HOSPITAL PLANNING
AND ADMINISTRATION

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CONTENTS

Preface ............................................. 7
Introduction ...................................... 9

PART I. PLANNING A HOSPITAL SERVICE AS PART OF A BALANCED HEALTH PROGRAMME

CHAPTER 1. The hospital in the regional health service .......... 13
CHAPTER 2. Hospital costs and utilization .......................... 23
CHAPTER 3. Hospital administration and organization ............. 36
CHAPTER 4. Some special roles of the hospital ....................... 46

PART II. PLANNING A HOSPITAL

CHAPTER 5. Planning procedures and estimates ..................... 59
CHAPTER 6. Hospital design ....................................... 67
CHAPTER 7. Staffing the hospital .................................... 88

PART III. PLANNING INDIVIDUAL SERVICES AND DEPARTMENTS

CHAPTER 8. General medical services .............................. 101
CHAPTER 9. The special medical services ............................ 121
CHAPTER 10. The technical medical services ......................... 145
CHAPTER 11. Psychiatric services in the general hospital .......... 175
CHAPTER 12. Non-medical services and facilities .................... 185
Epilogue ..................................................... 195

Annex 1. Annotated bibliography ................................... 197
Annex 2. List of reviewers ........................................ 207
Index ......................................................... 211

— 5 —
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Preface

Hospital organization is today an essential part of the medical care scheme. Owing to the increasing complexity of the medical sciences, it is very necessary that medical practitioners and specialists should be able to rely on a sound hospital service. Furthermore, there is general agreement on the active role the modern hospital has to play in health and social welfare programmes, and on its influence on economic development.

In the light of the rapid changes occurring in most of the countries of the world, it seems more and more urgent for them to have at hand basic information on the problems related to hospital planning and administration. The presentation of detailed information would be a formidable task; moreover, local conditions are so varied that to draw up a comprehensive guide to serve every country would seem impossible. The intention in the present work is far more modest; but if it helps responsible authorities to find possible answers to their difficulties, then those who have contributed to its compilation will be fully repaid for their efforts.

The monograph is divided into three parts. In order to stress the concept of an integrated and co-ordinated hospital service, the first section is devoted to planning on a national and regional scale. This is directed mainly to the attention of health authorities and therefore deals particularly with the legislative, financial, statistical, and over-all planning of hospital organization.

The second section endeavours to give some guidance on the planning of a general hospital. The term "general hospital" usually covers many types of institution, ranging from the rural hospital with a few dozen beds to the huge and highly specialized organization that has many beds and, also, facilities for scientific research and medical teaching. In the present work, the description has intentionally been restricted to the standard general hospital, or "intermediate hospital", i.e., a hospital with several hundred beds, comprising a number of medical, surgical, and special departments and meeting the needs of a population ranging from 50,000 to possibly more than several hundred thousand. This definition excludes hospitals for the mentally ill, sanatoria, and other specialized institutions.

The third section is devoted to an analysis of the requisites of the principal departments within a comprehensive general hospital. It is not to be assumed
that every general hospital should have all the departments described, but simply that most of these departments seem necessary for a well-balanced institution.

Despite its small size, this monograph covers a very broad field. This made it desirable to obtain the collaboration of a number of specialists in the preparation of certain chapters. The names of these contributors are listed on page 6. In addition, the preliminary draft was circulated to experts of international repute in different parts of the world, and their comments and constructive suggestions have proved extremely helpful in revising the text. A list of reviewers will be found on page 207. To all those who have collaborated in the preparation of this monograph, and especially to its principal authors, Dr H. M. C. Macaulay and Lord Llewelyn-Davies, the World Health Organization expresses its sincerest thanks.
Introduction

The hospital is an integral part of a social and medical organization, the function of which is to provide for the population complete health care, both curative and preventive, and whose out-patient services reach out to the family and its home environment; the hospital is also a centre for the training of health workers and for bio-social research. ¹

This modern concept goes far beyond the conventional idea of a hospital as a place for the treatment (mainly the in-patient treatment) of the sick. It visualizes the hospital as one part of a comprehensive system of preventive and curative medicine and as an institution devoted not only to in-patient treatment, but also to ambulatory and domiciliary care. Its historical importance, the capital investment it represents, the high quality of the medical care it gives, and the first-class qualification of its personnel have led the hospital to be considered, up to now, as a very special institution, of a higher standard and prestige than other components of the health service. If a hospital is to fulfil its destiny in the modern world, it can no longer be regarded as an “ivory tower”, but must establish and maintain close and cordial relations with general practitioners, medical officers of health and their staffs of health visitors and medico-social workers, industrial medical officers and occupational health nurses, and any and all other health workers in the community it serves. Indeed, it should do all in its power to make itself known to, and affectionately regarded by, the individual members of that community. The manner in which some of this may be achieved forms part of the subject matter of the chapters that follow.

The object of this monograph is to set forth some of the practical results of this concept on hospital planning and administration in order to help authorities in all parts of the world who are responsible for hospital development. In many countries that already have well-established hospital facilities, there is at present a vigorous movement towards the development of

area-wide planning; and it is hoped that here the book will be of use in the re-thinking involved in this process. Countries that are only now beginning to build up a strong hospital service have the opportunity to benefit from the experience, and sometimes to avoid the mistakes, of the more developed nations; for them, the book aims to provide, in outline form, a guide for action.

This monograph does not purport to be a textbook nor to cover all the multifarious details of hospital planning and administration—that would be far beyond the scope of a single volume. It is hoped, however, to point out some of the pitfalls that lie in the path of a hospital planning authority, to draw attention to mistakes that have actually been made in various parts of the world, and to indicate, in so far as possible, the general principles that should govern the subject and the kind of expert advice that should be sought before planning a hospital.

Although the book deals with most of the major questions in hospital planning and administration, equal weight is not given to all of them. It has seemed right to treat some aspects in considerable detail, particularly those concerning which there is little published material, or concerning which changing ideas have given rise to problems not previously met. Those aspects to which much thought has already been given and on which good published reference material is available are merely brought to the attention of the reader. From this it follows that the amount of space devoted to the various topics is not necessarily indicative of their relative importance.
Part I

PLANNING A HOSPITAL SERVICE AS PART OF
A BALANCED HEALTH PROGRAMME
CHAPTER 1

The Hospital in the Regional Health Service

The Concept of the Hospital within a Health Service

Hospitals are very expensive to build and to operate. Their initial capital cost is high; and their running cost year after year, especially for in-patient services, is enormous, as authorities in many countries have discovered to their discomfiture. There are modern hospitals that today are standing almost empty for lack of funds to maintain them.

The first task of the health service is to reach all the people all the time at the best level of care the country can afford. Hospital provision is only one part of the health service, and the money devoted to it must not impoverish the rest of the service. At the same time, expenditure on health services, of which hospitals are a part, should be regarded as an investment that will pay economic dividends in the form of lessened invalidity, reduced unemployment caused by sickness, and increased industrial production. Further, it should be expected and desired that expenditures on health should rise at least pari passu with increasing productivity and increasing national income.

Hospitals are the most costly part of a health service. It is sound economics, therefore, to do everything feasible to keep patients out of hospital and, by reducing the reasonable demand for in-patient treatment, to lessen the need for further provision of hospitals. There are two essentials in attempting to attain this desirable aim. The first is a system of comprehensive medicine operating throughout the community, embracing environmental hygiene and personal, occupational, and social health services. The second is the provision of a home care service that will enable as many as possible of those who are sick or injured to be nursed at home, with merely supporting help from the hospital. In both of these functions the hospital has an important part to play. As previously noted, the concept of a hospital as the centre of a home care service and as one of the centres of preventive

— 13 —
medicine in an area differs fundamentally from the old idea of a hospital as
no more than a place for the treatment of the sick.

The primary function of a hospital is the provision of medical care to a
community. A hospital, however, 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
public, and to be a centre for research.

Despite these varied functions, exaggerated importance must not be
given to the place of the hospital in a scheme of community health care.
The hospital's appearance is impressive, and its work is dramatic. It therefore
seizes the imagination. But the provision of hospital beds is no substitute
for effective environmental, preventive, and domiciliary health services,
which can lead to a reduction in the number of beds required as these services
develop and produce their effect upon the health of the population. The
truth of this has been demonstrated in some countries of western Europe
during the past few decades, when improved standards of living and dis-
coversies in medical science have, to a large extent, brought under control
tuberculosis, the acute specific fevers, and many diseases of children, and
have made the beds previously provided for these conditions unnecessary.
This fact needs to be borne in mind in the planning of hospital services in
the developing countries, for what is true of western Europe and North
America today will surely become true in many other countries of the world
in years to come. Hospital beds needed now for tuberculosis, for children,
and for fevers of various types should be planned in such a way as to make
them readily convertible to other uses when, fortunately, they are no longer
needed for their original purposes.

In many countries of the world today, medical needs are great, but
financial resources are slender. There is an essential minimum of hospital
service required, but such countries should relate the money they spend on
hospitals to the development of environmental, preventive, and domiciliary
medicine, and should not lavish it upon expensive hospital buildings, with
their high cost of maintenance. Indeed, if the knowledge and facilities for
applying the elementary principles of hygiene are lacking in a community,
the cost of hospital care will be partly wasted by reason of a high relapse
rate of disease.

"For many years to come the world will continue to harbour many
different philosophies, cultures and systems; hence hospital programmes,
which reflect so closely the essential features of the style of life, will have to
be carefully adapted to the diverse conditions prevailing in individual
regions." ¹

¹ Bridgman, R. F. (1955) The rural hospital: its structure and organization, Geneva (World Health
Organization: Monograph Series, No. 21).
Regional Planning

It is essential that hospital and health services be planned on a wide-area basis; planning on an individual or local community basis creates gaps and overlapping. Civic pride, though commendable, does not necessarily produce a hospital service that combines efficiency and economy and that serves the best interests of the patient.

The idea of regionalization is the placing under unified, general, administrative control the hospitals and health services of a wide area, containing a population of up to several million people (Fig. 1). In this way the provision of hospital services can be related with reasonable accuracy to the population they are intended to serve, gaps and overlapping can be avoided, and new hospitals can be sited in the most strategically suitable positions with regard to population density and means of communication.

The concept of regional planning varies within wide limits from one country to another. For example, in the USA it amounts to no more than a voluntary association of a group of hospitals in an area with a view to effecting some economies in such matters as bulk purchasing of supplies and some sharing of medical and other staffs. In Canada it has gone some-
what farther. In Great Britain regionalization of hospital services is complete. In the USSR the concept has gone beyond the planning and organization of hospitals and embraces the entire health services of a community, the curative and preventive services being under a single administration. In Chile, where regionalization is quite complete, the hospital is the headquarters of the public health services of an area.

