance review: It seeks to satisfy how well the materials management function is meeting the needs of the department in:

- i. timely availability of materials,
- ii. quality of materials, and
- iii. number of occasions when stock-outs have occurred.

Overall review by management audit: The complete material management function comes under the ambit of management audit. The aim of good materials management has been specified in the beginning of this section. Management audit determines the extent to which these aims have been achieved, viz. whether the purchase, stores, handling and issue practices have been followed appropriately, whether inventory levels have been maintained at the optimum level, whether good vendor relationships have been developed, whether materials have been obtained at the most economical prices, that issues and distribution

system does not encourage hoarding of stocks in wards/ departments, whether pilferages and wastages have been minimised.

Material cost per patient day (MCPD): It is arrived at by dividing the total material cost per day by the total hospital cost per day, i.e. it is a ratio of materials costs to total hospital costs. The MCPD is one of the most objective methods of evaluating the effectiveness of materials management practices in the hospital. A high MCPD ratio points to a scope for better materials management. A high MCPD contributes to higher per day patient costs.

The problems of materials management are ubiquitous and complex. No simple formula can take into account all of the variables encountered in real situations. The value of good approximations in permitting a practical and understandable solution to a problem is often far greater than any loss caused by a lack of accuracy or precision.

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Marketing of Health Services

OVERVIEW

Marketing is thought of by most people as selling and advertising. But as opposed to the general perception marketing is not just selling and advertising alone, but much more. It can cover a wide range of critical business activities that bring products, ideas or services to the customers. And these products, ideas or services are brought to the customers at the time they want, at the place they want, at the prices they can afford, and providing all the information the customers would need to make informed and satisfying choices.

Active competition should become both the style and the goal of a marketing programme. Although there is no open competition for the health care market yet because this is still a seller's market, chances for survival or for maintaining all services that currently exist can be substantially reduced without a sustained marketing effort. This does not mean that there should be a deliberate intention of proposing cut-throat competition or unethical practices to achieve financial goals. Administrators must start to look at their clientele (patient/consumer) as customers, because as with other industries there is a product (service) for offer and a necessity for others to use it.

Hospitals are similar to industries, but hospital and health administrators feel uncomfortable using proven industrial techniques to effectively develop an appropriate market for hospital services. In this era of open competition, the concept of competing with other hospitals and health services institutions for a larger share of the market place must now be accepted.

MEANING AND SCOPE OF MARKETING

Many authorities define marketing in different ways because there is no universally accepted definition of marketing. Two of the widely accepted definitions which highlight the essence of the subject are:

1. Marketing is a process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create exchanges that satisfy individual or organisational goals (American Marketing Association).
2. Marketing is a social and managerial process by which individuals and groups obtain what they need and want through creating offering and exchanging products of value with others (Philip Kotler).
The UK Chartered Institute of Marketing describes it as:
3. Marketing is the management process responsible for identifying, satisfying and meeting customer's requirements profitably.

Some common points emerge from these definitions. These are:

1. Marketing is a management process
2. Marketing offers and exchanges ideas, goods or services
3. Marketing is identifying and anticipating customer's requirements
4. Marketing is giving customers what they want
5. Marketing involves pricing, promotion and distribution of ideas, goods, or services.

Therefore, marketing activities would over–

- Scanning of the Environment (Demographic, technological, legal and socio-cultural environment)
- Finding out customers’ needs and wants
- Deciding which of these wants or whose wants the organisation can satisfy (this is the “Segmentation” and “Target Market” strategy)
- Developing a “Marketing Mix” (these are the four Ps of marketing: **Product, Price, Place** and **Promotion**) to satisfy the needs and wants of the target group
- Periodically evaluating the marketing efforts.

Marketing is by definition a *system* if we accept the dictionary meaning of a system. Certainly, the interaction and interdependence of such factors as product, price, place and promotion (marketing mix) fits the definition.

The “systems approach” provides the best mode for studying marketing activity. It helps in the determination of marketing and organisational goals, the development of marketing programmes and the total marketing mix. Adoption of a systems approach to the study of marketing provides a good basis for the logical and orderly analysis of marketing activities. It stresses marketing linkages inside and outside the organisation, emphasises changing environment, provides a framework for control, and depends on using the right information.

MARKETING ELEMENTS AND MARKETING MIX

Whether it is the marketing of goods or services, there are four entities that comprise the essential elements of marketing everywhere. These are together referred to as the “Marketing-Mix”. These elements are–

1. **Product:** The type of service to be offered—preventive, diagnostic, therapeutic, etc. viewed in terms of the benefits the service provides to the patient—relief from pain, longer life, less disability, etc.
2. **Place:** Where and how the service will be delivered to the patients—the location, hours, referral mechanism, etc. which determine the extent and mode of access to the product (service).
Basically this applies to the marketing of goods, channels of distribution of the product and includes warehousing, transportation, etc.
3. **Price:** This is the charge made for the service (which often is not paid directly by the patient anyway). This covers every thing the health care organisation requires the patient to go through in order to utilise the service.

The product has to be adequately priced. This involves the cost, consideration of profit margin, the concept of right price.

4. **Promotion:** How and what the prospective patients learn about the health care organisation and the service it offers—how the patient can become aware of services offered, develop an interest in using a service, actually utilise it, use it regularly and recommend the organisation to friend, etc.

Promotion is the aspect of selling and advertising. In other words, it is communicating the benefits of the service to the customer in order to persuade them to purchase such services.

The above are commonly referred to as the four Ps of marketing-mix or simply the four Ps of marketing.

MARKET SEGMENTATION

Market segmentation is the concept of dividing the market into similar, identifiable segments. Market segmentation occupies a key role in marketing strategy of successful organisations. Segmentation techniques are integral to an organisation’s entire marketing process from initial marketing research through marketing communication.

Segmentation is a powerful way for marketers to understand who they are trying to reach, what is unique about each group and how to design, distribute, price and promote offerings accordingly. It helps marketers make wise, cost-effective choices. Health care marketers should understand and perform segmentation techniques particularly when health care organisation’s clear direction is essential to ensure its profitability. (Engelberg M and Newbrand S 1997).

The purpose of segmentation is to design and deliver a service tailored for a particular segment of customers. In so tailoring the service, the health care provider should attempt to quantify the value of a particular customer segment.

When a critical review of any market is undertaken it soon becomes clear that the notion of a single market for a given service is of limited use. Many health care providers following a marketing aggregation policy (i.e. not recognising market segment) are increasingly considering means of appealing to different segments. In the recent past there has been a paradigm shift in marketing practices from transactional marketing to relationship (segment) marketing.

The process of market segmentation is one of dividing a total market into a series of submarkets (market segments). The marketing segment approach is concerned with:

- a. Considering the interactive basis for segmentation
- b. Choosing specific segments or a single segment within that base

- c. Determining appropriate service levels for these segments.

Traditionally, seven broad elements are used in considering market segmentation.

1. **Geographical segmentation:** Customers are differentiated on the basis of where they are located (Urban, suburban or rural).
2. **Demographic and socioeconomic segmentation:** Based on a wide range of factors including age, gender, family size, income, education, social class and ethnic origin.
3. **Psychographic segmentation:** Based on analysis of lifestyle characteristics, attitudes and personality characteristics.
4. **'Benefit' segmentation:** On the basis of the benefits the customers are seeking.
5. **Usage segmentation:** Divides customers into heavy users, medium users, occasional users or nonusers.
6. **Loyalty segmentation:** Based on relative loyalty a customer has to a particular service provider.
7. **Occasion segmentation:** Customers vary in the usage of a service depending on different occasion. However, this is generally not applicable to health care segmentation.

The various elements of customer service that can be offered and possible differentiation in terms of service levels within this element represent considerable opportunity to design service packages appropriate to different market segments. However, as a precursor to the development of a relationship (segmental) strategy, service providers must establish a good quality service and then develop a segmented customer base.

DISTINCTIVE NATURE AND CHARACTERISTICS OF SERVICES

We know that services are different than goods. It is therefore imperative to understand how services differ from goods and therefore, the resulting marketing imperatives arising out of such differences.

Definition of Services

Service has been defined as "Any activity or benefit that one party can offer to another that is essentially intangible and doesn't result in ownership of anything. Its production may or may not be tied to a physical product" (Kotler and Bloom).

"A service is an activity or a series of activities of more or less intangible nature that normally, but not necessarily, takes place in interaction between the customer and service employees, and/or between customer and physical resources or goods, and/or between customers and systems of the service provider, which are provided as solutions to customer problems' (Gronroos).

Thus, services can cover the whole gamut of human activities such as education, entertainment, amusement, advertising, finance, legal, travel, medical, health, communications, market research, banking, retailing, recreation, etc.

Special Characteristics of Services

Most, if not all, services have four basic characteristics. These characteristics are identified as:

1. Intangibility
2. Heterogeneity
3. Inseparability of production and consumption
4. Perishability.

Intangibility

This is the most basic difference between goods and services. A service is a performance, not an object that can be seen, tasted or felt but which can only be experienced. Intangibility is the critical distinction between services and goods. Nevertheless, all physical goods have some element of service built into them, and some services may have some tangible component. Services have a relative dominance of intangibility as compared to dominance of tangibility of goods.

Challenges in marketing due to intangibility:

1. Services cannot be stored like goods to meet fluctuations in demand. Demand for TV sets which is more during festival season can be met by higher stocking during previous lean months. Not so with services, especially health care demand which also has a seasonal fluctuation.
2. Customers have no choice to evaluate a service prior to its purchase because unlike goods, service cannot be displayed, exhibited or communicated beforehand. For the service provider this makes the production/advertising strategies difficult to plan.
3. Price for a service is difficult to set because of its intangible nature. Unit costing of a service in fraught with many more intangibles and hard to determine also because of the complex relationship between price and quality.

Heterogeneity

Services are performed by 'people'. Therefore there is possibility of variations and fluctuations in these performances from time-to-time, from performer-to-performer and from customer-to-customer. The quality of service may vary depending on who provides it, as well as when and how it is provided. One hotel provides a fast and efficient service with courteous employees. Even within the employees of this hotel there can be variations in performance over the course of the day. A number of diverse factors affect human performance. This, combined with the fact that no two customers are alike, complicates matters which make it difficult to ensure consistency in service quality.

The quality of service provided cannot also be fully controlled by the provider like the level of demand, or fluctuations in demand. The service provider therefore cannot be certain that the services delivered would match with what was promoted.

Challenges in marketing due to heterogeneity: Heterogeneity makes standardisation and quality control difficult to achieve. Reducing variability involves determining the causes. It may be due to unsuitable personality traits in an employee for which nothing can be done short of asking him to resign. However, there may be other reasons for poor performance. For example, it could be due to poor training and supervision, lack of communication and information, and generally a lack of support.

Inseparability of Production and Consumption

In case of goods they are first produced, then sold and then consumed. On the other hand, services are first sold and then produced and consumed. The production and consumption of services is simultaneous. The interaction between production and customers may be wide (spread over time) or quickly passing, and it may involve interaction between customers and service employee or between customer and machine (e.g. an ATM Machine). This interaction is the *essence* of services marketing, since it is during this interaction that the customer makes a judgement on the level of service being received by him.

Because of simultaneous production and consumption of services the customer is generally present in the "service factory" and is involved in the production process. This may affect the outcome of the service process or transaction. Further, while receiving service the presence of other

customers could have an impact on the type of service perceived to have been received by a customer.

Challenges in marketing due to inseparability of production and consumption: The involvement of the customer in the production and delivery of service means that the service provider must exercise care in what is being 'produced' and 'how' it is produced. The latter task will be of particular significance. How lawyers, hairdressers or doctors conduct themselves in the presence of the customer may determine the likelihood of repeat business. Therefore, proper selection and training of customer contact personnel assumes significance to ensure delivery of quality in this context.

"Health care managers should define their services not in broad, sweeping images of high-tech medicine and glossy newsletters, but in terms of dozens-perhaps hundreds-of specific encounters or events (e.g. admissions, food quality, telephone enquiries, staff responsiveness, discharge procedures, etc.) Employee's shape these movements of truth not only by the tasks they perform but also by the way they look, act, talk and interact with the customers, with other customers or with fellow workers. Employee behaviour must, therefore, be carefully orchestrated and managed" (Benoy, 1996).

Perishability

A service not delivered in time is gone waste. The opportunity is gone forever. Unlike goods a service cannot be stored, resold or returned. Hotel rooms not occupied, and college seats not filled cannot be reclaimed.

This 'perishability' of services presents a number of dilemmas and challenges:

Challenges in marketing due to perishability:

1. Because services cannot be stored, important aspects like demand forecasting, capacity utilisation, and planning become difficult decision areas.
2. Fluctuations in demand characterise service organisations and pose problems where these fluctuations are unpredictable. Strategies need to be developed for producing a better match between supply and demand.
3. Because services cannot be returned or resold, there is a greater need to have strong recovery strategies if the service goes wrong.

The above described unique service features, resulting marketing problems and required marketing strategies are summarised in Table 22.1.

Table 22.1: Unique service features, resulting marketing problems and marketing strategies

<i>Unique service features</i>	<i>Resulting marketing problems</i>	<i>Marketing strategies</i>
Intangibility	<ul style="list-style-type: none"> • Services cannot be stored • Cannot protect services through patents • Cannot readily display or communicate services • Prices are difficult to set 	<ol style="list-style-type: none"> i. Increase service tangibility ii. Stress tangible cues iii. Simulate or stimulate word of mouth communication iv. Create strong organisational image v. Promote brand names vi. Use cost accounting to set prices vii. Engage in postpurchase communications viii. Manipulate the atmospherics
Inseparability of production and consumption	<ul style="list-style-type: none"> • Consumer involved in production process • Other consumers involved in production • Centralised mass production of services difficult 	<ol style="list-style-type: none"> i. Emphasise selection and training of public contact personnel ii. Learning to work with larger groups iii. Manage customers iv. Train additional service providers v. Use multi site locations
Heterogeneity	<ul style="list-style-type: none"> • Standardisation and quality control difficult to achieve 	<ol style="list-style-type: none"> i. Proper person selection and training ii. Have system for monitoring customer satisfaction iii. Industrialise service through use of technology iv. Customise service
Perishability	<ul style="list-style-type: none"> • Services cannot be stored 	<ol style="list-style-type: none"> i. Use strategies to cope with fluctuating demand, like: <ul style="list-style-type: none"> • Differential pricing • Reservations systems • Consumer participation • Part time employees, etc. ii. Make simultaneous adjustments in demand and capacity to achieve a closer match between the two

THE EXPANDED MARKETING-MIX OF SERVICES

After considering the 4 Ps of marketing mix and the unique characteristics of services it now becomes clearer that just the management of the 4 Ps by itself is not sufficient for successful marketing of services. The distinctive characteristics of services and the challenges in marketing due to them requires the addition of three more Ps—**people**, **physical evidence** and **process** to the marketing mix. The marketing mix of services is complete only after the inclusion of these three factors. Let us ponder over them in the context of health care delivery.

Firstly, since services are produced and consumed simultaneously, the role of service delivery personnel becomes extremely important. *Secondly*, the encounters of these personnel with patients become the ‘process’ by which the service is delivered and which therefore determines the overall perception of service by customers. *Thirdly*, the physical surroundings and facilities, that is, the “setting”

where these encounters take place have also a bearing on service delivery in the minds of the customers. All this necessitates the incorporation of these three more factors in the traditional marketing mix of the four Ps described earlier. The role of these additional factors in the marketing mix is described below:

People : All human actors participating in the delivery of a service provide cues to the customer regarding the nature of the service itself. How these people are dressed, their personal appearance, their attitudes and behaviours all influence the consumer’s perception of service.

Physical evidence : It includes the physical facility where the service is offered. Especially when customers have little on which to judge the actual quality of service they will rely on these cues, just as they rely on the cues provided by

the people and the service process. Health care service delivery sites often stand in prominent locations offering exposure to a broad verity of audiences. Memorable architecture and attractive signage can convey a variety of important messages from overall to highlighting a particular competitive advantage.

Physical evidence manifests as under in the eyes of customers:

- a. Facility design, aesthetics
- b. Functionality
- c. Ambient-conditions
- d. Equipment
- e. Signage
- f. Employee dress, appearance
- g. Reports, statements, stationary
- h. Furnishings
- i. Colour
- j. Layout
- k. Noise level.

Process : This covers the actual procedures, mechanism, and the flow of activities by which the service is delivered, i.e. the service delivery and operating systems. The actual delivery steps which the customer experiences, or the operational flow of the service provides customers with evidence on which to judge the service.

This complete marketing for services is depicted in Figure 22.1.



Fig. 22.1: The complete marketing mix for services

Service Mix : Health care

- Product** : “Cure” and “Care” with diagnostic equipment, therapeutic equipment, clinics, medicines and treatment procedures
- Place** : Hospital, Clinic, Diagnostic centre
- Price** : Length of stay, level of illness, frequency of visits, type of room, use of equipment, treatment procedures
- Promotion** : Advertising, publicity, word-of-mouth, public relations
- Physical evidence** : Hospital wards, outpatient clinics, diagnostic and therapeutic equipment, general ambience of premises
- People** : Doctors, specialists, nurses, nursing aides, technicians, paramedics, dieticians, security, front office
- Process** : Physical examinations, tests, immunisations, surgery, diagnostic/therapeutic procedures, records, catering, laundry.

UNDERSTANDING THE MARKETING PROFILE

A majority of us are bound to be confused with the very concept of marketing because industrial and business marketing is totally focused on profit generation. Marketing is now hammering on social orientation too. This is to try to emphasise that profit generation is not the only thing that we expect from marketing. Profit generation is an important condition, but not the only one. Changing social problems are engineering a sound foundation for change in the concept, modalities and scope of delivery of health care.

For the hospital administrator considering a marketing programme, the recognition of the current status of the hospital or institution is the starting point. It should reveal how the hospital is perceived by competitors and the community.

A study of the current marketing profile of the hospital helps identify strengths and weakness in service, the programmes and the characteristics of the population used, why these are obtained by them at other facilities and locations. This becomes the cornerstone for developing goals of the marketing programme.

Potential Market

Differentiation between **actual** and **potential** markets should be understood and potential markets must be identified

though well-designed questionnaires geared to meet specific areas of interest. Population trends in the region and attitudes expressed by patients, general public and health care personnel will primarily determine the preprofile plans.

The Changing Environment

In a changing health services scenario the existing operating and planning practices will need to be modified, especially in determining when a new facility or an expanded programme should be considered as part of a hospital's role and responsibility. Where demands for new services, programmes, equipment or expansion of existing activities come from physicians, political interest, or other influential sources, decision making for such programme should be based only on market research identifying the need, potential market and financial viability, and not on other considerations.

Pricing Practices

Generally, hospital pricing practices are based on a combination of input costs, including overheads plus profit or on rates which are prevalent in the neighbourhood hospitals. The pricing structure of a hospital must be within a reasonable range of charges with hospitals in the area with a similar mix of service. A review of charges, including all the direct and indirect expenses that may be related to a specific cost centre, may usually demonstrate little relationship to the actual cost of providing and maintaining these services. Such situation offers an opportunity to reevaluate pricing and marketing practices, to develop a means of providing the services at a lesser cost to the public, and to become more competitive.

On the other hand, a reduction in cost to the public can be negatively received by the public as it may perceive that such an action indicates a “**cut-rate**” pricing of services due to poor quality.

Advertising

Hospitals have been practicing advertising though press releases under the guise of public relations. Some hospitals aggressively advertise, and such advertising programmes seem to have been successful in improving utilisation. The notion that advertising is not a dirty word seems to have gained acceptance with hospital managements who are prone to believe that this kind of publicity could also function as an educational and motivational tool.

Competition

The word ‘competition’ is unfamiliar to hospital administrators. Competition does not imply an interest to try to drive away other area hospitals out of business. However, hospitals must sharpen their skills and practices to effectively withstand any infringement by other hospitals and the potential loss of its market to other hospitals or facilities. For this, a hospital needs to develop a good intelligence network to monitor what services are being developed elsewhere. The long and short range plans of other health facilities in the area should be noted.

Facing competition requires strengthening of strong areas of services while supporting those that are weak. In addition to the cost factor, quality, accessibility, available resources and other existing plus-points play a role in competition effectiveness. Hospitals must be quick to respond to the needs of the community to achieve service goals before others have an opportunity to do so. Marketing expertise of the hospital can provide sound guidance in an approach towards this goal. Because in health services competition is not pointedly price oriented a hospital's reputation for dependability, skill and perhaps creativity becomes its chief promotional aid.

Market Research

Some industrial organisations maintain a product line that is considered a loser but still maintained because the ‘**ripple effect**’ may provide substantial or offsetting revenue. Similarly hospitals have programmes that appear superficially to be a liability to the organisation but in fact earn revenues and have utilisation potential to other services within the total structure. Marketing programme must be based on market research considering all connected aspects of the problem at hand.

Communication with consumers for research can be opened by means of questionnaires, site visits, public meetings, private group meetings, informational mailings, advertising, or the latest method-mall intercept (one-to-one encounter in shopping centres). Means of maintaining these channels of communication should be explored.

Service Quality Dimensions

The customer judges the quality of services not only on the basis of what is being delivered but also how that outcome is delivered. His primary expectation is related to the response and outcome of his illness, viz. ‘**cure**’. The process of achieving this end is through the receipt of service

experience, viz. ‘care’. Given the difficulties in adequately evaluating ‘cure’ and the faith that patients generally have in believing in the doctor’s ability to treat illnesses, it appears that patients take this aspect of service (cure) for granted and evaluate the service on other aspects of service delivery (care).

Various studies have shown that customers perceive five *dimensions* in their assessment of health service quality, viz.–

1. Reliability
2. Responsiveness
3. Assurance
4. Empathy
5. Tangible evidence (appearance of physical facilities, equipment, personnel and written material).

MARKETING IMPLICATIONS OF THE DISTINCTIVE CHARACTERISTICS OF SERVICES

The distinctive nature and characteristic of services have implications regarding marketing planning, marketing strategy, marketing organisation and marketing operations, as compared to marketing of goods.

The differences are summarised below:

<i>Dimension</i>	<i>Services</i>	<i>Goods</i>
A. Marketing Planning		
1. Demand	Fluctuating	Stabilised
2. Seasonality	Present	Goods specific
3. Consumer reaction	Spontaneous	Delayed
4. Need satisfaction	More emotional	More physical
5. Basis of competition	Personalisation	Technology
6. Replacement	Not possible	Common
7. Image	Corporate	Brand
8. Cost allocation	Difficult	Easier
B. Marketing Strategy		
9. Orientation	External and Internal	External
10. Focus	Customer expectations	Customer needs
11. Approach	Focused	Can be diffused
C. Marketing Operations		
12. Customer involvement	High	Low/absent
13. Physical presence of customer	Essential	Hardly necessary
14. Physical surrounding	Very important	Not so important
15. Facility location	Close to customer	Near supply

Contd...

Contd...

<i>Dimension</i>	<i>Services</i>	<i>Goods</i>
16. Process design	Physical environment plays a vital role	Only physical product
17. Process design	Immediate effect on customers	Customer not involved
18. Scheduling	As per customer interest	Random
19. Quality control	Variable standards	Fixed
20. Worker skill	Interaction	Technical
21. Time standard	Loose	Tight
D. Marketing Organisation		
22. Structure	Flatter	Taller
23. Communication	Criss-cross	Mainly vertical

MARKETING TARGETS

It is commonly thought that patients are the only group who are primarily concerned in health care marketing. However, in the broader context physicians, insurance companies, third party payers and corporate employers who pay for their employees’ hospital bills, and employees of the health care organisations become concerned parties as part of an overall marketing effect.

Patients

Improved health education and wide media coverage is resulting in consumers increasingly assuming greater responsibility and interest in their own health care. They are becoming more responsive to how they are treated (in the overall sense) when they enter hospitals as patients. But, the consumer is also inadequately informed. Marketing requires a look beyond the obvious group, i.e. those with whom direct contact is established as they use health service, to include the *potential* users who can increase the market share.

Often patients feel a negative reception on their first contact with hospitals. Consumers should feel more comfortable, more wanted and more like ‘customers’. Ease of entry into hospital system, or simply reduced waiting time in outpatient clinics promotes positive consumer reaction. Admission process into hospital is critical to the marketing image. Preadmission information brochures, hospital’s ability to provide any support prior to admission, and availability to answer any questions are very reassuring to patients.

Before admission, patients provide the hospital with an opportunity to publicise itself through suitably designed preadmission handouts. Outpatients services and activities can also be publicised through leaflets. More can be done to generate activities that will reduce hospital charges. A programme of 'happy-time care' could reduce hospital charges by identifying time slots during the day or week when use levels are low, or by introducing longer evening hours or longer scope of available services on weekends. Because the hospital is underutilised at these times, a cost benefit can accrue to the patient. Patients would then be encouraged to use services during these hours at special discount cost than that which would be charged during prime time. Many of these services could be on an outpatient basis, some for diagnostic services and some for therapeutic services like physiotherapy.

Physicians

Physicians control the flow of patient activities to a health care facility or away from it, directly affecting the user of services within the facility. They are also responsible for over-utilisation of services by extending the length of stay for tests or care. They may order a battery of tests, all of which might not be necessary or pertinent at the time. These are considered as methods for additional sources of revenue in the constant struggle to maintain a financially stable hospital. (However, these activities can be a source of penalties with the arrival of the Consumer Protection Act). Thus physicians become consumers from the marketing point of view.

Doctors as 'consumers' from the marketing point of view are the most complex of the consumer group. They can control and maintain a hospital's position in the health care market and ensure the adequate use of existing services and facilities.

In marketing to physicians as consumers it is necessary to know what patterns of care will change in hospitals in the foreseeable future as per their predictions. It is also necessary to know what types of charges are most desirable from the physicians' point of view.

Joint workshops of key members of medical staff with board members and the administration would encourage discussions about projected programmes, needs and requirements as seen by physicians, the board members and administrators. Through such workshops, a sense of mutual understanding and willingness to support the marketing approach can be developed, particularly when it

begins to identify programmes that might not be totally comfortable for medical staff.

Corporate Employers and Third Party Payers

Hospitals receive reimbursements from the insurance paid for by the corporate employers for services rendered to their employees, and by insurance companies. However, the employers, insurance companies and other third party payers are raising questions about the high cost of services and the need for cost containment. They are suggesting that hospitals can do better for less as they (insurance companies, etc.) are being burdened with growing liabilities. All these groups can no longer be considered just 'hospital bill payers' but also should be dealt with as consumers.

A strong programme of education and involvement of employers and third party carriers in hospital activities would be desirable. Presentations by the hospital and discussions thereafter may centre on the status of health industry and its impact on the insurance companies (third party carriers) and employers and may lead to an approach for improvement for mutual benefit.

Employees of Health Care Organisation

Maintaining the position of the hospital in the existing market becomes one of the strong responsibilities of the hospital staff. Employee attitudes and job satisfaction are important in assuring the customers of warmth, interest, concern and quality of service. Since health care employees are one of the prime support groups for customers, it becomes important to keep them happy and not to overlook employee-relations programmes. They determine the primary public image of the hospital. Among them the customer care personnel form the core group.

In marketing to health care employees as customers, health care institutions are required to look into the aspect of employee management that sympathy and empathy are inculcated in the employees of service providers.

Health care business which is labour intensive and demands high levels of personal contact between employees of service providers and customers, no market plan can be considered complete unless it includes strategies for reaching out and winning over its internal customers.

Customer Contact Staff

Staff that interacts with customers are referred to as either customer contact staff or front line staff.

It has been now accepted that future business success will depend on the level of emotional capital available to an

organisation. The term **emotional capital** refers the human resources available and which is regarded as an **asset** to the organisation. In health care organisation those who interact with customers heavily influence the customer’s service experience. They do this in three ways:

- i. they offer cues to the customers to help them assess an otherwise ambiguous situation;
- ii. they create first impression; and
- iii. they create the cognitive framework that shapes the way in which the service is interpreted and evaluated.

“However, front line personnel are not a homogeneous group. The hospitals housekeeping maid and the surgeon are both front-line employees in that they both deal directly with customers. Some of the skills that are required are common to both jobs. These core skills have become common requirements of all front-line staff regardless of the specific service that they provide (Figure 22.2).

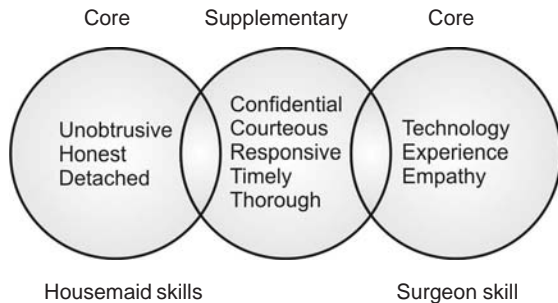


Fig. 22.2: Core/supplementary skills

In addition to these essentials, most service organisations also require some supplementary skills. Front-line staff provide a quality service if they possess all the qualities required, both ‘core’ and ‘supplementary’. Historically, those who provide services that required a lot of technical ability got away without some core skills. If a doctor was rude, or kept patients waiting, no one complained. No one accused him of providing a poor service. His position allowed him to behave in this manner. Now, though, even those in the professional services are expected to possess all core service skills, and also the supplementary skills” (Mudie and Pirrie, 2006).

ORGANISATION FOR MARKETING

Marketing Function and Marketing Department

In a business organisation manufacturing goods the marketing function is handled by the marketing department. This department is responsible for all of the marketing activities of the business. However, this is never the case

with services marketing. A marketing department of a service business can only control a small part of the marketing function, because it does not have the necessary authority to manage the buyer-seller interactions (interactive marketing). Therefore, the services marketing department cannot plan or implement activities pertaining to interactive marketing function, i.e. the marketing function which results from service provider – customer interactions.

Therefore, the marketing function in health care services organisation has to be conceived from three different perspectives : the perspective of **External-marketing**, **Internal-marketing**, and **Interactive-Marketing**. The traditional marketing mix addresses itself to external marketing only. However, the marketing department has to get involved in any and every way it can with interactive marketing. Interactive marketing and Internal marketing are interdependent or rather closely related. In the former the marketing department gets involved; in the latter the highest level of the management has to involve itself. Internal marketing, however, is more of a responsibility of the management of the organisation rather than of the marketing department. Internal marketing perspective is described in detail below.

The total marketing effort in services which includes three different facets of marketing is depicted in Figure 22.3.



Fig. 22.3: The triangle of services marketing

Internal Marketing

Internal/indirect customer: One of the important customer groups is not outside but within the health care organisation itself. **The organisation runs more smoothly**

if everyone in the organisation, treats the other employees as customers. Maintaining a positive relationship with them is as vital as with the external customer. The following groups form the internal or indirect customers of health care organisations:

- Physicians
- Employees of service providers.

Role of internal marketing: In service marketing, internal marketing plays a critical role. Promises that have been made to customers implicitly or explicitly are required to be fulfilled by the employees. **Internal marketing is the building of customer orientation among employees by training and motivating both the customer—contact personnel and the support staff to work as a team.**

Internal marketing can be defined as (Benoy, 1996) “The application of marketing, human resources management and allied theories, techniques and principles to motivate, mobilise, co-opt, and manage employees at all levels of the organisation to continually improve the way they serve external customers and each other. Effective marketing responds to employee needs as it advances the organisation’s mission and goals”.

Health care business which is labour intensive and demands high levels of personal contact between employees of service provider and customers, no market plan can be considered complete unless it includes strategies for reaching out and winning over its internal customers (Benoy, 1996). The activities involved in internal marketing include training employees, empowerment, knowing employee’s needs, good internal communication, and measuring and rewarding quality.

The importance of the employees in delivery of quality service means that they should not be ignored as relevant communication targets. Means of such communications are newsletters, house magazines or staff forums. If the house magazine features employees doing their jobs, it communicates to them that they are important. These communications can help to manage customer’s expectations as well as to know what to expect from the customers. Also, internal communication can no longer be regarded as a way for the organisation communicating to employee with no feedback mechanism. Managers need to listen as well as to inform.

The marketing in-charge: If an administrator with a marketing background is available in the organisation who is handling some other responsibility, such a person can be given the charge of the marketing function. Failing the in-

house availability of such a person the organisation should select an individual with formal qualification in marketing management. If the hospital employs a person with marketing skill, but who is without experience in health service, then the hospital should expose the person thoroughly to the working of the hospital in all its departments.

OUTSIDE MARKETING CONSULTANT versus THE IN-HOUSE MARKETING TEAM

Outside marketing consultant: If a suitable **in-house marketing person** is not available, it will be necessary to engage an **outside marketing consultant** who should have had exposure to the health field. The consultant could be assigned the following tasks:

- Providing marketing training for staff
- Periodic or regular consultation with the hospital administrator or the in-house staff person responsible for marketing
- Develop marketing plans for different projects for execution by different units or department of the hospital.

Although availability of marketing consultants in general is good, the same cannot be said about health care marketing consultants. The consultant should provide in writing the services, materials and assistance he will provide and the details of expected costs and fees.

As an alternative to a marketing consultant, the hospital can organise an in-house marketing team.

In-house marketing team: Selection of individual to be the head of the health care organisation’s own marketing team should include—

- a. Knowledge of the specific marketing project
- b. Familiarity (existing or past) with potential target groups
- c. Leadership qualities
- d. Potential for job advancement in the organisation
- e. Enthusiasm and motivation
- f. Innovative thinking.

MARKETING INFORMATION AND MARKET RESEARCH

A hospital or health care organisation should analyse all relevant statistical and other information already available within the organisation as a part of its routine record keeping function. Marketing information falls under two headings, viz.—

- a. Internal data about the hospital itself
- b. External data about the hospital’s competitors.

Marketing Information

Most of such information is generally available within the hospital or can be collected from elsewhere by the hospital's own staff. Information already available with the hospital is most often not viewed as marketing information. The organisation can avoid the unnecessary expense of original, systematic and professionally performed market research if it can answer its marketing related questions through analysis of these available data.

The difficulty is in being able to look at familiar information from a new perspective. The failure to use data that are already available or easily accessible to the management lies in the failure to recognise which of such data are marketing information.

Market Research

Market research is the objective and systematic process, of gathering, analysing and interpreting data relevant to a specific situation or problem facing an institution.

The value of market research lies in providing information that is complementary to marketing information because market research is original, objective and systematised research. It should be used only when information on specific issues is needed but cannot be obtained through already available marketing information. Such occasions should be very few and far between. The research should be performed with the aid of an outside professional agency with experience in the area of market research. A hospital should consider to carry out its own market research only if it has the complete skill and experience in research design, research methods, sampling procedures, questionnaire design, interview techniques, data analysis and data interpretation methods.

Market Research Questions

The questions most commonly addressed by market research personnel deal with low occupancy, low utilisation of services, response to introduction of new services, perceptions, preferences, potential demand, and usage patient—mix, identification of consumers unmet health needs and the like:

1. How do we get more privately insured patients?
2. How will the neighbouring hospital's new satellite clinic affect our market share?
3. Does the community need a specific service?
4. Why is patient census declining throughout the hospital?
5. Why is patient census declining in a particular specialty?

6. What does the consumer think about this hospital's specific services?
7. What are his attitudes towards the hospital/physical facilities/nursing care?
8. Does the consumer prefer another hospital because of a specific reason?

MARKETING PROMOTION

You may have the best of an idea or service. But people will not buy it if they have never heard of it or they are simply unaware of its existence. All goods or services may be well-developed, priced and distributed but they cannot sustain the market without effective promotion. It is not only significant that we improve quality to attract customers. It is even more impact-generating that we make available to potential users the required information and sensitise them regarding the services offered by the organisation, which necessitates innovative promotional measures.

What is Promotion?

In the simplest of terms promotion is broadly understood as 'communication' by marketers that informs, persuades and reminds potential buyers of a product or service to influence an opinion or elicit a response.

The *aim* of promotion is to move forward a product or service or idea in a channel of distribution, to inform and persuade customers to accept, recommend or use the service or idea which is being promoted. Promotion is a form of communication with an additional element of persuasion. The element of persuasion to accept ideas, products or service, etc. is the heart of promotion.

The Promotion-Mix

The communication or promotion mix comprises four ingredients, viz. (1) Advertisements, (2) Publicity, (3) Personal selling, and (4) All forms of sales promotion.

1. **Advertising:** Advertising is any paid form of nonpersonal presentation and promotion of ideas, goods or services. It is impersonal salesmanship for mass selling, a means of mass communication.
2. **Publicity:** It is nonpersonal stimulation of demand for a product, idea or service by placing commercially significant news about it in a publication, or obtaining favourable presentation of it upon radio, television or stage.
3. **Personal selling:** It is oral face-to-face communication and presentation with a prospect for the purpose of

making sales. There may be one prospect or a number of them in the personal conversation.

4. **Sales promotion:** It covers all activities other than advertising, publicity and personal selling. Such activities are displays, shows, exhibitions, demonstrations, camps and many other nonroutine selling efforts. Sales promotion tries to complement the other means of promotion.