The planning of hospitals on a regional basis provides a better and fairer distribution of services, particularly in less prosperous areas, in which the need is often greatest. It also enables a measure of control to be exerted to secure a reasonably uniform standard of medical care throughout the region. On the business side, a regional system promotes economy by making possible the centralization of such functions as accounting, statistics, laundry services, and bulk purchasing of drugs and hospital supplies. Certain expert advisory services can also be organized to advantage on a regional or subregional basis.

In advanced countries, the regional authority is the proper body to organize and administer, for the entire region, a blood transfusion service. This would include setting up mobile teams for the collection of blood, a laboratory for blood typing, refrigerated storage facilities, a distribution system, and arrangements for the preparation and dissemination of publicity material.

The role that each hospital is to play in a regional service should be laid down in general terms by the regional authority; but, within this broad direction of over-all policy, the day-to-day administration of individual hospitals is often best left to local initiative.

In the first report of the WHO Expert Committee on the Organization of Medical Care, ¹ three types of hospital were contemplated:

(1) The regional hospital, designed to provide a complete range of treatment, including such specialities as radiotherapy, neurosurgery, thoracic surgery, and plastic surgery. Where possible, such a hospital would comprise, or be closely associated with, an undergraduate medical teaching centre. This hospital would be strategically placed in the region so that patients in need of its highly specialized services could be readily referred to it.

(2) The intermediate (or district) hospital of several hundred beds, providing a high standard of medical, surgical, obstetrical, and specialized treatment.

(3) The small, local (rural) hospital of 20 to 100 beds, probably undifferentiated, providing, where necessary, general medical, surgical, and maternity care.

This monograph deals mainly with the intermediate, or district, hospital. The small, local hospital is dealt with comprehensively in Dr R. F. Briggsmen's monograph *The Rural Hospital*. This small, local hospital should not be necessary except in countries in which the population is very diffuse and the lines of communication are long. The small hospital, contrary to general belief, is not intrinsically economical and tends to be medically inadequate except for the treatment of the most straightforward and ordinary conditions. Its staff is often tempted to undertake procedures beyond the capacity of the hospital's facilities, sometimes with disastrous results. It is usually better for a sick person to undertake a somewhat longer journey to a large, well-staffed, and well-equipped hospital than to receive treatment near his home in a less well-equipped establishment. This is especially true for the treatment of fractures and other injuries, which will be dealt with in more detail in another section.

There are many places in the world, however, where the population is so sparsely distributed—in scattered villages, perhaps—that the small, local hospital is the only practicable means of providing in-patient care. Here the idea should be one of a preventive health clinic and out-patient station with some beds provided, for the health centre is essentially local in its function. It deals with the supervision of the health of expectant and nursing mothers and of young children, with health education in the homes of the people, with protective inoculations, with sanitation and control of insects and parasites, and with the health of the school child. For these services to be rendered, easy access to the people is essential: the health centre must be near the homes of those it serves. The same is true to some extent with regard to certain out-patient services, i.e., those requiring frequent re-attendance for supervision, treatment, and, especially, rehabilitation. An out-patient station remote from its parent hospital but regarded as a projection of the out-patient department of that hospital and receiving periodic visits from members of its staff can perform a very useful function. Special arrangements need to be made, however, for the transmission of records between the two establishments.

It was formerly thought that, in a system of hospitals administered on a regional basis, a considerable flow of patients in both directions would take place. Such, in fact, has not been found to be the case. A patient is usually treated entirely in the hospital to which he was first admitted, unless treatment by one of the "super specialities", such as radiotherapy, is indicated and such treatment is not available in the hospital in which the patient finds himself. What, however, does, and should, take place is a free measure of sharing of senior medical staff. Consultants on the staff of the regional hospital should hold consultant sessions at district hospitals, and vice versa. This facilitates interchange of medical opinion (often over the luncheon

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1 See footnote, page 14.
table) and brings the staffs of both hospitals into closer rapport. Consultant physicians and surgeons should also pay regular visits to small, local hospitals, where these exist, to ensure the maintenance of a good standard of medical care.

The appointment of consultant staff, unless made at the national government level, is best undertaken on a regional basis, the regional authority paying due regard to the wishes of the hospital to which the appointment is to be made. A regional authority can, and should, where desirable, encourage a district hospital to develop a particular service. It need not be a rigid rule that highly specialized services should be available only at regional hospitals; a large district hospital may sometimes have such facilities. It is more likely, however, that the regional authority may have to exercise a restraining influence on a district hospital that, for reasons of prestige, wishes to establish a new service that is not really required for the area served or that the district hospital would not be capable of running. A function of the regional authority is to lay down in fairly broad terms the range of services that each hospital should provide.

The principal factors to be borne in mind when defining the boundaries of a hospital region are major centres of population, existing major hospitals, and lines of communication. One of the aims should be to make a region reasonably self-sufficient in the provision of all types of medical care. If this aim is to include radiotherapy, neurosurgery, and cardiac surgery, which call for a high and rare degree of skill, abundant staff, and expensive equipment, large populations are necessary to keep the requisite facilities and staff fully occupied and working at maximum efficiency in order to justify the very heavy overhead expenses. Provided communications are adequate, the geographical size of a region is not of great importance; but a population of somewhere between one and three million is desirable. However, departure from these limits may well be necessitated by local conditions in some parts of the world.

If it can be arranged, it is well for a teaching hospital to be included within a region and for its work to be closely associated with that of the region in order that it may exert an academic influence and foster postgraduate medical education and research throughout the hospitals of the region. A teaching hospital is by no means essential, however; and in many developing countries such an establishment would be an impossibility.

One of the first steps to be undertaken in a country contemplating hospital development on a regional basis is an accurate and up-to-date survey of existing facilities of the whole health service in the region, including domiciliary as well as hospital services. An inventory of existing health buildings and major equipment will also be needed. One way to accomplish this is to appoint a number of small teams, mainly or entirely medical, composed of two or three men of high standing, with wide experience of what a hospital should provide. These teams would visit every hospital in the country,
ascertaining the "watershed" of each hospital in terms of patients, drawing
attention to gaps or overlapping, recommending amalgamation of neigh-
bouring hospitals where appropriate, and indicating in a general way any
necessary expansion of existing hospitals—in building, staff, or equipment—to enable them to play their part in the regional scheme. The teams might
also indicate—again, in a general way—the need for new hospitals in various
places. Detailed consideration would probably not be given to their
recommendations until the regional scheme had been in operation for a few
years and until the nature and scope of the demands had been more accurately
estimated.

In planning a regional health scheme, the responsible authority should
not only take present needs into account, but should also try to forecast
future demands in the light of such considerations as population changes,
increase or decrease in industrialization, and the progress of preventive
medicine, including the success or failure of programmes aimed at the
elimination of certain endemic diseases. This should lead in due course
to the preparation of a master plan for the region as a whole, indicating the
functional developments that should take place and the architectural growth
that will, in consequence, be necessary. Such a master plan, intended to
cover a number of years, must be flexible to permit changes that may be
necessitated by unforeseen alteration of environmental circumstances. It
will involve liaison with town and country planning and economic develop-
ment authorities.

The assessment of needs in terms of hospital beds for a region is discussed
in later chapters. Here it may merely be noted that there is, in many
places, a tendency to overestimate the need; and it is probably a good deal
safer to aim deliberately at an underestimation rather than to risk saddling
a community with a burden beyond its resources in manpower and money.

An important aspect of regional planning is that it readily enables
certain hospitals to be designated as centres for the treatment of conditions
that call for highly specialized staff or equipment—conditions such as
tetanus, paralytic poliomyelitis, poisonings, severe burns, and serious
accidents, for example.

The General Hospital

Hospitals may be divided, very broadly, into two classes: special and
general. Special hospitals deal exclusively with specific organs or systems
of the body (e.g., eye; ear, nose, and throat; central nervous system; ortho-
paedics), certain conditions (e.g., tuberculosis, accidents, infectious diseases,
cancer), or certain groups of the population (e.g., children). General
hospitals, which contain a range of specialist services, aim to provide
treatment for men, women, and children suffering from any form of illness
except highly infectious and dangerous conditions, such as smallpox.
The main disadvantage of the special hospital lies in its isolation from the general body of medicine. Patients do not always conveniently restrict their disabilities to those organs with which the special hospital deals. Moreover, the members of the staff of a special hospital tend very naturally to concentrate upon their own particular specialty. Historically, special hospitals have played an important part in the development of medicine. By reason of the high concentration of clinical material in them and their very specialized staffs, they have been natural centres of research and of postgraduate medical education. Their existence is still justified in major metropolitan areas of developed countries.

For the provision of medical care to a community, the general hospital is a more useful institution. In principle, a developing country should concentrate upon general rather than special hospitals, but there may be one or two exceptions. One of these is the children's hospital, which is really a general hospital devoted to a limited age group and which needs practically all the supporting services of a general hospital with a few more added. If a country has an unduly high incidence of diseases of childhood that seem unlikely to be brought under control for many years, there may well be a case for establishing children's hospitals. The same may be true for countries in which there is a very high incidence of some endemic disease, e.g., tuberculosis, with a great number of severe cases calling for institutional treatment, which, without special provision, would swamp the resources of the general hospital. If special institutions are built for such purposes, however, great care should be taken in their siting and planning so that when, in years to come, the need for them has passed, they can readily be adapted to other types of case.

Various kinds of general hospital (the regional hospital, the district hospital, and the rural hospital) have been defined in the previous section. The district hospital is the basic unit in a hospital system, and it is this type of hospital with which this book mainly deals. If too big, the hospital tends to lose the human touch and to become a somewhat soul-less and impersonal machine. At the lower end of the scale, the hospital should not contain fewer than 200 beds or it becomes difficult, or impossible, to provide a differentiated service. A hospital of 500 beds or more enables adequate departments of general medicine, general surgery, paediatrics, obstetrics, and psychiatry to be set up, together with a full range of the ordinary specialities, the several departments being large enough to justify the appointment of full-time, or nearly full-time, specialists to the staff. These should be men and women who will make the work of the district hospital their chief interest. The smaller the general hospital, the more difficult this is to accomplish if a desirable range of specialization within general medicine and general surgery is to be provided.

In addition to its conventional role, the modern general hospital should make in-patient provision for mental patients, the chronically ill (for
diagnosis, assessment, and short-term treatment), and patients suffering from the common acute specific fevers. With the exception of the obstetric, paediatric, isolation, and psychiatric units, which call for specialized planning, all other in-patient accommodation should be designed according to a standard pattern, as this makes for flexibility in use, increases the utilization rate, and enables the hospital to cope better with seasonal fluctuations in the incidence of disease.

The isolation block should not only admit from the outside patients suffering from the acute specific fevers, but should also serve for the segregation of patients from within the hospital who develop infectious conditions of a serious nature (e.g. staphylococcal infections). The cubicles should be designed somewhat on the large side so that, if need be, two patients suffering from the same condition (many will be children) can be nursed together.