There is also the '**word-of-mouth**' communication to accelerate the spreading over of marketing communication and public relations as a supplementary measure in the promotional strategy. It will be explained in more detail later.

From the point of view of ethics, none of the above promotional devices should mislead the consumer, abuse the findings of research, manipulate consumer behaviour or market conditions. They must be accurate, credulous and fair in making comparisons with others.

Advertising

Advertising can be a significant means of communication with the customers. Advertising helps in enhancing the level of perceived quality and thereby reduce the perceived risk. Various dimensions of service quality can be incorporated in the form of headlines, copy or caption.

Historically there has been some feeling that successful professional organisations do not need to advertise. This belief may not be as prevalent today as it has been in the past. Various channels are available in advertising. These are: Broadcast, print, outdoor, retail displays, cinema, telemarketing, audio-visual (radio, television), direct mail and internet.

Being one of the most visible ways through which an organisation communicates with its customers, the key differences between products and services should be taken into account in considering advertising strategy as follows:

1. **Intangibility:** Service providers should reduce the risk of buying an intangible product by customers by providing tangible clues about the service offering.
2. **Heterogeneity:** It may be appropriate to communicate in the advertisement a service guarantee or promise. Or to demonstrate the level of training of your staff.
3. **Simultaneous production and consumption:** The layout appearance of the physical facilities and the appearance and manner of the staff are critical advertising variables.

Advertising Strategies and Channels

Using appropriate advertising method to establish identification of the health care organisation should be one of the marketing goals. When a hospital achieves a unique therapeutic feat or a noteworthy achievement, the hospital need not wait for the media to pick up the story; rather, it should aggressively use marketing expertise to introduce their own story to the press/media. If properly and ethically applied, advertising can become a strong tool for the health care industry in publicising its services to customers. Among the areas that might be addressed are efforts to reduce costs, ways that the hospital shares services with other hospitals, methods used to make the financial (billing) systems more responsive to consumers and efforts the hospital will make to assist the consumer with getting into, through and out of the hospital smoothly.

The need is to advertise with more *creativity* without crossing ethical limits and publicise by developing a rapport with the media.

Advertising seems to be acceptable now without much reservation by health care institutions. The increasing use of advertising as a promotion mix is illustrated in four different advertisements that appeared in a local newspaper in a span of one month in a large city (Fig. 22.4).

Advertising exposure: The number of advertising exposures of a particular communication (advertisement) is determined by two factors: 'cover' or 'reach' and 'frequency'. Cover or reach is the proportion of a target audience reached by the advertisement, while 'frequency' is the number of times a particular audience has an opportunity to see/hear the advertisement message.

Advertisement impact: Different media vehicles can produce different levels of impact of an identical message.

Wearout: Advertising exposures may not have the same effectiveness over time. The effect of additional (repeat) insertions may, in fact, decline, resulting in diminishing returns for each unit of expenditure. There is usually a 'threshold' level of advertising. Once over this threshold, a saturation point is reached. Any further advertising leads to a negative or declining response, i.e. a 'wearout' sets in.

Wearout may be alleviated by broadening the media being used or alternatively by incorporating a more 'creative' or novel approach in the message.

Cost: The cost of media advertising could be prohibitive. The cost of using different media varies markedly. A true

message becomes more credible than if it was presented as advertisement.

- **Health exhibitions:** Health care organisations organise health exhibitions of various kinds to create awareness about their organisation and services and about general or specific health problems. Exhibitions offer the chances for potential customers to talk face-to-face with representatives of the organisation and the physical layout of the exhibition can give valuable tangible evidence about the nature of services on offer.
- **Special events:** In order to attract media attention and public attention the health care organisation can arrange an event which will create awareness about the activities of the organisation.
- **Medical camps:** General medical diagnostic camps or specialist camps for particular disease conditions serve the dual purpose of initiating treatment for poorer sections of patients and also initiating familiarity about the specialist capabilities of the health care organisation.
- **Sponsorship:** Sponsorship of various events is being increasingly used by service organisations to create awareness of the organisation. This could also be possible by health care organisations for appropriate events.

Publicity through above activities is likely to achieve maximum effectiveness if a clear plan is formulated, with a clear strategy for implementation. Implementing the plan requires carefully building up mutual trust with important media editors. However, it must be understood that evaluation of the impact of these strategies is difficult as publicity is usually used in conjunction with other promotional tools.

Personal Selling

Personal selling is defined as the personal presentation of services in a conversation mode with one or more prospective purchasers for the purpose of making sales.

Personal selling is often the most important variable in the development of customer expectations. If your doctor tells you are bound to be up and about on the fourth day of the operation, or that your reports will be ready the following morning then that is what the customer expects. However, personal selling in case of services does not occur in the same manner as it occurs in case of personal selling of goods by sales personnel.

Health service delivery involves human encounters whether face-to-face or more remotely via the telephone. The way in which the encounter develops can determine whether the customer walks away feeling pleased, satisfied,

annoyed, or victimised. Therefore, the service provider must choose their contact personnel carefully and train them to interact effectively with customers because these contact personnel are akin to salesmen in other organisations.

In attempting to mould the interpersonal skills of contact personnel who are akin to sales personnel service managers should ask themselves the following questions:

- Which staff are customer-facing? (It is not just the traditional technical staff but also the telephone operators, front office personnel, security personnel, the liftman, catering staff and the like)
- What ought they be communicating about the service?
- On what dimensions do consumers judge the standard of service delivery?
- What factors shape the expectations of each service encounter?

In health care services markets, the 'selling' of service and the 'performance' of services cannot be separated. Indeed, *there is no separate sales force* like in selling goods. So this separation of selling role may be unrealistic in practice. Secondly in health care services market, these market dominated ways of influencing sales for service products is not necessarily the most effective. Customers prefer to use more personal sources of information from friends and other contacts rather than entirely relying on outcomes of personal encounters with health care personnel.

Word-of-Mouth Communication

In case of services, especially services which involve some amount of uncertainty or risk like health services—consumers also tend to rely on word of mouth information from personal sources (e.g. friends, relative, gossip groups) than from nonpersonal sources like mass media. Therefore, word-of-mouth (w.o.m.) communication becomes a critical part of health care marketing.

Word-of-mouth communication can be *defined* as 'Oral, person-to-person communication between a receiver and communicator whom the receiver perceives as non-commercial regarding a brand, idea or service.'

Some important facts have emerged regarding w.o.m. communication in health care marketing are—

- a. Word-of-mouth is more effective in health care field than in other services categories.
- b. Word-of-mouth communication not only increases awareness and knowledge, but it also persuades and leads to action such as actually choosing the provider one has heard about.

- c. However, favourable w.o.m. communication cannot overcome personal negative experiences.
- d. Word-of-mouth communication increases as the level of customer satisfaction increases. An emotionally positive experience with a health care provider increases w.o.m. and satisfaction, which, in turn, raises the odds that w.o.m. will be positive. So health care marketers should seek a mandate to provide emotional highs to the patients and prevent strong emotional negatives.
- e. Health care organisations should encourage their employees (and their spouses) become involved in community and neighbourhood groups and to educate them on what to say when they get there.
- f. Consumers of medical care are more likely to engage in negative w.o.m. than to complain to their health care provider. Health care providers, therefore, must make a greater effort to make complaining easy and acceptable.

Sales Promotion

Sales promotion consists of all those activities which can help stimulate purchase of goods or services. Sales promotion is defined as “All the marketing activities other than advertisements, personal selling or publicity that stimulate customer purchasing and enhance dealer effectiveness”.

In health services marketing there are no dealers. Therefore, the latter part of the definition about dealers can be omitted while considering sales promotion in health care services. Sales promotion has also been described as any intermittent or short-term incentive designed to encourage purchase of a product or service but not always impersonal in nature, and usually nonmedia based.

Sales promotion can be used in three different ways:

1. It can be used merely to attract attention to a service in general.
2. It can be used as an incentive incorporating an offer which represents value to the target audience (for example, discounts on hotel room booking during particular season).
3. It can be used as an incentive to engage the audience in a transaction ‘now’ rather than later (e.g. ‘fly during the next three days and avail substantial discount’, in case of air travel).

Due to the special characteristics of health care services viz. intangibility, perishability, heterogeneity and simultaneous production and consumption, incentives incorporating offers which represent value to the customer and invitation to engage in the transaction ‘now’ do not apply generally to health care service offering.

Sales promotion tools: However, variety of sales promotion tools are capable of being employed by health services organizations as under:

Free visits/consultations: These encourage trial of a service. This could, for example, be used to cultivate customers as a follow-up of promotional lectures or interactive sessions with patients groups like diabetics, knee joint pain, obese patients with risk factor, etc.

Money-off price incentive: These can be used to stimulate sales of a new service shortly after launch or to counteract temporary increase in competitor activity.

Coupons/vouchers: This allows holders to obtain a discount of a future purchase and targeted at specific groups of user or potential users. For example, coupons/vouchers issues to regular customers for a series of tests and investigations at later periods. Voucher offers tend to be much more cost-effective than straight price incentives because of their ability to segment markets.

There are other methods of achieving sales promotion for services as under:

- a. Gift offers
- b. Competitions
- c. Short-term discounts
- d. Sign-up fee rebate for membership of some regular activities.

But because of the very nature of these promotional offers and ethical angle involved, these are of little or no value in health services marketing. In the end, it becomes apparent that sales promotion assumes least importance as a part of the promotion mix in health services marketing.

Public Relations

Public relations is an indirect promotion tool whose role is to establish and enhance a positive image of an organisation. It is defined as ‘the deliberate, planned and sustained effort to establish and maintain mutual understanding between an organisation and its public’. Public relations efforts seek to persuade people that the organisation is a worthwhile institution to be associated with. Health care services are most often evaluated very subjectively. Public relations facilitate this process of subjective evaluation and recommendation.

Many a times marketing is considered equivalent to or synonymous with public relations. It should be realised that public relations Directors are not trained in developing marketing studies that can result in management change, and few marketing managers understand the nuances of

management of public relations. Public relations have been covered in detail in another chapter in this book.

CONCLUSION

Broadly, health services marketing can be viewed as business activity that brings to the customers the service they want, at the time and place they want and at the price they can afford, and providing all the information the customer needs to make informed and satisfying choices. Health services marketing required a different treatment as compared to goods marketing because of the distinctive characteristics of services. These include intangibility, heterogeneity, inseparability of production and consumption and perishability. The traditional 4 Ps marketing mix becomes inadequate in services marketing because of its distinctive characteristics. The extended marketing mix of health service covers seven Ps, viz. Product, Price, Place, Promotion, People, Process and Physical evidence. The aim of health care marketing is to present an appropriate blend of these seven marketing mix elements.

A health care organisation can either hire the services of a marketing consultant or establish its own internal marketing department. A great amount of marketing information is available within the organisation itself and seldom is it necessary to carry out extensive market research.

An important target group of health care marketing comprises 'internal customers', i.e. the employees of the health care organisation itself besides customers, insurance companies, third party administrators and corporate employers. Promotion for marketing offers varied avenues for the marketing effort through the promotion mix of advertising, publicity, personal selling, sales promotion and public relations. In health care services which involves some amount of uncertainty or risk from customer's point of view, word-of-mouth communication plays an important role.

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Evaluation of Hospital Services

Services provided by a hospital incorporate elements which can be examined objectively, subjectively or both. Every enterprise is actively concerned with quality assurance by determining the quality of the commodity it produces and keeping in touch with consumers to secure their maximum satisfaction. As a result of advances in medical technology, introduction of complex diagnostic and therapeutic procedures, introduction of high technology and other sophisticated elements, some vital issues are being raised, such as: what is the quantum of output and degree of excellence of hospital service? What is the cost of operating the hospital? Is the hospital spending more because of inefficiency of hospital operation? Could the same quality of medical care be made available at lesser costs? What is the extent of patients satisfaction? What is the final outcome or end results in terms of indices like recovery rate, partial recovery rate, death rate, complication rate, etc.?

However, due to the diverse nature of activities, large number of variables and subjectivity, results are difficult to measure in hospital services.¹ By its vary nature, a great part of hospital output will always be intangible. Therefore, the measurement of tangible and intangible outcomes must go hand in hand, and no watertight compartmentalisation can be made between them. Because of this the evaluation process has greatly depended upon qualitative judgements in addition to quantified data in most instances.

Evaluation of hospitals is a challenge because of the variation in the intensity of care, equipment, personnel, and facilities in different types of hospitals. One cannot be sure that the instruments of evaluating the services in hospitals

could be made as sensitive, valid, accurate and specific as one finds in industry where accomplishments can be measured in terms of an accountable unit, viz., rupees and entirely by financial tools like profit and loss statement and balance sheet. Because of this multidisciplinary nature, medical care in hospitals does not lend itself to simple and direct units of measurement. What one can measure are therefore certain components or characteristics of it from which one can draw inferences and implications.

WHY EVALUATION?

The last stage in the management process, viz. evaluation is designed to measure the efficiency and effectiveness of the services after planning, organising, directing and controlling. No organisation worth its name can survive and progress unless it overcomes its shortcomings and builds upon its past performance. One cannot substitute form for substance and appearances for reality for all the time. Sophisticated technology in high-tech hospitals is equated with high quality care in the minds of both public and the providers, and high costs and quality are considered synonymous. Nothing can be farther from the truth.

Considered from all aspects, there are three main reasons which warrant objective evaluation of hospitals.

1. It is to safeguard interests of the recipients of hospital care. A layman cannot possibly judge for himself whether the care he is receiving is judicious and scientific. He has insufficient protection against malpractices, exploitation and inefficiencies of hospital's medical staff

and systems. Hence, it is the moral and legal obligation of the administrative and professional authorities to ensure that hospitals render safe and efficient medical services to patients. Besides, the legal accountability of the hospitals also cannot be overlooked.

2. It is to locate inadequacies and shortcomings of the hospital staff, its plant and machinery and what is most important, its working systems. Apparently, the hospitals' end-results cannot be good if there are no proper facilities or appropriate technical environment in which the physicians can work.
3. It is to provide the authorities, viz. governing body, board of trustees or owners a sound appraisal system of the effectiveness of managerial staff at various levels, hospital administrators and individual physicians, and furnish valid facts and data to regulate their future development.

Productivity is the relationship between resources used and results produced, i.e. the input-output ratio. A periodic assessment of the services will show the existing state of affairs, and therefore scope for corrective action for quality assurance.

Quality assurance aims at establishing a programme for monitoring and evaluating the quality of care, but is not synonymous with use of sophisticated procedures and invasive technology. It entails a cost-effective approach for optimum utilisation of resources and establishing ongoing quality control programme.²

What is Evaluation?

Evaluation has been defined as the process of determining the degree of success in achieving predetermined objectives. It is also defined as "Measurement of action against accepted criteria and interpretation of relationship amongst them". Appraisal, assessment, progress reporting, progress assessment, and review and analysis are some of the terms which have been used synonymously with evaluation.

Evaluation is one of the final tasks in the process of management (Fig. 23.1).

What to Evaluate?

In hospitals and health care, there are five indicators through which the quality of medical care and services can be assessed.

1. The organisation
2. The process

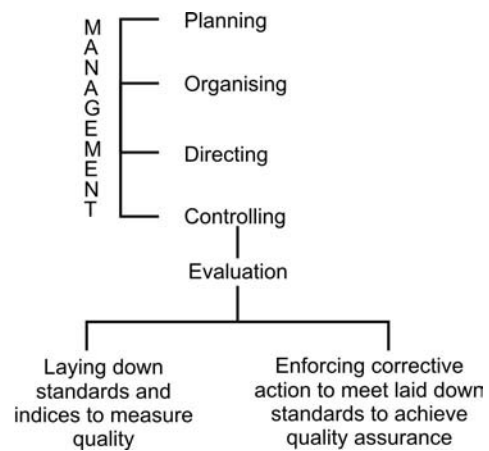


Fig. 23.1: Evaluation as part of the management process

3. The content
4. The outcome
5. The impact.

Traditionally, these can be grouped into three categories, viz. the means (structural factors), the methods (process factors), and the end results (outcome factors).

Evaluation of the "Means"

Evaluation of the "means" covers the inputs, ascertaining whether the hospital has been provided with optimum quantity and right quality of staff and physical facilities as in the shape of buildings, equipment, drugs, diet and supplies. Evidently, if the means are inadequate, the quality of hospital services would be of a low standard. Basically, this is an evaluation of the "organisation". The inputs that go into the production of medical care are the men (various categories of personnel), money, materials and machines. Effective utilisation of these resources determines the organisation's effectiveness.

The quality assurance committee has to ensure that there has to be a basic minimum infrastructure regarding space, equipment, physical facilities and the staff requirement. The type of organisation needed for each department or service, that is the authority-responsibility relationship, coordination and the budget has to be tailored to the need of each department keeping in view the overall hospital objectives.

Evaluation of the "Methods"

Evaluation of the methods is determining whether there is an *effective utilisation* of the available human and material resources and whether the hospital's policies and working

procedures are sound and judicious. Understandably, if the hospital's functioning and administration is poor, then the quality of its care cannot be of a good standard. This is an evaluation of "process" and "content" of the hospital care.

The quality assurance committee lays down the standing instructions for various procedures, patient documentation, and other records. The evaluation is carried out through many standing subcommittees like tissue, utilisation, therapeutic, nursing and infection control.

Evaluation of the "End-results"

Evaluation of the "end-results" means judging the effectiveness or ultimate outcome of the benefits derived by individual patient and the community from the hospital. This is an evaluation of the "outcome" and "impact".

The concept is summarised in Figure 23.2.

Evaluation studies of each of the above five aspects of a hospital's operations, i.e. the organisation, process, content, outcome and impact can be a very complex process. For example, the evaluation of organisation and process requires detail analysis with the help of operations research techniques and quantitative methods. On the other hand, a lot of subjectivity is involved in evaluating the range, quality and quantity of services provided by the hospital.



Fig. 23.2: Conceptual framework for evaluation

It is not always possible, or even necessary, that evaluation of all the above should be carried out simultaneously, although the need for such simultaneous evaluation is apparent in the overall context. But since the objectives, and derivative objectives of hospitals are not available in clear terms, sometimes what is only possible is evaluation of output—both in terms of qualitative and quantitative determinants, and evaluation in terms of cost and utilisation.

Difficulty with Outputs

Nevertheless, a hospital does not have just one output. A medical ward may "produce" deaths and discharges and occupied bed days, the hospital laboratory may produce different types of investigations unrelated to each other in their complexity and cost, the OPD "produces" outpatients treated, and so on. Thus, many different types of outputs are involved and each must be matched to the appropriate input(s).

Then, some outputs may be ends in themselves, and others the means to an end. A hospital is not primarily an institution to produce meals, nevertheless meals prepared per cook or distributed per catering assistant is as valid a measure of catering performance as admissions per bed is of overall hospital performance.

All outputs must be measurable but unfortunately, many cannot be precisely measured. Therefore, in the hospital evaluation will contain many performance measures which are qualitative; it will also contain other ratios which may not measure performance but which only help to explain levels of performance.

STEPS IN EVALUATION

There are five steps in the process of evaluation.

Step-I: Definition of the Purpose and Scope of Evaluation

In step I, the scope will have to be stated in such terms like whether it will be with reference to technical considerations, administrative considerations, consideration of effectiveness or efficiency, or a combination of one or more of them.

Step-II: Detailed Description of the Hospital System and Its Operation

One needs to clarify and define the objectives of the hospital in as specific terms as possible, the steps, activities and

procedures that are carried out, the details of administrative machinery that performs the various activities and the cost of all these activities.

Step-III: Determination of Indices and Criteria for Measuring the Achievement of Objectives

An index is an instrument or measuring device which measures on a sliding scale the achievement of a particular objective or set of objectives, whereas criterion is the particular value, on the measuring scale which defines success or failure in absolute terms.

For proper measurement, any index should have the following three important characteristics.

1. It should be *specific*
2. It should be *sensitive*
3. It should be *reliable*.

An important step in evaluation is to prescribe the standards of what we shall accept as satisfactory performance. Evaluation has no meaning unless we establish some yardsticks and formulate means, by which one thing can be compared with another. For that we must first determine all possible characteristics and components of technical and administrative services. Thereafter, we should consider what should be the desired "level" or "par" of each characteristics. This is generally the most difficult part in evaluation of hospital services.

The five basic aspects involved in hospital operations are *facilities, personnel, procedures, organisation and professional management*. Standards to be achieved, or desired, will have to be developed for each of these aspects. Leaving aside the crucial aspects of accuracy of hospital data, there are no recognised benchmarks against which objective judgements can be made. Whether a high bed turnover rate is good or bad will depend on local circumstances, because hospitals within a given classification vary widely in size, location, design, resources and skill. Despite attempts to "standardise" hospital characteristics, it will always be impossible to ensure that like is being compared with like. And, interhospital comparisons must be interpreted with considerable caution.

Performance indicators are only indicators and not measures of performance: It needs to be emphasised that in India we do not have universally accepted norms on any aspects of hospital performance. Therefore, application of specific figures to any individual hospital must be as a guide only, with interpretative understanding of conditions within that hospital. Simple indices can be misleading, and sophisticated

analysis has limited impact. Higher or lower figures than average or generally acceptable standards do not necessarily mean worse or better hospital services. They mean attention is called to a situation which differs only from the usual norm, and which may or may not be fully justified, but, in any event, should be explained. Thus, administrators are led to investigate problems highlighted by performance indicators at the work areas by talking to the people involved.

Step-IV: Preparing and Execution of Evaluation

Plan and design of the study will now have to be prepared and executed utilising the various methods such as, observations, interviews, study of documents and records.

Step-V: Reporting the Results of Evaluation

In step-V, the reports will include broad facts of the study and conclusions reached. Recommendation if required could also be submitted, with suggestions regarding alternative courses of action and modification in the present procedures.

External Evaluation or Internal?

Probing into one's affairs by others is liked by no person. To some extent this is also true of an organisation. Evaluation by an external agency or persons outside the organisation is, therefore, likely to elicit less cooperation and support from the concerned persons. Therefore, it should be restricted only to major studies requiring help of professionals. Otherwise, as an ongoing process, evaluation is best carried out as self-evaluation by the administrator with the help and cooperation of the personnel of the department or concerned area. Even periodic one-time evaluation of major problem areas can be carried out by administrator with little external help.

FACTORS WHICH INFLUENCE HOSPITAL SERVICES

A number of factors contribute to the quality of care. The extent to which a hospital tries to achieve better standard with regard to these factors will reflect upon quality of hospital services. The factors are as follows.

1. The Hospital Staff

Care in hospital involves four types of hospital personnel, viz. (i) the medical staff, (ii) the nursing staff, (iii) the paramedical staff, and (iv) general unskilled labour.

Obviously, an adequate number of each of these categories of personnel should be available on the basis of certain established standards, such as one doctor or one nurse for so many patients, a technician for so many tests, a radiographer for so many radiographs to be taken, a ward orderly for so many beds, and so on. Thereafter, the availability as well as effective utilisation of this staff has to be ensured by making rational assignment of duties, authority and responsibility.³ The points that should be noted are as follows.

Number authorised and available: Is additional manpower in any of these categories based on workload.

Qualification and experience of the staff: Is it adequate?

Availability of specialist or consultant staff: Are they available when needed or when their services are called for? Can honorary staff fulfil this requirement? Proportion of honorary staff to full-time salaried staff.

Absentee rate: Apart from the sudden absence from work due to common cause such as indisposition and planned leave of absence, is there any large scale absenteeism?

Disciplinary cases: Undue proportion of cases initiated against staff shows serious lacunae in personnel policies.

Avenues of promotion, pay structure, housing and health benefits and other perks: These have a bearing on job satisfaction.

Continuing education and in-service training of all categories of hospital staff in their respective spheres is necessary to keep up the standard of services. Regular organised programme should be designed and made available for in-service training of personnel. Besides, suitable incentives should also be provided by the hospital for enhancing one's qualifications.

2. Physical Facilities and Equipment

The location of various departments within the hospital, design of the wards and relationships of nursing stations to the patient beds should be such as to promote smooth flow of patient care activities. Adequate space, good design, functional layout, clean and pleasant environment all contribute to better services. Availability of necessary equipment, both technical and commonplace, in good working condition at the right place also affects patient care.

3. Clinical and Service Facilities

Adequate and appropriate clinical facilities are the most fundamental requirements for good patient care which is

the reason for the hospital's existence. The clinical units should also be complemented adequately by diagnostic and supporting departments, viz. pathology, radiology, blood bank, linen service, diet service and so on. These departments should be organised around the clinical services routine so that they provide effective service to the clinical areas. Coordination and synchronisation of work in these two areas will increase the work output as well as effectiveness.

4. Load of Work

Load of work on a particular hospital (or department within a hospital) affects the quality of care and serves as an index for augmentation of resources and inputs, or otherwise. The workload can be assessed from routine hospital statistics. Comparison of figures of one period with that of the previous period or corresponding period of previous year can give an idea of the trend of workload and utilisation of hospital facilities.

5. Effective Use of Beds

A hospital bed is the basic unit of hospital service. Utilisation of hospital beds is a factor contributing to, as well as a measure of, quality of care. Effective use of beds means:

1. Only patients requiring admission are hospitalised.
2. A patient should remain in the hospital for the minimum number of days so that more number of patients can be treated on one bed in the year. But this will have to be balanced keeping in view the patients' condition. Too drastic a reduction may increase the frequency of readmissions.
3. Assessment of the patients admitted in a ward should be carried out frequently both by the senior medical staff and hospital administrator to find out unnecessary admissions or unduly prolonged stay.
4. The outpatients services should be efficiently conducted to minimise demand on inpatient beds.

6. Hospital Administration

Management has become a science and management of a hospital both a science and an art. Hospital administration is more than institutional management; it is general administration, business administration, health and medical administration all combined together. Proper administration of a hospital by a trained and experienced hospital administrator would add to the efficiency and effectiveness of a hospital.⁴

Within the above framework, the organisation in terms of physical facilities equipment and human resources, the service provided in terms of quality, quantity and cost, and the extent of utilisation of the available facilities form the mainstay of a general evaluation of a hospital. To this must also be added the element of consumer satisfaction. The points to be covered under each of above are given below. In addition to this general framework, each individual functional area must also be looked into. Brief highlights are also subsequently given in respect to each of these areas.

ORGANISATION

Organisational Structure

1. Centralised or decentralised
2. Unity of command
3. Span of control of key functionaries
4. Authority and responsibility
5. Delegation
6. Coordination
7. Governing and executive body.

Facilities

1. General structure
 - Location
 - Architectural design
 - Internal traffic pattern
 - Roads, parking spaces, movement
 - Facilities for visitors
 - Environmental sanitation.
2. Primary facilities
 - Location, layout, functional relationships, operative policies and procedures with regard to
 - i. Wards/patient care units
 - ii. Outpatient department
 - iii. Emergency and casualty
 - iv. Operation theatres.
3. Supporting facilities
 - Location, layout, functional relationships, operative policies and procedures with regards to
 - i. Radiology
 - ii. Laboratory
 - iii. Blood bank
 - iv. Pharmacy
 - v. CSSD
 - vi. Laundry
 - vii. Dietary
 - viii. Medical records, etc.

Human Resources

Medical Staff

1. Organisational hierarchy
2. Number of medical staff
3. Qualification and training
4. Promotional avenues
5. Attitudes, ethics, bedside manners, cooperation and motivation
6. Job satisfaction
7. Service rules, regulations, byelaws
8. Committees—staff, medical audit, utilisation, tissue committee, etc.
9. Staff meetings, clinicopathological conferences.

Nursing and Technical Paramedical Staff

1. Number
2. Qualification and training
3. In-service training, advancement, promotional avenues
4. Attitudes and motivation
5. Job satisfaction
6. Grievance procedures.

Services Provided

Quality

1. Existence of medical audit or utilisation review committee and radiology, tissue and chart review committees
2. Unnecessary admissions, investigations, operations
3. Delay in admission, investigation, operations, consultation.

Quantity

1. Number of inpatients treated
2. Number of outpatients treated
3. Number of operations performed
4. Number of deliveries conducted
5. Number of radiographs taken
6. Number of laboratory investigation done.

Cost

1. Cost per bed day
2. Cost per medication
3. Investigation cost per inpatient
4. Investigation cost per outpatient
5. Total drug cost
6. Visible scope for economy in costs.

Utilisation

Utilisation of Inpatient Facilities

- Bed occupancy rate (BOR)
- Average length of stay (ALS)
- Bed turnover internal (BTI)
- Bed turnover rate (BTR)
- Dead bed space.

Utilisation of Outpatient Facilities

- Number attended
- Waiting time
- Service time.

Utilisation of Supportive Services

- Idle time
- Productive time.

The meaning of efficiency and productivity in medical care is not easy to define especially if it is to be expressed in generally accepted economic terms.

Consumer Satisfaction

- Extent of involvement of the community
- Number of complaints
- Staff attitudes to patients and visitors
- Extent of “left against medical advice” (LAMA) cases
- Popularity of the hospital.

It should be realised that patient satisfaction is only an indirect or proxy indicator of the quality of hospital performance.

Gross Results, Complications, Hospital Infection Rate

Gross Results

These gross results are the end results of hospital care in terms of patients:

- fully recovered,
- partly recovered,
- improved,
- not improved,
- died, and
- LAMA.

Complications

Complications may arise any time during hospitalisation. Usually the complication rate does not exceed 2 to 4 per cent.

Hospital Infection Rate

In ideal condition hospital infections should not occur at all. However, they do occur for reasons both within and beyond the control of hospitals. With all the care that the hospital can take, hospital infection rate should not exceed generally acceptable levels. Apart from attention to procedures pertaining to equipment, housekeeping, supplies and sterile techniques, precautions should be taken to reduce infection brought in by patients, visitors and hospital personnel.

INDIVIDUAL CLINICAL AND SUPPORTIVE SERVICES

Medical Services

Medical services are the sheet anchor of most general hospitals. They are so closely related to all other departments that sharp lines cannot be drawn to delineate specific responsibilities.

Policies and procedures should not only be available in writing but updated periodically. Consultations should be readily available and the organisational relationships with related specialities should be clearly understood. Therapeutic procedures must be only on written prescription of clinicians, consultants, and the audit committee must have clear and well-established criteria of professional care.

Surgical Services

Surgical services are the most spectacularly visible function of the hospital. In a general hospital, all branches of the surgical services—diagnostic, therapeutic and operation theatres are combined as one department.

Again, the policies and procedures should be available in writing. A “credentials committee”—the equivalent of medical audit committee of medical services, must have clear criteria regarding surgical procedures to guide it. All case records, including laboratory reports and consent to surgery must be complete prior to operation. The tissue removed at operations must be sent for pathology and the report available in patient’s record. A “tissue committee” should review all such reports. Policies should be laid down and procedures established with regard to hospital infection control, sterile supplies and safety standards.

Obstetrical Services

Obstetrical services are also organised like other department with policies and procedures peculiar to its requirement. Qualified staff should be available even off-time with

availability of consultants for complicated cases. Deliveries conducted and births and deaths must be properly documented and records maintained. There should be a system to investigate all maternal and infant deaths. Maternal death rate (ratio of maternal deaths to obstetrical discharges) in good hospitals does not exceed 0.25 per cent. Some infant deaths are inevitable, but newborn infant deaths should not exceed 3 per cent of all births.

Anaesthesiology Services

Anaesthesiology service is the least visible service in a hospital, but as important as others. Apart from the high professional knowledge and skill of the anaesthesiologists, the service should conform to all the standing policies and procedures. There must be a preanaesthetic physical check-up including relevant urine and blood examinations. Safely in operation theatres is normally assigned to anaesthesiology service. Standing order on safety regulations must be available and enforced. Deaths indirectly attributable to anaesthesia should not exceed one death in 5000 anaesthesias.

Laboratory Services

Services appropriate to the need of the hospital should be available, conducted and supervised by competent technicians and pathologists respectively, with appropriate system of maintenance of records of tests and standing orders and procedures. The calibration of equipment should be carried out regularly. Evaluation of procedures pertaining to sterile supplies, infection control and functioning of the "infection control committee" to monitor the above. All tissues removed at operations should be examined to establish agreement between preoperative and postoperative diagnosis, to check on normal tissue removed and to evaluate results. Normal tissue removed including appendectomies, hysterectomies and removal of hernia sacks does not generally exceed 10 per cent all operations. The tissue committee should establish criteria for surgical interventions for certain operations such as tonsillectomies, appendectomies, hysterectomies, caesarian sections and the like. Caesarian sections usually do not exceed 5 to 10 per cent of total live births.

Paediatric Services

Except in large hospitals, this service will generally be a part of medical service. However, in whatever way it is organised, the basic requirement is that it is geared for special attention to the peculiar needs of children and infants. The

physical facilities, policies and procedures should have been geared to these needs.

Radiology Services

Facilities, including the number of radiographic machines must be adequate to meet the requirement of the diagnostic and therapeutic procedures, with competent medical and technical paramedical staff. Policies and standing orders pertaining to radiation safety factors including accidental exposure hazards to personnel must be firmly adhered to. A fool-proof system of records of all radiological investigations should be in operation.

Outpatient Department

It should be an extension of the total hospital service itself, for those who do not require hospital bed care. The quality of care should be of a high standard, and all professional activities should be under supervision of a senior staff member. Adequate number of physicians should be available, with appropriate coordinated support from laboratory, radiology and pharmacy services. Adequate medical records including laboratory and radiology reports should not only be maintained, but a system of immediate retrieval should be available. Waiting time and service time per patient are two important indicators for outpatient care.⁵ Emergency and casualty services with appropriate staff should be available round the clock.

Physiotherapy and Rehabilitation

Physiotherapy and rehabilitation is increasingly becoming an integral part of general hospitals. The service should be operated under the direction of medical staff qualified in physical medicine and should also have appropriately qualified physiotherapy and occupational therapy staff. There should be a coordination with the surgical and medical services and outpatient department which feed this service. A committee of rehabilitation therapy should formulate the operational policies and procedures and evaluate results of care.

Nursing Services

Nursing services implement the physicians' plan of care and provides nursing care for the patients' assessed needs. The quality of hospital care is to a significant extent associated with the level of nursing care.⁶ There should be an administrative authority, the chief of nursing, with other

appropriate categories of nurses in adequate numbers. Again, there should be written policies, procedures in relation to the essential supplementary duties connected with supplies, linen, medical stores, diet and like. There must be available an appropriate number of nurses in all patient care units outside the usual hospital working hours. Student nurses must always work in the ward under supervision. Appropriate authority and responsibility should be delegated to the nursing staff. There should be periodic meetings of the nursing staff to discuss patients' nursing care and problems and to provide opportunity to improve their knowledge and skills.

Communicable Diseases

All communicable diseases must be reported to the local health authority. Isolation facilities must be adequate, with integral toilet facilities. Gowns, masks and gloves must be worn by attending staff and personnel, hands scrubbed after contact. Appropriate facilities for proper disposal of discharge from patients must be available. Mattresses, pillows, linen should be aired in the sun and linen sterilised. The walls and furniture should be washed after discharge of the patient, and the room aired for 24 hours before admitting new patient. Utensils, dishes and similar items used by patients should be boiled.

TOOLS OF EVALUATION

The methods that can be used for carrying out evaluation of medical care and hospital services are as follows.

1. Direct observations
2. Analysis of records and documents
3. Interviews with staff, workers, patients, visitors
4. Work study, activity sampling, organisation and methods (O and M) study and operations research
5. Analysis of medical records.

Evaluation of "Care" Services and Patient Welfare

When satisfactory treatment is assured, the patient still has the need for his or her stay in hospital to be made as free from unpleasantness as possible. "Measuring" comfort and ease of mind poses difficulties. Because the quality of medical and nursing care are not easily assessible nor patient satisfaction, the evaluation of patient welfare has therefore to be subjective. The important needs of the patients that must be satisfied are the craving for understanding of their illness, regard paid to their comfort and dignity, some degree

of privacy, rest and sleep, freedom from unnecessary noise, contact with family, suitable pastime, good food, smooth transition to other forms of care or return to home life. The methods used in evaluating these are direct observations, analysis of relevant records and documents, and information gathered through interviews.

Standards of services for such intangibles cannot always be quantified. Little headway has been made by hospitals of various state medical services, which are the biggest organised medical care systems, with setting of standards or spelling out elements of good practices for day-to-day services. Speaking of a nationalised health service, the NHS of UK has laid down standard practices in the facilities design, equipment, auxiliary services and many other areas which serve as readily available guides to achievement and evaluation. For example, on the waiting time of patients in the outpatient department, it was accepted that if less than 75 per cent of the patients are seen by a doctor within half an hour of their appointment time or if more than 3 per cent have to wait for an hour, the outpatient arrangements need investigation.⁷ All hospitals need to develop minimum acceptable standards in as many areas as possible.

Evaluation of Management Services and Use of Resources

Many obvious constraints result in poor care in hospitals. Insufficient resources in equipment, physical facilities, consumables and staff, and nonavailability of essential drugs and supplies cannot produce good patient care. Poor maintenance of buildings, plant and equipment and lack of skilled and motivated staff also compromises the quality of care. These become obvious even without any study. However, some methods developed by industrial management are of assistance in the evaluation of management services and the use of resources in hospitals.

1. *Work study*, the systemic, objective and critical examination of all factors which govern the operational efficiency of any specified activity in order to make improvements by optimising use of resources per unit of output is one such tool. The technique is suitable for application in industrial type departments such as laundry, kitchen, stores, central supply and maintenance.
2. *Organisation and methods (O and M) study* carries out a systematic examination of the organisational structure and the methods employed in carrying out work. This has applicability in the administrative as well as clinical areas such as laboratory, X-ray, central sterile supply department (CSSD), and nurse scheduling. The emphasis is on simplification, improvements and cost saving.

3. *Operation research* takes help of the technique of construction of an analytical model of the problem and a mathematical abstraction from the real situation. A solution is found by manipulation of the model. By changing one or more variables in the model's equations, it is possible to predict the consequences of the decision which the changed variables represent. It has been successfully used to assess the workload in radiology department, effect of improved OPD facility, on demands for beds, effect of starting an ICU on other services and many such predictions. However, the help of operation research specialist will have to be obtained for this.

The Tools of Evaluation

In spite of the many methods of evaluation of hospital activities with each type of activity utilising one or more of such methods, there are certain well-recognised but simple management tools in evaluating quality of care in hospitals. Different types of hospitals may use different tools or one or more of them in combination depending upon the peculiarities of each hospital. For example, daily inspections form an important aspect of ongoing evaluation in the armed forces hospitals, statistical quality control and cost controls are used in paying hospitals, whileas professional reviews and medical audit are important features of teaching hospitals. These tools are as follows.

1. Inspections
2. Reports and return (MIS)
3. Statistical quality control (SQC)
4. Professional reviews
5. Social surveys
6. Cost studies
7. Medical audit/comprehensive quality assurance programme.

Inspections

Inspections of all hospitals by the administrative medical officers and even consultants provide subjective or judgemental information, and yet they serve as a useful device to locate defects, weaknesses and deficiencies in hospital operation. They also lead to improving the established standards and result in innovations and further development.

A hospital inspection demands from the inspecting officer extensive knowledge and skills. Apart from the in-service

experience, common sense, pragmatism and intuition, the inspecting officer can apply all this better if he has acquired formal training in the fundamentals of certain formalised subjects such as hospital planning, biostatistics, work-study, work simplification, organisational behaviour and in general the principles of the modern management, for, the eyes cannot see what the mind does not perceive.

Inspections form a very important facet of hospital management in armed forces hospitals which stand out well apart from other hospitals in their appearances, cleanliness, orderliness and quality of care. Such inspections can be spread out over the week, each day of the week being earmarked to a specific area or sphere of activity in the hospital. However, it should also be realised that too routine a pattern of inspections can become boring and monotonous. In such cases, occasional surprise inspections would offer better feedback.

Reports and Returns (MIS)

Reports and returns from various areas of activity of the hospital are an important control device in that they are useful for assessing whether a situation is getting better or worse. They do so by comparing present performance with that of the recent past, and with that of corresponding period of previous years. Such trend information is a helpful guide to higher medical echelons in deciding what kind of corrective action is needed.

The information that can be generated out of the reports and returns could encompass the statistical indices some of which are mentioned below. These can be taken as starting points or guides, and additional indices developed as per each hospital's requirement.

- Average daily census wardwise, specialitywise
- Average length of stay (ALS)—wardwise or specialitywise
- Bed occupancy rate (BOR)
- Bed turnover rate (BTR)
- Outpatient clinics
 - i. Number of new cases
 - ii. Number of repeat cases
 - iii. Specialitywise break-up
 - iv. Unitwise break-up of cases
- Left against medical advice rate (LAMA).
Separate reports and returns may be called for which contain hospital utilisation data such as:
 - Number of X-ray done—for inpatients and outpatients, departmentwise and physicianwise
 - Number of laboratory investigations—their departmentwise breakdown

- Number of surgical operations, theatre occupancy time
- Number of physiotherapies
- General outpatients clinic—attendance, old/new cases
- Specialist OPD clinic attendance.

Other items of information can be added to the above list depending on the need of each of hospital. Reports and returns that can be generated by a small peripheral hospital will naturally be different from those of a district hospital, a private hospital or a teaching hospital. For purpose of efficient management, each will have to devise its own information requirement format.

Statistical Quality Control

Much management information comes from statistics. To get them right is an important as merely generating them. Statistics should present data in such a format that the hospital management can have at regular intervals an updated picture of activity in different departments.

Statistical quality control (SQC) is a management technique based on sampling, probability and statistical inference. Simple random sampling, systemic random sampling and stratified random sampling can be utilised. However, except in research projects simple random sampling would serve the purpose of most administrators. Sampling, if properly carried out is as accurate as the 100 per cent checking of the “universe”.

Whenever a process is carried out under controlled conditions some variations are bound to occur. However, such variations tend to fall in a specific pattern. Deviation from such a pattern is the result of assignable causes during the process. This deviation can be detected before serious damage is done, and the process can be restored to normal conditions with the help of SQC. This is the crux of SQC system. Help of a statistician in such matters would be of considerable help. However, such investigations can also be carried out by a hospital administrator with minimal training in statistical methods.

Professional Reviews

In evaluating the process and outcome, study of the structure of the organisation, i.e. the men-material- money inputs assumes only a secondary role. Professional reviews primarily evaluate performance of the medical and nursing staff, both on a concurrent and retrospective basis, thus, assuring the quality of medical care. This type of evaluation falls within the exclusive domain of the medical staff.

Professional reviews which may take the form of death review, X-ray review, tissue review and chart review attempt

to evaluate the physician's, and indirectly of the clinical supportive services performance. In death review, scrutiny of all fatal case documents can be used to adjudge the professional competence of the medical staff and provide useful feedback for policy planning. X-ray reviews try to ascertain whether screening of radiographic films could be avoided or reduced with more complete medical examination and detailed history taking, and also to find out whether any radiographic examinations were warranted but not carried out. Tissue reviews reveal whether surgery in certain cases was really necessary. Introduction of tissue reviews in many hospitals have brought down the rate of unnecessary hysterectomies and other injudicious surgical interventions. Periodic chart reviews of discharged patients evaluated comprehensively the performance of medical staff in rendering efficient medical care.

Social Surveys

Social surveys disclose social pathology.⁸ During the recent years, social surveys have become a regular feature in public health and can be effectively put to use in the hospital sector. A series of social surveys have been conducted to elicit the extent of patient satisfaction and degree of public image the hospital enjoys among the community. The surveys are conducted through questionnaires given to the patients as well as their attendants and visitors to the hospitals. The answer elicited through them reflect on different aspects of patient care. It is the patients who experience intimately at first hand the “cure” and “care” services, and are therefore able to offer valuable opinion on the adequacy of diagnosis and treatment as seen from their viewpoint.

Other people such as the patients' attendants and visitors come in contact with the highly visible aspects of hospital care like the housekeeping services, hygiene and sanitation, public relations and behavioural attitudes of the hospital staff. It is through the elicitation of opinions of the patients and the community that patient satisfaction, and the “image” of the hospital can be gauged. Needless to add, a hospital worth its name should constantly strive to maintain its image in a positive way.

Cost Studies

At what cost are the hospitals administered? We are mostly unaware of the capital and operating costs in running of hospitals. It is important to know whether these costs are excessive in relation to the health benefit they render. We should also want to know whether similar benefits can be provided at lesser costs.

“Costing” means the total cost of running the whole hospital or a department of the hospital. Unit costing means the cost of running one unit of service, e.g. cost per inpatient day, cost per outpatient attendance, cost per radiograph, cost per surgical operation, cost of one laboratory investigation, cost of drugs per inpatient, cost of diet per inpatient a day, per capita cost of drugs per annum and so on. Although there are limitations to cost studies, “costliness” can compare a hospital’s cost performance with a predicted value of what the cost of that hospital should be, given its particular case mix.

Medical staff generally have no clear-cut concept of financial implications of the services at their disposal. When the medical staff and hospital administrators realise the importance of these and other cost norms, it would have a beneficial effect on around cost reduction in hospitals, and the savings thus generated can be ploughed back to improve the quality of care.

Medical Audit/Comprehensive Quality Assurance Programme

To most people the word “audit” is familiar in relation to financial transactions justifying use of financial resources and thereby establishing guides for further financial operations. Hospital services are no exception to such audit, except that this audit directly relates to patients. Viewed as a means of justifying the use of medical care resources and thereby establishing a guide for future medical care operations, it has come to be known as the medical audit. The audit is based on the study of medical records in retrospect wherein questions regarding what was done for the patient, wrongful commissions and omissions, under or over treatment, justifiability and outcome are raised.

Springing from medical audit, comprehensive quality assurance system was a logical next step in the evaluation of the technical content of medical care that can encompass as many clinical disciplines in the hospital as possible and also the supportive services. Since the major output of hospitals is patient care, maintaining quality is a primary objective, and quality assurance becomes a critical control activity. Essentially a retrospective auditing process, quality assurance incorporates credentialing and the performance

assessment of medical and professional staff to ensure that patient care results are consistent with expectations. Monitoring activities include utilisation review of admissions, lengths of stay and readmissions. Some specific activity evaluations cover such areas as infection control, surgical case review, blood review, laboratory tests review, medical records documentation, and drug use.⁹

Medical audit has been separately dealt with in Chapter 29.

CONCLUSION

Evaluation of medical care services in hospitals encompasses the evaluation of the organisation, process, content, end-results and impact on users. In most instances, it is neither possible nor desirable to carry out such an exhaustive evaluation at one time except in rare instances. Evaluation in hospitals is complicated by the multidisciplinary nature of activities, diversity of staff, variation in the intensity of care of each patient and the intangible outcomes of medical care, thereby forcing qualitative judgements on the evaluations. What one measures is therefore only certain components and characteristics from which inferences are drawn and corrective actions are taken.

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SECTION

SIX

***Functional
Hospital
Organisation***

Hospital Linen and Laundry Service

OVERVIEW

Regular change of bed linen, provision of good, clean linen to patients and uninterrupted supply of required items of linen in wards and departments have a positive impact on the image of the hospital. Disturbed operation schedules due to inadequate availability of OT linen and complaints of poorly washed and infrequently changed bed linen by patients can be frequently found in hospitals. The importance of providing clean, adequate bed linen and patient linen at regular intervals and providing different types of linen for the varied requirements of various departments in the hospital needs no emphasis.

- a. The term “Linen and Laundry Service” includes the laundering of linen, storage of clean linen and repair and replacement of all linen. The service, therefore, has two components:
 - i. The laundry component responsible for efficient laundering operations
 - ii. The Linen management component comprising procurement, classification, holding, distribution, repair and replacement of linen.

The **aim** of the hospital linen and laundry service is to provide well-laundered linen for all requirements of the hospital in adequate quantities, at the right place, at the right time. This is possible only if the means to attain these objectives are controlled by the hospital itself. With the exception of small hospitals, these objectives cannot be met unless the hospital has its own mechanical laundry. In many western countries mechanical laundry is a part of the bigger hospitals. In UK every Regional Hospital Board has one or

more centralised laundry plants where from supply of linen is carried out to all the hospitals in the region, and many big hospitals in the region have their own laundry service. In USA also most of the larger hospitals own their own laundry plants, but some of the smaller hospitals engage contractors to supply all types of linen.

Two main **objectives** of laundry management are:

1. To maintain a daily balanced the number and type of articles required by the central linen room
2. To achieve the minimum total cost per article laundered without lowering standards.

HOSPITAL LAUNDRY VIS-A-VIS COMMERCIAL LAUNDRY SERVICE

The services rendered by a hospital laundry are radically different from that provided by a commercial laundry. A commercial laundry processes household linen which includes large percentage of pieces that must be marked, ironed by hand and sorted. On the other hand a hospital has large percentage of large pieces such as sheets, blankets, gowns and towels which require no handwork or sorting. *Commercial laundry practices should therefore not be followed in planning a hospital laundry.*

Hospital laundries are more reliable, cause less damage to linen, are more economical and reduce the danger of nosocomial infection. Mechanical laundry is safe, dependable and economical in the long run. Its other advantages are that regular linen supply is assured with limited inventory, safe handling of soiled and infected linen and complete control of the washing process.

While planning a hospital, mechanical laundry should be included in the initial study in order to provide adequate space and a suitable location. All types of laundry machines create varying levels of noise. A mechanical laundry is thus a noisy place. However, with sound-insulated equipments and proper ventilation the laundry plant can safely be located in the hospital building.

LINEN CLASSIFICATION

Linen used in hospitals can be classified into general purpose linen, patient body Linen, bed linen and OT linen.

General purpose linen: This includes curtains, drapes, table cloths, counter panes and similar items commonly used in all parts of the hospital. This is the linen which is not used for direct or indirect patient care.

Patient linen: This consists of patient clothing such as pyjamas, shirts, gowns, coats, etc. worn by the patients.

Bed linen: This consists of patient bed clothing such as bed-sheets, pillows, blankets, etc. used by the patients.

OT, labour room and procedure room linen: This includes clothing such as pyjamas, shirts, petticoats and tops worn by surgeons, anaesthetists and OT personnel and also surgical gowns, caps, masks, trolley covers, OT towels, DL wrappers, leggings, etc. required in operating rooms, labour rooms or procedure rooms, etc.

LINEN REQUIREMENT FOR HOSPITALS

Traditionally, for laundering purpose, linen is measured in terms of weight rather than in numbers or size of articles. Linen requirements of general hospitals vary from 3.5 to 7 kg per bed per day in western countries. The average for general hospitals in India is about 3.5 kg per day. It should be determined more definitely by analysis of requirements by each hospital. The above figures are for purposes of laundering processes and are for dry weight. On an average the percentage by weight of different types of linen are as follows:

1. Flatwork (sheets) – 70 per cent
2. Rough finish (towels, OT and labour room linens) – 22 per cent
3. Hand finished 8 per cent.

Weights of various items used in hospitals is given in Table 24.1.

Table 24.1: Weights of items of hospital linen

Item	Weight
Surgeons shirt	200 gm.
Surgeons pyjama	200 gm.
Surgical gown	500 gm.
Cap	15 gm.
Mask	15 gm.
Ladies head wear	30 gm.
Patient’s shirt	250 gm.
Patient’s pyjama	250 gm.
Patient’s petticoat	200 gm.
Patient’s jacket	200 gm.
Pillow cover	150 gm.
Bed sheet	700 gm.
Draw sheet	350 gm.
Abdominal sheet	500 gm.
Trolley cover	350 gm.
Blanket	1000 gm.
Baby blanket	350 gm.
OT towel	400 gm.
Mackintosh cover	350 gm.
Bath towel	700 gm.
Hand towel	250 gm.

Note: These are weights of cotton fabric. The actual weight will depend on the quality, thickness and blending of fabric with polyester yarn.

Norms for Linen per Bed (Bed Linen and Patient Linen)

A hospital should have 6 sets of bed linen per bed; one in use, one ready for use, one being processed in laundry, one in transit, and two as reserve for weekends, holidays and unforeseen requirements.

The suggested norms are:

1. Bed sheet (54’ ’ × 90’ ’) – 6 per bed
2. Draw sheet (44’ ’ × 60’ ’) – 3 per bed (Not all patients require draw sheets)
3. Pillow cover – 6 per bed
4. a. Shirt and pyjama for males - 3 per bed } 20%
 b. Blouse and petticoat for females - 3 per bed } extra
5. Patient towel – 3 per bed
6. Blanket – 1 per bed (20% extra)

This scale is adequate for a daily change of bed linen and alternate day change of patient linen. If the hospital policy requires daily change of patient body linen also, the requirement of such items will increase accordingly.

This scale is also based on the assumption that the hospital has its own functioning mechanical laundry.

OT linen, labour room and procedure room linen should be determined based on anticipated workload.

Classification of Linen for Laundering Purpose

From laundering point of view, hospital linen is classified into following categories:

1. Dirty (used) linen : Ordinary washable linen
2. Soiled linen : Soiled with blood or body fluids
3. Foul linen : Soiled linen with crusts of body fluids and smelling foul. Foul linen is not necessarily infected
4. Infected linen : Linen which is considered by clinicians as infected
5. Foul and infected linen : Foul linen lying untended for more than six hours can be considered as infected linen.

The above classification assumes significance because all linen received by the laundry will *require segregation at the point of receipt accordingly*. The soiled, foul and infected linen has to be pretreated before it is subjected to the usual laundering process.

CENTRAL LINEN ROOM

The hospital linen service operates through the Central Linen Room under the Linen Supervisor. Linen Room facilities are designed to maintain all linen supplies to the hospital. This room should be adjacent to the clean end of the laundry. If the laundry is located in an adjacent building of the hospital, the central linen room should be located near the entrance to the laundry.

The function of Central Linen Room is to supply all linen supplies for the entire hospital. Arrangement for mending and sewing of damaged articles is provided here. This room should be sufficiently large to hold at least 48 hour supply for the hospital. Adequate shelf space should be available. Shelves, racks, linen folding tables and closets for storage of small articles are the other items needed in the Central Linen Room. Space for parking of linen trolleys must also be catered for.

Location: When the laundry is in the hospital building the Central Linen Room should be located adjacent to the “clean” end of the laundry and with convenient access to the lifts. If the laundry is located in a separate building, the Central Linen Room should be adjacent to the entrance through which clean linen on trolleys is delivered to the hospital.

Sewing room: Sewing room is an integral part of the linen supply service and should be under the overall control of

linen supervisor. All linen repairs should be carried out in the central sewing room to achieve rationalisation of work and economy of labour. Space for the sewing machine and operator should be provided in this room. Sewing room records should be restricted to a repair and condemnation book, a goods received book and a materials conversion book.

LAUNDRY EQUIPMENT

Laundry equipment should be arranged to provide an uninterrupted flow of linen from the soiled-linen room through the laundry to the clean linen storage. Washing machines should be placed adjacent to the soiled linen room, and the extractors close to the washers.

Washing Machines/Washers

Two types of washers are in use—side-loading and end-loading. Side loading type comes with open pocket cylinder, with or without cylinders, horizontal partition equipped with cylinders, and unloading type cylinders. Side-loading and end loading washing machines are shown in Figures 24.1 and 24.2 respectively.

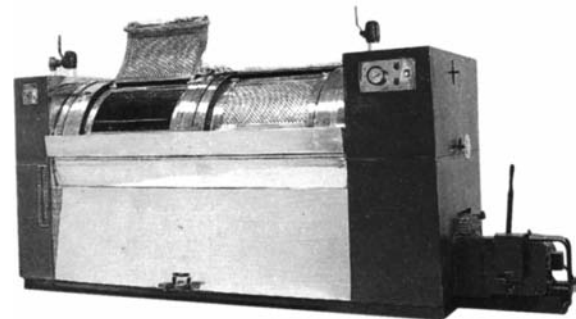


Fig. 24.1: Side loading washing machine



Fig. 24.2: End loading washing machine

End-loading machines are suitable for smaller laundries as they have a compact body and a space saving design. Side-loading machines are of heavy duty design, ideal where machines are used almost continuously. Capacities vary from 15 to 150 kg. Steam or electrical heating is available in both.

Washers should be placed adjacent to the soiled linen room and the extractors next to them.

A washing machine will generally produce six to eight loads per day. At least one or more large washer should be provided for the main load, with a smaller one to take care of special work in small quantities and odd lots.

Drains are required in the floor to receive water from washers. Drains should be of sufficiently large size, usually ten inches deep and broad, and should have removable screens to catch lint. Otherwise, accumulation and trapping of lint in the drainage system can result into clogging of the drainage system.

Hydroextractor (Fig. 24.3)

Hydroextractors, also simply called extractors, work on the same principle as a centrifuge for easy removal of water after the washing cycle in the washer. Capacities vary from 7 to 70 kg. A suitably placed shakeout table is used to separate the linen into various categories as it comes from the extractors. It should be located in such a way that it can be easily reached from the extractor and from where linen can be transported to other areas.



Fig. 24.3: Hydroextractor

Extractors should be located next to the washers because the linen to be transferred to the extractors is dripping wet.

Good vibration insulation is required for the foundation of these machines because these are self-balancing machines, with floating suspension. A heavy concrete base flush with the floor is satisfactory for this purpose.

Washer-cum-Extractor (Fig. 24.4)

This is a combination of a washer and an extractor in one unit. As the name suggests this equipment eliminates the use of hydroextractor as it combines the work of washing and extracting. Washer-extractors are offered by manufacturers for steam or electrical operation, and also with combined steam and electrical operation. At least one such machine in addition to all other machines is an asset for loads of small items which are to be urgently washed.



Fig. 24.4: Washer-cum-extractor

Dryer or Trumbler

A hydroextractor extracts almost 80 per cent of water from the linen, still leaving wet to a varying degree. A dryer brings the linen up to an almost dry state.

Generally available in an end-loading design their function is to dry the linen with forced draughts of hot air thrown over a continually rotating and tumbling load of linen. Tumblers come both with steam or electrical heating. One or more tumblers are required for rough finished work such as for OT linen. Two smaller machines are considered preferable to a single large one. In as much as they handle a large part of the wash which may not need ironing. It is desirable that they be located near the clean linen room. It can be located near a door into the clean linen room to reduce the distance which the rough, finished linen must be moved.

The air from dryers must be exhausted above the roof and the system equipped with lint catchers. A dryer is shown in Figure 24.5.



Fig. 24.5: Dryer (Drying tumbler)

Sluicing Machine

Before being sent to the laundry all badly soiled linen should have undergone preliminary wash to remove blood, faeces and other debris in the concerned ward/OT/labour room. It is imperative to remove all stains of blood, faeces, urine, etc. from used linen at the earliest. A sluicing machine is a must for this purpose. Part of the linen from operation theatres, delivery rooms, paediatric wards and infections wards invariably needs sluicing.

Sluicing consists of wetting the linen, treating it with stain removing chemicals and disinfectant, and giving it a copious wash before it is next sent to the washers. Sluicing machine is shown in Figure 24.6.



Fig. 24.6: Sluicing machine

Flatwork Ironer or Calendar

From the extractors, almost 70 percent of the linen goes to the flatwork ironer. Flatwork ironer, also called a calendar or calendaring machine, varies in the diameter of its ironing roller from 35 to 60 cm. The length of the roller can vary from 250-300 cm (100-125 inches). They are also available with single or multiple rollers and can have fixed as well as variable roller speed. Lifting is either pneumatic or manual and an exhaust system is incorporated. Choice of steam or electrical heating is available.

Most of the heat and vapour generated in a laundry is at the flatwork ironer. The principal exhaust ventilation should be from the area over the ironer. Enclosed canopies over the larger ironer facilitate the removal of hot humid air. The air should be exhausted above the roof. Flatwork ironer is shown in Figure. 24.7.

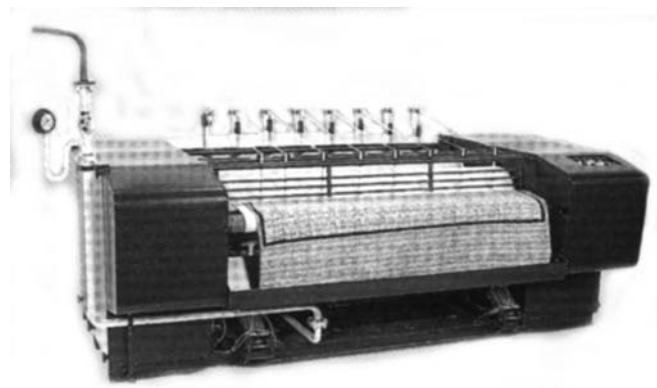


Fig. 24.7: Flatwork ironer or calendar

Presses

For finished press work, presses suitable to the items to be finished are required, e.g. pants/pyjamas or shirt/gowns. Properly designed presses can eliminate all hand ironing thus reducing labour costs.

1. *Flat bed press*: (Fig. 24.8) This is meant for general purpose and is offered by manufacturers in any required size. Lifting is pneumatic or manual, and steam or electrical heating is available. This press can take up all types of items for flat pressing which do not require elaborate pressing.
2. *Cotton legger press*: This is a general utility press for air operation. It has a light-weight head with fabric-safe plate. Lifting of the press or platform is manual or pneumatic and heating can be steam or electrical.



Fig. 24.8: Flat bed press

3. *Hand irons on ironing boards:* Ironing boards and hand irons are required for pressing small items or delicate clothing. In spite of mechanical flat bed pressing hand ironing cannot be totally eliminated.

Ample space should be provided for the press units for such items as uniforms, coats and trousers. As the press work constitutes the smallest percentage by weight of the work in laundry, press units can receive secondary consideration in their arrangement or allocation of space.

HARD WATER

Hardness of water is dependant on its content of calcium and magnesium salts. These are (1) Bicarbonates, (2) Sulphates, (3) Chlorides, and (4) Nitrates of calcium and magnesium. Calcium salts are twice as abundant as magnesium salts.

Water is measured for hardness in “parts per million” (ppm) of different salts. Hardness of various water supplies varies greatly. The range is from below 10 ppm to over 1,800 ppm. Water near the upper limit is unsuitable for use. The great majority of usable fresh water supplies have hardness in the range of 10 to 550 ppm.

Hard water supply is unsuitable because of its scale-forming and soap-detergent neutralising properties. Hard water forms scales in boilers, water heaters, hot water piping and fixtures. Hard water also neutralises soaps and detergents to form sticky, insoluble lime and magnesia compounds. This wastes large amounts of detergents and requires unusually large quantities of water. It also lowers the whiteness reflectance of linen.

Therefore in towns and cities where only hard water is available, a suitable water softening plant installation must be considered in consultation with water treatment engineering firms.

OPERATIONAL MANAGEMENT

Laundry Manager

Laundry efficiency is very sensitive to changes in the morale and utilisation of staff and therefore the ability of the manager to motivate and control staff is of paramount importance. The efficiency of his department is largely dependent upon the laundry manager’s skill and initiative. Technical competence is most important but unless this is complemented with management experience the laundry manager will not be fully effective.

Equipment

In order to achieve optimum machine utilisation, careful calculation and planning of machine times and matching of machine loads should take place during the planning stage for establishment of a laundry. The following important factors should be taken into account:

1. Machine capacities should be compatible, for example, a 50 kg load from the washer extractor having to pass to a tumbler dryer with a capacity of 30 kg.
2. Sequence of machine operations should be controlled to keep machine down time to a minimum.
3. Machine output will be reduced if:
 - i. Optimum machine cycle-times are exceeded, or even reduced.
 - ii. Machine output may be reduced if loads are not of the correct weight. Overloading machines is likely to involve longer cycle times. Underloading will be a waste of time and labour. Inefficient calendaring machine or over provisioning of calendar capacity may be highly uneconomical for labour.

PREVENTIVE MAINTENANCE

An effective programme of preventive maintenance should be established to minimise machine breakdowns to cause the minimum amount of interruption to laundry processes.

A plant register is an invaluable aid to management and should contain the following information:

1. Details of the laundry machinery showing date of installation, type, load size, etc.

2. The hourly and weekly capacity per machine.
3. The present hourly and weekly output per machine.
4. A record of lost machine hours due to
 - i. Breakdown maintenance/routine maintenance
 - ii. Staff absence
 - iii. Other reasons.

Siting of Machines

Work in laundry proceeds from sorting room to packing section by the shortest possible route avoiding back-tracing, thus reducing movement of linen and operators.

About two articles of every three are so called “flat-work” and machine-finished. Accordingly, this main route must be given top priority when siting machines in relation to each other. The layout of equipment must follow the sequence of operations. Machines should not be located too close or sited at right angles which prevent free passage with loaded trolleys. Machine doors which open towards each other can prevent simultaneous loading and unloading.

Schematic Layout of Laundry

Figure 24.9 depicts the schematic layout of a laundry planned for a 500 bed hospital.

Soiled Linen Room

Soiled or soiled and infected articles are held in sorting bins in the soiled linen room. Appropriate size loads are then prepared and fed to the sluicing machine. A number of laundry trays of sufficiently large size for soaking soiled linen should be available at the soiled linen room.

Containers for Infected Linen

Containers for infected linen should be waterproof, strong, cheap or disposable and light to carry. Light gauge polythene bags enclosed in a washable outer canvas are recommended. The outer bag should be appropriately coloured (see Biomedical Waste Rules for Colour Coding) and marked to identify the contents.

LAUNDRY EFFICIENCY

A comprehensive programme of improving and maintaining laundry efficiency on the principles of industrial engineering should include the following:

1. Product design
2. Sequence of operations

3. Work place layout and equipment
4. Staff training.

Correct laundering methods should be established for each class of article, to ensure that only the simplest methods are employed consistent with the standard of ‘finish’ strictly required for each type of article so that additional effort or time is not wasted to achieve a superior standard or finish than minimally required. To achieve this initial training of all laundry workers should be organised in an established hospital laundry. Overall efficiency depends on achieving the correct relationship between:

1. The workload
2. Machine output capacity
3. Operator performance

A laundry manager needs to reconcile the daily requirements of the Central Linen Room with his own need to maintain a balanced flow of work for the various laundering processes.

Performance Figures, Work Load per Worker

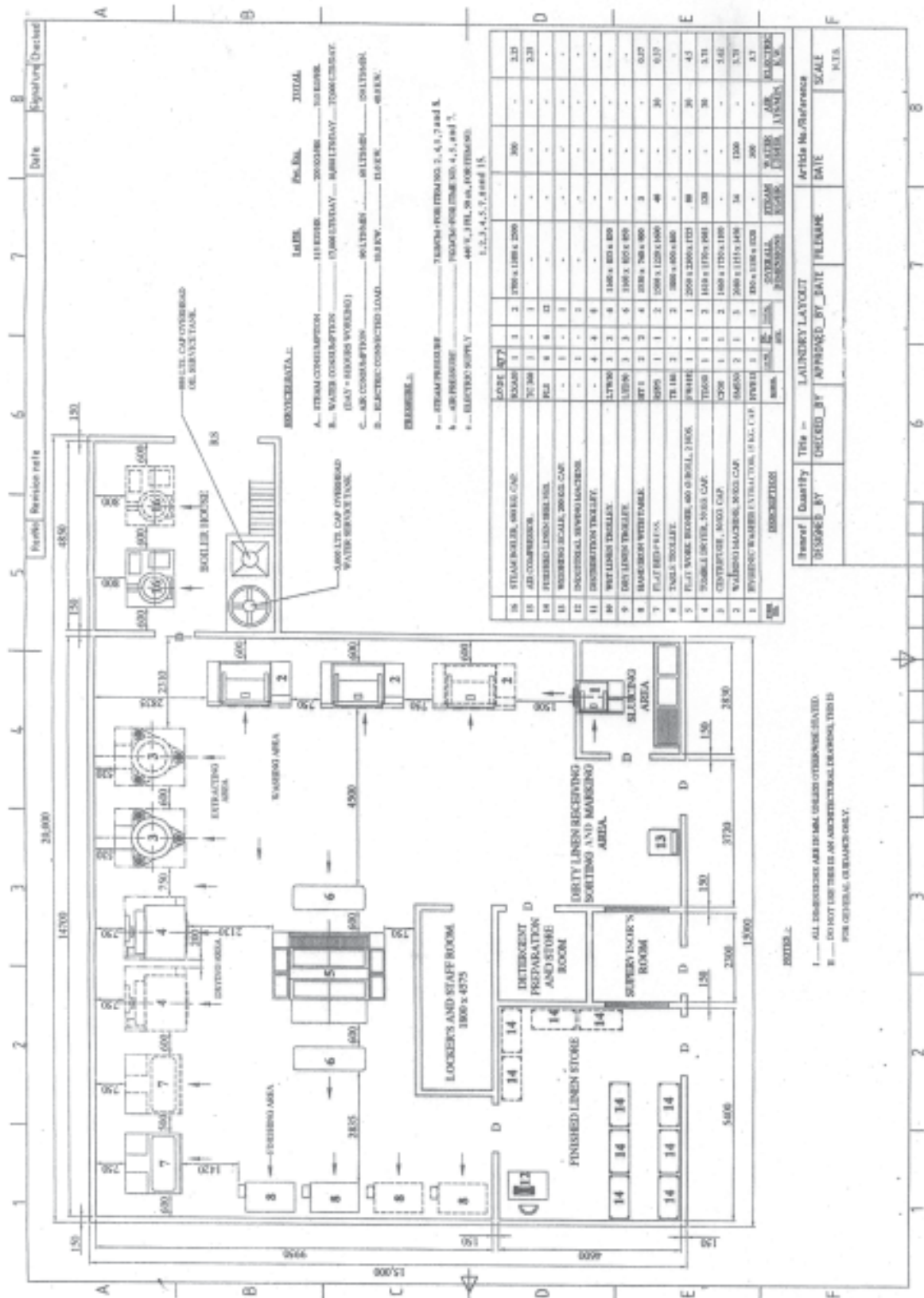
Staff

Performance figures have been produced after a series of production studies as per Hospital, O & M and Work Study Report No. 12, HMSO, London.

1. Sorting and Classification:
 - i. General Hospital : 400 articles per hour.
 - ii. Psychiatric Hospital : 460 articles per hour
2. Washing, including Hydroextraction:
 - i. Manual controls : 110 kg per hour
 - ii. Automatic controls : 135 kg per hour
 - iii. Wash/Extractors : 225 kg per hour
3. Tumbler drying : 385 kg per hour
4. Folding tumbled work : 250 articles per hour
5. Calendaring and associated preparations : 87 articles per hour
6. Pressing on machine and folding : 30 articles per hour
7. Hand ironing : 12 articles per hour
8. Packing and racking : 250 articles per hour.

Water and Steam

The quantity of steam consumed by the various laundering process is within the jurisdiction of the laundry manager. As an instrument of control the metered consumption of steam should be charted on a graph. It is the laundry manager’s duty to regulate the quantities used and maintain a record for steam control.



Either an insufficient or an excessive number of rinse cycle or incorrect 'depth' (water level) in the washers may not only give a low standard of cleanliness or reduced output but would waste water and steam. Manually controlled machines should not use more than 40 to 54 litres of water per kg weight and machine with automatic control not more than 16 to 19.5 litres per kg weight.

Laundering Cost

Total laundering costs have been shown, regardless of the level of output, to be more sensitive to productivity of labour than to any other factor, thus emphasising the crucial role of management.

Wages generally comprise about 59 per cent of operating costs and about 41 per cent of total production costs. The number of articles processed per operator per week should not be less than 1600.

Disposable Items

Various articles for which, having regard to the actual underlying cost of laundering them, disposable substitutes may be preferable, e.g. face masks. The cost of introducing disposable items must be realistically assessed. Cost comparison must be made between:

1. The purchase price, storage cost and disposal cost of disposable items.
2. The actual cost of laundering the particular linen items plus its purchase price and estimated life.

In addition, other factors which also should be taken into account are the extra work created on the supply and

storage functions, the acceptability by staff, control of use and incidences of wastage. The following disposable items are commonly used in hospitals:

- Hand towels
- Serviettes/Napkins
- Bibs
- Bed-pan covers
- Urinal covers
- Tray cloth
- Face masks
- Operation caps.

Linen Distribution System

The main type of linen distribution system in hospitals are:

1. Exchange trolley direct from Central Linen Room to user units.
2. Topping up from the Central Linen Room at the user units.
3. Requisitioning and correction from Central Linen Room as on required basis by user units.

The Role of Laundry Manager

Operating a laundry is a labour intensive enterprise which is very sensitive to changes in the morale and utilisation of staff. The laundry manager has not only to be a man of high technical competence, well-versed with all the technical aspects of laundry operations but also with competence in man management, with an ability to motivate and control the workers. Efficiency of a hospital laundry depends largely upon his skill, capability, competence and initiative.

Disposal of Hospital Waste

A hospital produces many types of waste material. Housekeeping activity generates considerable amount of trash, and the visitors and others bring with them food and other materials which must in some way be disposed off. In addition to the waste that is produced in all residential buildings, hospitals generate pathological waste—blood soaked dressings, carcasses and similar waste. These waste materials must be suitably disposed of immediately lest they putrefy, emit foul smells, act as a source of infection and disease, and become a public health hazard. While in developing countries most of the public health problems are due to industrialisation, in developing countries many of the public health problems are also related to defective sewage and waste disposal.

Many of our hospitals neither have a satisfactory waste disposal system nor a waste management and disposal policy. The disposal of waste is exclusively entrusted to the juniormost staff from the housekeeping department without any supervision, and even pathological wastes are observed to be disposed off in the available open ground around hospitals with scant regard to aesthetic and hygiene considerations.¹

Hospitals are prone to create health hazards for the public at large and also for healthcare workers with unscientific disposal of biomedical waste. Management of biomedical waste also assumes great significance where countless poverty stricken rag pickers expose themselves to disease and death while eking out a living out of sifting and sorting of such waste. Among all the hospital waste, the ‘sharps’ i.e. needles, scalpels, blades, etc. are the most dangerous culprits, mainly because of their propensity to cause

accidental pricks and cuts thereby providing direct entry of pathogenic organisms into the blood stream.