The in-patient units for psychiatric and for chronically ill patients will be dealt with more fully in the sections on these subjects.

As stated earlier, the in-patient treatment of the sick is only one of the functions of a modern hospital. At a very early stage in the planning of a hospital service, consideration needs to be given to the details of the administrative machinery required (and this will vary from country to country) to make the hospital truly a centre of preventive as well as curative medicine, including ambulatory and domiciliary treatment. This entails bringing "outside" doctors into close association with the hospital. The special diagnostic departments of the hospital (X-ray, pathology, and, possibly, electrocardiography) can be made easily available to domiciliary patients, and local doctors can be offered part-time clinical assistant appointments in such parts of the hospital as the casualty and out-patient departments. They can also, for instance, be invited to use the hospital's medical library and the staff common room.

All these measures will help to maintain a good standard of medical practice and encourage doctors to treat as many of their patients at home as is possible. To enable them to do this effectively, the senior staff of the hospital must be prepared to support them by meeting them in consultation, when necessary, in the homes of their patients.

Liaison will also need to be established with the local preventive health services, possibly by an interchange of staff; with the health visitors, who should be encouraged to attend certain hospital out-patient clinics (e.g., those for diabetics) to see that the physician's advice is being followed at home; and with the home-nursing and domestic help services of the area.

A good amount of building space as well as administration will be needed if a hospital is to fulfil the above requirements. Many of the services will be in, or associated with, the out-patient department. For instance, it may be thought desirable for the medical officer of health or the head of the department of preventive medicine to have an office in the hospital. He
is the best possible liaison with the environmental and preventive services of the town, and would also be available to advise hospital staff on matters of hygiene and outbreaks of infection. His quarters could advantageously be placed near the medico-social service in the out-patient department. It may also be found desirable to provide accommodation in the out-patient department for such functions as protective inoculations and miniature mass radiography.

A consultant in occupational health is a great asset to a large hospital. His work is mostly of a preventive nature, in factories and workshops in the area; and he needs room for his department, a place to house his demonstration exhibits, and facilities for teaching.
CHAPTER 2

Hospital Costs and Utilization

The Cost of Hospital Services

The high cost of building and operating hospitals has already been emphasized in the preceding chapter. One bed in an elaborate hospital, with all the accompanying ancillary facilities, can cost as much as some people earn in a whole lifetime. And the cost of running a hospital bed per year amounts, in many countries, to several times the average man's annual income. Hospitals can, therefore, easily absorb an undue proportion of a nation's health budget, leaving too little for the critical preventive services that can do so much to reduce the need for hospital care in the future.

To keep the hospital bill in check and to make the most economical use of this expensive health facility, three principles should be observed. First, the building must not be more elaborate than is necessary to perform the function allotted to the particular hospital in the medical care system. Second, only those patients should be admitted whose needs cannot be met by cheaper means. Third, none of the time that the patient spends in the hospital should be wasted.

Much is said about hospital construction in later chapters. There are, of course, economies in standardization; and, where practicable, these economies should be sought. A hospital should, moreover, be built realistically in terms of the staff that will actually be available to work in it. It is far too common to find hospitals built on the assumption that particular grades of staff will be available and then, when they are opened, to have whole wards and clinics remain unused or under-used because the necessary staff cannot be recruited or the money cannot be found to pay them. Plans that are suitable for a wealthy country with a large number of trained personnel are quite unsuitable for a country with limited money and staff. Financial planning and staff training programmes must be in line with plans for hospital construction.
Once a hospital has been built and the staff has been engaged, it is likely that its beds will be fully used. Within limits, the supply of hospital beds can determine the demand for them. There is always a danger of patients' being admitted to hospital who do not need such an expensive form of medical care. Patients should not be admitted whose needs can be met more cheaply and more satisfactorily in another type of institution or by making extensive use of ambulatory and domiciliary health facilities. Properly developed community health facilities are essential to prevent waste of expensive hospital in-patient resources. Thus, as previously suggested, a realistic survey of community health needs must be undertaken before the size of a hospital to serve a given community is decided upon. There is an advantage in making the hospital staff itself responsible for determining which patients need to be admitted. The proper use of the hospital can be encouraged by close contacts between the hospital staff and those working in the health units outside the hospital. It can also be furthered by wider social and, particularly, housing policies, which make it as easy as possible for relatives to play their full part in looking after patients in their own homes, with the necessary professional help and support.

Used intelligently, hospital costs can be a valuable guide to hospital management. Costing data, like other statistical data, can be collected only by expenditure of money; and this should be undertaken only if the data are going to be used as a tool of management. The first step is to attempt to separate in-patient costs from out-patient costs, and a second is to attempt to separate services provided for the staff from services provided for the patients. Units of service need to be developed for such departments as kitchens, laundries, boilers, and pathology and X-ray departments so that valuable comparisons can be made between hospitals on a cost per unit of service basis.

Studies have shown that the cost of services per in-patient day or week varies greatly both among countries and within countries. Some of these variations are unintentional. Some hospitals are unduly expensive because they are under-utilized, whereas others are unduly cheap because they cannot recruit the staff they need to fill their staff vacancies. Other variations are deliberate and justified. Some patients may not need as much attention from the specialized departments of the hospital as others. Further variations may be due to chance or to history.

It is the purpose of a costing system to raise the questions that need more investigation. Conclusions about the efficiency of a hospital cannot be drawn from crude comparisons of the cost per in-patient day. Account has to be taken of the types of patient who have been cared for, and whether they were discharged to their homes or to low-cost convalescent or other residential facilities for the later stages of their care. Even if two hospitals are being compared whose cases and opportunities for arranging further care are similar, it is by no means certain that the hospital that costs less per
day is doing the more economical job. Consideration has to be given to the effectiveness of the treatment given. Did any of the patients have to be readmitted to this hospital or another? Where case loads and effectiveness of treatment are similar, what matters more than the cost per day is the cost per patient treated; in other words, more active treatment, though it costs more per day, may lead to a proportionately greater reduction in length of stay. Thus, an apparently costly hospital may, in fact, be more efficient and more economical.

In a recent study, 1 when the cost of a hospital bed-day in six countries was expressed in terms of dollars, extremely wide variations were apparent. A general hospital bed cost one and a half dollars per bed-day in Ceylon; about 5 dollars in Chile; around 10 dollars in Czechoslovakia, Israel, and Sweden; and over 35 dollars in the USA. It was therefore remarkable to find that, when the expenditure per day on a general hospital bed was related to total national expenditure per day and per head, the variation was comparatively narrow. A hospital bed cost nearly three times the personal expenditure per head in Sweden, over three times in Chile, four times in Ceylon and Israel, and five times in the USA. The range for mental hospitals, though also varying enormously when local costs were translated into a common currency, was even narrower when related to daily expenditure per head. In all cases the cost of the mental hospital bed varied from about the same as the national expenditure per head to less than twice the national expenditure per head.

In-patient care seemed to consume just under half of all the expenditure on health services. In Ceylon the percentage was under 40%; in the USA and Sweden, it was higher—about 45%. Most of the current hospital expenditure was for staff.

From the patient’s point of view, admission to hospital can be a financial disaster. Serious illness has the double effect of making the patients incur expenditure for medical services and, at the same time, markedly reducing their ability to finance them (except, of course, for patients with considerable investment income, pensions, etc.). In general, a hospitalized patient costs much more than a patient who does not need to go into hospital; and, as shown above, the cost of a day in hospital may be several times the patient’s normal daily income while at work. It is for this reason—plus the fact that the need for hospital care is greater among the aged than among the young—that most, if not all, countries of the world have developed some means of enabling some, or all, patients to pay indirectly. Such arrangements for indirect payment (including government services, compulsory and voluntary insurance schemes, provisions by employers, charities, and others) have tended to be developed on a larger scale for hospital services than for other medical services. It has been shown that over 90% of hospital costs are

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paid for by schemes of indirect payment in Ceylon and Israel; in Sweden, over 98% are paid for in this way; in the USA, about 80% of hospital costs are paid for indirectly. In countries in which compulsory insurance schemes exist, the actual cost per bed-day (including all expenditures) must obviously be calculated accurately. This entails government control of hospital accounting, whether the institutions be public or private.

Systems of indirect payment involve real costs in collecting the money to pay the hospital bills—an expense that does not arise when the patient pays directly. These costs are lowest when the collecting mechanism is attached to an existing system of collecting money, such as taxation or compulsory social security insurance. Voluntary insurance (particularly when there is a considerable choice of schemes) tends to cost more than compulsory insurance. In collective schemes operated by employers in the USA, the cost of operating the insurance is about 10%; in individual schemes in the same country, about half of the premiums goes to administration and profit.

**Hospital Utilization and Statistics**

The term "hospital utilization" denotes the manner in which a certain community makes use of its hospital resources. Since the modern concept of a hospital includes services to the community on an out-patient as well as an in-patient basis, the role played by the hospital in the community can be fully studied only by taking into consideration all aspects of hospital service, including in-patient, ambulatory, and domiciliary care, preventive medicine, and health education.

This concept is fairly new, however; and no indices have been developed to measure the various components of hospital utilization in its widest sense. The best known indices apply to in-patient care and, to a certain extent, to out-patient care within the hospital. In the present section, therefore, hospital utilization will be considered in its narrowest sense, attention being centered mainly on in-patient care.

**Indices of measurement of hospital utilization**

Various indices are commonly used in the assessment of hospital utilization, but no one of them alone can give a full picture of the utilization pattern in a certain area or country. Furthermore, they are all affected by a multiplicity of factors (to be discussed later), and their use must therefore take into consideration the particular circumstances of the area concerned.

The different indices may be calculated on a gross or a specific basis. A gross index is an index expressing the over-all average utilization for all types of hospital in the area. The specific index, on the other hand, expresses the utilization of a certain type of hospital or of a certain service
within the hospital. The various indices may be classified under two main headings: (a) those relating to data concerning the hospital, such as the number of beds, bed-days and admissions, discharges, and deaths; and (b) those relating to the population at risk.

In this section, the following definitions will be used:

1. Hospital beds. A hospital bed is one regularly maintained and staffed for the accommodation and full-time care of a succession of in-patients, and is situated in wards or areas of the hospital in which continuous medical care for in-patients is provided. The total number of such beds constitutes the normally available bed complement of the hospital. This bed complement excludes the cots for normal, healthy, newborn babies in maternity wards but includes incubators and bassinets for premature babies.

2. Admissions. Admissions refer to the number per year of acceptances by a hospital of a patient who is to receive medical care while in residence therein and who is expected to remain for one or more nights. Normal, healthy, newborn babies should not be counted as in-patient admissions, but babies requiring special care should be included among the admissions.

3. Discharges and deaths. The annual number of discharges includes the number of patients who have left the hospital (cured, improved, etc.), the number who have transferred to another health or social institution, and the number who have died.