“Waste” can be defined as any discarded, unwanted residual matter arising from the hospital or activities related to the hospital. “Disposal” covers the total process of collecting, handling, packing, storage, transportation and final treatment of wastes.

Volume

Rapid mushrooming of hospitals and nursing homes has resulted in unprecedented amount of biomedical waste being generated. In a study of pattern of wastes in Indian cities, the quantity of refuse varied from 0.48 to 0.06 kg per capita per day with total compostable matter varying from 30 to 40 per cent.² The quantum of domestic waste in advanced countries is six to ten times more. So far as hospitals in advanced countries are concerned, the average refuse in hospitals in Denmark and West Germany is 3 kg per bed per day and in USA up to 14 kg per bed per day.³ The quantum and type of waste reflects the life-style of the society, and this must be borne in mind in the planning of waste disposal in hospital.

On an average, the volume of total **solid waste** in hospitals in India is estimated to range between 1 kg and 3 kg per day on a per bed basis. In a teaching hospital of 700 beds, solid waste averaged 1.5 kg per bed per day.⁴ It is estimated that about 0.5 kg out of this consists of food waste. In a study carried out in the family wing of a large hospital, the composition⁵ of waste was bandages, gauge and cotton wool waste 34.1 per cent, coal ash 31.6 per

cent, foliage 13.5 per cent, food waste 11.5 per cent and glass, bottles, etc. 1.8 per cent.

A 1988 study at AIIMS revealed that 67.5 per cent waste originated from wards, 13.4 per cent from OPD and 19.1 per cent from the service area.⁶

Waste management is generally not given the importance it deserves for various reasons. The net result is that a hospital tries to cut down on the expenditure involved in waste disposal by meagre allotment of resources for this function.⁷ A clean hospital and good housekeeping have a direct effect on the health, comfort and morale of patients, visitors and hospital personnel alike. Cleanliness radiates cheer and a well-kept hospital would give the public a feeling of confidence. But in most hospitals waste handling is left to poorly educated sweeper category of workers, operating without adequate guidance, training or supervision.

TYPES OF WASTE

In general, **hospital waste** can be classified into two major groups. The first group comprises of mainly solid or semi-solid waste, and the second group mainly liquid waste.

Waste covered under Group I includes in Table 25.1:

1. Dry garbage	Ordinary floor refuse, papers, flowers, trash
2. Partially wet garbage	Waste from kitchen (fruit peels, left-over food, etc.)
3. Wet tissues and bones	From operation theatres, labour rooms, mortuary, laboratory
4. Plaster casts	From plaster room, OT
5. Packing materials	Cardboard cartons, paper packets, etc.
6. Surgical waste	Dressings, cotton pads
7. Metal waste	Tin cans, bottle caps, needles
8. Glass	Broken bottles, syringes
9. Disposable plastic items	From all areas in hospital

The **second group** of hospital waste covers sullage and sewage which emanates from bathrooms, lavatories, toilets, kitchen, pantries, operation theatre, dressing room, laboratory and laundry. The quantity of total liquid waste is estimated at 200 to 300 litres on a per bed per day basis.

A **third group** of hospital waste is the radioactive waste from radiotherapy and nuclear medicine department, usually in large teaching hospitals and specialist institutes. The quantum of such waste *per se* is very little, but requires an understanding of the principles of disposal of such radioactive waste. This highly specialised subject is not covered in this section.

Hospital waste disposal covers solid waste-whether biological or nonbiological-that is not intended for further use, including materials generated as a result of direct patient care activities. Such waste can be termed as medical waste, and includes infected waste that can transmit disease (e.g. microbiological waste, discarded laboratory glassware and materials, intravenous tubing, syringes, needles and dressings).

CHARACTERISTICS OF A GOOD WASTE DISPOSAL SYSTEM

Incidents of inappropriate hospital waste disposal and the fear of HIV and AIDS have drawn medical attention to hospital waste management practices.

There are conflicting views among the medical fraternity regarding hospital waste management but there is now a crying need to sensitise health administrators, especially in view of the Biomedical Waste (Management and Handling) Rules, 1998 promulgated by the Ministry of Environment and Forests, Govt. of India. Salient points of these Rules are reproduced in Appendix-V.

Any good waste disposal system should be planned for:

- i. Good appearance
- ii. Safety
- iii. Pest control
- iv. Odour control, and
- v. Public health safety.

The system should also be sanitary, economical and convenient.

During the planning stage, attention should have been given to the routes by which garbage and infected material are to be removed. In principle, firstly, the garbage and infected material should be removed from its point of origin by a direct (and shortest) route. In tall, multistoreyed buildings, a conveniently placed special lift only for garbage will be necessary.

Secondly, the movement of dirty and infected materials should be restricted to the minimum. Thirdly, handling and transportation of the waste within the hospital premises should also be minimised (Fig. 25.1).

COLLECTION AND REMOVAL

Whatever the final method of disposal, collection is an important aspect. The method of collection will depend upon the method of disposal. Collection can be done in waste baskets, plastic buckets or in trash carts. Waste baskets

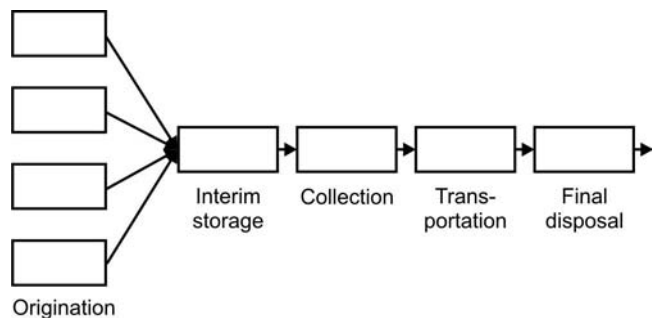


Fig. 25.1: Flow process: Hospital waste

made of metal are preferable to wicker or wood for ease of cleaning. trash carts should have sets of containers wherein after collection of a dirty filled container, an empty clean container is replaced in its place. Two sets of containers for all areas permit washing, cleaning, drying and airing of containers which is not possible with a single set. Laminated heavy disposable paper bags or cloth bags are used in some modern hospitals but are quite high on costs. Receptacles meant for trash, paper, disposed dressings and bandages, or other flammable material should be of metal and kept covered with a tight-fitting lid.

Timing of collection and removal should be convenient to all departments.

It should be avoided during the normal hospital routine or while the patients are resting. Collection and removal should be free from noise to avoid disturbing the patients. The method of removal has to be adopted to suit the layout of the physical facilities, but in majority of hospitals trash is collected at a central point on each floor and then removed from there for final disposal. Steps should be taken to keep the point of central collection clean. Trash in cans should be covered to avoid an unsightly appearance.

DISPOSAL

Waste disposal is a problem that is rapidly assuming alarming proportions.

There is no epidemiological evidence to suggest that ordinary hospital waste is any more infective than residential waste. There is also no epidemiological evidence that general hospital waste has caused disease in the community as a result of improper disposal. Therefore, identifying wastes for which special precautions are indicated is largely a matter of judgement about the relative risk of disease transmission. Bio-medical waste (Management and Handling) Rules, 1998 have removed all doubts about these aspects.

However, hospital wastes, for which special precautions appear prudent include microbiology laboratory wastes, pathology waste and blood specimens or blood products, infected waste which, in general, should better be incinerated or should be autoclaved before disposal in a sanitary landfill. All blood, suction fluids, excretions and secretions of infective cases may be carefully poured down in a drain connected to a sanitary sewer. Sanitary sewers may also be used to dispose of other infectious waste capable of being ground and flushed in the sewer.

Disposal of hospital waste has public health implications, as compared to such material from the community, because of the potentially dangerous nature of such waste as mentioned in the beginning of this section. Whatever the method of disposal, it has to be carefully chosen and regularly supervised. all hospital waste may not fall in the “toxic classification, but the waste emanating from the obstetric units and labour suite, operation theatres, laboratory, etc. can certainly be considered as hazardous waste, pointing to the danger to the environment and, thus, to public health safety and welfare.

In principle, the mode of disposal of waste is to treat the waste appropriately at the source itself, and then ensuring its hygienic transportation to the site of final treatment and that during internal transportation of the waste within the hospital, it should not come in close vicinity of patients.

GENERAL CLASSIFICATION OF WASTE

From the final disposal point of view, based on their combustibility and moisture content, waste has been classified into six types.⁸ (Incineration Institute of America) (Table 25.2).

Type 0 Waste: Trash

Type 0 waste is a mixture of highly combustible waste such as paper, cardboard cartons, wooden boxes and combustible floor sweeping from commercial, industrial and house-keeping activities.

This type of waste contains 10 per cent moisture, 5 per cent incombustible solids and has a heating value of 8,500 BTU/ lb.

Type 1 Waste: Rubbish

Type 1 waste-rubbish, consists of combustible waste such as paper, carton, rags, wood scrap, saw-dust, foliage and floor sweeping from domestic, commercial and industrial activities.

This type of waste contains up to 25 per cent moisture, up to 10 per cent incombustible solids, and has a heating value of 6,500 BTU/lb.

Type 2 Waste: Refuse

Type 2 waste—refuse, consists of an approximately even mixture of rubbish and garbage by weight. This type of waste is common to residential blocks, and contains up to 50 per cent moisture, 7 per cent incombustible solids, and has a heating value of 4,300 BTU/lb.

Type 3 Waste: Garbage

Type 3 waste—garbage, consists of animal and vegetable wastes from restaurants, cafeterias, hotels, hospitals, markets and similar establishments. This type of waste contains up to 70 per cent moisture, up to 5 per cent incombustible solids and has a heating value of 2,500 BTU/lb.

Type 4 Waste: Pathological

Type 4 waste—is human and animal remains consisting of carcasses, organs and solid organic wastes from hospitals, laboratories, abattoirs, animal pounds and similar source, containing up to 85 per cent moisture, 5 per cent incombustible solids and having a heating value of 1,000 BTU/lb.

Type 5 and 6 Wastes: Industrial Operations

Type 5 and 6 wastes are byproduct waste (gaseous, liquid or semiliquid and solid) from industrial operations.

Methods available for disposal of waste in general in hospitals:

The methods available in general for disposal of refuse are as follows:

1. Storage at a central point in the hospital area from where it is removed by the local municipal authority. In most public hospital, this method is being followed. Needless to say, this is the most unsatisfactory method, posing public health problems.
2. Refrigerated storage in cans in a walk-in type of refrigerated facility has the advantage of minimising unpleasant odours. This method is most suitable for food wastes in tropical countries.
3. Food scrap can also be flushed out in the sewage system. However, such scrap should be pulverised by a garbage-grinding device before being let out into sewage system.
4. *Sanitary landfill*: This method is suitable for smaller hospitals where all types of waste is filled in pits, each

filling being covered with a layer of loose earth, the layer of waste and earth alternating. A series of pits will have to be maintained.

5. Burning in incinerators.

Hospital waste disposal by unregulated sanitary landfill has been shown to be associated with prolonged survival and dispersal of potentially harmful microorganisms in the environment, and unregulated landfill disposal, as in our country, is definitely more hazardous.

BIOMEDICAL WASTE RULES—1998

Biomedical Waste (Management and Handling) Rules, 1998 have come into force for the management and handling of biomedical waste, and apply to all hospitals. The salient points of these Rules as regards classification, labelling and records are given below and in Appendix-V.

Salient Points of Biomedical Waste Rules

1. The “Biomedical Waste (management and handling) Rules, 1998” have been notified by the Central Government for the management and handling of biomedical waste. These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle biomedical waste in any form.
2. Under these rules “Biomedical waste” means any waste, which is generated during diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals, and including categories mentioned in Schedule-I, and “Biomedical waste treatment facility” means any facility wherein treatment, disposal of biomedical waste or processes incidental to such treatment or disposal are carried out.
3. *Treatment and disposal*: Every hospital is obliged to set up requisite biomedical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste, or ensure requisite treatment of waste at a common waste treatment facility or any other waste treatment facility.
4. *Segregation, packaging, transportation and storage*:
 - a. Biomedical waste shall not be mixed with other wastes.
 - b. Biomedical waste shall be segregated into appropriately coloured plastic containers/bags at the point of generation in accordance with colour scheme given in Schedule II and labeled according to Schedule III.

- c. If container is transported from the premises where biomedical waste is generated to any other waste treatment facility outside the premises, the container shall, apart from the label prescribed in Schedule III, also carry information as per Schedule IV.
 - d. No untreated biomedical waste shall be kept stored beyond a period of 48 hours.
5. **Authorisation/registration:** Every hospital generating, collecting, receiving, storing, transporting, treating, disposing and or handling biomedical waste has to make an application accompanied by prescribed fee to the State Pollution Control Board, or authority prescribed by them, for grant of authorisation.
 6. **Annual report:** Every occupier/operator has to submit an annual report to the prescribed authority by 31st January every year, to include information about the categories and quantities of biomedical waste handling during the preceding year.
 7. **Maintenance of records:** Every hospital should maintain records related to the generation, collection, reception, storage, transportation, treatment, disposal and/or any form of handling of biomedical waste which records shall be subject to inspection and verification by the prescribed authority at any time.
 8. **Accident reporting:** When any accident involving biomedical waste occurs at any institution or facility or any other site where biomedical waste is handled or during transportation of such waste, the authorised person shall report the accident to the prescribed authority forthwith.

Table 25.2: Categories of biomedical waste

Waste category	Treatment and disposal
Category No. 1 Human Anatomical Waste (human tissues, organs, body parts)	Incineration [@] /deep-burial*
Category No. 2 Animal Waste (animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospital colleges, discharge from hospitals, animal houses).	Incineration [@] /deep-burial*
Category No. 3 Microbiology and Biotechnology Waste (waste from laboratory cultures, stocks or specimens of micro-organism live or attenuated vaccines, human and animal cell culture used in research and infectious agents	Local autoclaving/microwaving/incineration [@]

Contd...

Waste category	Treatment and disposal
from research and industrial laboratories, wastes from production of biological toxins dishes and devices used for transfer of cultures.	
Category No. 4 Waste Sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps.	Disinfection by chemical treatment ^{@@} /Autoclaving/microwaving and mutilation/shredding ^{##}
Category No. 5 Discarded Medicines and Cytotoxic Drugs (waste comprising of outdated, contaminated and discarded medicines).	Incineration [@] /destruction and drugs disposal in secured landfills.
Category No. 6 Solid Waste (items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, beddings, other material contaminated with blood)	Incineration [@] /autoclaving/microwaving
Category No. 7 Solid Waste (wastes generated from disposal items other than the waste sharps such as tubbings, catheters, intravenous sets, etc.)	Disinfection by chemical treatment ^{@@} /autoclaving/microwaving and multination/shredding ^{##}
Category No. 8 Liquid Waste (waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities) discharge into drains	Disinfection by chemical treatment ^{@@} and discharge into drains
Category No. 9 Incineration Ash (ash from incineration of any biomedical waste)	Disposal in municipal landfill
Category No. 10 Chemical Waste (chemical used in production biological, chemicals used in disinfection, as insecticides, etc.	Chemical treatment ^{@@} and discharge into drains for liquids and secured landfill for solids

^{@@} Chemical treatment using at least 1% hypochlorite solution or any other equivalent chemicals reagent. It must be ensured that chemical treatment ensures disinfection.

^{##} Mutilation/shredding must be such so as to prevent unauthorised reuse.

[@] There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.

^{*} Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.

Contd...

Biomedical waste is categorised under ten categories for treatment and disposal, as under:

Thermal Treatment and Incineration

Disposal by burning is the most satisfactory method of disposal of solid waste which is recommended for disposal of all hospital waste. In thermal treatment, the principle mechanism of waste destruction is the use of high temperature and excess air. Thermal incineration is also preferable for disposal of hazardous wastes because of its high efficiency in destroying organic materials. A number of research and field scale projects have proved that the efficiency of this process surpasses any other in the destruction of pathological waste.

COLOUR CODING OF CONTAINERS

Colour coding of containers as laid down in the rules must be strictly followed which is given in Table 25.3.

Table 25.3: Colour coding and type of container for segregation, temporary storage, transportation and disposal of biomedical wastes

Colour coding	Type of container	Waste category	Treatment option
Yellow	Plastic bag	Cat. 1, Cat. 2, and Cat. 3, Cat. 6	Incineration/ deep burial
Red	Disinfected container/plastic bag	Cat. 3, Cat. 6, Cat. 7	Autoclaving/ Microwaving/ Chemical treatment
Blue/White translucent	Plastic bag/puncture proof container	Cat. 4, Cat. 7	Autoclaving/ Microwaving/ Chemical treatment and destruction/ shredding
Black	Plastic bag	Cat. 5 and Cat. 9 and Cat. 10 (solid)	Disposal in secured landfill

Notes: 1. Colour coding of waste categories with multiple treatment option as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in schedule I.
 2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
 3. Categories 8 and 10 (liquid) do not require containers/bags.
 4. Categories 3 if disinfected locally need not be put in containers/bags.

THERMAL TREATMENT TECHNOLOGY

Two types of systems, viz. the *Low Heat System* and *High Heat System* can be employed to achieve this. The low heat

system uses steam, hot water or electromagnetic radiation to heat and decontaminate the waste by operating at temperatures of up to 150 degree centigrade. High heat system uses the process of combustion pyrolysis to destroy the waste by operating at temperatures ranging from 600° C to 1500°C. Various kinds of thermal equipments which are used for treatment of hospital waste are the Autoclave, the Microwave system and the Incinerator.

1. Autoclaving

The process of autoclaving of sterilisation by steam under high pressure, generally used for sterilisation of instruments and linen in operation theatres and microbiology laboratories is now also available for final treatment of hospital biomedical waste.

Autoclaves can be classified into two basic types:

1. *Gravity type autoclaves:* Where air is vacuated from the treatment chamber by steam pressure alone. It operates with steam temperature of 120°-122°C and has a cycle time of 60-90 minutes to achieve full steam penetration into the articles to achieve complete sterilisation.
2. *Prevacuum type autoclaves:* Where a vacuum pump is used to evacuate air from the treatment chamber in order to reduce cycle time to less than 60 minutes, with temperature reaching up to 132°C for full steam penetration into the articles.

The important point to note is that proper temperature, pressure and *holding time* have to be matched to achieve desired level of sterilisation. Generally, all infectious waste should be treated at 121°C with holding time of 30-60 minutes.

Autoclaving reduces the volume of waste by a small amount, with plastic material melted and disfigured. Addition of equipment like *shredder*, *grinder* and *compactor* helps in shredding, pulverising and compacting the waste. This helps in volume reduction.

2. Microwaving

Microwaves are electromagnetic waves which enter into or penetrate materials. When exposed to microwave energy, molecules of a mass are put to vibration which produces heat, resulting in disinfection. Unlike autoclaving which heats the waste from the outside, in the microwave heating occurs *inside* the waste material. Maintenance of temperature of 95° to 100°C for a holding time of 25 minutes ensures that all microorganisms are killed.

Unlike autoclaving, microwave process is a more automated process. It results in volume reduction of the waste upto about 80 per cent of its original mass even though there is no weight reduction. However, one of the major disadvantages is that it is not able to penetrate large objects like amputated limbs and similar anatomical waste. Its capital cost and operational cost are quite high, besides requiring skilled operators.

3. Incineration

Incineration is a process by which combustible material is burned at high temperature under controlled conditions to convert waste into harmless mineral residue and gases.

Combustion of biomedical waste is a chemical process that involves rapid Oxidation of organic substances in the waste (notably carbon, hydrogen and oxygen). Complete combustion of organic constituents require exposure of the material to required temperatures and specified residual times.

From the initial incinerator technology of single-stage type where the waste was simply placed on a grate with underfire injected by natural draft and emissions let out directly into the atmosphere, the technology advanced to two-stage incinerators which employ the use of an after-burner with excess-air injectors. Volatile chemicals and combustion gases produced in the first chamber are heated in the second chamber to about 1050°-1100°C with excess air, and held at this temperature for a period of a few seconds. The main objective of this stage is to destroy all chemicals and volatile products produced during stage one, including dioxins and furans. A diagrammatic representation of a two-chamber incinerator is shown in Figure 25.2.

Even with this it is not possible to eliminate the polluting gases, which are barely visible particulate matter, and carbon monoxide due to incomplete combustion. Hydrochloric acid vapours produced on burning of chlorinated plastics, oxides of nitrogen due to nitrogenous compounds in the waste, heavy metals like lead, nickel, cadmium and mercury, and dioxins and furans which tend to reform when gases are cooled below 400°C in presence of particulate matter and chlorine.

Dioxins and furans: A special group of chemicals, these are persistent organic pollutants that can cause debilitating illness, and being carcinogenic can cause severe reproductive and developmental defects. Dioxins and furans are born of inefficient incineration technology.

They accumulate in the body via breathing, skin contact and though diet. They also harm the body’s natural immunity, and exposure to dioxins is a significant factor in genetic birth defets. Burning of plastics is a major source of dioxins and furans.

For effectively countering these problems, venturi ‘scrubbers’ are introduced in the incinerator to ‘scrub’ and filter acid gases—HCl, HF and sulphur-dioxide. The modern controlled-air incinerators burn waste in two chambers, under both starved-air of excess-air requirements. In the primary chamber waste gets dried, heated and burnt at 40-80 per cent of oxygen requirement. Combustible gases produced by this process are mixed with excess air and burnt in the secondary chamber with 100-150 per cent excess air requirement.⁹ Using a supplementary burner maintains elevated gas temperatures and provides for complete combustion.

Incineration reduces the volume and mass of the waste by 85-90 per cent which may finally be disposed of by landfilling.

For ease of understanding, different methods of disposal can be grouped under three main groups for final disposal (Table 25.4).

Table 25.4: Grouping of waste for final disposal

	<i>Final disposal</i>	<i>Waste category</i>
<i>Group-I</i>	Incinerate or Autoclave or Microwave	Category -1* Category-2* Category-3, Category-6
<i>Group-II</i>	Deep burial or fill in secured landfill (After disinfection by Chemical treatment)	Category-4, Category-7, Category-8, Category-10
<i>Group-III</i>	Deep burial or fill in secured landfill (After physical destruction/mutilation)	Category-5, Category-9

*For Category 1 and 2, deep burial can be done by hospitals located in towns with less than five lakhs population or in rural areas.

Choice of Technology

The medical administrator has to address the issue of hospital waste management from the point of view of technological feasibility, operational practicability and economic adaptability. All the technological options should be evaluated critically on the basis of a number of factors.

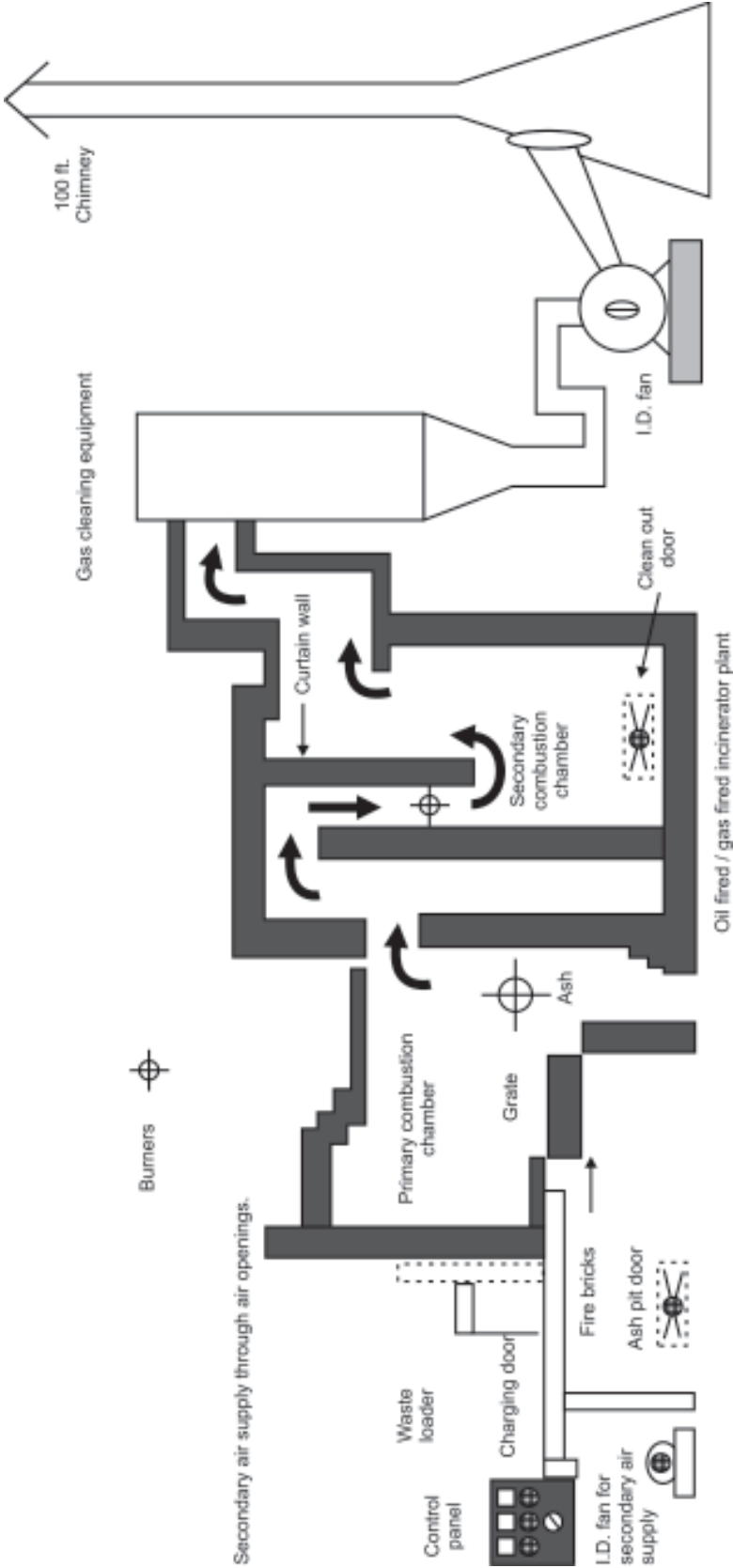


Fig. 25.2: Schematic drawing of oil fired/gas fired incinerator plant

For any system to succeed it needs the committed support of top level management, which in most cases may be found lacking because of low importance attached to waste disposal. It is related to the backdoor as the subject has no revenue value.

Of the various methods, only thermal incineration promises a total detoxification of organic wastes in any physical form. To make it cost-effective, it is normally used on concentrated wastes and is followed by energy (heat) recovery wherever feasible. Thus, it is the easiest, fastest, cleanest and perhaps the most economical system of waste disposal now and in the future. A comparison of the advantages and disadvantages of electric and oil-fired incinerators are given in Table 25.5. This compares on definitely tilts the balance in favour of oil-fired incinerators.

Table 25.5: Comparative merits of electrical and oil-fired incinerators		
	Electrical	Oil-fired
Energy	93 kw/hr for 40kg/hr load	2-2 kw/hr and 2.4 kg of light diesel/hr.
Pollution	Excessive smoke formation	Smoke - free
Temperature build-up	Very slow. 600°C in 6 hrs.	Very fast. 600°C in 30 min.
Maintenance	Failure rate high. Heating elements often burn up	Low maintenance

SEWAGE DISPOSAL

In towns and cities where the municipal sewage disposal system is in operation, the hospital sewage is directly disposal of into such a central system. In places where a municipal sewage disposal system is not available for some reason, the hospital will have to plan its own sewage disposal plant. Hospital liquid waste contains laundry waste (soap and soda

and greasy materials from hospital kitchen waste. A central municipal sewage disposal system is usually large enough to neutralise by dilution any possible adverse effects of these effluents. However, such effluents are likely to interfere with the biological process in the septic tanks of the hospital's own sewage disposal plant if not adequately death with. Incorporation of grease traps in the plant may have to be considered.

The effluent from the settling tanks of the plant can be safely discharged into the ground. The effluent can also be discharged into a river or *nullah* if final chlorination of effluent is done in a river whose water is used for domestic consumption along its course.

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Public Relations in Hospitals

INTRODUCTION

Due to a growing appreciation of human values coupled with improved socioeconomic conditions, the community's expectations from hospitals have undergone a sea change. A hospital is a part of social system. Firstly, it has to deal with professionals like doctors, nurses, technicians and other paramedical personnel. Secondly, it has to deal with personnel that are a part of the management services like dietary, laundry, supplies, housekeeping, accounts, watch and ward and so on. Thirdly, it has to deal with the patients, their relatives, visitors and the community at large. Therefore, the hospital must do more than to satisfy its actual customers. Apart from those who are attending as outpatients or are admitted as inpatients, there are all the potential customers in its catchment area who at some future time will need to call on its services.

Public relations are not only a summation of individual relations, but much more. These relations have their origin in the acts and attitudes of every worker and staff member who collectively mould the image of the hospital in the community. Current and ex-patients are the best (or worst) advertisement for a hospital. People cannot resist telling their friends and neighbours about a hospital experience, and from this emerges a series of pictures of the hospital which together make up its local image.

Public relations can be defined as the image of a hospital by the users and their peer groups. The image may be positive or negative, and is a combination of:

- i. impressions of the users and public,
- ii. attitudes of the people working for the hospital,
- iii. attitudes of hospital administration.

The intrinsic needs of each of the above differ. Patients want effective services and satisfaction and a sympathetic approach. Workers (staff) want job satisfaction and recognition by their peers and people. Hospital administration wants efficiency and maximum satisfaction of staff as well as patients.

PUBLIC RELATIONS SPRING FROM HUMAN RELATIONS

The patient including his family and relatives is a bundle of expectations, anxieties, hopes and fears. Whileas hospitals tend to judge themselves on formal levels such as number of beds, specialists, equipment, size of budget and so on, the patient is not interested in such statistical aggregates. Once in a hospital, he seeks satisfaction for his very special and private psychological and emotional needs.

A patient has needs for privacy of person—at least when he is not critically ill. He needs also the option of sociability when he is fit to socialise within the hospital. He has the need to be informed in general about his illness and progress. He needs freedom from pain when it occurs. He needs at least to be informed about the planning of his care. He has the need to be assured that he will not be abandoned at a time of crisis. The patient also needs to have confidence that people caring for him not only are good in their job but also know his special requirements. And he needs to feel the presence of the reassuring nurse who cares about what happens to him.

Depending on its image, a hospital is variously considered as a crisis place, a curing place or a trauma place. As a place, Canter¹ Considers the nature of the hospital as

resultant of the interaction of three major influences as under, and suggest that each of these should be constructively modified if we seek to humanise the hospital:

- i. the physical setting,
- ii. the activities which take place within, and
- iii. the conceptions held by users.

Even when the hospital is not dependent for its continued existence on the financial support of the community, it cannot properly fulfill its role unless it can win and maintain the confidence of the public which it is there to serve. Hospital administration must ensure that the hospital is serving the purpose for which it is created and is meeting the needs of those it serves. To meet this aim, all those concerned with the hospital have to make a conscious effort to project the correct image of the hospital. This effort on the part of a hospital is nothing else but the essence of public relations in practice.

Public is becoming more and more conscious of their rights and privileges and are expecting a higher standard of service. They cannot evaluate the professional quality of care, but they do evaluate the food, linen and housekeeping services and behaviour of the staff. They are generally grateful to the attending physician, but they may not be so grateful to the hospital for the bed, board and other services. It is the public for whom the hospital exists. **Therefore, public relations have to stem from the involvement of every single individual working for the hospital, as every action by every such person is an act towards public relations.** There is a need to dispel from the minds of the physicians working in a hospital the notion that public relations is the task of the administrator alone. **The image of the hospital reflects through the behaviour of every member of the staff (Fig. 26.1).**

A battery of health professionals have frequently to interrupt the patient's privacy and, so to say, trespass into his or her territory often without knocking or announcing. Members of the medical team often carry out activities without introduction. And then they depart without any explanation as to what they have done. In some hospitals, the patient seems to get a distinct impression of being the trespasser on the territory of the medical team than the other way round.

Good publicity by itself is not the only part of public relation although an essential part of it. An understanding of the consumer's needs, and sympathetic services, is the crux of public relations in a hospital.



Fig. 26.1: The image of the hospital stems from staff interaction with others

BASE OF A GOOD IMAGE

The three things that project a positive image of a hospital are:

- i. technically competent medical care,
- ii. a mutual trust between the hospital and its clientele, and
- iii. goodwill and understanding between patients and the hospital staff.

Nevertheless, the extent of good public relations which a hospital enjoys cannot be measured quantitatively. Yet, the extent can be elicited by asking users as to their general impressions of a particular hospital. The impression which the community harbours about a hospital may be pleasant (positive), indifferent, or unpleasant (negative). This impression is not just a question of chance alone. Creation of this impression has to be deliberately planned and actuated by conscious effort. **It is one of the functions of public relations to continuously promote understanding and appreciation of the hospital by the community, and to continuously monitor it.**

“The manner in which activities are carried out on the patient or in his or her territory is important. This includes recognising the patient as an individual, providing explanations where indicated, not leaving the body exposed, working quickly to minimise bodily contact, and recognising the physical and psychological discomfort that may arise from an invasion of privacy.”

There are many reasons for bad public relations and poor image of the hospital resulting in complaints. The main complaints from the patients and the community relate to the following (Table 26.1).

Table 26.1: Complaints relating to patients and community

1. Indifferent care	Lack of "human touch"
2. Low quality care	Assessed by patients from the quality of linen, diet, equipment, facilities, cleanliness, etc.
3. Lack of information	About facilities and staff, but especially on the patients' disease condition
4. Lack of guidance	Sign, posting, boards, oral information
5. Lack of creature comforts	Chairs, benches, drinking water, toilets, etc.
6. Delays at almost every step	
7. Overcrowding	
8. Long queues	
9. Noise	
10. Poor sanitation	
11. Behaviour of staff	

Broadly, there are two methods of promoting good public relations in a hospital. They are the operative method and the communicative method (Fig. 26.1).

Operative Methods

Operative methods are essentially connected with almost every aspect of the hospital's operations, including those that are carried out by such workmen as telephone operators, inquiry office personnel and admission office clerks to mention a few. All those coming in contact with patients, as well as those operating behind the screen share the same burden.

The three fundamental ingredients of a hospital's operations are: (i) cheerful and courteous behaviour, (ii) prompt and efficient treatment, and (iii) clean surroundings and well-kept appearance of workers. Some of the important aspects are enumerated below.

1. A high quality of patient care is the *sine quo non* of good public relations. No amount of smiles and propaganda can compensate for poor professional care.
2. Adequate physical facilities with a good functional layout. Adequate waiting areas, toilets, drinking water and refreshment facility in the outpatient department and such facilities which take care of the basic creature comforts of the patients and others.
3. To make others happy, one must be happy himself. Good morale of workers not only increases efficiency, but workers with high morale interact in a positive manner with one another and also with patients and the community. Frustrated doctors, nurses, technicians and paramedical personnel will bring the working of the hospital into disrepute. The least expensive way to

improve public relations is to render the service with a smile and cheerful greeting.

4. By placing more emphasis on technology in dealing with the diagnosis and treatment, there must always be a continuous effort not to create other anxieties and concerns, as Florence Nightingale exhorted that the first concern of the hospital is to do patient no harm.
5. Operating efficiency with effective coordination among all clinical departments and other supportive services stems from good administration. Organisational structure, policies and procedures, authority and accountability should be clearly understood by each worker.
6. *Sensitive areas:*
 - a. Many misunderstandings by patients and public originate in the OPD. Efforts should be made to reduce high waiting time of the patients in OPD.
 - b. Lindell² has felt that the nature of the admission process plays a major part in determining the humanity of the hospital. The procedure may be an administrative triumph, but if it reduce our patient to a barely insignificant case or number who is an imposition on the high technology medical shrine, the process is a failure.
 - c. Delay in receiving specimens at the laboratory counter and delay at the dispensary should be curtailed.
 - d. Casualty department must be organised to deal with any type of casualty, at the same time causing least confusion when a number of relations accompany the patient.
 - e. Importance of food served hot from the dietary department and of clean and well-pressed linen from the hospital laundry cannot be overemphasised.
7. *Other activities:* The Hospital premises should be kept clean at all times and not only during the morning working hours. Hospital visitors should be dealt with courteously—their visit to a hospital inpatient is of great emotional value to the patient. A member of nursing or medical staff should be available in the ward during visiting hours to answer their queries.

Availability of medicosocial workers in a hospital is very beneficial in respect of patients having social problems more than medical problems. Voluntary services by people from the community help to provide emotional support to patients. Such services can run libraries for patients, write letters on behalf of disabled patients and help the nursing staff in carrying out unskilled nursing chores. Perhaps the greatest benefit is that they soon develop an insight into the limitations of the hospital and, by discussing the same with other

members of the community, cause a mutual understanding and goodwill between the hospital and the community.

Communicative Methods

These methods employ means of communication in all possible forms to enable the hospital to convey its message to the public. Some of these are also intermixed with the intramural functions of the hospital and operative methods. The others deal with the media. Communicative methods may be used in the following ways.

1. Making available appropriate information to the patients, their relatives and visitors at Enquiry and Registration, and also on patients' discharge regarding his or her health status and follow-up. A discharge interview with the attending physician can serve this purpose well.
2. An open-house approach to the visitors without interfering in the routine medical care functions. Large number of visitors to patients cannot be avoided in our peculiar sociocultural ethos.
3. The queries of the relatives and visitors can be satisfied if a doctor or senior nurse conversant with the ward is made available in the ward during the visiting hours for this purpose.
4. Administrative rounds by hospital administrators at different levels. However, they should be as informal as possible.
5. A provision to listen to verbal complaints instead of insisting on written ones.
6. Written communication: prompt replies to questions.
7. Provision of a Suggestion Box at an appropriate place.
8. Visual communication—film shows, exhibitions, hospital brochure.
9. Hospital tours by groups such as school teachers and students, housewives and members of women's organisations, peoples' representatives, religious leaders.
10. Holding of an annual "Hospital Day" or open-house day where public can be shown every aspect of the hospital's operations including some of the highly technical functions.
11. Advisory committee—its role should be to suggest to hospital administration the methods to overcome their shortcomings, and interpret the functioning of the hospital to the community.
12. Talks and interviews on radio and television.

In his discussion on the humanisation of the hospital, Lindell² has advocated that firstly the misconceptions held by community towards the hospital should be dispelled by breaking down the "trauma", "crisis" and "high technology"

associations and by developing the 'health maintenance' and 'community support images'. Secondly, the physical setting should be modified to respect the "human" in the patient by helping him or her to feel significant. The hospital will be humanised if the "human" in the patient is understood and respected. On entering hospitals, people do not cease to be individuals with no personalities and needs and do not cease to interact of their own or become merely bodies.

Indicators for Measuring Public Relations

The following are the means through which the extent of public relations can be gauged.

- Patient satisfaction surveys
- General opinion poll
- Number of complaints received
- Extent of voluntary effort by community
- Turnover of medical staff
- Consistency in attendance by patients
- Donations
- Letters to editors in local papers.
- Inpatients leaving against medical advice (LAMA).

Public Relations Officer

Few hospital authorities have regarded public relations as a special function calling for the services of an expert. In smaller hospitals, the chief hospital administrator or his deputy usually assumes this responsibility in dealing with the external agencies, delegating certain functions to others at appropriate levels. However, larger hospital will require a full-time public relations officer.

ADDITIONAL IMPORTANT CONSIDERATIONS

Communication to the Press

A prudent administrator must get to know the local press. The local press can be the hospital's principle helper in this regard. A hostile press can do a lot of harm. If an editor understands the hospital's problems, he can help enormously. However sensational reporting cannot always be prevented. In such cases, it may be worthwhile to hold a press conference and be frank. When something has gone seriously wrong and consequences may be of legitimate public concern, to await questions and then provide patchy answers is to court disaster. Legitimate information must be volunteered as early as possible.

Clearance of all material intended for release must be controlled by the chief of public relations who would consult the concerned departmental chief. The material should be put on a format and released in a manner calculated to benefit

the hospital. Information regarding the condition of hospital patients, especially VIP's and very serious patients, should be guarded and preferably governed by an approved code. Interviews of patients by the press or taking their photographs should only be permitted if the patient or his or her relatives consent and if it is in the hospital's interest.

Medical Information and Information Regarding Patients

Information concerning the medical staff for release for public consumption, except medical papers for professional publications, is required to be cleared by public relations. Needless to say, such information and medical facts should be within the ambit of medical ethics. No information regarding patients should be released without the consent of the patient (for which a consent form must be signed by the patient), and the consent should be "informed consent". All questions about the hospital, its operations and its patients which are likely to be publicly quoted or published must be cleared and replied only by the chief of public relations.

Nursing Services

Whatever may be their physical condition, the psychological needs of patients demand a strong sense of its recognition by nurses. The nursing staff must learn to assess with a refined judgement what are the patients' needs without, more often than not, the voluntary declaration of how he or she feels or wants. To this end, the nursing education programme should be able to prepare them adequately for performance of the patient activities related to their cultural bases. The hospital administrator on his part must determine the patient expectations from the hospital, communicate them effectively to all levels of supervision and through them to the nursing staff for creation of better team spirit. Problems identified through consumer critique can be tackled by managerial efforts which involve nothing but thoughtfulness, concern for patients' needs are respect for human dignity than anything else (Ray, 1979).³

Role of Women's Voluntary Organisation

There is considerable scope of women's voluntary organisations not only to improve public relations but also in easing some of the administrative burdens of the hospital. These organisations have been doing commendable work for many worthwhile causes, including health care, and there is no reason why their services should not be utilised on a bigger scale in hospitals.

In many western countries, millions of women give their dedicated time to voluntary hospital services. In USA, the

service is formalised in the form of "Womens Hospital Auxiliary". The NHS of England has demonstrated the effectiveness of community involvement especially in long-stay hospitals and utilises the services of volunteers extensively.⁴ For the last 20 years, the NHS has shown its appreciation of volunteers by appointing voluntary service coordinators to get the best out of it, and to enhance the effectiveness of voluntary service contribution.

Voluntary effort by such organisation can be utilised in hospital wards, in the OPD, at the reception and enquiry counter, in managing gift shop and in fund raising. However, it is through their work, generally establishing community contact and educating the community, that their public relations value lies. The volunteers should be made conversant with the general functioning of the hospital in order to make effective community contact.

However, it should be made certain that such services do not attempt to exercise authority in the administration of the hospital and became a liability than an asset. Usually, they can be of unestimable value, provided working relationship between such organisations and hospital administration are laid down on mutual understanding.

CONCLUSION

In conclusion, it is necessary to strive to provide a high quality of service as well as to educate the public on the hospital's problems or limitations. The hospital has to exist, function, survive and grow as a part of the social system, it cannot function in its own ivory tower. It is bound to be influenced by the external and internal environment as in turn it influences them. The warmth, concern, perception, sensitivity, and compassion are integral to the art and business of healing—it can never be replaced by technology. Nursing service has an extremely important role to play in this respect. The patients and the community have a legitimate right to expect a reasonably satisfactory standard of service, and the hospital has an obligation to meet it. Public relations programme cannot be a sporadic activity but has to be ongoing process.

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CHAPTER

27

Ethical and Legal Aspects of Hospital Administration

INTRODUCTION

The increasing number of medicolegal cases has made it necessary for hospitals and medical administrators to become aware of the medicolegal aspects to minimise civil and criminal litigation and ensure quality of medical care. In India, lawyers as yet have very little training and exposure in the complex issues involved in medical care. Therefore, health care personnel must understand the basic medicolegal issues involved in personal injury, negligence, malpractice, medical frauds, professional incompetency, ethical issues in human experimentation, defensive medicine, organ transplants, reproduction medicine, sex determination and genetic counselling. Then only they can do the right things, and protect themselves from frivolous litigations.

Government hospitals in the past were considered to represent the sovereign power, and under the dictum “sovereign can do no wrong” were considered immune from ‘tort’ liability in respect of their employees who were considered to be engaged in official acts. The principle of sovereignty has now been abandoned everywhere except in India, where it is still on the statute book. However, it is noteworthy that the courts have now started talking more humanistic views in favour of plaintiffs even in cases involving sovereign immunity.

There is an increasing awareness among the public about the duties and obligations of medical practitioners (as individuals) as well as of the hospitals where they work. Many recent cases such as electrocution of the patient on the operation table in a government hospital, operating in wrong eye in a government hospital, death in hospital due to denial of bed in ICU, irreparable damage to the knee joint

as a result of surgical operations, etc. have refocused the attention of medical administrators to the problem.

In a point of view about the hospitals, people feel that a doctor can get away with it because he has the protection of an institution. A patient has to suffer because he does not know his legal rights and is not aware of legal remedies. Nobody ever tells the patient his rights and nobody guarantees against a doctor’s carelessness which may cause him physical injury for ever, or even death.¹

There are a larger number of nursing homes which have changed their boards to ‘Hospitals’. Many of them are unregistered. A large number of hospitals are being established by businessmen and political leaders. There is hardly any system of pricing, even for common ailments, the price depends upon the customer—how much the patient can pay or how much one can extract out of him. In the process of generating additional revenue, large number of hospitals have purchased and installed modern technology for diagnosis and treatment, and the patients are pressurised for additional diagnostic tests and procedures.

The consumer cannot think rationally during an episode of sickness and, therefore, is subjected to these additional tests. A large proportion of the population is poor and illiterate, ignorant about their rights and responsibilities, and therefore, at the mercy of the doctors and of the hospitals.

The hospital administration has an obligation to have a clear understanding of its ethical and legal responsibilities. Hospital management is responsible for the policies, for maintaining a safe hospital, physical facilities and services. In addition, the hospital is also governed by regulations of the local government authorities in respect of building codes,

safety and fire regulations and sanitation arrangements. Being an integral part of the social system, it has to be subject to all laws of the land.

The administration should take due care in establishing policies for selection and appointment of members of medical staff, because it is through the actions of the staff that most legal problems arise. There should also be an understanding of the management's civil and criminal liability. Responsibility for safety from explosive and inflammable anaesthetic gases and chemicals, machinery, steam and even damages from falls on slippery floors is that of the administration.

GENERAL ACTS/LEGISLATIONS APPLICABLE TO HOSPITALS

Industrial Disputes Act, 1948

Hospitals were included under the term 'industry'. The industrial dispute act is applicable where the number of employees is 50 or more and lays down the procedure to deal with disputes arising in an industrial establishment. A 1982 amendment to the act exempted hospitals and dispensaries, among others, from the purview of the act, but this provision was kept in abeyance by an amendment in 1984. The government has now a comprehensive legislation under its active consideration to deal with industrial disputes. The government has framed model standing orders under this act which are required to be followed by all institutions covered by the act.

Minimum Wages Act, 1948

Under this act minimum wages are fixed for different categories of workers.

Employees Provident Fund Act

The hospital as employer is required to recover from its employees at prescribed rates, contribute an equal amount as employers' share and credit the fund regularly with the government. It is applicable to hospitals if the number of employees is more than 20. Noncompliance is punishable by imprisonment.

Payment of Bonus Act, 1956

The act is applicable to hospitals with 40 or more employees. Charitable or not-for-profit hospitals are exempt from this act.

Payment of Gratuity Act, 1972

Gratuity is payable to employees @ 15 day's pay for every completed year of service at the time of his or her superannuation or death. This act is applicable where there are 10 or more workers and in respect of worker who have completed 5 years of service (or at least one year in case of death).

Payment of Wages Act, 1936

Statement of wages showing all details is required to be given to the employee, wages must be paid during the first seven days of the month, and only authorised deductions can be made from the wages.

Employees State Insurance Act, 1948

Employees State Insurance Act, 1948 is a measure of social and health insurance for which it provides monetary and medical benefits to industrial employees in case of sickness, maternity and employment related injury. The hospital as employer has to contribute 4 per cent of the total wage bill to the scheme.

If the hospitals is providing complete and free treatment to the employees and their dependents, the provisions of ESI will not be applicable.

MEDICAL/PROFESSIONAL ACTS APPLICABLE TO HOSPITALS

Indian Medical Council Act, 1933

Indian Medical Council Act, 1933 lays down the code of ethics for medical practitioners and regulates medical education. State Medical Councils established under the act have the same function in their respective states except that recognition of teaching hospitals is centrally governed by the IMC act.

Indian Nursing Council Act, 1947

Indian Nursing Council act, 1947 act lays down the educational standards and requirements for registration of nurses.

The Pharmacy Act, 1948

The Pharmacy Act, 1948 deals with the establishment of pharmacies and drug stores and with the profession of pharmacist's. A hospital has to acquire a drug licence if it sells drugs across the counter, where only registered pharmacist can be employed for dispensing of drugs.

Births and Deaths and Marriages Registration Act

Births and deaths and marriages registration act lays down the responsibilities of the hospital regarding informing births and deaths in hospitals. All births and deaths taking place in the hospital are to be registered under the act. They are to be notified immediately to the local municipal authority and the Registrar's office.

Miscellaneous Acts Applicable to Hospitals

Societies Registration Act, 1860

Societies Registration Act, 1860 governs the working and management of institutions established or owned by charitable trusts.

All hospitals in the voluntary sector or nongovernment organisations (NGOs) in the field of medical care have to be registered under this act.

State Public Charitable Trust Acts

Some states have enacted their own public Charitable Trust Act which generally governs the detail working and management of hospitals established by public charitable trusts. In such states, the society must also be registered under the state act.

Acts in Relation to Establishment of Hospitals or Nursing Homes

There are local laws in each states governing the establishment and standards about the hospitals/nursing homes. Such acts should be studied in advance. Maharashtra has its Bombay Nursing Home Registration Act of 1949.

Shops and Establishment Acts

Any establishment legally falling under this definition within the local municipal jurisdiction has to be registered under this act. The act may be known under different titles in different states. Maharashtra has its Shops and Establishment Act of 1948. If any hospital is governed under this act, then it is also governed by all other labour enactments.

LAW OF TORTS

The word "tort" is derived from the Latin tortus which means twisted or crooked. Tort can be defined as "any wrong, injury or damage to the person for which a civil suit can be brought".

Various Examples of Major Torts as follows

1. Act of wrongful commission (e.g. unnecessary operation)
2. Act of omission (e.g. autopsy without obtaining consent)
3. Negligence (e.g. swab or instrument in abdomen)
4. Intentional interference (e.g. that which can lead to physical and/or mental disturbance).
5. Invasion of the right of privacy
6. Breach of profession secrecy (e.g. making known to public that "the patient is sterile")
7. Battery (e.g. surgeon going beyond the limit of patient's consent)
8. Miscellaneous torts
 - a. Nuisances (inconvenience or damage to individuals or public)
 - b. Misrepresentation (deceit)
 - c. Defamation (slander, libel)
 - d. Malicious persecution.

In India, the number of lawsuits against physicians for torts or civil wrongs resulting from various acts of commission or omission are almost nonexistent. Hardly one in 10,000 doctors would have been dragged into court by patients, as against 1.5 per cent in the United States.

CONSUMER PROTECTION ACT (CPA)

Till recently, all cases of disputes regarding negligence on the part of doctors or hospitals were raised in a court of law. It was filed either under the law of torts to claim damages or under other relevant sections (304 A, 336, 337 and 338) of the IPC, to get the negligent punished. However, after the introduction of the Consumer Protection Act, a drastic change has taken place and litigants are preferring claims through the District, State or National forums. The two main reasons for this are that hardly any costs are involved in this procedure, and the case is decided in a short span of 3 to 4 months.

A Primer on Consumer Protection Act

Consumer Protection Act (CPA in short) was enacted by Parliament in December 1986 and came into force on 1 September, 1987. The aim of act is to provide a simple, speedy and inexpensive redressal for consumer grievances relating to defective goods, deficient services and unfair trade practices. A 1992 landmark ruling by the National Consumer Disputes Redressal Commission in the case of Vasantha Nair vs Cosmopolitan Hospital has already established that medical services can be tried under CPA.

Consumer

Consumer means any person who hires any services for a consideration, and includes any beneficiary of such services other than the person who hires the services, when such services are availed of with the approval of the first mentioned person.

The status of a patient is that of a consumer, because the patient pays for the services or has the liability to pay which may be by full down payment, in instalments or under any deferred payment system. If a person has received free services without paying for the same, he cannot be called a consumer. This is why government hospitals providing services without any charges are outside the preview of the Act.

A person who avails himself of the facility of a government hospital is not a consumer because the facility offered in government hospitals is not service hired for a consideration. For deficiency of service in government hospitals, the aggrieved person will have to file a claim in civil court. If the conduct of the hospital doctor amounts to criminal negligence, the patient can cause to prosecute the doctor in criminal court.

Deficiency

Deficiency is any fault, imperfection, shortcoming or inadequacy in the quality, nature and manner of performance in pursuance of a contract or otherwise in relation to the service.

Service

Service means service of any description, but excludes free service and personal service. Treatment in a hospital (excluding government hospitals) on payment amounts to hiring of service for a consideration. Therefore, a complaint would lie if there is deficiency in service rendered by a member of the medical profession.

Definition of “service” excludes from its scope service under a contract of personal service. Strictly speaking, service rendered by a doctor is not essentially personal service. The high court of Kerala had ruled (Vasanth P Nair vs Cosmopolitan Hospital 1991), “There is in a general sense a personal element in the medical officer’s service to their clients, but we do not think that they can be called personal service...It will be incorrect, unfelicitous and crude to describe it as personal service. Personal service stems from a master-and-servant relationship...It is wrong to call the service rendered by a lawyer or doctor to his or her clients as personal service”.

Doctors have tried to take shelter in the past under the concept of personal service, which is no more tenable.

Time Limitation

A claim for compensation under CPA must be filed at a Forum within three years of the subject matter of the complaint (e.g. death) having arisen.

If an amendment to the Act, presently under consideration of the government is passed, this period is likely to be raised to one year.

At the District Forum, a case has to be heard within three months of being filed.

Consumer Disputes Redressal Levels

Under a three-tier redressal machinery, consumer disputes redressal forums have been established at all the district levels and state capitals. The National Consumer Disputes Redressal Commission is located at New Delhi.

The National Commission deals with compensation claims above Rs. 30 lakh. The largest medical consumer compensation claim is Rs. 3 crore by a person from Amritsar for the death of his son after multiple surgeries, allegedly unnecessary. The largest consumer compensation received so far is Rs. 17.35 lakh by international table tennis player V Chandrasekhar for his case against Apollo Hospital, Chennai for disabilities suffered after a negligent operation.

The State Commission deals with disputes where compensation claims above Rs. 5 lakh are preferred. District forum deals with compensation claims up to Rs. 5 lakh.

Powers of Redressal Forum

Redressal forums have the same judicial powers as a civil court. It means it can summon and enforce the attendance of witnesses and to produce documents.

Medical Malpractice cases which could take over a decade in the past, are now decided in months by the redressal forums.

Epilogue

The medical profession got a severe jolt when in April 1992 the National Consumer Redressal Commission, on appeal from Kerala State Redressal Commission, decided that the activity of providing medical assistance for payment carried out by hospitals and members of medical profession falls within the scope of the expression “service” defined in Consumer Protection Act 1986 and that in the event of any deficiency in the performance of such service the aggrieved party can invoke the remedies provided under the Act.

A body of medical men feel that when an individual errs, he should be prepared to face the consequence that follow, irrespective of what category and in what capacity he is discharging his duty at the time, and a doctor of any discipline working in any category or capacity is not, and cannot, be an exception to this principle.²

The key grievance of the medical fraternity is that there is no provision for having a medical technical expert on the Forums to provide technically sound opinion on the doctor's/hospital's performance. An amendment to the Act has now made a provision for inclusion of an independent expert.

Patients' Bill of Rights

The government is concerned about the deteriorating services in medical care both in private nursing homes and public hospitals. Consumer organisations are also pressing for a charter of right of consumers of medical services. The Indian Medical Association would also welcome a citizen charter for patients welfare on the lines of the similar charter in the United States.

A subcommittee of the central consumer council is going into the various shortcomings as existing in both public and private medical care and to prepare a charter of patients rights. Indian Medical Council has a member on the subcommittee. The charter will serve as the guiding document for considering cases by courts, besides being a reminder to doctors and hospitals of their responsibilities and obligations. The draft of the charter of patients' rights being finalised by this committee is being modelled on the American Bill of Patients Rights approved by the American Hospital Association in 1973.

The American Patients Bill of Rights is reproduced in Appendix VI.

SUMMARY OF THE INDIAN MEDICAL COUNCIL'S LIST OF OFFENCES AND PROFESSIONAL MISCONDUCT

The following is a list of offences and professional misconducts that may lead to suspension of the doctor's name for a specific period or permanently strike his name off the rolls if his conduct is found wanting professionally.

1. Adultery or improper conduct or association with a patient or member of the family.
2. Issuing false certificates, reports and other documents—birth, death, sickness for leaves.
3. Conviction by Court of Law for offences involving moral factors.

4. Selling of scheduled poisons to the public under cover of his own qualification.
5. Performing or enabling an unqualified person to perform an abortion or any illegal operation for which there is no medical, surgical or psychological indication.
6. Issuing certificates of efficiency in modern medicine to unqualified or nonmedical persons.
7. Advertisement of the services or the institution run by the physician.
8. Using unusually large signboards—other than name, qualifications and speciality or fixing signboards at places other than that of residence or practice.
9. Disclosing secrets of a patient.
10. Refusal on religious grounds to give assistance or conduct operations of sterility/birth control unless he is not qualified or is incompetent.
11. Performing operations without consent.
12. In case of a hospital/nursing home, the ultimate responsibility rests on him.
13. Fees should not be publicly exhibited but it can be kept in the physician's waiting room or consulting room.
14. Will not use agents for procuring business.
15. Should not claim to be a specialist unless has special qualifications and enough experience.

Comment

The medical fraternity realises that the Medical Council of India (MCI) does not have enough powers to discipline its members, nor does it effectively use the power it has. MCI is now enlarging the scope of its Ethics Committee, proposing major amendments to MCI Act to give more power to the Council to deal with malpractice cases.

HOSPITAL'S RESPONSIBILITIES

Consent for Medical Examination, Treatment and Autopsy

Consent is implicit in the case of patients who submit to the doctor, and the absence of consent must be made out by the patient alleging it. Written consent should be obtained for surgical operations and special procedures. The same applies to autopsy except in medicolegal cases where the hospital may be obliged to carry out medicolegal post-mortem examination on orders of the coroner or other court having jurisdiction.

It is a criminal offence as per Indian Penal Code to operate upon a person, or to administer drugs to a person without his or her consent. Valid consent cannot be given:

1. By a child under 12 years of age
2. By a person of unsound mind, or a person who is intoxicated and is therefore unable to understand the nature and consequences of that to which he has given consent.
3. Under fear of injury or under misconception of fear if the doctor knows that consent was given in consequence of such fear or misconception.

The general belief of many doctors appears to be that patients are unable to make a reasoned choice because they cannot appreciate the intricacies of medical science, and therefore it is not possible to get “informed consent”. This often results taking a paternalistic stand that “doctor knows best”. This view assumes that the consent is implied in the very fact that the patients has sought the expertise of the doctor.

On the other hand, a study on obtaining consent showed that a vast majority of patients gave a clear choice about participation in drug trials based on adequate information supplied, the decision making directly related to the amount of information provided. The choice of decision did not depend on social or educational background.

The paramount question is: can a doctor withhold treatment if there is no informed consent, and what if the patient is admitted in a critical condition? In such a situation the apparent conflict between the moral duty of the doctor to save life and the right of the patient to determine what shall be done to his body must be resolved purely on ethical considerations, relegating the purely legal view to the background.

The Medical Service

The legal privileges and limitations of the medical staff should be known to all members of the staff. The legal rights, privileges and limitations, and the do's and dont's in these matters should be laid down in writing. Accepted diagnostic and therapeutic procedures practised in good faith by the medical staff are always upheld in law. However, hospital must have exercised care in selection of the staff who must be qualified and competent, with valid registration with the State medical council or nursing council as the case may be, or with appropriate technical qualification in case of biomedical technicians and paramedical staff.

Refusal of Treatment

Every doctor, whether at a government hospital or otherwise, has the professional obligation to extend his service with due expertise for preserving life. No law or State action can intervene to avoid/delay the discharge of the paramount obligation cast upon members of the medical profession. No law or procedure can insist on documentary formalities to be completed before a doctor could render medical aid. All hospitals and medical institutes should provide immediate aid to all the cases, irrespective of the fact that they are medicolegal cases or otherwise (Supreme Court, 1989).

The Medical Council of India has also pointed out that there is no provision in any laws which prevented doctors from attending to seriously injured persons and accident cases before the arrival of police, or registering a case, and other formalities.³

While in the past it was left to the moral discretion of the doctor to treat on humanitarian consideration, today he is legally bound to treat to save life. If not, action can be brought against him.

Defective Equipment

A hospital is required to provide appropriate equipment and appliances in good working condition for use in diagnosis and treatment of the patients. It is implicit that the hospital's appliances are reasonably fit for their intended use. Periodic inspections, tests and maintenance are part of the functioning of a hospital. The hospital is also obliged to provide devices, such as bedrails, siderails or supports designed to prevent injury to patients who are in a weakened condition.

Negligent Monitoring

A hospital is under obligation to monitor the condition of all patients continuously and its failure to do so is liable to lead to the hospital management being held responsible under the doctrine of vicarious liability. Proper recording of patients history, and question about his or her drug allergy should be asked. Liability may arise when failure to monitor postoperative cases results in not detecting the deterioration in patient's condition in time, e.g. internal haemorrhage or an adverse blood transfusion reaction. Monitoring would not only require the hospital and its nursing staff to recognise developing complications but would also entail appropriate emergency action to supplement care given by the attending doctor.

Observation of Patients

Unattended patient's falls from bed, stretcher or operation table is a frequent cause of accidental injuries. Siderails and restraint straps and special care when moving patients to and from the operating table must be used. Constant vigil is essential to safeguard patients unable to protect themselves. If a patient receives an injury while being unconscious, such as a brachial nerve palsy from hyperextension of an arm on the armboard, negligence on the part of one or all team members of the operating team may have to be disproved in court.⁴

Drug Handling

The process of ordering, storage and distribution of drugs is the direct responsibility of hospital management, while administration of drugs to patients is that of the medical and nursing staff. Therefore, the hospital assumes a dual responsibility for failure of an employee to follow standard procedure when administering drugs and a *vicarious liability* of the hospital administration. The liability arises from improper handling of drug, missed dose, drug administered to wrong patient, improper labelling, use of date expired drugs, and unnecessary use of drugs.

Drug Trials

Research for advancement of medical science by developing better therapeutic procedures and new drugs is permitted, because much of what is research or trial today becomes standard therapy tomorrow.

In hospitals where investigational drugs are to be used, or other drug trials to be carried out, it should be done preferably under the aegis of a "Research Committee" who may lay down policy and approve the method of any study project. The consent of patients participating in such a trial should be an "informed consent" which means that the patient should be made aware of the pros and cons of the drug trial, its aim and objectives and possible side effects, however remote. In cases of double blind studies where the patients as well as the staff is not aware of which drug is being given at a particular time, the code of double blind study should be immediately available to the attending physician to be able to counteract any untoward reactions, in emergencies.

Presently, no national guidelines or laws are available in India to regulate the code of conduct of medical research. In the event of need, public opinion and the courts would have to draw upon the sources of international wisdom like

the 1964/1975 Declaration of Helsinki (Recommendations of guiding medical doctors in biomedical research) when sitting in judgement.⁵

Negligent Supervision

The degree of patient supervision is governed by the patients' ability to take responsibility for self-care. Where a patient disregards warnings and instructions, for example, moving out of bed without assistance, the hospital may have no liability for any injury resulting from the patient's failure to follow instructions. On the other hand, where the hospital is aware that a patient is extremely hostile or otherwise unwilling to comply with regulations, it may be expected to provide a greater degree of surveillance.

Physical Facilities

As in case of equipment and appliances for diagnosis, treatment and care of patients, the hospital is obliged to exercise care in maintaining its physical facilities and premises in a reasonably safe condition. Many of the inpatients are infirm and disabled, which dictates a higher standard of care in the design and maintenance of its premises to meet the special needs of patients, translated into provision of siderails in corridors and handrails in lavatories and bathrooms to maintain the safety of patients. The hospital is also liable for injuries caused to the visitors by wet slippery floors or damaged stairs.

Hospital Infection

Although hospital infection is known to occur in all hospitals, its legal implications are only recent. The hospital has an obligation to keep the premises hygienic and to follow policies and procedures that are aimed at preventing further harm to the patient through acquiring some infections, with which he or she did not come to the hospital in the first place. Infections caused by improperly sterilised equipment, appliances or instruments may result in liability, so also from generally insanitary conditions in the hospital premises if the causal relationship between them is established. The hospital is also liable for infections contracted by its personnel (e.g. tuberculosis, serum hepatitis, encephalitis) during the course of their duty.

Blood Bank Service

Transfusion reactions do occur but irreversible reaction resulting in death after blood transfusion in hospital may be the result of negligence. Blood bank service contains a high

potential risk for injury to patients and a high-risk of legal liability for the hospital. Such risks include acceptance of a donor, extraction of blood, storage, grouping and cross-matching, and transfusion to the patient. All these procedures may lead to liability if not performed in accordance with safe and universally accepted standards. However, the hospital is not liable for the quality of the blood when it receives blood from a recognised blood bank.

Unlawful Detention

Unlawful restraint of an individual's personal liberty, i.e. unlawful detention against the patient's wishes constitutes false imprisonment, even without use of actual physical force, except in cases when it can be proved that in not doing so there is a danger to their own life or to the life or property of others. Detaining a patient until his or her bills are paid constitutes unlawful detention. When patients insist on leaving the hospital before completion of treatment, it must be recorded in the medical documents and discharge should be recorded as "discharge against medical advice" if the discharge is against the advice of the treating physician.

Invasion of Privacy

Disregard for a patient's right to personal privacy, especially if patients are unable to protect themselves because of unconsciousness, immobility or disability, is legally actionable. Divulging information to nonauthorised sources from the patient's medical record, committing unwarranted intrusion into patient's personal affairs, taking pictures of patients without their knowledge for future use—all these constitute invasion of privacy. Releasing information to the media/press on patient's condition, especially public figures, may be of interest to the public. But it must be guarded and released in a format that does not invade the patient's right of privacy. The hospital staff should also be guarded in their interviews with the press to avoid injury to the reputation of the patients.

Anaesthesia

Every death in operation theatre either due to natural cause or otherwise is to be reported by the hospital authorities to the police. Anaesthesia, if given without proper and valid consent is regarded as assault and battery, except in grave life-threatening emergencies. A patient who is unable to understand the nature, the purpose and the risk of operation is legally incompetent to give valid consent. It is always safe and better to hold an inquest, if the patient dies after anaesthesia without regaining consciousness.

Operating Room Procedure

Operating room policies and procedures should be established as a protection both of the employees and patient. Identification of the patient should be done by one more person besides the surgeon. The surgeon should see the patient before anaesthesia is administered. Protection of personal property, i.e. removal of valuables from the possession of the patient is normally the responsibility of the ward. However, some responsible person—perhaps the circulating nurse—checks the patient for contact lenses or eyeglasses, dentures, wristwatch, rings or religious medals. Some of them constitute a hazard for the anaesthetised patient.

A patient on the operating tables must never be left unattended. Constant vigil is essential to safeguard patients under anaesthesia. Operating room team members must apply the principles of asepsis at all times.

The responsibility for counting all sponges, needles and instruments before operation and at the time of closure rests with the scrub nurse. The surgeon should take field count before closure. A hospital that has not established counting procedures would be in a difficult legal position.

Faulty equipment must never be used inside the operating room. A burn may occur from the use of hot instrument, or electric burn due to short-circuiting of electrosurgical unit. Correct administration of drugs on the operating table is ensured by checking drug by two nurses or by a nurse and anaesthesiologist.

All tissues removed from a patient is sent to the laboratory. Specimens labelled incorrectly lead to critical complications for the patients. Loss of a specimen can prevent determination of a diagnosis or definitive therapy. Foreign body removed from the patient may have a medicolegal significance. Receipt for it from the person authorised to collect it protects the hospital.

The patient entrusts his or her life to others when undergoing a surgical operation; the operating room team must act with utmost vigilance.

Disclosing of Information to Patients

The patient has a right to be adequately informed about his or her illness or condition. However, what patients want to know may not be congruent with what physicians routinely disclose in the process of obtaining consent. Although there is a very little understanding about what average patients desire or need to know before consenting to treatment of any kind, patients appear to prefer detailed disclosure.

Doctors disclose only selected information to patients, because of medical ethics, favouring discretion over a firm duty to tell the truth to the patient. This is also based on the doctrine of therapeutic privileges—to withhold relevant information from patients if it is reasonable to predict that such information may harm the patient.

Terminal Illness

Many legal, ethical and social challenges are presented by major scientific medical breakthroughs.

Medicine has also taught doctors that the knowledge on incurability of a disease should not make the physician withdraw treatment or care as long as patient breathes. Recent thinking, is that the withdrawal of treatment of a patient whose condition is moribund is justified. Prolonging life with the help of the machines and other heroic measures in case of the terminally ill is now being questioned more and more. If death is imminent, it is not considered improper for the physician to do nothing much except to relieve pain.

The concept of brain death is quite clear. When the brain is dead and beyond repair, there is no point in keeping the heart and circulation going with expensive medical technology, because the person cannot exist when off the respirator. And, on or off the machine, he can never think nor perceive nor may have any function of the brain.⁶

Withholding of Life Support in the Critically Ill

To withhold life support in a patient who will inevitably die in a few hours or even a few days may seem easy. It may be difficult to withhold support when the time span of terminal illness is more prolonged.

Recently after recognising the concept of brain death an act has been passed in Parliament recognising brain death and thereby permitting the withdrawal of life support in patients who are brain dead. This ends an era of utter helplessness and mental agony for the patients relatives as well as the hospital.

Euthanasia

In the West, a significant number of acutely ill patients who are about to die as also patients with chronic but terminal disease express a desire to be killed or be medically assisted in suicide. Such requests are now also being made in India.

A question that is often raised in medical as well as social forums is “should a doctor have the obligation to assist a terminally ill patient or a patient who is at the point of no return to and his life, i.e. to commit suicide?”

Euthanasia includes¹¹ (a) voluntary euthanasia or intentional killing of patients who express a competent, freely made wish to die, because of the pain or suffering they experience. The patient is involved in the decision. (b) Medically assisted suicide, at the patient’s insistence and wish. The patient is involved in the decision. (c) Homicide, following a surrogate decision on a crippled or handicapped patient, or a patient with a poor or hopeless quality of life. In this case, the patient is not, involved in the decision.

It should be understood that withholding or withdrawing treatment when it is certain that such treatment will be of no benefit and when death is inevitable, does not constitute euthanasia, because the intent is not to kill but to prevent prolongation of the act of dying.

Dying Declaration

On many occasions the attending doctor is asked by the police to record a dying declaration of a patient with slender chance of survival. Many dying declarations have been recorded by doctors in hospitals in presence of witnesses and accepted by courts, even though such a declaration should have been recorded only by a magistrate.

However, the Supreme Court has made it fully clear that there is no requirement of law that a dying declaration must necessarily be made by a Magistrate. The Supreme Court has further made it clear that there is no legal requirement of it containing an elaborate and exhaustive statement so as to cover each and every aspect of the incident. What evidentiary value or weight has to be attached to such statement must necessarily depend on the facts and circumstances of each case (Charipalli Shankarrao vs Public Prosecutor, High Court of AP, Hyderabad, January 1995). From the judgement it is clear that if the presence of a magistrate or other legally authorised representative of the law cannot be ensured in time, a doctor can be called by the patient himself to record his dying declaration. In such a case, the doctor must record the declaration in the presence of at least one independent witness.

Medical Records

Hospital medical records are the property of the hospital and not of the patient or the treating physician. It is implicit that medical records are generated in the course of patients’ illness in the hospital without bias or prejudice on the part of doctors and others contributing to them during discharge of their professional duties. Communication between patient and doctor is “privileged communication”, and confidential.

Therefore, records cannot be divulged without the valid consent of the patient. Those who came into possession of the most intimate, personal information about patients have both a legal and ethical duty not to reveal confidential communication, except when there is an established legal obligation to do so.

In Britain, patient now (from 1991) have a statutory right to obtain access to their health records. In India, according to the current law, the patient has no statutory right of access to his or her medical records, although it may be possible for the solicitors to gain access to them under court orders. Nevertheless, with efforts to strengthen the position of the consumer protection act and to make it more practicable and fair in the context of medical services, patients access to medical records is likely to become a statutory right in India also.

The ethics committee of the Indian Medical Council has also veered to the view that medical records, except in medicolegal cases, may be handled over to the patient. While it does not say that the hospital is obliged to do it, the view is significant for its moral and ethical standing.

Right to Life, Sex Determination and Abortion

Every human being has an inherent right to life. But the question is when can one call an entity a human being? What is a “person”? Does it start from the formation of the zygote produced from the time of the union of the sperm and ovum? Is “individuality” reckoned from that moment? When does the growing embryo or foetus become a “person”?

There is nothing wrong or unethical in abortion, as seen by doctors. Medical termination of pregnancy, another name for abortion, is now legal. In abortion, there is the conflict of the right of two “persons”, the mother and the foetus. Is the right of the mother to abort absolute, without consideration of the right of the unborn foetus?