4. Bed-days or patient-days. "Bed-day" or "patient-day" is the unit of measure denoting the service rendered to one in-patient in the hospital census between one day and the succeeding one. Sometimes the day of admission and the day of discharge are counted as one day. In other cases, a full day is counted only when admission is before mid-day or discharge is after mid-day. Thus, the data given should be the annual total of the daily census of occupied in-patient beds throughout the reporting year. Patient-days should not include data for healthy, newborn infants.

In this section, the bed complement will be designated "B"; the annual number of admissions will be "A", which can be replaced by the sum of discharges and deaths (D+D); and the annual number of hospitalized patient days will be "H". The daily average of beds occupied (N) will be H/365.

Indices relating to the hospital

Average length of stay (L). This index indicates the average period in hospital (in days) per patient admitted. Ideally, this figure should be calculated as follows: cumulative number of bed-days of all discharged patients (including those dying in hospital) during one year divided by the number of discharged and dead patients. This calculation takes into account
the bed-days of patients in the year (or years) previous to the one under consideration, but disregards the bed-days of patients who were still in hospital at the end of the year. It may be said, therefore, that the result of this method of calculation represents the true average length of stay per patient; and it is recommended that this method be used, at least in long-stay hospitals.

However, various countries or various institutions obtain the figure for the average length of stay in hospital in different ways. The following are some of the formulas currently in use:

(a) total number of bed-days in the year divided by the number of admissions in the same year: \( L = \frac{H}{A} \)

(b) total number of bed-days in the year divided by the number of discharges and deaths in the same year: \( L = \frac{H}{(D+d)} \)

(c) total number of bed-days in the year divided by half the sum of admissions and discharges (including deaths) in the same year:

\[
L = H \times \frac{1}{\frac{1}{2}(A+D+d)} = 2 \times \frac{H}{A+D+d}
\]

It will be noted that these three methods result in a figure representing the average length of stay per patient per year, which is not the same as the average period of stay per patient admitted. In hospitals in which the patient’s stay is usually short, the two figures are practically identical, and either may be used; in hospitals in which patients stay for relatively long periods, or in cases in which changes in the bed complement have occurred during the year, the average length of stay is more correctly calculated by the first method described above.

A new method of assessing the length of stay in hospital derives from the distribution of patients by number of days spent from the day of admission. This can be done by counting, on a survey day taken at random, the number of days all the patients have spent since their admission. It is possible to obtain a graphic curve that expresses the number of patients in relation to the number of days spent between the admission day and the survey day. This curve shows a maximum that corresponds to a value that can be called “average time after admission.” This value is practically identical to the average length of stay. It happens that the curve shows two maxima because the patients are composed of two groups, the acutely ill, with a short length of stay, and the long-term patients.

The great advantage of this method is that it is possible to select during a ward round with the clinician a homogeneous group of patients and to disregard those who suffer from chronic disorders and those who are kept in hospital for social reasons. It is also possible to study separately one category of patient—those suffering from pleurisy, for instance—and to
determine their average length of stay. To obtain a higher standard of accuracy the survey can be made at intervals.

**Bed-occupancy rate (O).** This figure expresses the average percentage occupancy of hospital beds. It is calculated by dividing the daily average number of beds occupied (obtained from the daily census of occupied beds) by the bed complement (nominal number of beds in the establishment) and multiplying by 100:

\[ O = \frac{N}{B} \times 100 = \frac{H}{365 \div B} \times 100. \]

The bed-occupancy rate reflects the ratio between beds used and beds provided. Opinions differ regarding the wisdom of using this mode of presentation, and some would prefer to use as a denominator the actual number of beds used (including any additional beds) rather than the bed complement. On the other hand, it would appear preferable to use the bed complement as a denominator since a bed-occupancy rate of 100 or over would call the attention of administrators to a disproportion between the number of beds provided and the number used. Furthermore, it sometimes happens that the need for additional beds is only seasonal in nature, in which case a month-by-month analysis would enable administrators to plan ahead for meeting this contingency. A persistently high occupancy rate all through the year would, on the other hand, call attention to a possible shortage of beds.

Occupancy rate should not be thought of solely as a measure of administrative efficiency. Although it is reasonable to expect that services such as "cold" orthopaedic surgery, in which admissions can be controlled, should achieve high occupancy rates, such as 90%, there are other services, such as accident care and children's services, in which a fairly low occupancy rate is necessary, perhaps 75%, to ensure that emergency admission is always possible. Thus, the establishment of occupancy rate is an instrument of medical and social policy.

**Turnover interval (T).** The turnover interval expresses the average period, in days, that a bed remains empty, in other words, the average time elapsing between the discharge of one patient and the admission of the next. This figure is obtained by subtracting the actual number of hospitalization days from the potential number of hospitalization days in a year and dividing the result by the number of discharges (and deaths) in the same year:

\[ T = \frac{B \times 365 - H}{D + d}. \]

The turnover interval is zero when the bed-occupancy rate is 100 and becomes negative when the bed-occupancy rate is over 100. In order to be
meaningful, the turnover interval should be calculated separately for the various types of hospital and, especially, for the various wards of the hospital. A very short or negative turnover interval points to a shortage of beds, whereas a long interval may indicate an excess of beds or a defective admission mechanism.

Indices relating to the population at risk

The object of calculating indices relative to the population at risk is to know to what extent the population utilizes the hospital services; therefore, it is necessary to know the number of people that this population comprises. This number can easily be found when two conditions are fulfilled: (a) the geographic area served by the hospital or group of hospitals is clearly defined and a regular census is made, as in the case of nations, or regions, or isolated areas; and (b) the hospital or group of hospitals is within reach of this population and the means of communication are fairly convenient and fast.

If these two conditions are not fulfilled, it is necessary to make a detailed statistical survey. If there is more than one hospital in the area, the analysis will show the distribution of patients among them. If part of a population cannot easily reach the hospital, the survey will give the gradient of the attraction of each hospital. The method for determining the population at risk is applied by the planning authorities; it will be discussed in the following chapter. The population at risk is designated “P”.

Admission rate. The admission rate, which is also known as the hospital frequentation rate or hospital attendance rate and which is designated “A_h”, is usually expressed as the number of hospital admissions per 1000 of the population per year. Other units of population may be used, however: rate per person, rate per 100 persons, etc.

In calculating admission rates, all admissions, including readmissions for the same pathological condition, are counted. In the case of mental hospitals and other establishments in which the patients stay for a long time but may be allowed to leave the hospital for short or long periods “on parole” or “on leave”, an admission should be counted only if the patient has previously been discharged, not simply let out “on parole”.

Admission rates are calculated both on the basis of total admissions to all hospitals, regardless of type, ownership, etc. (gross admission rates), and separately for the various types of hospital or hospital service (specific admission rates):

\[ A_h = \frac{A}{P} \times 1000. \]

Hospitalization rate per person. This index expresses the volume of hospitalization in terms of number of hospitalization days per person per
year. It is calculated by dividing the total number of hospitalization days in a year by the mean population in that year:

\[ H_c = \frac{H}{P} \]

**Bed-occupancy ratio.** The bed-occupancy ratio is the average daily number of persons hospitalized per unit of population (usually per 1000 population). It is obtained by dividing the average daily number of beds occupied (average daily census) by the mean population in the same year and multiplying by 1000. Alternatively, this ratio could be obtained by the product of the bed/population index \( (I_{b/p}, \text{see below}) \) and the bed-occupancy rate, divided by 100:

\[ B_c = \frac{N}{P} \times 1000 = I_{b/p} \times \frac{O}{100} \]

**Bed/population index.** The bed/population index \( (I_{b/p}) \) is probably the commonest and most controversial figure used for the assessment of hospital utilization. It expresses the availability of hospital beds in terms of the number of beds per 1000 of the population. Sometimes this figure is expressed as the number of persons per bed.

The bed/population index is obtained by dividing the bed complement by the mean population and multiplying by 1000:

\[ I_{b/p} = \frac{B}{P} \times 1000 \]

Used alone, this figure cannot be considered as an index of hospital utilization, but simply as an indicator of the availability of beds, regardless of how they are utilized. On the other hand, as will be seen below, the availability of beds is perhaps the most important single factor in the determination of the hospital utilization in a country.

**Factors influencing hospital utilization**

The manner in which a certain community utilizes the hospital bed and the extent of such utilization are influenced by many factors that depend on the social, economic, educational, and cultural characteristics of the people and on the attitudes and special habits of the medical profession. With regard to the latter, it may be presumed that the doctor orders or advises admission to a hospital primarily for medical reasons; however, this is not always the case. Very often the people themselves influence the decision for or against hospital admission. Thus, in less developed communities, fear of the hospital or unwillingness to separate from the family may be strong arguments against hospital admission, whereas in more
sophisticated communities the hospital "habit" may be such that a person may bring pressure to bear on the attending physician for admission to the hospital, even though there may not be objective reasons for this course of action.

In view of such considerations, comparative studies on hospital utilization must be interpreted with caution, as a wide divergence in utilization may be found among countries without its meaning that this divergence reflects any difference in the quality or efficiency of the medical services. Nevertheless, because of the rising cost of hospital care, such studies are valuable in pointing out the directions in which economy may be effected without influencing the quality of care.

The following are some of the factors that affect the utilization of hospitals.

*Availability of hospital beds*

It has been observed in the economically developed countries that the larger the number of available hospital beds, the larger the volume of hospital utilization; but it is unlikely that these two trends are really correlated. They are the result of factors linked to the socio-economic development, such as better health education, increased health consciousness, larger protection by social security, and higher standards of living, leading to an increased number of demands for medical care. A saturation level is eventually reached, especially for maternity services and some specialized departments. In some cases, there is a direct relationship between the bed/population ratio and the utilization indices, such as admission rates, bed-occupancy rate, per person hospitalization rate, and others. If the bed complement is very great, high bed/population ratios may be accompanied by a low bed-occupancy rate and/or a high turnover interval.

*Methods of payment for hospital services*

As previously noted, there are two methods of payment for hospital services: direct and indirect. In the former, payment is made directly by the user of the hospital services; in the latter, services are paid for through prepaid programmes, sickness insurance, general taxation, and other indirect means. Hospital utilization is greatly influenced by the method of payment.

*Age of the population*

A population with a high life-expectancy (and a consequently higher proportion of aged persons) tends to raise the volume of hospitalization. The effect of age on utilization indices is reflected in an increase in the per person hospitalization rate and in the average length of stay per patient.
Service coverage and bed distribution

A high bed/population index does not always indicate a full coverage of the population; this depends on the geographic distribution of hospital beds rather than on the total number of beds, and an even geographic distribution increases hospital utilization by making the hospitals more available to all the people. On the other hand, a large number of beds concentrated in urban areas may still mean a low admission rate for the country as a whole, inasmuch as large sectors of the rural population may not be able to take full advantage of the hospital because of the distances involved. Similarly, the per person hospitalization rate may be low while the bed-occupancy rate may be high, indicating a very high utilization rate by one segment of the population and a low utilization by another.