In the Indian social ethos, a female child is considered as a curse in some societies. Prenatal determination of sex is employed for detecting a female foetus with the sole aim of inducing abortion to get rid of it. Such clinics thrived—with open advertisements to boost and perhaps are still thriving although sans advertisements of sex determination. Many doctors and hospitals have been active partners in the peoples’ tendency to do away with the unborn female child.

A very relevant question has been raised recently. “There is a likelihood of demand for foetal tissues, e.g. foetal brain, in the treatment of Parkinson’s disease. Will it be ethical for

doctors and hospitals to participate in the venture of women getting pregnant for later aborting the foetus for monetary consideration?”⁷

These are questions the answers to which may vary from the medical and legal points of view. In the light of the modern knowledge of the science of life, the legally and ethically acceptable view calls for a debate with wider participation.

PROFESSIONAL NEGLIGENCE

When a patient is admitted in the hospital, a contractual obligation is established (though not written in words) whereby the hospital is obliged to give to the patient all the benefits of its facilities, and staff have to exercise “reasonable skill and care” in looking after him or her. It is in the deviation from these norms of reasonable patient care, established over a period of time, that the law of torts comes into the fore.

It is an unedifying fact that we have no detailed and accurate recorded data on the occurrence and incidence of misadventures in drug administration, diagnostic procedures, and surgical operation in hospitals. In a complex hospital, negligence becomes “error”, scientific detachment and incompetence becomes a “lack of the specialised equipment”. Medicine is still not an exact science in spite of great advances in biomedical sciences. It is imperative for doctors, nurses and paramedical personnel to exhibit utmost precaution, care, judgement and skill in dealing with and treating patients, balancing the relative risk of the disease with the risk involved in the use of drugs, surgery or diagnostic procedures.⁸

A medicolegal problem can be defined as any matter of interest to legal authorities in connection with any aspect of patient care. Therefore, any situation where there is an allegation, confession or suspicion of causes attributing to bodily injury or danger to life, is a medicolegal problem.

Negligence is a tort, i.e. a wrong done by one person to another. Medical negligence has been defined as “a mistake by a medical practitioner which no reasonably competent and careful practitioner would have committed.”

Reasonable Skill

Of every medical practitioner, a nurse and technician, a certain degree of skill is expected comparable to the average skill of his or her professional brethren of the same standing, and concomitant with the current state of medical knowledge and technique. He can adapt any currently accepted technique of diagnosis and treatment in which he honestly

believes. A specialist in a particular field is expected to possess special degree of knowledge and skill of his speciality as against the average skill expected of general practitioner.

A doctor cannot be held negligent simply because something went wrong. He is liable only when he falls below the standard of a reasonable competent practitioner is his field so much so that his conduct is inexcusable.

Reasonable Care

Reasonable care comprises of proper prescribing of medicines in appropriate dosages, correct dispensing, correct use of instruments and appliances, and proper nursing care. Reasonable care would also involve resorting to consultations with senior colleagues or specialists in difficult cases or when in doubt.

“The practitioner must bring to his task a reasonable degree of skill and knowledge, and must exercise a reasonable degree of care. Neither the very highest nor a very low degree of care and competence judged in the light of the particular circumstances of each case is what the law requires. Failure to act in accordance with the standard of reasonably competent medical person at the time...is a perfectly accurate statement, as long as it is remembered that there may be one or more perfectly proper standards, and if a medical person conforms with one of those proper standards then he is not negligent”.⁹

Professional negligence results from lack of reasonable care and skill or by willful negligence on the part of a medical practitioner, nurses or a medical technician in the care of a patient so as to lead to his bodily injury or to loss of life.

In order to bring a successful claim for compensation against a doctor (or hospital) in a court, the patient must prove negligence. Additionally, the patient must also prove that the negligence of the doctor (or hospital) caused his injury, disability or death. Medical negligence may take following forms.

1. Negligent diagnosis
2. Negligent operation or surgical procedure
3. Negligent recording of patient’s complaint
4. Administering a wrong drug or injection
5. Failure to advice a patient of the risk of an operation, if there is such a risk
6. Failure to monitoring patient’s condition
7. Improper or malfunctioning equipment
8. Inadequate nursing supervision and staffing

9. Negligent administration of an injection— wrong injection, wrong patient, intravenous instead of intramuscular or *vice versa*.
10. Leaving a swab or instrument inside patients body during operation
11. Failure to obtain informed consent from patient
12. Failure to protect a patient from the risk of an infection.

The Law of Negligence

Causing Death by Negligence

The crime is committed when someone causes the death of a person by doing any rash or negligent act not amounting to culpable homicide. A doctor may have no intention to cause death and no knowledge that the act he or she does in all probability would cause death. The rash or negligent act must be the direct cause of death.

Criminal Rashness

Criminal rashness is performing a dangerous or wanton act that may cause injury but without the intention to cause injury. It amounts to acting with indifference to the consequences.

Criminal Negligence

Criminal negligence is the gross and culpable neglect or failure to exercise a reasonable and proper care and precaution to guard against injury to the patient which it was the imperative duty of the doctor to have adopted. It is less likely that a patient will be able to prove criminal negligence against a doctor than ordinary negligence.

Criminal negligence should be distinguished from the negligence in tort. Clearly, if criminal negligence is proved against a doctor, a claim for damages in a civil court must succeed. But failure to prove criminal negligence is not detrimental to bringing a case for damages for negligence in a civil court or consumer redressal forum.

In criminal negligence, the state comes into the picture. Criminal proceedings may be brought by the state in the interest of public safety against a wrongdoer, in instances of obvious negligence such as amputation of a wrong limb, removal of a wrong organ, operation on a wrong patient, and leaving instruments and sponges inside abdomen, to mention a few. The burden of proof is on the claimant. The principle of *res ipsa loquitur* (the thing speaks for itself) comes into fore in such instances. The patient is therefore absolved of the responsibility or proving the guilt of the hospital or the doctor.

Civil Negligence

Negligence due to which a patient suffers monetary loss by way of unnecessary long stay in hospital, extra or unnecessary treatment or loss of his earning capacity is called civil negligence. In civil negligence, the state does not come into the picture at all, and civil proceedings may be brought by the patient or his relations for compensation for injury or death, in a civil court. The burden of proof is on the claimant.

Contributory Negligence

Contributory negligence is the negligence for which partly the doctor or hospital and partly the patient is responsible and the burden of proof is equal.

Legal Position

The same act may be both a tort against an individual patient and a crime against the state, whereby the wrongdoer may be subject to both—a civil action and a crime against state. In a civil suit, the onus of establishing proof will lie on the plaintiff (patient or his relations), the plaintiff must prove that the failure of the legal duty by the defendant (hospital or physician) is the proximate cause of injury or damage.

The hospital is generally responsible for the acts of its personnel employed for direct patient care. These include the doctors, nurses, X-ray technicians, laboratory technicians, pharmacists and so on. There are two aspects of tort liability. When these personnel perform purely professional duties, so long as the hospital has exercised due care in their selection, generally the hospital is relieved of the responsibility. The physicians, nurses or technicians may in such instances be solely responsible for the profession errors committed by them.

Valid Consent for Surgery

In surgical practice, the law permits a surgeon to operate on a consenting person in good faith. The validity of the consent is very vital lest the consent which the surgeon considers valid may in law stand invalid by reason of infancy, intoxication, fraud, coercion or misrepresentation of facts. The patient enters into a contract authorising his surgeon to operate only to the extent of the consent given, and no further. It was found that the courts, in case where surgeon knows he is acting contrary to the patient's consent, find the surgeon liable on the theory that he is guilty of technical assault and battery. Some courts, notwithstanding that the surgeon acted with full knowledge, apply the theory of negligence rather than that of technical assault and battery.

Assault and Battery

Assault is an unlawful threat to harm another person physically. Battery is the carrying out of the threatened physical harm. Lack of consent is an important aspect of an assault and battery charge. The purpose of a consent is to protect the surgeon, anaesthetist, operation room team members and the hospital against claims of unauthorised operations and to protect the patient against unsanctioned procedure.

Liability for assault and battery may be charged, if the surgeon goes beyond the limits to which the patient consented. Under the extension doctrine, the surgeon may extend the operation to correct or remove any abnormal or pathological condition, because of medical necessity tampered with sound judgement. Under the doctrine, the patient's explicit consent for operation serves as an implicit consent for any or all procedures deemed necessary to cope with unpredictable situations that jeopardise the patient's health.^{4,10}

In Emergency or Life-threatening Situation, Do Not Wait for Consent

Failure to perform an emergency operation or procedure and death of the patient due to such failure amounts to negligence on part of the doctor. In an "emergency medical situation", it is universally accepted that the doctor need not concern himself with obtaining consent from the patient. An emergency situation is where loss of life or limb or serious disability will result if treatment is withheld" (High Court of Kerala 1987 K T Thomas, appellant vs Smt Elisa and others, respondents).

Consent is implicit in the case of a patient who submits to the doctor, and absence of consent must be made out by the person alleging it (in this case, the surgeon). A surgeon who failed to perform emergency operation must provide with satisfactory evidence that the patient refused to undergo the operation not only at the initial stage but even after the patient was informed about the dangerous consequences of not undergoing the operation. This is all the more so if the patient is no more alive to give evidence.

Even if patients brought to the Emergency with alcohol-related problem (intoxication, accidents involving intoxicated persons), if there is an obvious life-threatening medical or surgical situation, the patient should be treated forthwith. In cases of mental disorders—suicide attempt, schizophrenia, drug-induced psychosis, etc.—the question of consent is unimportant, as the law presumes or implies a

consent for persons who are not mentally competent to understand the meaning of their decisions or actions.

Consent does not have to be given in an emergency where treatment is given or an act is done in good faith for the benefit of the patient. Mistaken diagnosis is not necessarily a negligent diagnosis. No human being is infallible. A practitioner can only be held liable if his or her diagnosis is so palpably wrong as to prove negligence.

A doctor is not liable for negligence if he has acted in accordance with a practice accepted as proper by a responsible body of medical men skilled in that particular art, even though a body of adverse opinion also existed among medical men. The doctor is liable when he falls below the standard of a reasonable competent practitioner in his field so much so that his conduct might be deserving of censure or inexcusable.

Respondent Superior and Vicarious Liability

The question of *vicarious responsibility* arises in such cases where, for an act of negligence by an employee of the hospital in the performance of his duty, an action for negligence may lie against the hospital authorities on the legal principle of “*respondent superior*” meaning let the superior be responsible, on the basis that the hospital itself must assume certain responsibilities for medical care of the patients.

In the case of *V Chandrasekhar vs Apollo Hospitals*, the Madras High Court (March, 1995) awarded Rs. 17.35 lac as damages for the disabilities he had suffered after an operation in the hospital. The court ordered that the two doctors, who performed the surgery, and the Apollo Hospital, where the operation was done, to pay the amount, apart from litigation costs. The hospital authorities had pleaded that there was no negligence on their part, and they could not be liable for the alleged negligence on the part of surgeons who treated the plaintiff. Rejecting the plea, the judge said that if the patient had suffered injury due to negligence of doctors (employed by the hospital or by doctors who work there on some arrangements), the hospital would be equally liable for damages on the principle of *vicarious liability*.

Doctrine of Deucistecum

This doctrine lays down that when any grave mistake is committed during surgical or medical process without any knowledge and remains unnoticed till subsequent inspection or postinspection process, then the doctors are not legally liable for the said mistake detected subsequently, though it is causing damage to the person concerned. Thus, doctors are not liable for negligence when faults in the management

of patients are discovered during the process of medical audit. The doctrine lays down that such an audit made for introspection and improvement cannot be used in law against the doctor.

In conclusion, the legal responsibilities of a hospital regarding medical negligence spring from its moral and social obligations. The hospital is responsible for the negligent acts of its medical, nursing and other paramedical personnel. So long as the hospital has exercised due care in their selection, the hospital has been generally relieved of responsibility and the physician, nurse or technician may in these instances be individually liable for their professional errors. But the question of vicarious responsibility and the question of fact have to be settled in court. Hospital administration may be held responsible for civil negligence, but not for criminal negligence. An important aspect of this problem is putting in writing in the form of standing orders the duties and responsibilities of each category of medical, nursing and technical staff in the hospital.

In the latest judgement that would let the doctor community have a sign of relief, a three member bench of the Supreme Court on 5th August, 2005 held that the Damocles’ sword of criminal prosecution should not be hanging constantly over medical practitioners’ heads by making them liable for every instance of negligence. While quashing prosecution of a doctor at CMC Hospital, Ludhiana, it has held that “a simple lack of care, an error of judgement or an accident, is not proof of negligence on the part of a medical professional”.

Holding that negligence in the context of medical profession necessarily called for a treatment with a difference, the Chief Justice of India heading the Bench said the negligence attributed to the doctor must be gross in nature to make him liable for criminal prosecution.

“To prosecute a medical professional for negligence under criminal law it must be shown that the accused did something or failed to do something which, in the given facts and circumstances, no medical professional in his ordinary senses and prudence would have done or failed to do”, the Chief Justice said. Noticing an increase in the cases of doctors being subjected to criminal prosecution, the Bench laid down elaborate guidelines so as to shield the doctors from frivolous criminal prosecution.

MEDICAL INDEMNITY INSURANCE AGAINST MALPRACTICE SUITS

No doctor can practice in USA and UK unless he or she is insured under the compulsory indemnity insurance by paying

an annual premium to the insurance company. The insurance company provides legal representation and pays compensation to the patient if such an award is made by the courts. As yet there is no compulsory indemnity insurance scheme for doctors in India.

Consumers of hospital are now more conscious and articulate of their legal rights. Several patients and consumer organisation are looking for chances to sue hospitals. With the rising number of cases for damages against doctors under the Consumer Protection Act, doctors are insuring in increasing members, although it remains to be seen whether compulsory insurance will come into force as follow-up of Consumer Protection Act.

Medical indemnity insurance is widely held to be one of the solutions to handle the threat of malpractice litigation. It goes without saying that the names of doctors, the hospitals employing them, and the amount of indemnity should be a secret guarded by them, lest unscrupulous patients are encouraged to go in for litigation at the drop of a hat.

The Nationalised insurance companies in the country have now come out with professional indemnity insurance scheme for individual medical practitioner and for hospitals, nursing homes, diagnostic centres, clinics, blood banks, laboratories, etc.

In case of individual doctors, the policy will indemnify any act committed by the insured giving rise to any legal liability to third parties. The insured includes the policy holder and his or her qualified assistants or employees named in the proposal.

In the case of hospitals and other medical establishments, the policy will indemnify the insured in respect of any act committed by the professionals or qualified assistants engaged by the medical establishment which gives rise to any third party legal liability.

In both types of insurance, all claims for compensation have to be legally established in a court of law. However, insurer may arrive at compromise settlement if prima facie liability exists under the policy.

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Disaster Management

Disaster is a calamity of sudden occurrence, a catastrophe causing injury and death to a large number of people during a short span of time.

Disasters have resulted from one or more primary causes [or hazards] such as an earthquake, heavy rainfall, hurricane, chemical accident, drought, or armed conflict. Some hazards [e.g. earthquake and hurricane] kill and injure many people at the time of impact. Often, however, the greatest toll on humankind is due to secondary effects such as flooding, fires, famine and multitude of refugees. In general, the primary causes of disasters are not preventable. Their secondary effects, however are amenable to prevention, or at least mitigation.

WHO defines a disaster as any occurrence that causes damage, economic disruption, loss of human life and deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the effected community or area.

The needs of disaster—affected community depend largely on the following factors:

1. The type of disaster
2. The resources of the community
3. It's degree of preparedness, and
4. The stage in the disaster's evolution.

The health care system including hospitals and public health infrastructure of the area must be organised and ready to act in mass emergency situations. And therefore, it must be conversant with the type of measures to be taken in the event of a disaster.

District Medical and Health authorities are the key institutions in planning and management of health services

on area-wide basis for disasters. Hospitals and health centres participate in the local medical effort.

Major Disasters in India

There has been a five-fold increase in the frequency of disasters during the last thirty years. Some of the major disasters were:

1. Bhopal gas tragedy [Affected 2 lac people, claimed more than 3000 lives.
2. Cyclones along the coast of Andhra Pradesh and Orissa at interval of every few years [claimed 25,000 lives]
3. Earthquake in Uttarkashi in 1990
4. Earthquake in Latur in Maharashtra in 1993
5. Many train accidents, off and on
6. Earthquake in Gujarat—Jan 2001
7. Tsunami, Southern Indian coastline—26 Dec. 2004. 10,273 dead, 2,39,024 families homeless, 27,22,000 population affected.

The level of preparedness directly governs how a hospital deals with the initial onslaught of a disaster. A well-prepared, well-informed hospital will already know what is needed and will be able to provide crucial information and effectively implement essential relief programmes.

Much can be done, both to prevent and reduce the adverse consequences of disasters on health, at the local level during the various stages in the evolution of a disaster.

PHASES OF A DISASTER

Generally a disaster evolves in phases, as under. Out of these, the reconstruction and rehabilitation phase lasts the longest, depending on the resources of the community and administrative authorities.

- Predisaster phase
- Alert phase
- Impact phase
- Postimpact phase
- Reconstruction and rehabilitation phase.

1. Predisaster Phase

Before a disaster strikes a community has to assess risks, train the people to be prepared, and plan programmes to avert a disaster, if possible. It can do these itself but external help is very desirable.

Risk assessment: The aim is to make people both aware of the nature of particular local risks and ready to respond promptly in their area. It is meant to demonstrate those risk factors that need to be addressed in order to mitigate the effects of the disaster. Sudden - onset disasters assessment must consider both the risk factors which increase deaths; and the resources necessary for relief.

The local hospital will have an active role to play both before and after a disaster, because a good state of preparedness may reduce the impact of the disaster, the greatest number of lives can be saved, and many problems of the survival health can be dealt with more efficiently if the hospital is active and well-organised.

Training: Training for preparedness is the key to successfully deal with disasters. The aim of training in the predisaster phase is to develop the skills listed below:-

- Effective personal protection from falling debris.
- Prompt rescue of the wounded
- Triage of the wounded
- Resuscitation and first aid for injured victims
- Prepositioning of relief supplies needed for the post-impact phase such as surgical equipment, essential medicines, blankets, tents
- Establishment of temporary water supplies
- Allocation of responsibilities for different relief activities to avoid unnecessary chaos.

2. Alert Phase

The alert phase refers to the period when a disaster is developing. The duration of the alert phase varies according to the type of disaster, for example, it is nonexistent for earthquakes, short but crucial in case of hurricanes, and quite long in case of draught and famine.

3. Impact Phase

The needs of the community during this phase depend largely on the characteristics of the disaster and the degree of

preparedness. Earthquakes, for example, are unpredictable, sudden and highly lethal. By contrast, hurricanes and cyclones are usually more predictable.

Most deaths in earthquakes are due to crushing injuries, occur immediately or soon after the impact. Additional deaths are due to burns from fires which sometime break out soon after. In earthquakes there is a high level of mortality as a result of people being crushed by falling objects. Earthquakes at night are more deadly. During the night fractures of pelvis, thorax and spine are common because people are lying in bed. In the daytime, injuries to the arms and legs, collarbone and skull frequently occur.

The priorities of a relief effort after an acute natural disaster should reflect these realities. The immediate response should not await a detailed assessment of impact. The effectiveness of the relief effort will depend entirely on local efforts, on how adequately the community is prepared.

During this phase, planning will include activation of the response mechanism, daily monitoring; updating of response measures, if necessary; and coordinating outside assistance.

4. Postimpact Phase

This phase may vary between a few days and several months following the initial impact.

The following actions will be required during this phase:

- Evacuating the survivors to safe areas and provide shelters to the homeless
- Providing food and water
- Continuing the triage and transportation of the injured to appropriate facilities.
- Re-establishing primary health care services
- Re-establishing sanitary measures to prevent outbreak of epidemics.

The destruction of sanitary and sewage facilities due to disaster leads to indiscreet disposal of liquid and solid waste and excreta, creating insanitary conditions adding to the problem. Health implications in these situations usually manifest in the form of food and water-borne disease. The effect on health facilities and health manpower, which are also affected by a disaster, greatly hamper the immediate mobilisation of medical and public health services.

GENERAL CONSIDERATIONS

Disaster management can be considered as an extension of emergency services of medical care institutions on a larger

scale. The normal working system of a hospital cannot bear the sudden demands on its system unless it is prepared for it in advance.

Certain professional qualities have to be developed among the local health care and medical care personnel, especially the ability to estimate requirements and resources which is the essential means of avoiding bewilderment and confusion when the disaster alert is sounded.

Medical Supdt, Casualty Med. Officer, Resident Physician or Surgeon and switchboard operators, some of who would be present in the hospital at the time an alert is sounded, become the key personnel who should notify other key personnel in all the departments viz. operation theatres, Blood bank, Laboratory, Radiology, Medical stores, Ambulance service and the Matron or nursing superintendent. Matron should activate all wards and start making arrangements in the wards for receiving casualties. Maximum number of staff in the above depts should arrive in the hospital within fifteen to twenty minutes of the call.

The medical superintendent or a member of the medical staff nominated by him would be responsible for determining the priority for treatment and evacuation. Here the importance of Triage must be realised. The Nursing superintendent would be responsible for allocation of nursing and paramedical staff.

Responsibility should be allocated to an important person in the administrative office for the recall of staff from homes and hostels. The Director/Deputy Medical superintendent would be responsible to deal with relatives and friend of the injured and the dead, public relations, police, and also handling of voluntary workers.

SORTING OUT CASUALTIES IN A DISASTER SITUATION: THE CONCEPT OF TRIAGE

In the event of disaster involving mass casualties, the demand for treatment overweights the available means at every stage in medical care. *Physicians and in particular, surgeons can be faced with insuperable problems and must therefore make decisions that are generally no longer in keeping with the rules of conventional medicine. They must improvise and they may have to take measures which would be termed irresponsible under normal circumstances, but which, on the other hand, save the lives of large number of casualties and enable them to be evacuated.*

Therefore, in order to achieve best possible results the service must consider Triage. The word “Triage” comes from the French word meaning “to sort out”.

TRIAGE AT SITE OF DISASTER

Casualties can be assessed and sorted on the basis of priorities for treatment and evacuation by means of the following procedure, which has been in use in military medicine since the 18th century. The process is elaborated below.

As a guideline for sorting out mass casualties, the following categories have been established, indicating the priorities of medical treatment and evacuation.

- Category 1: Immediate treatment {Approx.20% }.
Priority 1
- Category 2: Delayed treatment {Approx. 40% }.
Priority 2
- Category 3: Minimal treatment {Approx. 40% }.
Priority 3

Experience has shown that about 20 per cent of the casualties require immediate life saving treatment. This (Category-1) includes casualties suffering from severe bleeding from easily accessible sources, obstruction of respiratory tract, pneumothorax or haemothorax (in which case it must be established that the obstruction can be removed in the shortest possible time), hypovolaemic shock, severe injuries to the extremities, facial burns or burns to the upper respiratory tract.

Delayed treatment (Category -2) can be considered for about 40 per cent of casualties. Having possibly received life saving treatment, their lives are no longer in acute danger, so that an operation can be performed within the next 6 to 8 hours. This category includes casualties suffering from fractures and dislocation, injuries to the abdomen and the thorax, the urogenital tract, the skull or the brain, 2nd degree burns covering 20 to 30 per cent of the body or 3rd degree burns covering up to 20 per cent of the body.

Some Category-2 casualties may require upgradation to category-1, or some category-1, casualties may necessitate a downgrading to category-2. The triage officer will have to be constantly on the alert for this.

Minimum treatment (Category-3) is required by about 40 per cent of casualties. They must be differentiated and selected by the doctor and where necessary move to a collecting post for the slightly wounded. For casualties suffering from minor wounds, fractures of the small bones, sprains or second degree burns covering less than 20 per cent of the body, first aid measures suffice for the time being. They can be given further medical treatment if the situation improves and once casualties in Category 1 and 2 have been attended to.

In certain exceptional cases and a disaster involving mass casualties is one such exception—some patients will have to be assigned to Category-4 (expectant treatment). This category will include the dying, or the injured with no chance of survival. To operate on the latter would be so difficult and time consuming that, meanwhile, other casualties in Category-1 would die. Such injured require pain controlling drugs and nursing comfort. Beyond this, a constant watch must be kept on their condition in case it is necessary to assign them to another category.

This process of Triage represents the most important and most difficult task and can only be entrusted to a highly experienced physician or surgeon familiar with the procedure. He must make decisions quickly, often under considerable pressure and must have a wide specialist knowledge and the courage of his convictions.

It should be noted here that the diagnosis of the casualty is not final. It must be renewed at every stage of evacuation on the way to the hospital, and repeated during prolonged periods in any intermediary medical unit. A patient at first sight in a hopeless condition may recover, while another initially requiring urgent treatment may have deteriorated and be near death. The general or logistic situation may also have altered—for example there may be more doctors and ancillary staff available, the influx of casualties may have eased, renewed supplies may have arrived, or the possibilities of evacuating casualties may have worsened or improved.

Medical Command Post

Establishment of a Medical Command Post (MCP) at the disaster site greatly facilitates the operation of the total plan. The MCP coordinates medical operations, establishes triage, decides on the appropriateness and location of field dressing stations, and site and operation of the ambulance dispatch area. The MCP must have direct communications link with the resource hospital which coordinates the hospital based aspects of these operations.

The first task of the MCP is to obtain an overview of the severity of the disaster and the resources available.

Here, it is best to use a Triage Tag, which allows for identification of the patient, listing of critical information such as patients injuries and medications received. A **RED** tag (Category-1) can be used for the critical patient whose survival is dependent on immediate stabilisation of a life threat. A **YELLOW** tag (Category-2) indicates a seriously injured patient who requires some medical stabilisation in the field prior to transportation, but whose life is not immediately threatened. The **GREEN** tag (Category-3) is

applied to the ambulatory or walking wounded patient who does not require any medical attention at the disaster site prior to transportation to a hospital. Providing the maximum care possible for the greatest number of patients, aimed at maximum survival, is the essence of the system.

The priority for removing patients from the disaster site by ambulance dispatch and other transport is:

1. Critical patients (Red tag) first
2. Urgent patients (Yellow tag) second
3. Walking wounded (Green tag) third
4. Dead (any Dying) (Black tag) last.

Use all available transport, keeping emergency ambulances for the most serious.

ORGANISATION OF DISASTER MANAGEMENT AT THE HOSPITAL

Mobilisation of hospital services for a mass emergency is only a quantitative extension of normal hospital operations and emergencies. Therefore, every hospital must be prepared to give emergency care to mass casualties and have a disaster plan.

Hospitals have to be prepared for three kinds of disasters. The first is internal hospital disaster, such as explosion or a major fire. The second is an external disaster, such as a hurricane, flood, earthquake or a transportation accident. The third is a forewarned disaster, such as the receipt of a large number of patients from some other hospitals.

As far as possible, planning should include consultation and liaison with local civil authorities such as Fire brigade, Police, Civil Defense Warden and similar agencies. Such planning should result in disaster-site triage and distribution of patients that assures effective coordination and the most efficient use of available facilities and resources.

Forming a Disaster Management Committee

To execute the disaster plan, the hospital should have a Disaster Committee consisting of key functionaries of the hospital, viz. the Director, or the Medical Superintendent, Administrative Officer, Heads of Clinical Units including operation theatres and casualty, Matron, and Officers in Charge of Transport, Supply, Security and Communications.

Preparing a Disaster Plan

The primary task of the Disaster Committee is to assess the situation of the hospital, its capabilities, strengths and weaknesses, available resources, and prepare a disaster plan for managing sudden influx of casualties on a mass scale.

The essentials of a disaster plan are:

1. An efficient system of notifying and assigning personnel to specified tasks
2. A unified medical command
3. A probable self-sustaining ability in the area of basic utilities and supplies for a minimum of one week
4. Establishment of the source and methods of supply of drugs, dressing and other stores and consumables
5. Method of identifying patients who are immediately dischargeable
6. Conversion of all usable space to provide triage, observation and treatment areas
7. Introduction/use of a special disaster medical record or medical tag that accompanies the patient at all times
8. Establishment of a centralised public information centre with a designed spokesman
9. Security system, to minimise the presence of unauthorised individuals and vehicles in or near the reception, triage, observation and immediate care areas.

DISASTER ORGANISATION

The organisation should include all key personnel and clearly spell out lines of authority and responsibility of each such person.

A senior member from amongst the medical staff should be nominated as Chief of Disaster operations. He should have a designated deputy or alternate in case of non-availability of the chief.

The plan must be put into writing, spelling out duties and responsibilities of everyone involved. A copy of the plan should be available in each department and known to all the key personnel in that dept.

Assignment of responsibilities should be fixed within each department.

The plan may have to be activated even on a holiday. Therefore, specific responsibility has to be given to certain persons to act on a holiday. Also, the authority to activate the plan should have a deputy or alternative as a back up.

Responsible personnel of the following services will have to be appointed in the plan:

1. Records
2. Communication
3. Engineering and maintenance
4. Supplies
5. Transportation
6. Security
7. General administrative services.

Specific areas will have to be earmarked within the hospital premises or around for the following:

1. Receiving and sorting (Triage) area
2. First-aid station
3. Holding ward
4. Treatment and nursing areas
5. Pharmacy or medical store
6. Temporary morgue for dead body storage
7. Decontamination area.

Headquarters

A designated area will have to provide for establishing the headquarters of the disaster organisation and its control room. This could preferably be done in a suitable place in the existing administrative block, by vacating a few rooms, or a temporary shelter may be erected at suitable nearby place.

The Control Room should be situated near the existing admission and registration point for patients. This is also where the initial sorting of casualties will take place.

Adequate space should be provided for the following officials:

1. Medical Director
2. Administrative Chief
3. Stores and Supply Officer
4. Communication Officer
5. Public relations Officer
6. Transportation Officer
7. Housekeeping and Sanitation Officer
8. Security Control Officer
9. Nursing Officer

Issuing the Disaster Alert

The method of alerting everyone to emergency status should be clearly spelt out and known to all. The method could be a short and crisp telephonic message from the switchboard operator which may read something like this:

“This is a disaster Alert. I repeat, this is a disaster alert. I have been directed by the Director (or Chairman, or Medical Superintendent) to inform you that due to the occurrence of a earthquake at (place or, mention the other actual occurrence) the hospital’s disaster plan is likely to be activated. Please be prepared”.

At this stage the alert should be communicated only to the heads of units and heads of administrative services. A roster of such personnel (who have to be alerted) should be readily made available with the switchboard operator for this.

Needless to add, the Director or Hospital Administrator should be available on telephone at all times. If the hospital has radio paging system, this information could be disseminated through this system.

This disaster alert is to utilised to make provision for:

1. Halting of routine surgeries, conclusion of surgeries in progress and transfer of such postoperative cases elsewhere.
2. Clearing of surgical wards and wards of other specialist surgical departments of mobile patients and patients no longer requiring urgent hospital treatment.
3. Setting up of additional emergency beds.
4. Setting up of a "Information Centre".
5. Checking up stores and supplies.

Activation of Disaster Plan

The same method of verbal message adopted for alerting the key personal through the switchboard operator can be followed for disseminating information regarding actual activation of the plan. Responsibility for the actual activation of the plan should be entrusted to a designated individual at the highest level, perhaps the Director, Hospital Administrator or the Chief of the disaster committee.

Reception of Casualties

A reception and sorting area should be earmarked for the receipt of casualties, their preliminary sorting out carried out by nature of injuries or illness. This should be a large enough area to cater to the expected member of casualties. The existing Casualty and Emergency department would mostly be unsuitable because of its size. In some hospitals the emergency services area is not suited for this, and the size of the disaster may dictate that an area outside the hospital is more realistic particularly for secondary triage and for accessibility to large numbers of patients simultaneously.

The area should allow for retention, segregation, and basic documentation of incoming casualties. The sorting staff should be directed and supervised by an experienced physician or surgeon.

Sufficient equipment, supplies and apparatus should be made available in this area to permit prompt and efficient patient movement.

Tasks at the Reception

Personnel:

- Doctor I/c -1
- Nurses - 2

Tasks:

1. Check priority
2. Check documentation.

- Clerical - 1
 - Attendants - 2
3. Valuables on the person of the patient
 4. Reassurance.
 5. Medical comforts (water, tea, coffee, etc.)
 6. Information to relatives.
 7. Directing the casualty to appropriate dept.

Minimum Documentation

1. General data like name, age, sex
2. Medical data: Prepare inpatient card or outpatient card
3. Check general condition, splints, tourniquet
4. Admission register: Only preliminary diagnosis.

Triage at the Hospital

Patients arriving at the hospital will need retriage since some would have undergone many changes in their condition.

When a large number of injured people would start coming at the same time to the hospital, the cases should be sorted out into the following categories:

A. Those who must be urgently attended to. Among these, two orders of priorities should be distinguished.

Priority-I: Emergency cases who must be operated within the hour:

Some examples are:

- Acute cardiorespiratory insufficiency
- Severe haemorrhage
- Internal bleeding
- Rupture of internal organs
- State of severe shock
- Skull injuries with coma.

Priority-II: Emergency cases in which it is possible to wait a few hours before operating. Some examples are—

- Intestinal lesions, severe haemorrhage
- Open joint and bone injuries
- Multiple injuries with shock
- Extensive closed fractures and dislocations
- Skull injuries without coma.

B. *Priority-III:* Those given attention on the spot. Priority is given to the more serious cases among those with a chance of survival.

There are the individuals who are attended to while waiting to be sent to a specialised centre and those who do not need major medical care and can be treated on the spot.

Priority III grouping also includes very serious cases with no chance of survival that it would be pointless to move them.

About 60 per cent of all casualties require definitive hospital treatment, and a third of these will undergo emergency surgery.

Patient Holding Areas and Allocation of Patients

To ease the load on acute care wards and other main patient holding wards, ancillary clinical treatment facilities would be required to be established. These may be organised with lesser resources in manpower and equipment for taking care of less serious patients or patients awaiting transfer or discharge. The plan should provide for expansion of the hospital by using nearby buildings for use as auxiliary wards or as holding areas if necessary.

It should be predetermined as to which wards, rooms, classrooms, etc. will be used for housing the casualties. These should be systematically defined in the plan, showing number of beds, location, with specific personnel assigned for the operation of these areas. Each area should have a pre-determined complement of bedside items, and a cupboard of drugs and medicines, dressings, instrument trays and other essential items required in the wards.

Surgeons and physicians and all other specialists have to adopt themselves to the situation presented by the disaster. Under the direction of the specialist concerned all the medical and surgical staff participates in the care and management, even if the injuries are outside their specialisation.

A reserve supply of linen, mattresses, blankets and emergency clothing should also be included in the plan stating their quantity, location, person in charge and requisition procedure.

Authority and decision making responsibility for admitted patients for transfer to other wards, other hospitals, or discharge to home should rest in the senior doctors specifically nominated for each ward. A time schedule may have to be decided in advance for this purpose, depending upon the clinical condition of patients.

Patient Turnover

A bed census would have to be taken periodically, probably twice a day as against once a day in normal times, to determine the number of patients subject to immediate discharge, transfer to other hospitals or requiring continued care within the hospital. The review system provides early and prompt review of all casualties indicating level of care required, where they could best be housed, and when they should be discharged to ambulatory care.

There can be a predetermined schedule for discharge of patients, for evacuation of nonambulatory patients requiring continuing care elsewhere and a plan for the discharge/evacuation of patients who are able to leave and give up their beds for more seriously ill patients.

The discharge procedure should be streamlined as well as simplified to handle large number of patients at short notice. For this purpose, a team of two or three doctors can be formed with responsibility for decision making, discharge documentation, and follow-through.

The procedures should allow for orderly disposition of casualties to their homes, other hospitals or to voluntary organisations.

For transportation of casualties to their homes or to other hospitals, provision will have to be made for a large number of ambulances pooled from all available resources. Private cars and other vehicles of all types belonging to the voluntary agencies may also be required to supplement the ambulances.

Communication Systems

Uninterrupted internal communication between all departments as well as means of prompt communications with outside agencies ensures smooth management of the disaster plan. There should also be an organised messenger system to substitute in the event of their complete failure, or over and above these, when all lines get busy for long periods. The messenger personnel must be fully conversant of all the areas and all functionaries in the hospital. For this it may be necessary to create a pool of messengers.

Medical Supplies

Medical supply management is a critical part of both overall disaster preparedness and effective relief effort. If the disaster is localised and of slight or moderate impact, medical supplies required for the emergency will tend to be manageable at the local level. If the magnitude is great, large quantities of medical supplies may be needed urgently, with assistance from other areas.

The lack of forethought in planning and lack of experience in disaster management usually manifests in a sense of helplessness among health authorities, over estimation of logistics without ascertaining local resources, confusion and panic reactions.