Availability of extramural medical services

The type, extent, and quality of extramural medical services affect hospital utilization in various ways. A well-organized domiciliary medical service can, by caring for patients in their homes or clinics, reduce the load on the hospital. However, in developing countries these services also tend to uncover hitherto undiscovered sickness in the community, which can give rise to a completely new demand for hospital services.

An important role is played by the out-patient department of the hospital. A good consulting out-patient department with diagnostic facilities may greatly reduce the number of admissions to the hospital. Similarly, hospitals provided with a casualty station or an observation ward in the out-patient department may avoid many unnecessary admissions.

Hospital "bottlenecks"

Another important factor in hospital utilization, connected with the hospital itself, is what might be termed "hospital bottlenecks", or, in other words, the efficiency of the hospital's supporting services: X-ray department, laboratory services, operating room services, and others. Shortage of personnel, space, or equipment in these departments results in a prolonged average hospital stay and a lowering of the admission rate. Improved efficiency in these departments increases the admission rate and thereby increases the cost per day. This results in decreased hospital stay, however, and may lower the cost per case, i.e., per person treated. Similarly, the administrative services, such as the admission and discharge procedures, may act as bottlenecks and adversely affect the efficiency of the hospital.

Medical customs and social patterns

The customs or attitudes of the medical profession affect hospital utilization. Thus, early ambulation, which has been adopted in many countries,
has resulted in a lower average stay in hospital. With regard to obstetrics, customs differ greatly from country to country. In some countries, the medical profession, or the women concerned, insist on hospital deliveries for nearly all cases whereas, in other countries, hospital deliveries are confined to abnormal cases and, possibly, primiparas. In addition, the length of hospitalization in normal obstetric cases varies from two to three days in some countries to up to fourteen days in others.

The demand on hospitals is also affected by social and cultural patterns of the population, as previously suggested.

*Supply of physicians*

The number of doctors in a country influences hospital utilization in a number of ways. On the whole, the pattern of hospital utilization is less influenced by the number of doctors than by factors such as the attitude of the medical profession toward hospitalization and the organizational patterns of medical care.

Other factors being equal, the number of doctors influences the admission rate as follows: in areas with a very small supply of doctors, the admission rate tends to be low, as large sectors of the population have no access to medical practitioners, and much illness remains undetected. As the number of doctors increases, more cases of illness are detected and the hospital admission rate rises. A point of maximum rise is reached when the physician/population ratio is such that there is practically complete coverage of the population, but the number of patients per doctor is very high. Thus, the overburdened practitioner tends to refer to the hospital cases that, had he more time, he could deal with efficiently on an out-patient basis or at home. A further rise in the number of doctors diminishes the patient load and allows for more medical work outside the hospital. The admission rate therefore tends to fall, though not to the level of areas undersupplied with doctors.

*Research and training*

Hospitals with programmes of research or training, or both, tend to be more selective in their admission policy. On the other hand, the average length of stay in these hospitals tends to be longer because there are many specialized departments, such as neurosurgery, orthopaedics, and neuro-psychiatry, that select serious cases.

*Existence of proprietary hospitals*

The proprietary hospital is also selective in its admission policy, usually receiving minor or curable cases. Therefore, complicated cases are mostly referred to general hospitals, which must keep them longer. Thus, in the
proprietary hospitals, the length of stay is generally shorter than that in other hospitals.

**Housing**

The current trend for families to live in smaller houses or apartments has a definite influence on hospital utilization. Many admissions to hospital are due not so much to the need for hospital care as to the inconveniences encountered in caring for the sick person at home. Smaller housing units demand less home help. Therefore, the combination of shortage of space and shortage of home help is an important factor in the demand for hospital admission. This is particularly true with regard to the elderly, who often cannot be kept at home when sick.

**Morbidity**

Hospital utilization is greatly influenced by the morbidity pattern of the community. The sporadic increased demand due to an outbreak of disease and the day-to-day morbidity pattern both determine, to a large extent, the type and volume of hospital admissions. Thus, the acute, communicable diseases result in a demand for more beds in "short-stay" institutions, which raises the admission rates, whereas the degenerative or chronic infective and parasitic diseases tend to prolong the average stay in hospital.

**Internal organization**

The greater the amount of segmentation within a hospital, the less the degree of utilization, as shown by the bed-occupancy rate and the turnover interval. This points out the need to provide the greatest practicable flexibility in planning a hospital and to avoid, so far as possible, earmarking beds for particular diseases or putting them at the sole disposal of particular consultants.

The length of stay in hospital and the interval between onset of disease and resumption of work should be shortened by all possible means.

The work and importance of a hospital ought not to be measured in terms of beds; the average length of stay, occupancy rate, and admission rate are all part of the picture. The hospital's activity should also be related to the number of patients examined and treated as in-patients or out-patients, in the rehabilitation service, or under home care. The hospital of the future should have fully developed extramural services and a reduced number of beds. Consideration of the hospital bed as the sole yardstick of medical care activity belongs to the past.
CHAPTER 3

Hospital Administration
and Organization

Public Hospitals and Private Hospitals

As a rule, a distinction is made between public hospitals and privately owned hospitals, but there are shades of meaning within the two classifications, and there are terms to describe intermediate types of hospital.

Public hospitals

The public hospital is understood to be an establishment, or group of establishments, created and managed by a public authority. In some cases this authority is local and corresponds to a municipality. In other cases, the public hospital may be created and managed by a wider community, such as a department, province, or region, containing a larger or smaller number of communes. In this instance it is administered by the departmental or regional services. Finally, the public hospital may be created and managed by the State itself and be administered directly by a ministry.

In certain countries, administrations responsible for hospitals have their own budgets, which are balanced either by a system of daily tariffs—calculated to cover the expenses exactly and charged to users of the hospitals or to the bodies responsible for their fees (sickness insurance, social security, aid to indigent persons, funds for pensioners of the armed forces, and others)—or by means of an annual budgetary allocation, also calculated to cover exactly the costs of running the hospital. The public hospital enjoys legal status; and the administrative board that manages it can buy or sell property, accept donations and legacies, bear witness in court, and so forth.

In some countries the term "public hospital" covers hospitals that are managed by government services or public municipal, departmental, or national bodies and that are financed as part of the over-all budget for public services.

— 36 —
Private hospitals

As a rule, the following types of private hospital are distinguished:

(1) Private hospitals run by philanthropic institutions, which make no profit and do not operate on a commercial basis. These are created and managed by very different groups: religious communities or groups, lay philanthropic institutions, sickness insurance and mutual aid societies, industrial undertakings, social security organizations, and others.

(2) Private hospitals run on a commercial basis, founded and managed by commercial groups or by individuals as commercial enterprises.

Public control

Although the distinctions between public and private institutions are quite clear and definite, and although they are reflected in very different types of administration, public control of both types of establishment tends to be exercised more or less closely at different levels, for three reasons:

1. The conditions of hygiene are subject to control by the public health authorities; and such control, as a rule, includes enforcing certain technical standards and inspection by the public health service.

2. There should be co-ordination between public and private hospitals in order to avoid duplication of equipment and overlapping of services. This may be achieved by deciding the total number of beds required for a given area and making the extension and/or creation of new beds, either public or private, subject to an official authorization.

3. The extension of medical aid to indigent persons and of social security facilities for workers means that more and more of the patients admitted to hospitals of all kinds no longer pay the whole cost of diagnosis and treatment and that the budgets of public and private hospitals depend more and more on payments from sickness insurance or other welfare funds. Such financial bodies naturally tend to demand the right to exercise control over the finances and operation of private hospitals, even of those that are run on a commercial basis. This is one of the results of the constantly higher cost of medical and hospital treatment, and leads to budgetary control by the public authorities.

Hospital Administration

The term "hospital administration" covers a large number of activities, as diverse as are the systems of hospital organization themselves. As occasion arises, the hospital administration fulfills very different functions, which may be roughly classified into three categories:
(1) Preparation of hospital legislation, planning of the hospital system as a whole, determination of investment policy and of regulations for the operation of hospitals, and establishment of architectural control and standards. These activities come within the State’s legislative and executive power and are essentially the responsibility of the ministry of public health, in co-ordination with other ministries (interior, finance, construction, education, labour and social security, and planning). Some of these responsibilities can be transferred to local or regional governmental authorities.

(2) Application of hospital legislation and of social assistance provisions by the authorities responsible for the management of hospital services, whether they be local or regional, public or private. Administrative boards, where they exist, are responsible for managing the establishments and examining the proposals of hospital directors. Otherwise, the hospital directors are themselves responsible to the appropriate authorities.

(3) Daily running of the hospital by the administrative staff concerned with personnel, finance, accounts, and technical services. The director of the hospital and his assistants are in charge of these activities.

This distribution of responsibility naturally varies according to the degree of development and complexity of the hospital administration in each country.

Since it is recognized that the hospital can no longer be considered an isolated unit but must become a part of the general health services, the present chapter deals essentially with hospital administration at the national and regional levels, that is to say, with structure and methods that are applicable to the planning and management of a hospital system. The management, financial, and accounting problems particular to individual establishments are not considered.

Hospital Organization

Principal types of hospital organization

The hospital administration in each country is the result of historical development over varying periods of time; it differs according to the history of the institutions themselves and according to the way in which the country’s social structure has evolved. At first sight, it seems that each country has a different hospital administration and that all the intermediate stages can be found between the fullest possible liberalism and complete State control. In order to throw some light on this problem and to attempt to define the lines of future developments, it seems advisable to commence by examining the broad categories of juridical organization existing today. It is impossible to describe in detail the many systems in the various countries of the
world, but there are several characteristic systems in certain countries or groups of countries that it is very useful to consider as examples.

The United Kingdom and the USA

One of the main characteristics of these countries was the marked development of private and essentially philanthropic initiative and the ease with which elements of quite different structure were co-ordinated.

The USA has one of the largest hospital networks in the world. Its structure is extremely heterogeneous since it includes private philanthropic hospitals (voluntary and non-profit) side by side with municipal establishments and State and Federal hospital centres. One feature is common to them all: each has its own administration and enjoys a high degree of autonomy. Co-ordination among the various hospitals is achieved by means of mutual agreements, and interference by the central government is limited to the element of control inherent in the giving of subsidies for construction and equipment (Hill-Burton Act). The technical standards with regard to amenities are applied by national, but not governmental, bodies of a private character (American Hospital Association, American College of Surgeons, American College of Physicians, American Medical Association) through a Joint Commission on Accreditation of Hospitals.

In the United Kingdom, a similar system operated until 1948, when a new and comprehensive regional system was created under the National Health Service. Roughly speaking, the administration of the hospitals is co-ordinated by regional hospital boards serving up to several million inhabitants. Each hospital or group of hospitals has anything from a few hundred to 1000 to 2000 beds, and is administered by a hospital management committee. The central government exercises over-all control, establishes the over-all budget, and distributes it to the regional boards, who, in turn, decide the allocation to the several management committees. It should be noted that in England each of the teaching hospitals has its own board of governors, independent of the regional hospital board; but this is not the case in Scotland.