Classification of Stores

Classification of stores and materials in different categories helps in control over their supply, demand, availability,

procurement and turnover. For this purpose the stores can be broadly classified into the following groups:

1. Medicines, drugs, pharmaceuticals
2. Surgical dressing materials: Bandages, Gauze, Cotton, POP rolls, burn dressings
3. Stretchers, splints
4. Blankets, bed linen
5. Medical gases
6. IV fluids
7. X-ray plates
8. Miscellaneous.

Sufficient stocks of following materials must be gathered from all available sources to meet the potential requirement of increased casualties. Additionally secondary source of such supplies must be identified and earmarked:

1. Treatment of burns
2. Intravenous fluids, volume expanders
3. Analgesics and hypnotics
4. Medical gases including oxygen
5. Chemical disinfectants
6. Dressing materials
7. Plaster materials
8. Splints.

Emergency drugs, equipment and supplies should be located adjacent to each patient holding area. This will be additional to the main hospital store. Some of the stores personnel will have to be assigned to activate/ operate these expanded units.

In case of sudden requirements or in emergencies, a predetermined procedure should be established for unlocking and issuing critical storeroom items in the absence of the storeholder. A separate set of emergency keys for the stores department and pharmacy should be available for this purpose.

Blood Bank

If the hospital has its own blood bank a large number of volunteer donors are bound to approach it for blood donation. This should be forethought and arrangements made for reception of donors, blood collection and storage on a large scale.

Physical Plant

The hospital must have an alternate stand-by source of power additional to the normal municipal supply to operate lifts, communication systems, X-ray and lab equipment and other electrical appliances. Sufficient fuel in case it is necessary to operate the generator for prolonged periods should be stored.

Availability of sufficient quantities of water, and water conservation, has to be given a thought. An independent hospital source of water is desirable in case of damage to regular water supply or its contamination; chlorination of water will have to be catered for and procedure for this established in such an event.

If there is damage to the hospital mechanical laundry, provision for additional laundry service will have to be made.

Additional supplies of building maintenance material will have to be checked and personnel should be earmarked to support expanded hospital activities.

In the event of an outbreak of fire the fire fighting equipment installed in the hospital should be capable of being used instantaneously. For this, regular checks and periodical fire fighting drills should be incorporated in the plan.

An *incinerator* for disposal of hospital waste has become a necessity now. If the incinerator becomes nonoperational due to any reason, a make-shift substitute incinerator would be necessary to dispose of the hospital waste. Alternately, a method a trenching will have to be devised as a temporary measure.

Sufficient quantities of insecticides and hygiene chemicals should be available in reserve supply.

Emergency Mortuary

Proper identification, preservation and disposal of dead bodies taking into consideration medicolegal formalities is a serious problem. To cater to the large number of dead, some nearby buildings such as empty warehouses, halls or similar other will have to be requisitioned for holding temporarily the increased number of dead bodies. Alternatively, the plan must include setting up of a temporary emergency mortuary. The use of the hospital mortuary is not recommended. There is rarely enough space, access is difficult and it may hinder accommodation of hospital dead bodies. Air conditioned tents which may be erected conveniently at any place should be considered wherever possible, maintaining a temperature of 4-6°C to prevent or delay decomposition of bodies to the extent possible.

A responsible person should be nominated to organise and supervise the disposal of the dead and their legal clearance form police or other nominated authorities. It becomes impracticable, may be impossible, to carry out postmortems due to high number of cases. An appropriate legal authority, generally the Divisional Commissioner or City Magistrate can waive the postmortems in such an eventuality. This waiver should be obtained before the dead bodies start arriving.

Traffic Control

The lifts would have to be manned continuously. A traffic control chart should be available with appropriate sign posting to facilitate internal patient movement to Radiology, Intensive Care, Operation theatres and from there to patient wards.

A large number of onlookers, idling public, relatives and family members and people anxious to help crowd the hospital during such times.

To avoid uncontrolled entry of all and sundry and to avoid chaos, all entrances and exits should be manned, to allow only the authorities or essential personnel besides casualties, police and the relief personnel.

Volunteers

There has to be an organised plan for participation of volunteers because uncontrolled help by volunteers can create more chaos and confusion than it can help solve.

Public Relations

A responsible officer should function as the PR officer during the operation of the disaster plan. The information related to casualties, their movements, locations should be available with this officer. He should continuously gather and update his information and be conversant with the latest situation in the hospital. He should also be provided with adequate number of messengers specifically assigned to him.

Only this person should be responsible for the release of information the press and the media, and for issue of daily information bulletins for information of the public.

The officer will also be responsible to establish contact and communication with civil defense agencies whose names, titles, location and contact numbers should be available with him.

CONCLUSION

Disasters can occur on large scale without warning. A large portion of the management of this human tragedy has to be

dealt with by hospitals and other health care organisations. It is said that being forewarned is being forearmed. But this will not be the case most of the times. Therefore, being prepared for the possible would offer the best chance in successfully tackling a disaster situation.

The following is a step by step approach in getting prepared for disaster situation.

1. Review of the likely disaster scenario
2. Review of the Hospital's capabilities, strengths and weaknesses
3. Forming a Disaster committee
4. Preparing the Disaster plan: to include:
 - a. Command post at disaster site
 - b. Disaster alert
 - c. Triage
 - d. Transportation
 - e. Receptions of casualties
 - f. Treatment and management of patients
 - g. Holding and turnover of patients
 - h. Disposal of dead bodies
 - i. Communication
 - j. Medical stores and supplies
 - k. Physical plant and machinery
 - l. Traffic control
 - m. Volunteers
 - n. Public relations.
5. Rehearsal of the plan
6. Updating of the plan.

The disaster plan should be rehearsed at least twice a year. Actual reception and evacuation of patients may not be possible during such rehearsals, but the drills should be as realistic as possible, and they should involve the complete medical staff, administrative, nursing and other hospital personnel. Based on the experience during rehearsals the plan should be revised, updated and modified.

CHECK-LIST

A check-list for the disaster plan is given at Appendix VII [Page 371]. Readers would do well to go through the check-list before putting the disaster plan on paper.

Quality Assurance through Record Review and Medical Audit

Quality assurance is achievable through an ongoing evaluation of patient care which would assure the hospital that all that was done for the patient was done to justify diagnosis, treatment and outcome and to pinpoint inadequacies in medical care for rectification for the future cases.

Quality of care measurement generally involves two basic concepts: (i) the quality of the general care, relating to care services incorporating organisational and the man-materials-money-machines inputs, and (ii) the other relating to cure service or the quality of the art-of-care that is, clinical audit.

A REVIEW OF THE PROCESS, CONTENT AND OUTCOME

There are a number of strategies for assessing the quality of medical care. Quality assessment methods differ, for example, in time frame for review (prospective, concurrent and retrospective), in data-gathering methods (record review, abstract, observation, and interview), and in the categories of criteria (structure, process and out-come). Quality of care assessment through the study of structure has been dealt within a previous chapter (Chapter 23). Quality of the art-of-care through the process, content and outcome is the subject of this chapter.

Process measures are simply those measures that evaluate what a provider does to and for a patient. They mean how well a patient is moved through the medical care system, in a “micro” sense (e.g. from arrival to departure at an emergency room or outpatient clinic). Outcomes reflect what happened to the patient in terms of palliation, cure, rehabilitation or death.

The term ‘quality assurance’ is of recent origin which has replaced the term “medical audit” which basically depended upon the study of medical records in retrospect. When the concept of medical audit originated, it was thought that a review of medical records was expected to answer the following questions.¹

1. What did the patient have?
2. What was done for him?
3. Was something that was required to be done, not done?
If not, why not?
4. Was the treatment optimum? If not, why not ?
5. Was the outcome satisfactory? If not, why not?

Analysis of the above questions provides the means for judging whether whatever done for the patient was done to justify diagnosis, treatment and end-results, and whether it was done in the best interest of the patient. The process has also been envisioned as a self-motivated continuing education process for the physicians, and the findings of the quality assurance audit as springboards for remedial action.

Quality is defined as adherence to standards and criteria that are based on current knowledge and sound experience. Quality assurance is a planned programme which objectively monitors and evaluates the clinical performance of all practitioners, identifies opportunities for improvement, and provides a mechanism through which action is taken to make and sustain those improvements.

The concept of medical audit originated in the USA. The Joint Commission on Accreditation of Hospitals-JCAH (a joint body formed by American College of Surgeons, American Medical Association, American College of Physicians and American Hospital Association) enforced the

condition for accreditation that each of the hospitals should have an ongoing medical audit for assuring a satisfactory level of medical care. For those errant hospitals which did not care for accreditation by the JCAH, enforcement of similar precondition by the US federal government for reimbursement of the Medicare, Medicaid, Blue Cross and Blue Shield programmes has brought most hospitals under the ambit of medical audit. USA and Canada are perhaps the only two countries and a few in Europe where the regulation of standards of medical care is carried out voluntarily by a system of accreditation of hospitals.

In India, the importance of medical audit for quality assurance is gradually being grasped by some hospitals, most of which are teaching hospitals. Medical audit conducted as a pioneering experiments in 1978 at the All India Institute of Medical Sciences and Safdarjang Hospital² not only brought out many shortcomings to the fore, but the presentation of the findings to the physicians and surgeons was a revelation to them—whileas one study was only retrospective to highlight problems and shortcomings, the other one which was carried out prospectively proved to be of great value as accepted by the hospital's community of physicians themselves in answering questions posed in the beginning of this section.

Theory and Practice

The theory and practice of health care provision are often not the same. While in theory we should be able to take it for granted that sick will always receive the best possible treatment and care, in practice we know that we cannot. Thus, the provision of health care is paved with good intentions, but even the best hospital can fall below standards for a variety of reasons, ranging from accident, mistake and poor communication to lack of resources, mismanagement and malpractice. Hence, the need for quality assurance procedures which ensure that every hospital has an arrangement for the regular checking and assessment of its standard.³

Take for instance the care of patients with serious infections who require the newer, more potent antibiotics, some of which require monitoring of drug levels to avoid harmful effects such as kidney failure. Physicians may argue strongly for purchase of the newer drugs as well as setting up tests for drug levels in the laboratory, both of which may increase costs. Yet in the very same hospitals, one can often find a number of patients on expensive drugs that were not strictly necessary or on more frequent dosing schedules than were required.⁴

Usually both the above types of quality problems can be found in many hospitals.

Purpose of Quality Assurance

The purpose of the quality assurance programme is to:

- i. help patients and potential patients by improving quality of care,
- ii. assess competence of medical staff, serve as an impetus to keep up-to-date and prevent future mistakes, and
- iii. bring to notice of hospital administration the deficiencies and in correcting the causative factors.

The process can also help to exercise a regulatory function, restricting undesirable procedures. This cannot but help the medical staff to improve upon their clinical and professional judgement. By timely verification, it cannot but help provide assurance for future actions so that better methods could be used.

Quality Assurance and Costs

It is important to note that physicians will often be most conscious of those instances where resources were too limited to meet patient's needs. Thus, they will argue strongly for more resources to provide better quality of care, but the costs will be higher.

Administrators, on the other hand, may have pressures on them to keep costs from rising, and they will eliminate either harmful or inefficient care before considering increasing the costs to improve quality through new services, new methods and new equipment.

Quality assurance programmes to be successful will need to meet both sets of needs. Institutions which are sensitive to these two sides of the cost/quality dilemma will most likely be able to achieve some of each of the desired goals.⁴

PROFESSIONAL REVIEW OR CLINICAL AUDIT

Definition of clinical audit: Clinical audit is a clinically led initiative which seeks to improve the outcomes of patient care through structured review whereby clinicians examine their practices and against agreed standards and modify their practices where indicated.

Professional reviews, e.g. death review, radiographic review, tissue review and chart review attempt to evaluate the physicians' and hospitals' performance. Scrutiny of all fatal case documents can be used to adjudge the professional competence of the medical staff and provide useful feedback

for policy planning. The aim of the radiographic review is to ascertain whether screening of radiographic films could be avoided or reduced if a complete medical examination, history taking and analysis were carried out, and also to find out whether any radiographic examinations were warranted but not carried out. Tissue reviews are done to answer queries whether surgery in certain cases was really necessary. Introduction of tissue reviews in certain hospital have minimised the rate of unnecessary appendectomies, hysterectomies, tonsillectomies and other injudicious surgical interventions. The periodic chart review is another method to evaluate the performance of the medical staff in rendering efficient medical care. The review board or committee includes the pathologist, radiologist and heads of clinical services besides the administrator, who all study medical records and make recommendations on all phases of medical care activities.

Method

A clinical audit programme can be either concurrent or retrospective. Concurrent evaluation provides opportunity for simultaneous corrective action, whereas the retrospective evaluation acts as a continuous and ongoing self-improvement process.

Concurrent or on-the-spot Audit

A hospital administrator uses this method routinely so far as nonclinical aspects of hospital care are concerned, in the form of daily and periodical administrative rounds. Nevertheless, this can also profitably form part of the ward round of clinicians and consultants. Because it is done while the patient is still in the ward, it oversees things as they happen from day-to-day. As the round progresses, the visiting clinician should look into the patients' case records, enquire from each patient about his or her progress, treatment and diet, peruse nurse's report book and treatment book, and even inspect the housekeeping activities and sanitation of the ward and other aspects connected with patient care. Any lacunae discovered during such round are usually corrected on the spot or instructions passed to appropriate personnel for remedial action.

The discharge analysis function (carried out in the medical records department) may be more useful if moved to the floor of the wards and incorporated into the ongoing concurrent review process.⁵ Failure to verify verbal orders given by physicians is often the source of problems like medication errors and ordering of duplicate laboratory tests.

These could be monitored by the discharge analyst of the records department or even the senior ward sister. The analysis of record immediately after discharge in the ward itself can prove fruitful in obtaining the final diagnosis from the physician before the record arrives in the medical record department. This can assist in providing accuracy of information in the medical record itself, the most frequently used data source in the hospital.

The Retrospective Audit

In many instances where people are keen to carry out such an evaluation, the whole process has generally been gone through with no preparation and in the most haphazard manner. Needless to add, any quality assurance programme requires a step by step approach to derive the desired result.

Prerequisites of retrospective audit: There are three fundamental prerequisites that need to be fulfilled before the programme is instituted:

- i. good medical records,
- ii. establishment of criteria for diagnosis, investigations and treatment, and
- iii. cooperation and involvement of medical staff.

A good medical record of each patient: It is imperative that the patient's illness and all events connected with it while he or she is in the hospital are lucidly and faithfully recorded. In a general hospital, medical records are generated at, or by:

- i. admission office,
- ii. doctors' notes,
- iii. nurses' reports, and
- iv. supportive services—Laboratory investigation reports, radiographic reports, and special investigation reports.

The medical record has to be sequentially filed and a "face-sheet" affixed to each case record before it is presented to the evaluation committee. This will require services of a medical records librarian, but it is not difficult to learn by other paramedical staff. The quality assurance programme depends on completeness of these records.

Choosing Appropriate Criteria and Standards

Criteria and standards are two medical audit terms, which often confuse people. This need not be so, as criteria and standards are not difficult to understand. Referring back to the definition of medical audit, criteria and standards relate to "what we should be doing". Therefore, each criteria should be recorded as a succinct statement.

A criteria is essentially an item of care, or an aspect of practice, that we can use to assess quality. An example of a simple criteria may be “The records show that patients with Type II Diabetes are reviewed half yearly”.

A standard is a statement of the proportion of occasions on which the criteria is fulfilled. Standards may be expressed as percentages. as example, a standard can be stating that 100 per cent of Type II Diabetes patients should have a half yearly review recorded in their records.

In other words, standards and criteria are what you are going to measure, and what you are going to measure against respectively.

While as criteria and standards should be based on latest knowledge and research, it is acceptable to base criteria and standards on a consensus agreement by members of the audit committee.

Establishing Criteria for Diagnosis, Investigations and Treatment

This is the most important aspect, to establish norms and criteria for each aspect of patient care according to the accepted current medical practices, for nothing can be evaluated if there are no norms for comparison. A high-power committee of senior clinicians and consultants should be convened to indentify and enumerate the various characteristics of medical care that need to be measured, and then arrive at a concensus in affixing standards and criteria for each.

Priority is given to those elements of care and service that have the greatest potential to harm patients or deprive patients of significant medical benefit if not carried out correctly.

In measuring quality, “process” measurement involves methods which the organisation uses to provide services, i.e. “is the process proper or performed correctly”. It involves comparison with standard procedures and determination of relative values on a scale when standards do not exist or are not applicable. Some examples of the process quality measurement are written procedures for the care of isolation patients, identification procedures for patients going to surgery, staffing schedules, sterile techniques being maintained in the operating room, and contaminated linen tagged appropriately.

Certain categories of data are de facto indicators of substandard care (e.g. failure to treat patients with severe hypertension, surgery for cataract yielding a normal lens).

Variations from standards and criteria are judged as justifiable when peer review attributes the variations to unique

aspects of patient’s condition or other factors beyond the control of the hospital or practitioner.

Variation from standards and criteria are judged to be unjustifiable when the variations are attributed to failures in hospital support (e.g. inadequately trained staff or insufficient equipment) or to the concerned practitioner’s poor performance or lack of knowledge.⁶

Some Standards and Criteria

Examples of various norms and standards generally accepted in most hospitals are as follows.

Gross death rate: Ratio of total deaths to total discharges. In general hospitals, it is about 3 to 5 per cent.

Net death rate (Institutional deaths): Number of deaths occurring 48 hours or later after admission. It does not generally exceed 2.5 per cent.

Anaesthesia death rate: For deaths which can be definitely attributed to anaesthesia. Even in circumstances beyond control, the ratio may be 1:5000 anaesthesia.

Postoperative death rate: Death occurring within 10 days after an operation (nonspecialised, general surgery)—less than 1 per cent.

Maternal death rate: Ratio of maternal deaths to obstetrical discharges—0.25 per cent.

Neonatal death rate: Ratio of death among newborn infants to total births - 2.0 per cent.

Autopsy rate: Ratio of autopsis carried out to total hospital deaths - 10 to 15 per cent (desirable).

Hospital infection rate: Less than 4 per cent of all admitted cases.

Postoperative infection rate: Ratio of postoperative infection to total number of operations performed - 1 to 2 per cent.

Caesarean section rate: Ratio of caesarean sections performed to total number of births—10 to 15 per cent.

Readmission and recurrence rate: There is no specific data available for this.

It may not be possible or even desirable for the committee to lay down norms for every and all types of cases. Therefore, it can devote attention to some, or more, of the following, either simultaneously or by rotation.

1. Short-stay cases (say, 3 days or less)
2. Long-stay cases (say, 20 days or more)
3. Specific disease groups, e.g. gastrointestinal, caesarean sections, “acute abdomen”, appendicitis, fractures, head injuries and so on

4. Specific disease groups or operations carried on over a specific period
5. Cases of increased incidence of a particular disease or disease group
6. Cases where postoperative complications have arisen
7. Cases where hospital infection has set in, etc.

Agreement on standards: Once the criteria are developed for specific diagnoses, conditions or procedures by a committee of senior medical staff it must be reviewed and agreed upon formally by the entire medical staff.

Standards as a measure of quality may either be established voluntarily or imposed by law. There is a need for professional bodies active in the field of hospital administration to come together to establish them based upon current state of medical knowledges, equipment, technology, methods and ethics. Excellent standards have been achieved by some of the private hospitals. Voluntary standards constitute the hospital's desire to serve to the best of its ability in a safe and effective manner striving to reach a high level of service.

Securing the full cooperation and involvement of medical staff: The doctors and nurses must be prepared to subject themselves to evaluation by their own peer group. It is necessary to remove any fears from their mind and to emphasise that evaluation through quality assurance programme is not an administrative fault-finding tool. Needless to add, the evaluation committee must be scrupulously honest and impartial in their judgement, remembering all the time that the aim is to improve patient care.

In addition to being fully accepted by the professional staff, a quality assurance programme must be fully supported by the organisation or leadership of the institution.

In most cases, however, it is difficult for the medical board to control the activities of the staff. This difficulty is manifested by delinquent, inadequate entries into medical records and poor attendance at committee meetings because of the traditional reluctance of medical staff to enforce sanctions against colleagues. This reluctance is a major contributor to institutional failure to take corrective action against professional deficiencies.

Focus Group

One method of collecting and using the valuable perceptions of physicians as a primary source of productive topics is the creation of a focus group in the hospital.

A focus group discussion is an informal discussion convened for the specific purpose of identifying issues and attitudes. Great attention is not necessary for most focus groups, the purpose of which is to initiate, isolate and verbalise specific areas to be submitted to further study and action.

Discussing among practitioners, administrators, and department heads can become a systematic part of the problem identification. Such focus groups, purposely formed and convened by the quality assurance coordinator or other suitable person for the express purpose of identifying issues for study, provide an effective and inexpensive problem identification method that can be instituted by a hospital of any size.

External or Internal

External quality assurance is seen as being concerned with the setting of explicit standards of service over wide areas of health care system by independent outside authority, which can then be checked by independent assessors of the kind practised by JCAH in the USA and equivalent bodies in Australia, Canada and the Netherlands.

Internal quality assurance is seen as essentially a local exercise, whereby the activities of physicians and surgeons are subjected to a confidential review by their peers designed to improve patient care and encourage professional self-evaluation.

Quality Assurance Committee (QAC)

The next step is to form the committee which should meet periodically to carry out the evaluation. The committee should consist of the following.

- Medical administrator
- Two senior clinicians
- Pathologist
- Radiologist
- Nurse administrator (matron)
- Medical records officer—secretary.

Additional personnel such as superspecialists and consultants can be co-opted on the committee as and when required.

A major key to productive results is to assign specific functions to the QAC. These functions of the QAC should include, but need not be limited to the following.⁷

1. Coordination

- Collecting information
- Consider activities that should be related, e.g. quality appraisal and continuing education

- Communicate across patient care disciplines
 - Coordinate actions of hospital authority groups.
2. *Information*
 - Provide a centralised source of reports to the board
 - Suggest need for intervention to hospital authority groups.
 3. *Planning*
 - Establish priorities.
 4. *Prodding*
 - Insist on effective, productive quality appraisal efforts from all hospital components.
 5. *Consultation*
 - Provide specific assistance, usually through the coordinator.
 6. *Response*
 - Internally, acknowledge issues of importance to individuals and departments when suggesting high-priority areas for immediate attention
 - Externally, provide the organisational home for responding to quality requirements of external agencies, if any, e.g. medical companies.
 7. *Search for expertise*
 - Operate openly, not behind closed doors, seek out the specific clinical and/or management expertise necessary to reach sound conclusions.

8. *Follow-up*

Insist on reports of the impact of implemented changes. Correcting the orientation of committee members is crucial in view of the subtle approach that must be used if quality assurance is to be effective rather than threatening, controversial, and counterproductive. Committee members must recognise that their major functions are:

- i. to coordinate, not to control,
- ii. to inform, not to scold,
- iii. to plan, prod, and suggest priorities, not to do detailed studies “in committee”, and
- iv. to recommend and report, not to intervene directly.

All of the recommendations of the committee—since they go to authority figures or groups for final action—are by consensus rather than by vote. With this approach, the committee need not be feared as interfering with or threatening established authority, such as that of the board of trustees, administrator, medical staff executive committee, or administrator of nursing services.

To sum up, the work of the committee should be directed toward specific end products.

1. The selection of the elements of the medical care delivery process that are to be audited

2. The development of a set of expectations and performance standards for these elements
3. The development of a valid, reliable, efficient audit instrument
4. The development of a reliable data collection process
5. The development of an analytic system
6. The development of a feedback system.

Mechanics of the Review

Records of patients are initially abstracted with the help of the staff of the medical records department. Records which confirm to the criteria are not examined any further, records which show discrepancy between the information abstracted and the criteria laid down are placed for review before the members of the committee. For each meeting, the medical record librarian or other person nominated takes out the medical documents of the specified category of discharged patients, and they are distributed equally to the members of audit committee who may review the documents in advance of each meeting.

Members note down their observations in each case considering the salient points relating to diagnosis, treatment, complications, end results and so on. After review, important discrepancies which cannot be satisfactorily explained are reported to the department concerned or to the entire staff without identification of individual physicians. If many staff are found to show a broad pattern of substandard performance in one or more aspect of care, this is interpreted as a deficiency of knowledge and skills, calling for specific remedial educational programme.

When only a few doctors account for a large portion of an observed shortcoming, the head of the department or the executive committee of the medical staff must meet them to discuss the problem. Corrective action is taken when ongoing monitoring and evaluation and peer review identify inadequate clinical performance or other deficiencies in patient care. Administrative and supervisory staff takes steps to improve the paramedical staff performance, where indicated. The particular area of performance is subsequently audited to determine whether criteria are now being satisfactorily met with.

Here, it should be noted that the work of the medical records committee differs from the QAC in that the medical records committee limits itself to determining the completeness and appropriateness of records as per standards laid down by the hospital. It primarily checks deficiencies in records and not deficiencies in clinical care. The Medical

Records Committee passes on the results to the Audit Committee because it is not their (Record Committees) mandate to check deficiencies in clinical care. To that extent, the functions of the two committees are complementary to each other.

THE COMPREHENSIVE QUALITY ASSURANCES SYSTEM (CQAS)

Professional reviews, concurrent evaluation, medical audit, external evaluation, peer review—each of these methods has strengths that make them most appropriate in some situations and limitations that make them inappropriate in others. However, establishment of a comprehensive QA system should be the ultimate goal of hospitals.

Each department should go through a problem-identification and standard-setting process and submits audit standards to the central QA committee of the hospital for priority setting and measurement. Some standards are also adopted for measurement across departmental lines.

The first step then—the “input” into the audit cycle is the identification of problems. Suggestions for problems to be studied can come from any sources—complaints from staff or patients, medicolegal review, statistical reports, chart audit, etc. The problem identification method of chart audit or “microsampling” consists of having physicians review charts without preconceived, explicit criteria. This method is a very effective way to discover large number of significant problems, but it is not an indispensable component of CQAS.

The process of microsampling is quite simple. A small number of charts (5 to 20) are picked about six weeks prior to the meeting. Two physicians in turn look for shortcomings in each chart, and the agreed upon findings are presented to the group.

It is essential to achieve unanimity in regard to the observation being an error in the particular chart under review, but it is not essential to have unanimity in regard to the standard or criterion. Requiring unanimity here may stop all progress because of differing views about the purpose of the standard.

The purpose for setting standards is not to create performance standards or directives for proper practice. Standards in quality assurance result **from** professional decisions, they do not result **in** professional decisions or actions. The criterion should be based on what action peers consider preferable in similar circumstances (not limited to identical situations).

In smaller hospital in which full-time assignment to coordinate QA functions is not possible it may be carried out by appointing an overall QA coordinator from among the medical staff, formalising the role of other personnel who contribute to the QA programme goals, including their relationship to the QA coordinator, and defining inwriting the relationships of the QA coordinator with the various departments that contribute to QA functions.

Nearly every large hospital will need a full-time QA coordinator. The demands of the programme in a large hospital are too expensive to expect that they can be met by someone in an ad hoc fashion on a time-available basis.

TOTAL QUALITY MANAGEMENT (TQM)

What is Total Quality in Health Care?

Total quality has been defined as doing things right the first time and every time by everyone at every workplace. However, in a hospital setup the individual expertise of any one employee alone cannot leave a positive impact unless systems are also laid down to ensure prompt and expert care in a consistent manner by the whole team.

In the past, medical professionals thought that total quality was not their job—it was considered to be the foray of the administrators. They did not think that many problems could be sorted out not by investing in financial resources alone but by improving the systems and changing the mindset.

Implementing Total Quality Management [TQM] in a hospital requires convincing the workers that total quality is **not** extra work but it envisages changed way of working, where people have to be encouraged to be creative and find solutions to their own problems.

Quality Improvement Project [QIP]

From time-to-time there will be some areas in the hospital where need for improvement will be felt.

A quality improvement project [QIP] addresses a problem that is chronic, significant, measurable and for which a solution can be found, often in cross-functional areas. A step-by-step approach as under can help during the project.

Step 1: Identification of the Problem, and Need to Improve

- a. Flow-process chart : of the system, process or action under study, to pinpoint bottlenecks

- b. ABC analysis : to determine which portion of the problem to concentrate on
- c. Cause-effect diagram : to identify important causes responsible for the problem and their effects
- d. Root-cause analysis : to identify the basic cause (s) responsible for the problem.

Step 2: Remedical Action

The remedical action should spring from ideas which will be generated from brain-storming sessions of the members of the team.

Retrospective Reviews and Medical Audit can be Quite Simple

Having considered all the different aspects of quality assurance, putting it into practice would appear daunting to many. While accepting that instituting a comprehensive quality assurance programme can be a stupendous task, it is not necessary to begin with a bang only to end in a whimper. The simplest way is to make a beginning with a retrospective medical audit on a modest scale and enlarge upon the idea gradually to incorporate large areas/more departments as more experience is gained. As a starting point, such a simple format is given in Appendix VI to this chapter.

CONCLUSION

The quality assurance process has been divided broadly into two components: (i) the one relating to the 'care' services encompassing the organisation and the men-materials-

money-machines inputs and their utilisation which had been dealt with under general evaluation of hospital, and (ii) the other relating to the 'cure' services incorporating professional and technical study of patients' medical records culminating in medical audit. The former has been profitably carried out by hospital administrators, whereas the latter is considered as an exclusive domain of the medical staff themselves.

Medical audit is not the product of a bureaucratic imposition by misguided administrators, no mere fad, fancy or managerial gimmick but an obligation on all who are concerned with the provision of hospital services.

If both the provider and the recipient of medical care service are equally convinced that the service is not only of good and acceptable standard but can be shown to be so, then both will be equally satisfied.

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Appendices

APPENDIX

I

Significance of the Aesculapaeus' Rod and the Snakes in Medical Emblem

It has been many a times queried by many doctors, nurses, administrators and students alike as to the meaning and significance of the snake emblem so commonly found in things related to medicine and hospitals. The emblem incorporates in various combinations a rod, snake or snakes entwined around it, and wings.

The snake symbol has been associated with the medical profession since ancient times. The Greeks regarded the snake as a symbol of virility, wisdom and eternity. Greek history reveals that it was carried by the Greek mythological god Apollo in his hand and by Mercury round a rod. Intertwined around a staff, it was carried by Aesculapaeus, the Greek god of health and healing. The emblem recurs in the temples built in his worship by the descendents of Aesculapaeus where the central figure was the statue of Aesculapaeus holding a staff with the snake intertwined around it. Thus, the rod with the snake which came to be associated with the then known science of health and art of healing continues to be so to the present times as a common symbol of

things connected with the medical profession and hospitals. Wings represent soaring of knowledge.

So far as India is concerned, the ancient Indians have been worshipping the snake form from time immemorial, as depicted by the snake carried by Lord Shiva around his neck, the description in the *Puranas* of Vishnu resting on the body of a thousand headed serpent, and Krishna standing on the hood of an enormous snake. In the excavations of the remains of the Indus Civilisation at Mohenjodaro dating back to 3250 to 2750 BC, two snakes are depicted carved on the trunk of an *Aswattha tree*. There is a striking similarity of form in these carvings to those used as a symbol of medical profession in the Greco-Roman era. The rod is called the Brahmada, the rod of Brahma (the 'creator' in the Hindu Trilogy of Brahma, Vishnu, Mahesh), and the snakes symbolise the Kundalini or serpent fire of eternity lying dormant at the base of the spinal column of every person. The science of healing was associated with gods. The rod of the Creator with the sign of knowledge and eternity, therefore came to be acknowledged as the medical symbol.



Fig. 1

APPENDIX

II

Schedules of Accommodation

Patient Care Unit

1. What will be the hospital's total bed capacity? _____
2. What will be the proposed organisation for patient care units (type of service)?
 - a. Clinical classification: Check
 - b. Types of care: Check

i. Medical _____	i. Intensive _____
ii. Surgical _____	ii. Intermediate _____
iii. Obstetrical _____	iii. Long-term _____
iv. Nursery _____	iv. Other _____
v. Paediatric _____	(specify)
vi. Others _____	
 - c. Other classification (specify) _____
3. How many beds will be assigned each patient care unit?

	Bedroom size				Total beds
	1-bed	2-bed	other	(specify)	
a. Clinical classification (specify specialities, e.g. medical-gastroenterology, cardiovascular, surgical orthopaedic, ENT)					
i. Medical _____	_____	_____	_____	_____	_____
ii. Surgical _____	_____	_____	_____	_____	_____
iii. Obstetrical _____	_____	_____	_____	_____	_____
iv. Nursery _____	_____	_____	_____	_____	_____
v. Paediatric _____	_____	_____	_____	_____	_____
vi. Others _____	_____	_____	_____	_____	_____
b. Type of care (specify clinical specialities, e.g. intensive care (cardiovascular, neurological other) :	1-bed	2-bed	other	Total	
			(specify)	beds	
i. Intensive _____	_____	_____	_____	_____	_____
ii. Intermediate _____	_____	_____	_____	_____	_____
iii. Long-term _____	_____	_____	_____	_____	_____
iv. Other _____	_____	_____	_____	_____	_____

- c. Other classification:
 - i. _____
 - ii. _____
4. Based on above bed assignment for Unit _____ Beds _____

patient care units, how many beds will comprise each unit? _____
5. Will flexibility be provided between patient care units under

	Yes	No
--	-----	----

 - a. Clinical classification _____
 - b. Type of care _____
6. What facilities will be provided in patient bedrooms?

	Bedroom size		
	1-bed	2-bed	Other (specify)
a. What toilet lavatory and bath facilities will be provided?			
i. Private toilet and lavatory	_____	_____	_____
ii. Private toilet with lavatory in bedroom	_____	_____	_____
iii. Toilet and lavatory between rooms	_____	_____	_____
iv. Shower	_____	_____	_____
b. What toilet, lavatory and bathroom equipment will be provided?			
i. A bedpan washer in each toilet	_____	_____	_____
ii. Grabrails in toilet and bathrooms	_____	_____	_____
iii. Mirror	_____	_____	_____
iv. Shelf	_____	_____	_____
c. What type of nurses call system will be provided in patient bedrooms and toilets?	Bedroom size		
	1-bed	2-bed	Other (specify)
i. Visual	_____	_____	_____
ii. Audiovisual	_____	_____	_____
iii. Other (specify)	_____	_____	_____

d. How many central piped oxygen outlets will be provided?	_____	_____	_____	8. What will be the nursing staffing pattern for each patient care unit on each of the three shifts and on holidays ?	Number per patient care unit	Number of unit for each service	Total number
e. How many central piped vacuum (suction outlets will be provided ?	_____	_____	_____	a. Supervisor	_____	_____	_____
f. How many central piped air outlets will be provided ?	_____	_____	_____	b. Head nurses	_____	_____	_____
g. How many electrical outlets will be provided ?	_____	_____	_____	c. Staff nurses	_____	_____	_____
h. What type of lighting is desired for ?	_____	_____	_____	d. Floor unit manager	_____	_____	_____
i. General room illumination	_____	_____	_____	e. Aids/orderlies	_____	_____	_____
ii. Patient reading	_____	_____	_____	f. Other	_____	_____	_____
iii. Examination of patient	_____	_____	_____	9. How many nurses' stations are to be provided on each patient floor ?			
iv. Night lighting	_____	_____	_____	a. Will workspace be provided for the following activities at each nurses' station ?			Check
i. What storage facilities will be provided for patient cloths ?	_____	_____	_____	i. Charting			_____
i. Built in lockers	_____	_____	_____	Type of chart rack :			
ii. Individual clothes closet	_____	_____	_____	built in			_____
iii. Other (specify)	_____	_____	_____	mobile			_____
j. What method will be used for delivery and pick up of supplies and equipment to and from patient bedrooms ?	_____	_____	_____	other (specify)			_____
i. Carts and baskets	_____	_____	_____	ii. Communications			_____
ii. Pass through cabinets accessible from patient bedroom and corridor	_____	_____	_____	nurses-calling system			_____
iii. Other (specify)	_____	_____	_____	telephone			_____
				telephone dictating system			_____
				iii. Patient observation			_____
				patient physiological data monitors			_____
				other (specify)			_____
				10. Will a doctor's room be provided ?		yes_____ No_____	
				11. What facilities will be provided for diagnostic and treatment activities ?			Check
				a. Separate examination and treatment rooms			_____
				b. Combine examination and treatment rooms			_____
				12. What provisions will be made for the medicine preparation and storage area ?			
				a. Location			
				i. In a separate room			_____
				ii. In an alcove off the nurse's station			_____
				b. How many nursing personnel will be accommodated ? Number			_____
				c. What capacity refrigerator ? Litre			_____
				13. What are the nurse's toilet facilities to be located on the patient care unit ? Specify			_____
				a. Will change and rest rooms be provided ? Yes_____ No			_____
				b. Are individual lockers to be provided ?	Yes_____	Number_____	No_____
				14. What offices are required ?			Number
				a. Nurses' supervision			Number
				d. Dietician			_____

Bedroom size
1-bed 2-bed Other
(specify)

- b. Head nurse _____ e. Physician _____
 c. Floor unit manager _____ f. Other _____
15. Will a floor pantry be provided for each patient care unit ? Yes _____ Number _____ No _____
 a. What activities will be carried out in this area ? Specify _____

 b. What is the size of the refrigerator ? Litre _____
16. What facilities will be required for the clean utility room ? Yes No
 a. Will all supplies be required for the clean utility room ? _____
 b. Will separate storage be provided for :
 i. Linen _____
 ii. Housekeeping _____
 iii. Sterile solutions _____
 iv. Equipment (small) _____
 v. Other _____
 c. What method will be used for delivery of supplies and equipment to the patient care units ? Check
 i. Cart with adjustable shelves and compartments _____
 ii. Vertical conveyor _____
 iii. Other (specify) _____
 d. Will equipment for treatment be assembled and prepared in this area ? Yes _____ No _____
 e. What equipment will be provided for processing and storage ? Number Size
 i. Counter _____
 ii. Sink _____
 iii. Cabinets _____
 iv. Open shelf _____
 v. Storage cart _____
17. What facilities will be required for the dirty utility room ? Yes No
 a. Will all solid materials be collected here for disposal ? _____
 b. Will linen and trash be bagged in patients' room and transferred here for temporary storage ? _____
 c. Will solid utensils be rinsed here before being returned to central supply ? _____
 d. How will linen, equipment, utensils and trash be removed ? Check
 i. Carts via disposal life _____
 ii. Vertical conveyor _____
 iii. Other (specify) _____
 e. What equipment will be required for processing ?
 i. Clinical sink _____
- ii. Utensil washer _____
 iii. Counter with sink _____
 iv. Linen carts _____
 v. Covered container _____
 f. Will laboratory specimens and forms be picked up from this room for delivery to the laboratory ? Yes _____ No _____
18. Will provisions be made for the following on each patient care unit ? Yes No
 a. Dayroom _____
 i. Dining facilities for ambulant patients _____
 ii. Recreational equipment _____
 b. Teaching/conference room _____
 c. Stretcher and wheelchair alcove _____
 d. Sweeper's closet _____
 e. Drinking water fountain _____
 f. Visitor's waiting room _____
 g. Toilets for physicians, nonnursing personal, visitors _____
 h. Central bath and shower _____
 i. Heavy duty electric outlets, for mobile X-ray unit _____
19. Are there any other points not covered above? If yes, what area they ? _____
20. Additional remarks _____
- Delivery Suit**
1. How many labour rooms will be required ?
 a. What equipment will be needed in the labour room(s) ? specify _____
 b. Will toilets be provided for patients in labour rooms ? Yes _____ No _____
2. Where will the nurses' call signal from labour room be received ? _____
3. Will there be a preparation room ? Yes No
 a. What equipment will be provided ?
 i. Cabinet and sink _____
 ii. Bathroom _____
 iii. Toilet _____
4. What method will be used for collecting and transporting laboratory specimens ? _____
5. How many delivery cubicles will be required ? _____
6. What equipment will be required for the delivery cubicles ? Specify _____
7. How many scoub sinks will be provided in the delivery suite ?
 Will soap dispensers and brush holders be wall mounded ? Yes No

8. Where is the wall clock to be located for easy visibility of the delivery team ? _____
9. Will facilities be required for observing deliveries ?