Latin America and Western Europe

The Latin countries and some other countries of Western Europe have been greatly influenced by the hospital legislation that emerged from the French Revolution of 1789. The public hospitals are municipal establishments enjoying administrative and financial autonomy. At the departmental or provincial level, strict control is exercised by the representative of the government; but the central government has executive power with regard to organizational plan and budget. Although this central government has the power to reverse decisions that are not in accordance with the regulations,
the initiative rests to a great extent with the local authorities. However, the latter are calling more and more upon the State for equipment subsidies. The statutes of the specialized hospitals are different: they are often managed at the departmental or provincial level; but, here again, the initiative is not entirely in the hands of the central government.

Eastern Europe

Hospital legislation in the countries of Eastern Europe was affected by the Russian Revolution of 1917. There are no more private hospitals, and hospital administration is, to all intents and purposes, State-controlled. The central authorities (which may be organized on federal lines) are responsible for the control of hospitals, which are public services and not in any way autonomous. Integration of preventive and curative health services has reached a very advanced stage; and the health authorities run hospitals, specialized institutions, social and preventive medical services, and public health organizations. Hospitals are just one of the elements in the public health service.

Emerging countries

In the emerging countries, four important influences have affected hospital organization in the past; and, because of the absence of hospital law in most of these countries, these influences are still felt.

Turkish influence. In many Moslem countries, where Turkish and Islamic influence has predominated, the legislation does not confer legal status upon hospitals. The hospitals depend for their income on the provisions made by their founders; but, as these provisions are progressively nationalized, the hospitals are becoming State services. There is a tendency towards more and more centralized government, and the hospital administration is in the hands of the central authorities.

British influence. In the countries that were formerly a part of the British Empire, and in the countries of the Commonwealth, hospital organization is very similar to what it was in the United Kingdom before the introduction of the National Health Service in 1948. Private, philanthropic hospitals exist; but the bulk of the service is given by public hospitals, which are a government service. The operational budgets of these hospitals derive partly from local budgets, but many services are run directly by a public works department and a central supplies office.

French influence. In the former French colonies, hospital administration is an adaptation of the military system, and most of the care is free. Hospital organization is therefore centralized, and there is very little participation by the local authorities. It is, therefore, fundamentally different from that of
continental France. It should be mentioned that, both in these countries and in countries formerly under British influence, a great deal of work has been done by religious missions, which continue to be private undertakings.

*Chinese influence.* In the countries of Eastern Asia that were under the influence of the traditional Chinese civilization, the communes enjoyed complete liberty to create mutual aid and co-operative services at the communal level, particularly public health and medical care services. Although profound changes have recently taken place, there still remain some traces of this particular type of organization, which is not altogether unlike that which existed in past centuries in Europe.

**General principles of hospital organization**

It is obvious that, where there is such diversity, it is impossible to recommend a uniform scheme of hospital organization that would be applicable in all countries. The hospital system in any country depends too much on social institutions, level of development, needs and resources, and the relations existing between the public and the authorities for it to be possible to envisage any type of organization as a model for all countries. It is also essential to guarantee the availability of capable and well-trained administrative personnel and of highly qualified architects, engineers, and technicians before embarking on such a difficult enterprise as establishing a network of modern hospitals. However, on the basis of reforms introduced in various countries, of criticism directed at existing systems, and of experience acquired from such systems, it is possible to arrive at some general idea of present tendencies in hospital administration.

Within the framework of regional planning, as described in chapter 1, definite functions are assigned to each type of hospital; and there is, therefore, a grading of hospitals. Furthermore, the increasing technical complexity of modern hospitals and the mounting costs of operating them, which require the intervention of the State and of social security and sickness insurance organizations on a national scale, call for planning at the highest possible level.

On the other hand, there is no doubt that local initiative has been an extremely dynamic feature of the recent past and that, when the resources are available, such local initiative can achieve important results. This is due partly to the fact that the local population is interested in the local hospital and partly to the diversity of the needs and the many factors involved. However, although it is highly desirable to encourage the dynamism of local initiative, care must be taken to avoid any kind of isolationism. The organization of hospitals ought to be thought of in terms of regional planning and co-ordination to ensure that health institutions of any kind fit into the regional pattern. It seems, therefore, that hospital organization should be a compromise between centralization and
decentralization and that, generally speaking, this compromise should be related to the country's economic, social, and cultural development.

The following are offered as proposals for countries at various stages of development.

Countries in early stages of development

In these countries, very few technicians and administrators are available; and the traditional local communities are not sufficiently informed to be able to define their needs and desires. The hospital service is limited to a few scattered establishments to which most of the population cannot have easy access. In such cases, a strong, central administration, with full power to apply a rational and efficient plan, is essential. At the outset, such an administration should endeavour to obtain valid statistics concerning the number of existing establishments, their capacity, their equipment, their personnel, and the extent to which the facilities are used by the population.

Simple legislation should define the three essential categories of hospital—regional hospitals, intermediate hospitals, and rural health centres with a few beds—for the purpose of applying the total, integrated, public health programme. The financial and technical resources are apt to be so limited that priorities will have to be established, and it will often be necessary to compare the possibilities in terms of equipment, personnel, and material and the financing of the various possible organizational schemes, and to adopt, initially, the system that can be most easily put into operation, even if it is not what would be theoretically ideal. A choice will often have to be made between the two alternatives: concentration of technical means and qualified personnel in regional centres, or the constitution of a network of intermediate hospitals of medium capacity. All the existing factors must be taken into account; and, in addition to the availability of material and personnel, consideration will have to be given to facilities for transporting patients to centres and medical teams to rural areas, and to problems connected with the maintenance and repair of technical equipment. The central administration must be responsible for the choice among different possible solutions and for the application of the plan.

Nevertheless, the development of basic health services will, as a rule, be given first priority; and no opportunity should be neglected to encourage local initiative in the form of collective building of rural health centres.

Countries enjoying dynamic economic development

In countries in a stage of dynamic economic development, industrial and commercial expansion leads to important population migrations towards towns and to the formation of zones that acquire distinctive characteristics.
The advice of the local communities becomes useful, and regional or local public health committees can be set up to advise on needs and to receive the reports of hospital administrators. If such local communities are authorized to collect taxes, they may be required to participate financially in the erection of health establishments and to be responsible for certain operating costs.

*Countries that have achieved a high level of economic development*

When local communities have considerable resources in personnel and funds at their disposal, the hospital organization can be developed to the full. At the local and intermediate levels, it will be possible to set up public health administrative committees that can administer and manage local health establishments such as health centres, rural hospitals, convalescent homes and homes for chronic patients, old people's homes, maternity homes, and preventive medicine and hygiene services. Services well suited to local requirements can be promoted if the local committees can receive technical guidance and are given financial aid.

At the regional level, in an area with one to three million inhabitants, a planning committee should be set up. It should prepare the regional hospital plan and advise the central government on the proposals of local and intermediate administrations. A subcommittee comprising some of the members of the regional committee, with the addition of technical advisers, can be responsible for the management of the regional hospital centre. The committee and the subcommittee should include members of the medical teaching staff if the regional centre acts as the teaching hospital for a faculty of medicine. Other subcommittees or special hospital boards can be created to administer the intermediate hospitals.

At the national level, the ministerial department responsible for the adaptation and application of the hospital legislation should be assisted by technical committees and services as follows: (a) an operational research unit, basing its work upon hospital statistics kept regularly up to date, to provide the basic data for the study of the hospital plan; (b) an architectural control and advisory service, to be responsible for the establishment of standards, the trying-out of new solutions, the criticism of technical documents submitted by the hospital administrations and accompanied by the opinion of the regional committees, and the supervision of the building and equipment; (c) an interministerial committee grouping together the various interested departments to establish the hospital plan for a given period (at least four years).

This plan should include a list of operations classified in order of priority, with their estimated cost. Such a plan should be submitted to the legislative authorities responsible for approving the financial provisions, earmarking the necessary credits for the period in question, and co-ordinating the
various contributions (government subsidies, loans, participation by social
security organizations and local authorities, donations, allocation of scarce
national building resources, and others). The hospital plan should provide,
over a given period, for the adaptation of the hospital system to the develop-
ing needs of the population, by the modernization and extension of existing
facilities and the erection of new buildings.

The method for the calculation of the number and distribution of beds
and technical services comprises three stages:
The first stage is an analytical study of the situation. This should take
into account the statistical elements and the utilization indices previously
described, as well as statistics concerning the number of surgical operations,
radiological and laboratory examinations, by category, and all other
elements of hospital service. It must be emphasized that the various
indices must be compared, and that none of them taken alone has any
absolute value. One of the most useful elements in the establishment of the
hospital plan is the admission rate for each administrative unit served by
the hospital network (Fig. 2). This can be obtained by establishing the

FIG. 2
CATCHMENT AREA OF TWO HOSPITALS
SHOWING RELATIVE FREQUENCY RATES

TOTAL POPULATION: 200,000
AREA: 8,405 km²
AVERAGE POPULATION OF THE 15 RURAL UNITS: 6,500
AVERAGE POPULATION OF THE TWO URBAN UNITS: 40,000

GENERAL HOSPITAL 1
300 BEDS

GENERAL HOSPITAL 2
300 BEDS

HOSPITAL FREQUENCY RATE
(annual admissions per 1,000 population)
The size of the circle is proportional to the
total rate for the area. The sector shaded
black represents the proportion admitted
to hospital 1.
geographical origin of patients admitted to the different hospitals. By technical methods of analysis of the distribution of patients, the admission rate for each geographical unit can be obtained. The population at risk and the degree of attraction of each hospital can be estimated. With this information it is possible to determine what modifications in capacity must be made to meet the conditions prevailing at the time of the survey.

In the second stage, the forecasts concerning population movements and demographic development in towns and rural areas should be obtained from the town and country planning services. For example, if a rural zone with a low hospital utilization rate is to be industrialized and considerably increase its population, the provision of new hospital accommodation may be justified. If, on the other hand, a relative depopulation is expected owing to the modernization of agricultural methods and the attraction of industries outside a zone, the solution will probably be found in improvement of communications and means of transport.

In the final stage of preparation of the plan, all the above-mentioned data are assembled; and a selection is made of the most probable figures relating to: future hospital admission rate by each geographical unit; distribution of beds and of general and specialized services among regional, intermediate, and local hospitals; degree of attraction of specialized services; average duration of hospitalization and average bed-occupancy; trends in morbidity and new therapeutic means; and requirements in ambulatory and domiciliary services.

Ultimately, a model hospital plan is obtained in which priority can be given to the various phases of implementation according to financial provisions, resources in personnel, and actual architectural possibilities. A study of this kind calls for the collaboration of many services so that a complete operational analysis can be made. The administration can therefore set up its own technical services to make the study, providing it with wide facilities for obtaining information, or make use of bodies specializing in the subjects in question.

It must be said, again, that the statistical analysis of the present situation and the forecasts concerning the demographic changes are a prerequisite to hospital planning; but they must be complemented by consideration of the many social, professional, and cultural factors that are impossible to measure accurately. The decisions concerning, for instance, the care of elderly and chronically ill patients, the policy towards tuberculous and mentally ill patients, the attention given to preventive medicine, the structure contemplated for the rural health programme, the means of communication, and all the factors studied by specialists in human geography and influencing the pattern of society can alter dramatically the results obtained by the statistical methods.
CHAPTER 4

Some Special Roles of the Hospital

The Hospital as Teaching Centre

A hospital system should include provision for training the staff needed to man all the health services of a country, both curative and preventive. Every hospital, whatever its size and whether or not it is designated as a teaching hospital, should be regarded as a potential centre for teaching and research. In the larger hospitals, special facilities must be provided to encourage these functions.

Medical education can conveniently be divided into undergraduate and postgraduate levels. Undergraduate education lasts from the time a student enters his medical school until he passes his qualifying examination. In most countries, he then undergoes a period of postgraduate training before he is permitted by the law of his country to practise as a doctor. The medical school, which usually comes under the aegis of a university, comprises the buildings—lecture theatres, dissecting rooms, and laboratories, among others—in which the student's preclinical work is done and sometimes the associated teaching hospital where he is brought into contact with patients.

In some countries, the medical school does not have its own hospital but makes an agreement with the hospital authorities permitting it to utilize the required number of hospital departments for the teaching of clinical medicine. In this case, the hospital doctors have teaching responsibilities; and their qualifications are recognized both by the university and by the hospital authorities. In the present chapter, any establishment that fulfils a double role—treating patients and teaching medical students—will be referred to as a teaching hospital, irrespective of its administrative pattern.

It is obviously not practical in a book of this kind to describe in detail the establishment of an undergraduate teaching hospital in terms of buildings and teaching staff, but it can be stated that a teaching hospital has a triple role to play. It must provide for the treatment of the sick, for medical education—undergraduate and postgraduate—and for research. It is
therefore necessary for generous provision to be made in size, number, or both of the many parts of the hospital—laboratories, consulting and examination rooms, operating theatres, and others—to accommodate students in addition to the normal staff working therein. There will also need to be provided lecture theatres, demonstration rooms, a library, a museum, clinical laboratories in association with wards, research laboratories, and other facilities. Because a teaching hospital ought to have a full range of medical services, it is, in most cases, identified with the regional hospital centre.

A teaching hospital tends to be somewhat selective in the types of patient it admits, often giving preference to those who are suffering from rare conditions or who are suitable subjects for research. Though it is important that a medical student see patients of this sort, it is also important that he acquire a thorough working knowledge of common ailments—the kind that are likely to make up the bulk of his work if he goes into general practice. For this reason there is much to be said for an undergraduate's spending, for example, six or twelve months of his clinical years in district hospitals, where he is likely to encounter an unselected cross-section of the diseases of the locality. If this is to be the policy of the planning authority, some additional accommodation will need to be provided in selected district hospitals—lecture and demonstration rooms, studies, cloak-rooms, and so on.

Postgraduate clinical education is less didactic than undergraduate medical studies and is mostly a matter of gaining further knowledge, experience, and judgement by practising a specialty under the supervision of an expert. A planning authority will need to establish posts equivalent to that of a registrar in teaching, regional, and district hospitals in which young doctors of ability may work under expert supervision with a view to becoming, in due course, masters of their specialty and to attaining senior posts in the service. If a sufficiency of such training posts cannot be found, it may be necessary for a country to send its graduates abroad for more advanced training.

In addition to the medical training of doctors, the hospital has a responsibility to provide clinical facilities for the training of nurses. However, an adequate nursing staff should be employed by the hospital to cover all the nursing service needs.

Arrangements should also be made for the training of radiographers and of physiotherapists; but, important as their work is, they will not be needed in numbers at all comparable to that of nurses. Consideration should be given to the establishment of a limited number of training schools for radiography and physiotherapy, which would entail some augmentation of the relevant departments in a few selected hospitals.

The training of laboratory technicians should also be undertaken, but this can be done in any reasonably well-established department of pathology by a system of apprenticeship supplemented by courses in theory.
Hospital and Public Health Laboratory Services

Historical events and tradition have led, in some countries, to the development of hospital and public health services as separate and parallel functions. In other countries the treatment and the prevention of disease are the responsibilities of a single health service. Between these two extremes there are many intermediate types of organization. Common to them all is the need for an efficient and reliable laboratory system if prevention of disease, on the one hand, and diagnosis and cure, on the other, are to be effective. If the opportunity arises in a developing or expanding health service to handle both functions through a unified laboratory service, there are important reasons for doing so.

A laboratory that is concerned solely with public health work tends to be oriented towards the concept of disease as a manifestation of community life. A hospital laboratory, on the other hand, concentrates upon the individual patient. There are many points, however, at which the interest and functions of public health and hospital laboratories merge. Prophylaxis of infectious disease in the community by immunization procedures, by control of water and food supplies, and by supervision of community hygiene is the first and obvious way in which the public health laboratory decreases the number of persons likely to become hospital patients. However, having achieved an increasingly successful control of infectious disease, public health administrators are now tending to turn their interests to other aspects of community environment that have a bearing upon the potential hospital patient load. Their interests are being drawn, for example, to such matters as food control, atmospheric and water pollution, industrial hygiene, early cancer detection, prevention of sepsis in hospitals, Rhesus sensitivity in antenatal patients, and other relevant matters.

The responsibilities of public health laboratories are, therefore, spreading into fields that overlap those of hospital laboratories. Overlap is also evident in the responsibility that the hospital laboratory assumes for patients admitted for pulmonary conditions induced by heavy atmospheric pollution, patients with carcinoma or viscerotoxicity induced by industrial processes, patients with undetected late cases of cervical cancer, diseases complicated by strains of organisms resistant to antibiotics, cases of Rhesus sensitivity, and conditions caused by food poisoning or water pollution. In the reverse direction, the central sterilization department of a hospital might well consider as one of its community responsibilities a “syringe service” to the medical profession in the area, thus reducing the public health risk of infectious hepatitis transmitted by improperly sterilized syringes.

Increasingly closer contacts between public health and hospital laboratory functions underline the need for a single, unified laboratory service that will serve equally the prophylactic and the diagnostic needs of the
community and of the individual. Fragmentation of laboratory services is undesirable; and, inasmuch as the hospital diagnostic laboratory must, of necessity, be situated within the hospital perimeter, it is well to have the functions of the public health laboratory closely related to those of the hospital laboratory. This not only permits a certain elasticity of service, but also brings medical officers of health and clinicians into closer relationship. Through the medium of the laboratory, which serves the responsibilities of both, they are enabled to devise programmes centred upon the regional hospital, which can thus be a preventive as well as a curative centre, and one in which the medical officer of health is involved in the hospital service. A co-ordinated national health laboratory service not only meets the needs of both preventive and curative medicine, but also is more economical and avoids the overlap and duplication that are the inevitable result of parallel services.

Role of the General Hospital in the Mental Health Programme

The need to develop mental health services as a part of general health care has been frequently stressed by the World Health Organization. As a starting point for relating the hospital service to the mental health programme, general practitioners, social services, public health services, and health clinics should rely on the psychiatric services of the general hospital for early diagnosis and treatment of mental illness. The integration of the general hospital psychiatric services into the community psychiatric services can be established on this basis. Psychiatric clinics can be held in the hospital out-patient department, where the psychiatric staff—psychiatrists, psychologists, nurses, and social workers—can first consider whether the patient can be treated through domiciliary care, with visits to the out-patient clinic. This is the preferred course of action since it avoids removing the patient from the community, where, like everyone else, he belongs.

If out-patient treatment should be inadequate, it may be appropriate to give day—or night—psychiatric care within the community. If this still leaves opportunity for the patient’s condition to deteriorate, or permits too little control of his illness, a third possibility could be considered: day or night treatment in a centre within the precincts of the general hospital. Should all these possibilities be excluded, should an emergency situation become apparent during the first consultation, or should it be thought advisable to keep the patient for observation, a period of in-patient treatment may be necessary; but it should not exceed an average of three months. With discharge to the community and expert after-care by the same social and/or nursing service (depending on the training and skill of the workers), it should not be necessary to have longer hospital care for the patient, except in a very small minority of cases. For such cases, it will be advisable
to have well-equipped annexes to the general hospital for longer hospitalization (Fig. 3).

FIG. 3
PATTERN OF MENTAL HEALTH FACILITIES

The whole question of mental hospitals is under discussion at the present time. In countries in which mental hospitals played a central role long before community services and psychiatric units in general hospitals were developed, there tends to be some competition between those who believe that the future of mental health lies in the improvement of the mental hospital and those who go so far as to state that such hospitals will, in the near future, disappear completely. Other experts, however, take a middle view. Under these circumstances, it is clear that, in the vast majority of countries, it would be wise not to begin with custodial care, but to emphasize strongly the need for active and intensive treatment of psychiatric patients, during the early stage of their disease, within the confines of the psychiatric service of the general hospital. The more psychiatry has its place in the general hospital, the more will patients and their families, no longer afraid of the stigma of the old insane asylum, seek help when the first symptoms of mental disease appear. Such a development for the setting-up of mental health services is advantageous both to psychiatry and to general medicine. Medical experts are becoming aware of the fact that, even when there are
very clear somatic symptoms and diseases, emotional factors play a minor or major part in the causation of general illness in a high percentage of cases.

Since this monograph deals especially with health care as provided by district (intermediate) hospitals, not much will be said about specialist care such as child psychiatry, which could be better provided in regional and teaching centres. Nevertheless, it should be stated that there would have to be some facilities in the district hospital for child psychiatry, for geriatric services, and others. With regard to the psychiatric care of children, it has to be decided whether this can be provided more appropriately by the paediatric department or by the psychiatric service. There should, in any case, be close co-operation and interaction between these two services in a good general hospital. The requirements for the establishment of a child psychiatric unit should be set forth by a specialist in the field. In addition to some beds for observation, the needs will probably include treatment facilities for hospitalization of moderate length, foster homes in which psychotherapeutic care can be given, and an out-patient department along the lines of a child-guidance clinic.

The Hospital as a Consumer

Central stores

Hospitals are consumers of a great variety of goods; and the problems of storage, inventory, and distribution of these goods are of great importance. Supplies are most often stored and distributed from the department concerned. For instance, so long as the amount remains small and corresponds to a few days of consumption, food is kept in the annexes of the kitchen; linens in the laundry department; drugs in the pharmacy; surgical instruments in the operating block; and laboratory supplies in the laboratory. But, when the bulk of these goods is great, it becomes necessary to keep them in a central store.