Yes	No
_____	_____

How many persons will be accommodated ?

_____	_____
-------	-------
10. What type of storage space will be provided in the delivery room(s) for supplies and equipment ?
a. Cabinets _____
b. Open shelves _____
11. What method will be used for infant identification ? _____

What equipment will be required ? _____

12. Will central piped systems be provided for :

	Delivery cubicle	Emergency delivery room
a. Air	_____	_____
b. Oxygen	_____	_____
c. Vacuum	_____	_____
13. Will linen be identified by colour ?
Yes _____ (specify colour) No _____
14. How will sterile supplies be brought from central supply to delivery room ?

_____	Check
-------	-------

a. Cart _____
b. Other (specify) _____
15. What provision will be made for emergency sterilisation procedures?

16. Will anaesthesia apparatus be located ? _____
17. How will clean linen be delivered to the delivery suite?

_____	Check
-------	-------

a. Linen cart-central _____
b. Sectional cart _____
18. How will soiled linen be removed from the delivery suite ?
a. Solid linen bin _____
b. Other (specify) _____
19. Specify the type and capacity of equipment used for removing wastes:

	Type	Capacity
a. Liquid	_____	_____
b. Obstetrical	_____	_____
c. Trash	_____	_____
d. Other (specify)	_____	_____
20. Where will the stretcher trolley be stored ?
21. What provision will be made for storage and preparation of medications in the delivery suite ?
22. Where will the following be stored ?
a. Miscellaneous equipment _____
b. Sterile supplies _____
c. Unsterile supplies _____
23. Where will the following be located ?
a. Communication systems
b. Paging speakers
c. Telephone
24. Will office space be required for following personnel ?

	Yes	No
a. Obstetrician	_____	_____
b. Residents and interns	_____	_____
c. Supervising nurse	_____	_____
d. Other(specify)	_____	_____
25. Will postpartum recovery room be provided ? _____
26. Will locker, sleeping and toilet facilities be provided in the delivery suite for the medical staff ? _____
27. Will locker, sleeping and toilet facilities be provided for nursing personnel ? _____
28. What waiting room facilities be provided for fathers ?
a. Television _____
b. Toilet _____
c. Furniture _____
29. What will be the staffing pattern

_____	Number
-------	--------

a. Nurse supervisor _____
b. Head nurse _____
c. Staff nurse _____
d. ANM _____
e. Other (specify) _____
30. Are there any other points not covered above ? If so what are they ?
31. Additional remarks
- Laboratory**
1. Will the hospital have a pathologist ?

Yes	No
_____	_____

a. Full-time _____
b. Part-time _____
If not, what provision will be made for supervision ? _____

2. If laboratory service is under contract,
a. Who will own the equipment ? _____
b. Who will be responsible for equipment repair, upkeep, replacement ?
c. Will personnel be employed by the hospital or contractor ?
3. Determine the hospital services who will utilise the laboratory :

_____	Yes	No
-------	-----	----

a. Emergency _____
b. Autopsy _____
c. Nursing _____
d. Outpatient _____
e. Surgery _____
f. Other (specify) _____
4. Where will the laboratory be located ?
5. What functions will be included in the laboratory ?
a. Diagnostic _____

- b. Teaching
 - c. Research
6. Determine the space requirements for the technical units based on the number of tests, equipment, and number of personnel projected for each of the following
- | | Number
of tests | Number
of pers-
onnel |
|---------------------------|--------------------------|-----------------------------|
| a. Bacteriology | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Biochemistry | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Haematology | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Histology | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Parasitology | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Serology | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Urinalysis | <input type="checkbox"/> | <input type="checkbox"/> |
| h. Blood bank | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Blood drawing room | <input type="checkbox"/> | <input type="checkbox"/> |
| ii. Donor's recovery room | <input type="checkbox"/> | <input type="checkbox"/> |
| iii. Laboratory | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Other (specify) | <input type="checkbox"/> | <input type="checkbox"/> |
7. What technical units will be combined in the same work area ?

8. Will the technical units be in one open area, individual rooms or separated by partitions ? _____
9. Will the following facilities be provided for ?
- | | Yes | No |
|----------------------------|--------------------------|--------------------------|
| a. Clerk typist | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Pathologists' office(s) | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Conference room | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Specimen toilet | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Venepuncture room | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Waiting room | <input type="checkbox"/> | <input type="checkbox"/> |
10. Will the following service facilities be provide for ?
- | | Yes | No |
|---|--------------------------|--------------------------|
| a. Animal house | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Photography and medical illustration | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Preparation and sterilisation of culture media | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Sterilising glassware | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Washing glassware | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Other (specify) | <input type="checkbox"/> | <input type="checkbox"/> |
11. Will specimens and requests be sent to a central location in the laboratory or to individual technical unit ?

12. How will the laboratory reports be distributed ?
- a. Central collection point in the laboratory

- b. Laboratory personnel
 - c. Messenger service
13. Indicate the desirable functional arrangement of the technical, administrative and auxiliary areas _____

14. What are the laboratory furniture requirements ?
- | | Location | Number |
|-------------------------------------|--------------------------|--------------------------|
| a. Built-in and free-standing desks | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Storage cabinets | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Free-standing | <input type="checkbox"/> | <input type="checkbox"/> |
| ii. Wall hung | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Workbenches | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Drawers below | <input type="checkbox"/> | <input type="checkbox"/> |
| ii. Cabinets below | <input type="checkbox"/> | <input type="checkbox"/> |
| iii. Knee space below | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Stools and chairs | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Filling cabinets | <input type="checkbox"/> | <input type="checkbox"/> |
15. What material is to be used on workbenches
- | | Check |
|--------------------|--------------------------|
| a. Stainless steel | <input type="checkbox"/> |
| b. Plastic | <input type="checkbox"/> |
| c. Wood | <input type="checkbox"/> |
| d. Other (specify) | <input type="checkbox"/> |
16. What equipment will require special consideration for the following ?
- a. Darkened area
 - b. Power
 - c. Artificial ventilation
 - d. Protective measures for personnel
17. What are the storage requirements for :
- a. Chemicals
 - b. Glassware
 - c. Laboratory supplies
 - d. Office supplies
 - e. Other (specify)
18. How will vacuum (suction) and air be provided ?
- | | | |
|---|-----|----|
| a. Central piped system | Yes | No |
| If yes specify number and location of outlets | | |
| b. Others (specify) | | |
19. Identify equipment which requires special electrical considerations
20. What are the requirements for :
- a. Emergency power
 - b. Gas outlets (specify)
 - c. Electrical outlets (specify)
21. Are toilet and locker facilities to be provided for personnel within the department ?
- | | | |
|--|-----|----|
| | Yes | No |
|--|-----|----|
22. Additional remarks



APPENDIX

III

Classification of Various Service Areas and Departments in a Hospital

Broadly all the service areas and departments in a hospital can be classified into four groups. Some of the service areas and departments will not be found in many hospitals, and one will not find all the departments in all hospitals. However, the existence of many departments other than the general clinical departments are unknown to many personnel working in a hospital, and a general understanding of the same is useful. The list is by no means exhaustive. The areas and departments are as follows:

Clinical Service

1. OPD : general OPD, specialist OPDs
2. Emergency services
3. Intensive care
4. Medicine and medical departments
 - General medicine
 - Cardiology
 - Communicable diseases
 - Dermatology
 - STD
 - Gastroenterology
 - Endocrinology
 - Neurology
 - Psychiatry
 - Nephrology
 - Pulmonology
 - Immunology
 - Rheumatology
 - Haematology
 - Oncology.
5. Surgery and surgical departments
 - General surgery
 - Orthopaedics
 - Neurosurgery
 - Reconstructive surgery

- Otorhinolaryngology
 - Ophthalmology
 - Urology
 - Cardiac surgery
 - Gastroenterology
 - Surgical oncology.
6. Paediatrics
 - General paediatrics
 - Paediatrics surgery
 - Nursery
 - General nursery
 - Premature nursery
 - Isolation nursery.
 7. Obstetrics and gynaecology
 8. Anaesthesiology
 9. Dental surgery
 10. Physical medicine and rehabilitation.

Clinical Supportive Services

1. Imaging department
 - X-ray
 - CT scan
 - Ultrasonology
 - Magnetic resonance imaging (MRI).
2. Laboratory services
3. Operation theatres
4. Blood bank
5. CSSD
6. Medical stores and pharmacy.

Clinicoadministrative Departments

1. Nursing department
2. Admission office
3. Medical records

4. Mortuary
5. Infection control
6. Ambulance service.

Administrative Departments

1. Board of trustees
2. Hospital administrator
3. Accounts department
4. Personnel department
5. Linen and laundry department
6. Security
7. Housekeeping
8. Communications
 - PABX

- Paging
 - Intercom
 - Computers (LAN).
9. Stores and purchase department
 10. Engineering services
 - Water supply
 - Electricity
 - Air-conditioning
 - Lifts
 - Drainage
 - Garbage disposal
 - Building and roads
 - Gardens
 - Repair and maintenance workshop.

APPENDIX

IV

Recommendation of the Workshop on Medical Records

The following is a summary of the recommendations of the Workshop on Standardisation of Medical Records and Reports for Hospital Management and Development for District Level Hospitals (1986), under the aegis of CBHI, Directorate General of Health Services, Ministry of Health and Family Welfare, New Delhi.

Medical record department should be considered as one of the most important units of hospitals at all levels as medical records maintenance is a separate discipline which deals with the maintenance and up-keep of the medical sciences. Hence, there is a need to establish and develop a separate Department of Medical Records in each hospital to be integrated into the hospital information system.

As for all staff requirement the minimum essential functions are as under:

1. OPD registration
 - a. Maintenance of accession register
 - b. Issue of OPD ticket
 - c. Collection of fees (if any)
 - d. Issue of disease list of all OPD and collection of these lists from all OPDs at the end of the session and entry of these diseases in the OPD register.
2. Preparation of statistics
3. Filing of records
4. Retrieval of records/information
5. Coding and indexing according to latest ICD revision
6. Dissemination of medical information.

As regards inpatient admission, Cases referred from OPD for admission in the hospital will be registered in the Medical Record Department.

In the Central Admitting Office, the functions are identified as follows.

1. At the time of admission
 - a. Entry in admission register and to give a number to the patient
 - b. Preparation of admission and discharge record forms
 - c. Preparation of patients' name index card,
 - d. To send the records with patient to the respective ward.

2. At the time of discharge
 - a. Collection of patients' records
 - b. Checking for completeness of patients' record
 - c. Coding and indexing (according to the latest ICD revision)
 - d. Preparation of census
 - e. Permanent filing
 - f. Preparation of statistics (daily/monthly/yearly)
 - g. Maintenance of births and deaths register
 - h. Furnishing of death/birth information to local registrar.
 - i. Revival of record for
 - Follow-up
 - Medicolegal purpose
 - Life insurance
 - Research and study
 - Other requirements
 - j. Dissemination of medical information.

Staff requirement recommended is as under:

	30–100 bedded Hospital	100–250 bedded Hospital	250–600 bedded Hospital	above 600– bedded Hospital
Sr medical record officer	—	—	—	1
Medical record officer	—	1	1	1
Asst med record officer	—	1	1	1
Med record technician	1	2	3	4
Med record clerk-cum-typist	1	3	6	6
Attendant	1	2	4	4

The staffing pattern will have the promotional avenues from the lower level to the highest, i.e. up to senior medical record officer.

As for the training component, since there is a great demand of trained personnel in medical record science, the available trained hands at the moment may be employed, and the medical record department should be strengthened with existing paramedical staff after short orientation course. It is also recommended that each state should have

a training centre for medical record science. The training centre should be attached to only those medical colleges, teaching hospitals of the state where full-fledged medical record department is functioning. Till the training facilities are lacking, the present training centres, e.g. at JIPMER Pondicherry, Safdarjang Hospital, New Delhi and CMC Vellore are the only available agencies for this purpose.

The qualified and trained personnel in medical records science should be eligible for registration in the employment exchanges as technical personnel. In this behalf, effective measures have already been taken by some of the states in requesting the employment exchanges for registration of the qualified personnel as mentioned above.

The workshop on medical records was of the view that at least one week's orientation training course in medical records science/management should be imparted to the superintendents, medical officers, nursing staff and pharmacists of the district hospitals. It was also considered that during the internship of the fresh medical graduates at least one week orientation and practical training programme in the medical colleges should be organised preferably along with the social and preventive medicine training.

The equipment suggested according to the size of the hospital is as under :

	<i>Upto 30 beds</i>	<i>30-100 beds</i>	<i>100-250 beds</i>	<i>250-600 beds</i>
Filing rack (10' × 3' × 1)	2	4	10	20
Cabinet index (5' × 8')	1	1	2*	6*
Cabinet index (3' × 5')	—	1	2**	6**
Almirah (steel)	1	2	4	6
Ladders	1	1	1	2
Typewriter	1	1	2	3
Duplicator	—	—	1	1
Electric calculator	1	1	2	2
Photostat machine	—	—	1	1
Numbering machine	1	1	2	2
Furniture				
Table	1	2	6	11
Chairs	2	4	15	25
Working table (4' × 8')	—	1	1	1
Filing space (liner feet)	—	140 ft	265 ft	450 ft

*With 10 drawers

**With 40 drawers

The following are the minimum essential reference books needed.

1. Latest ICD revision (one set)
2. Medical dictionary (one)
3. Manual of medical records (one).

Adequate provision of stationary and printed medical record forms and registers must be ensured for efficient functioning of the medical record department.

As per need of the hospital, the supply of medical record forms and registers should be based on the size and type of the hospital with an uninterrupted supply of medical records forms and registers.

Space Requirements

To begin with, a separate room of at least 10'×12' should be provided to start the functioning of medical department in small hospital.

Later, arrangements may be made as per recommendation given below.

<i>Hospital</i>	<i>Office No.</i>	<i>Room size</i>	<i>Filing No.</i>	<i>Room size</i>
Up to 30 beds	1	10' × 12'	—	—
30-100 beds	1	10' × 12'	1	16' × 20'
100-250 beds	2	10' × 12'	2	16' × 20'
250-600 beds	3	10' × 12'	3	16' × 20'

Paucity of funds is one of main problems in the proper functioning of the medical record department. The annual cost on equipment, furniture, accommodation, stationary, printing and establishment according to results of the pretesting studies work out as follows.

		<i>100-250 bedded hospital (in lacs) Rs</i>	<i>250-600 bedded hospital (in lacs) Rs</i>
Nonrecurring	equipment and furniture	0.85	1.50
	Accommodation	<u>4.00</u>	<u>6.00</u>
		<u>4.85</u>	<u>7.50</u>
Recurring	Stationary and printing	0.80	1.30
	establishment	<u>1.20</u>	<u>2.20</u>
		<u>2.00</u>	<u>3.50</u>
<ul style="list-style-type: none"> • Based on recommended staffing pattern • Amount revised from 1986 figures 			

Adequate budget provision should be made for proper development and management of the medical records department for each district hospital.

As regards retention period, it is considered that medicolegal records should be preserved for at least 10 years, whereas the other medical records be retained for 5 years.

As regards the dissemination of information, it is recommended that a monthly bulletin on the services rendered by the hospital be brought out regularly. As regards the information which is required to be sent to the higher authorities, it would be the sole responsibility of the hospital administration to appraise the medical record cell at the state level.

Regarding the working manual of "model working manual" on the functioning of the medical records department at district level hospitals is being drafted by the Central Bureau of Health Intelligence, New Delhi for adopting it by hospitals according to their needs.

Regarding role of medical colleges' hospitals which are having full-fledged medical records departments, they should provide practical and reorientation training for at least a week to the personnel of other hospitals.

It is also recommended that all other medical colleges where such department does not exist, efforts should be made to have a full-fledged medical records department. Automation is a necessity of the times, and it is felt that computers should be installed at district hospital upwards installed at hospitals' for quick and prompt storage and retrieval of the data.



APPENDIX

V

Salient Points of Biomedical Waste Rules

1. The “Biomedical Waste (Management and Handling) Rules, 1998” have been notified by the Central Government for the management and handling of biomedical waste. These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle biomedical or handle biomedical waste in any form.
2. Under these rules “Biomedical waste” means any waste, which is generated during diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining thereto or in the production or and “Biomedical waste treatment facility” means any facility wherein treatment, disposal of biomedical waste or processes incidental to such treatment or disposal are carries out.
3. **Treatment and disposal:** Every hospital is obliged to set up requisite biomedical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste, or ensure requisite treatment of waste at a common waste treatment facility or any other waste treatment facility.
4. **Segregation, Packaging, Transportation and Storage:**
 - Biomedical waste shall not be mixed with other wastes.
 - Biomedical waste shall be segregated into appropriately coloured plastic containers/bags at the point of generation in accordance with colour scheme given in Schedule II and labeled according to Schedule III.
 - If container is transported from the premises where biomedical waste is generated to any other waste treatment facility outside the premises, the container shall, apart from the label prescribed in Shedule III, also carry information as per Schedule IV.
 - No untreated biomedical waste shall kept stored beyond a period of 48 hours.
5. **Authorisation / registration:** Every hospital generating, collecting, receiving, storing transporting, treating, disposing and or handling biomedical waste has to make an application accompanied by prescribed fee to the state Pollution Control Board, or authority prescribed by them, for grant of authorisation.
6. **Annual report:** Every occupier/operator has to submit an annual report to the prescribed authority by 31 January every year, to include information about the categories and quantities of biomedical waste handled during the preceeding year.
7. **Maintenance of records:** Every hospital should maintain records related to the generation, collection, reception, storage, transportation, treatment, disposal and/or any form of handling of biomedical waste which records shall be subject to inspection and verification by the prescribed authority at any time.
8. **Accident reporting:** When any accident involving biomedical waste occurs at any institution or facility or any other site where biomedical waste is handled or during transportation of such waste, the authorised person shall report the accident to the prescribed authority forthwith.

SCHEDULE I

Categories of Biomedical Waste		
Option 1	Waste category 2	Treatment and disposal 3
Category No. 1	Human anatomical waste (human tissues, organs, body parts)	incineration [@] / deep burial*
Category No. 2	Animal waste (animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospital colleges, discharge from hospitals, animal house).	incineration [@] /deep burial*
Category No. 3	Microbiology and Biotechnology Waste (waste from laboratory cultures, stocks or specimens of microorganisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)	local autoclaving/microwaving/ incineration [@]
Category No. 4	Waste sharps (needles, syringes, scalples, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps)	disinfection (2 chemical treatment ^{@@} / autoclaving/microwaving and mutilation/ shredding ^{##})
Category No. 5	Discarded medicines and cytotoxic drugs (waste comprising of outdated, contaminated and discarded medicines).	incineration 2/destruction and drugs disposal in secured landfills
Category No. 6	Solid waste (items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, beddings, other material contaminated with blood)	incineration [@] /autoclaving/microwaving
Category No. 7	Solid waste (wastes generated from disposable items other than the waste sharps such as tubbings, catheters, intravenous sets, etc).	disinfection by chemical treatment ^{@@} / autoclaving/microwaving and mutilation/ shredding ^{##}
Category No. 8	Liquid waste (Waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities.) discharge into drains.	disinfection by chemical treatment ^{@@} and discharge into drains
Category No. 9	Incineration Ash (ash from incineration of any biomedical waste)	disposal in municipal landfill
Category No. 10	Chemical waste (Chemical used in production of biologicals, chemicals used in disinfection, as insecticides, etc.)	Chemicals treatment ^{@@} and discharge into drains for liquids and secured land- fill for solids.

@@ Chemicals treatment using at least 1 per cent hypochlorite solution or any other equivalent chemicals reagent. It must be ensured that chemical treatment ensures disinfection.

Mutilation/shredding must be such so as to prevent unauthorised reuse.

@ There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.

* Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.

SCHEDULE II

Colour Coding and type of Container for Disposal of Biomedical Wastes			
Colour coding	Type of container	Waste category	Treatment options as per Schedule I
Yellow	Plastic bag	Cat. 1, Cat. 2, and Cat. 3, Cat. 6.	Incineration/deep burial
Red	Disinfected container/Plastic bag	Cat. 3, Cat. 6, Cat. 7	Autoclaving/Microwaving/Chemical treatment
Blue/ White	Plastic bag/puncture proof translucent container	Cat. 4, Cat. 7	Autoclaving/Microwaving/Chemical Treatment and destruction/shredding.
Black	Plastic bag	Cat. 5 and Cat. 9 and Cat. 10. (solid)	Disposal in secured landfill

- Notes: 1. Colour coding of waste categories with multiple treatment option as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule I.
 2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
 3. Categories 8 and 10 (liquid) do not require containers/bags.
 4. Categories 3 if disinfected locally need not be put in containers/bags.

SCHEDULE III

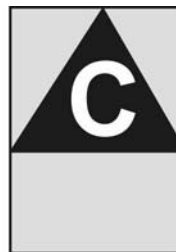
Label for Biomedical Waste Containers/Bags

BIOHAZARD SYMBOL

CYTOTOXIC HAZARD SYMBOL



Biohazard



Cytotoxic

Handle with care

HANDLE WITH CARE

Note: Label shall be nonwashable and prominently visible

SCHEDULE IV

Label for Transport of Biomedical Waste Containers/Bags

Waste Category No.....	Day.....Month..... Year
Waste class	Date of generation.....
Waste description	
Sender's Name and Address	Receiver's Name and Address
Phone No.....	Phone No.....
Telex No.....	Telex No.....
Fax No.....	Fax No.....
Contact Person.....	Contact Person.....
<i>In case of Emergency please Contact:</i>	
Name and Address:.....	
.....	
.....	Phone.....

Note: Label shall be nonwashable and prominently visible



There cannot be a standard format or data sheet to record these observations of the evaluation committee because the requirements from hospital to hospital and from speciality to speciality would differ. However, the following format can be used to make a beginning in hospitals where no evaluation is at present taking place. As experience is gained with time, appropriate modifications can be carried out in the format to suit a particular hospital or particular discipline in the hospital.

**SUNRISE HOSPITAL
MEDICAL AUDIT: CHART REVIEW**

Part—I

Identification data for inpatient to whom this case sheet pertains:

1. Name.
2. Address.
3. Central registry no.
4. Ward no. 5. Bed no.
6. Diagnosis on admission.
7. Final diagnosis
8. No of days in hospital.
9. Disposal—(Discharge/Died/LAMA/Transferred).

Part—II

Particulars of clinician treating the case

1. Dr.
Speciality.
2. Status. (Professor, Reader, Lecturer,
Senior Registrar, Junior Registrar, etc.)

Part—III

Attributes of the Case

Relating to the Records

1. Are the records properly filled? : Yes/No

2. Are history, physical examination, diagnosis : Yes/No
and treatment details available?
3. Are the laboratory and radiography reports : Yes/No
attached the entered in the record at
appropriate place?
4. Are the progress notes sufficient and relevant : Yes/No
that the clinical course can be followed?
5. Has the summary of the case been recorded : Yes/No
at the time of discharge?

Relating to Diagnosis

6. Whether a provisional diagnosis was made : Yes/No/NA
and endorsed after the admission?
7. Whether the provisional diagnosis tallies with : Yes/No/NA
the final diagnosis?
8. Whether laboratory findings support final : Yes/No/NA
diagnosis?
9. Whether radiological findings support final : Yes/No/NA
diagnosis?
10. Are laboratory investigations sufficient in : Yes/No/NA
relation to nature and gradient of illness?
11. Was any laboratory investigation : Yes/No/NA
unnecessarily asked for?
12. Was any radiological examination superfluous?: Yes/No/NA
13. Was any radiological examination indicated : Yes/No/NA
and yet not asked for?
14. Whether the preoperative diagnosis tallies : Yes/No/NA
with the postoperative diagnosis?
15. Whether the autopsy findings tally with the : Yes/No/NA
clinical diagnosis?
16. Whether the autopsy findings tally with : Yes/No/NA
pathological diagnosis?
17. Whether the autopsy findings tally with : Yes/No/NA
radiological diagnosis?
18. Was there any avoidable delay in arriving : Yes/No/NA
at the diagnosis?

Relating to Treatment

19. Are the operation notes adequate? : Yes/No/NA
 20. Are the anaesthesia notes adequate? : Yes/No/NA
 21. If the case required consultation by other specialists, was the same sought for? : Yes/No/NA
 22. Was the treatment given generally acceptable or open to question? : Yes/No/NA
 23. Whether the overall treatment given to the patient can be judged from the data endorsed in the medical record? : Yes/No/NA
 24. Whether the clinician exceeded the privilege or limits of his or her training and competence? : Yes/No/NA
 25. Whether there was adequate indication for surgery? : Yes/No/NA
 26. Whether any normal organ or tissue removed? : Yes/No/NA
 27. Whether any part of the treatment given was superfluous? : Yes/No/NA
 28. Whether the patients refusal to undergo a prescribed treatment was justifiable? : Yes/No/NA

Relating to End Result

29. Was the final result in the consonance with the nature of the case and expected prognosis? : Yes/No/NA
 30. In case of the death, whether it was expected, justifiable or not? : Yes/No/NA
 31. Were the complications justifiable or not? : Yes/No/NA

Relating to Complications and Cross-infection

32. Whether there was any hospital cross infection which could have been avoided? : Yes/No/NA

33. Whether there was postoperative infection which can be avoided? : Yes/No/NA
 34. Whether there was a complication because of faulty surgical operation? : Yes/No/NA
 35. Whether there was postoperative complication which could have been avoided? : Yes/No/NA
 36. Whether there was any anaesthetic complication which could have been avoided? : Yes/No/NA

Relating to Operation Cases

37. Was consent for anesthesia and operation obtained? : Yes/No/NA
 38. Was there adequate indication for surgery? : Yes/No/NA
 39. Was any normal tissue removed and if so was it justified? : Yes/No/NA
 40. Was the preanaesthetic assessment for anaesthesia done and recorded? : Yes/No/NA

Relating to the Length of Stay of Patient

41. Was there any inordinate delay between admission and surgical operation? : Yes/No/NA
 42. Whether there was inordinate delay between admission and commencement to specific/definitive treatment? : Yes/No/NA
 43. Whether there was inordinate delay between admission and ordering of laboratory or radiological investigations? : Yes/No
 44. Whether there was inordinate delay in arriving at final diagnosis? : Yes/No/NA
 45. Was the length of stay of the patient in hospital longer than was really necessary? : Yes/No
 46. Did he or she develop any ailment during stay in hospital necessitating longer stay? : Yes/No

PHYSICIAN INDEX
(RELATING TO MEDICAL AUDIT)

PART—I
(PARTICULARS OF THE CLINICIAN)

1. Name
2. Professional status (Senior registrar, Junior registrar, Asst surgeon Grade I, II, III, Consultant, etc.)

PART—II
SCORING
(FOR CALENDER YEAR)

Sr No.	Date on which medical audit held	No of clinical records examined relating to this clinician	Total No of attributes in all the case sheets	Number of attributes that are unfavourable to the clinician							Remarks
				Relating to comple-tness of records	Relating to diagnosis	Relating to treatment	Relating to length of stay	Relating to compli-cations and cross-infection	Relating to end result	Relating to use of supportive services/resources	
	Jan										
	Feb										
	Mar										
	Apr										
	May										
	Jun										
	Jul										
	Aug										
	Sep										
	Oct										
	Nov										
	Dec										
	Total										

Note: This same form with minor modification can be used for evaluation of a ward/clinical discipline.



**APPENDIX
VII**

Check-list for Preparation of a Disaster Plan

- **General**

- Has a disaster committee been appointed?
- Has the plan been discussed and approved by the board of directors or appropriate authority?
- Is there an awareness by hospital personnel of the specific phases of the plan applicable to their hospital?
- Does the plan include for holding of increasing patient load through procedures designed to meet different situations?
- Does the plan provide for extending minimal hospital functions over a prolonged period?

- **Organisation**

- Have the lines of authority and responsibility been laid down?
- Are all key personnel included in the plan?
- Is a functioning medical Chief of Disaster Operations nominated?
- Are deputies to Medical Chief of disaster operations nominated?
- Is the plan for each department separately published and known to all personnel of each such department?
- Are the assignment of key responsibilities fixed within each department?
- Have the evening and night duty personnel been included so that the plan may be activated as promptly during such shifts?
- Have the following been provided for and responsible personnel designated?
 - Administrative services
 - Information and communication
 - Engineering and maintenance service
 - Food service
 - Transportation
 - Stores and supplies: Medical
 - Stores and supplies: General
 - Safeguarding personal effects of casualties
 - Receiving and storing (Triage) area.
 - Holding wards

- Treatment and nursing area
- Blood Bank
- Pharmacy
- Morgue
- Decontamination
- Social service and volunteers.

- **Operations Headquarters**

- Is the area/place designated for establishment of operations head quarters?
- Is adequate space provided for—
 - Medical Chief
 - Administrative
 - Stores and Supply Officer
 - Communications Officer
 - Transport Officer
 - Nursing Superintendent
 - PRO
 - Food and Housing Officer
 - Security Control Officer

- **Alerting**

- Is the procedure laid down for prompt activation of hospital to emergency status?
- Is the chief hospital administrator available by telephone at all times?
- Is there a procedure for alerting the Receptionist at the switchboard/EPABX?
- Does the Receptionist have a roster of those to be immediately alerted?
- Does each department have a fan-out system for contacting respective personnel of their own department in respect of emergency?

- **Activation**

- Is authority to activate the disaster programme assigned to a specific individual?

- b. Has such a person been backed up by several responsible deputies?
- c. Does the plan provide for the first administrative person who is notified of the disaster to consult with designated individuals within the organisation?
- d. Is the designated individual or his alternative authorised to make value judgements promptly?
- **Reception of Casualties and Triage**
 - a. Is the receiving area in close proximity to the ward?
 - b. Does the area allow for retention, segregation and processing of incoming casualties?
 - c. Is the sorting or triage staff directed by an experienced surgeon or physician?
 - d. Does the area allow for retention, segregation and processing of incoming casualties?
 - e. Does the area have independent power supply and connected with generator supply?
 - f. Are sufficient equipment, stores and supplies available to permit efficient handling of casualties?
- **Integration of Patient Areas**
 - a. Is there a predetermined schedule signifying which wards, rooms, classrooms, etc. will be used for housing emergency cases?
 - b. Are these areas diagrammatically defined in the plan showing bed location, movement routes, supply locations, etc.
 - c. Are personnel assigned for those areas and grouped for the operation of these areas?
 - d. Has a pre-established component of bedside items, dressings, drug stores, instruments, etc. provided for each area?
 - e. Have reserve supplies of bed linen, blankets, emergency clothing included in the plan?
- **Reallocation and Transfer of Patients to Ancillary Accommodation**
 - a. Has the authority for decision making for transfer or reallocation of patients to expanded bed areas been decided?
 - b. Has the medical and nursing staff been earmarked and assigned to such areas?
 - c. Has a time schedule been laid down for moving of patients, priorities and assignment of personnel to specific location?
 - d. Are there emergency stores, equipment and supplies located with each ancillary area?
 - e. Have personnel been earmarked or assigned to activate ancillary units?
- **Emergency Supplies**
 - a. Are emergency pharmacy stocks for treatment of burns, fractures, injuries kept in reserve stock?
 - b. Are IV fluids, essential drugs and medical gases available in reserve stock?
 - c. Has a secondary source of supply of these been identified?
 - d. Are sufficient quantities of required disinfectants kept in reserve stock?
 - e. Has the procedure for issuing critical store room items in emergency been laid down?
 - f. Is there a separate set of keys for the stores department and pharmacy for making issues in emergency?
- **Transportation**
 - a. Have the sources of ambulances for transportation of casualties been identified?
 - b. Are sufficient vehicles earmarked for transportation of casualties from disaster site to hospital and hospital to other institutions?
- **Physical Plant**
 - a. Does the hospital's stand by generator meet emergency requirement of all electrical load?
 - b. Are sufficient fuel stock available to run generator for extended periods?
 - c. Has availability of water been considered in the plan?
 - d. Are facilities for storage of water adequate?
 - e. Does the hospital has its own source of water? Is chlorination procedure incorporated in the event of substitute source of water.
 - f. Are additional maintenance supplies and personnel available to support of expanded hospital activities?
 - g. Are sufficient substitute resources available in the event of breakdown of garbage and sewage removal system?
 - h. Is a substitute method of incineration for biomedical waste or temporary landfill for other garbage provided?
- **Discharge Procedures**
 - a. Is a review procedure established for early and prompt review of all treated casualties with a view to determine level of care required and their discharge to ambulatory care?
 - b. Is there an organised discharge routine streamlined to handle large number of patients at short notice?
 - c. Is there a predetermined schedule for discharge of patients and evacuation of nonambulatory patients and those requiring continuing care?
- **Record Keeping**
 - a. Has the admission office been strengthened for handling a large influx of patients ?
 - b. Is there a separate record and tagging system for casualties?
 - c. Is the record office organised to provide statistical reports at intervals?
- **Emergency Mortuary Facilities**
 - a. Are buildings, rooms designated for temporarily holding increased number of dead bodies?
 - b. Has the disposal of dead bodies and their clearance been coordinated with police/legal authorities?
- **Public Relations, Liaison with Civil Authorities and Volunteers**
 - a. Is the method for contact and communication with police, civil defence, municipal authorities, etc. included in the plan?
 - b. Is the individual responsible for release of information located in disaster head quarters?
 - c. Does the plan provide for coordination with other health facilities in the region?
 - d. Is there a organised plan for participation by volunteers?
 - e. Is there a person or centre to which volunteers will be referred?
 - f. Has a method been planned for assignment of volunteers for various tasks?

A

Aesculapaeus' rod 357
Ancillary services 63
 dispensary 64
 dressing room 63
 injection room 63
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