In economically developed countries, where the network of trade centres is highly organized, it is generally not necessary to keep a large amount of goods in the hospital stores because the factories or retail departments are able to provide the hospitals, in a matter of hours, with a great number of items upon receipt of a simple telephone call. The goods can be stored by the manufacturers, and the delivery of relatively small amounts can be made upon request. However, the rules of public administration are such that the cost and technical specifications of these items must have been agreed upon by contracts following examination of tenders.

Nevertheless, small hospitals can encounter difficulties in organizing their own stores, especially when they cannot be certain that the delivery of an important item will be made at once in case of emergency. This applies,
for instance, to spare parts for radiological apparatus, operating lamps, reagents for testing blood, and other supplies. Therefore, there is a tendency to organize a central store at the regional level. This central store is a kind of "co-operative" for all the institutions of the region. Contracts are made on a very large scale so that the regional storage centre can benefit from lower costs, have a comprehensive collection of spare parts for vital equipment, and organize workshops for the production of many items, such as perfusion sets, tubes, special laboratory apparatus, and other supplies.

In developing countries, the problem is of a different nature. Long experience has shown that, if countries do not possess within their borders a reliable medical supplies industry, with an output sufficient to cover most of the needs of the health services, so that they are necessarily dependent upon imports, bulk purchase and distribution of medical supplies on a national basis are the most economical practice. (Even in industrially advanced countries, economy and efficiency can usually be achieved by having groups of institutions procure and distribute supplies in bulk, as suggested above.)

In considering the arguments for or against the establishment of regional central stores, the main questions that must be raised at the beginning are the following: Is there already a governmental organization to administer a medical supplies service? Is it functioning as part of the ministry of health or of some other government agency, such as the ministry of supply? To what extent are its services regionalized? What are its functions and responsibilities? Does it control all phases of the medical supply programme—data accumulation, planning, purchasing, receipt, storage, and distribution? Does the government have the necessary physical facilities for handling supplies in bulk—offices, warehouses, transport? To what extent are other government agencies involved in any of these operations? Are trained personnel available to fill at least key positions in all of the operations mentioned above? Are there local possibilities for producing linen, wood or metal furniture, cotton wool, bandages, crockery, glass, or other supplies? Does the country have pharmaceutical plants? Are there local representatives of dealers in X-ray equipment, surgical instruments, and laboratory apparatus to ensure maintenance and repairs?

**Administrative considerations**

It goes without saying that there can be no effective working and smoothness of operation unless there is a sound administration to deal with the problems of medical supplies. All the wise planning, all the scientific counsel, all the financial operations will be wasted endeavour unless the administration of every aspect of the services is handled with a high degree of efficiency. This efficiency is dependent upon the services of properly qualified and trained personnel.
The chief official is, naturally, the most important figure. He must have knowledge and experience in the handling of medical supplies—if not of all categories, then at least of those constituting the major requirements. He must have experience in business, that is, he must have a record of successful management in this field. It is not necessary that he should have a scientific specialty—he need not, for example, be a pharmacist, and the assumption that only a pharmacist can fill the post of director of a medical supplies organization is false. The specialty of pharmacy is too narrow for this very wide field. Similarly, this official need not be a medical practitioner.

It would seem—and experience tends to bear this out—that the obvious and most suitable agency to contain the government medical supplies organization is the ministry of health, which would necessarily effect coordination with other government agencies concerned with finance, economics, and related matters.

The major activities of a medical supplies administration consist of the accumulation of data, the estimation of requirements, purchasing, storage, and distribution.

The accumulation of data

The assembling of realistic information upon which a programme can be built can only be achieved by a properly organized office force that knows how and where to get the needed information and how to present it. In order to estimate the requirements for supplies, it is necessary to know, first, who will be using them—that is, the hospital facilities of the country and their bed capacity—and, second, the respective rates of consumption analyzed by groups—first-aid stations, casualty departments, out-patient departments, general dispensaries, polyclinics, and the like. Similar and, in some cases, more complicated, analyses concerning supplies such as antibiotics and X-ray films, which have a limited life, or antimalarials, the need for which fluctuates with the incidence of the disease, have to be worked out in different degrees for literally thousands of items. Unless such data are assembled with business-like attention to detail, a medical supply programme can become a matter of wild guess-work.

Estimating requirements

The aim here must be to know not only the quantity required but also the quality. To achieve the necessary precision, knowledge of what is already available in the country must be at hand, as well as estimates of the total quantities needed to carry out the programme. Information on available sources of supply and the adjustability of need to suit the purpose are basic essentials for the clear presentation of the requirements. Planning preliminary to procurement of supplies must be realistic in outlook. The inclusion of items that are controlled or in short supply must be envisaged
accordingly. The expendability of these supplies, both consumable and nonconsumable, must be determined according to their use.

An index of consumption and replacement cannot be found for all items and for all countries; there is no such thing as an international replacement rate. Variations in the characteristics of peoples are very pronounced. Thus, one nation may by nature be thrifty and careful, whereas others may be the reverse; and these propensities are reflected in the annual demands of their institutions. The standards of maintenance of machinery and apparatus are another highly variable characteristic. The unnecessarily prolonged use of certain therapeutic agents and the tendency in some countries to regard medicaments such as penicillin as panaceas have a direct bearing on the requirements for certain supplies.

There are available formulas, with which any medical supply expert should be familiar, that show the equipment necessary for unit numbers of beds and for various types of hospital and other medical installations. These formulas, which have been compiled from statistical data in technologically advanced countries, are useful references and provide a comprehensive mathematical means for calculating the requirements on a component basis. However, it is the task of the planning group to relate the data of these formulas to the data that have been locally accumulated and to the peculiar exigencies of the country, and to adjust the requirement programme accordingly. This has been found to be the key to accurate and appropriate planning.

Planning is not to be thought of simply as a limited activity preceding the formulation of requirements. It is a continuous process involving knowledge of all the other operations of a medical supplies programme, and requires a continuous study and follow-up of past and present activities in order to prepare for future operations. For example, with regard to X-ray machines, the planner must decide on the quality and quantity required on the basis of the existing data, the present X-ray facilities in the country and their condition, the degree to which the machines are suitable, and the ability of those who use them. When the planning does not involve replacement of existing equipment, the scope of the projected work, the availability of trained medical and technical staff, the suitability of other technical components, and the type and constancy of electric current are all important for the determination of the requirement specifications and figures. The procurability of the materials required within a specified time and the storage, handling, distribution, and delivery to the point of ultimate use are all factors of weight in the preparation of a realistic order.

Broadly speaking, there are two aspects to planning. The one is budgetary and involves the determination of a proposed total expenditure on the basis of monetary estimates for established item categories, for preliminary appropriations. The other is the more specialized and technical task of preparing detailed lists of goods for purchase.
Purchasing

Procurement involves the choosing, according to item specifications, of the best source of supply, establishing a delivery date, and the acquisition of items at the most favourable cost.

The difficulty in procurement of medical supplies lies in the enormous variation in specifications for the same standard item, the number of standards that exist in the world, and the many sources of supply for each standard. For instance, proprietary preparations of acetylsalicylic acid are innumerable, and it is also sold by many firms under the common name; and a piece of apparatus, such as an electrocardiograph, can be produced in probably equal quality by many countries. This is true for most of the items in a medical supply programme. A further difficulty lies in the restrictions imposed by the foreign exchange policies that are in existence almost everywhere. In addition, because of certain trade agreements, a country may be subjected to pressure to purchase through channels that are not the cheapest ones. These factors, together with the complications resulting from the present world supply situations, make it hard to reach a decision in terms of money or in kind.

Storage

The administration of storage covers the receipt, storage, maintenance, and issue of supplies at a general depot. The operation differs from storage operations of other commodity groups, food supplies, and engineering supplies because small quantities of medical supplies may represent great sums of money, and because special storage conditions are required for their preservation.

Practically all forms of storage are involved in the handling of medical supplies: the strong-room for housing narcotics, the cold room kept at −20°C for the storage of live virus vaccines, the spacious warehouse for hospital equipment, and the shelter for barrels containing crude disinfectants.

The sorting-out of medical supplies and the storage in proper sections of the warehouse, according to item classifications, of the thousands of individual commodity lines, are highly technical matters. Swift and accurate delivery can be assured only by a uniform and intelligent system of identification and cataloguing. The identification of each item by non-technical personnel is impossible unless there is a simple, progressive, numerical coding system. The warehouse catalogue, the key to this labyrinth, must be clear, ample, and up to date; and its maintenance should be the responsibility of the specialist head of each section. When a word description does not suffice for accurate identification, as in the case of a complicated apparatus or something new to the country, illustrations are a necessary supplement to the catalogue.
It is obvious that different items require different kinds of handling and storage. For instance, it would be a mistake to keep together the laboratory and the pharmaceutical equipment and supplies. The use of these two categories of material is very different: pharmaceutical supplies are expendable and never come back from the hospital, whereas a great amount of laboratory equipment is returned to the central laboratory for control and reconstitution of sets.

In imports from countries of a different language, difficulty may be experienced in identification, storage, issue, and, what is more important, the end-use of the product. Unless such items carry labels and instructions for use, including dosage equivalents, in the language of the receiving country, translation of the necessary information will become a part of the storage operations. This is particularly essential in the case of dangerous drugs.

The risk of fire and explosion in a medical supplies warehouse, and the storage of items such as picric and nitric acids, inflammable materials, and oxygen and other gas cylinders merit special attention.

A properly functioning inspection service is necessary. There are, in a relatively limited space, supplies of great value, requiring constant attention, not only from the viewpoint of the risks suggested above, but also with the object of proper maintenance of the stock and the premises. A repair shop is a useful and economical activity of this service.

The preparation of consignments for distribution requires appropriate procedures, especially in the handling of fragile and precision equipment, with due consideration of the time factor. Great losses can, and do, accrue from careless and unskilled packing and lack of attention to the very important handling instructions, especially when these appear in a foreign language. The keeping of accurate supply records and inventories and the preparation of reports require experienced clerical staff.

The introduction of machines for storage operations has been an advance in modern warehousing. However, the mechanization of these operations must be examined in relation to the volume of work, the speed of handling required, and the cost of ordinary labour.

Distribution

Distribution includes all movements of supplies, both incoming and outgoing, at the point of arrival, at the manufacturer’s plant, or when ready for issue at the State warehouse. The necessary transport facilities must be available; and, for smooth and rapid flow of materials, liaison should be established with the authorities controlling ports, railways, air freight firms, road hauliers, the postal services, and other agencies as needed. The administration’s object will be the organization of this final and important stage of the whole supply operation with the major aims of speed and
efficiency of movement. Where no satisfactory common means of transport exists, it may be necessary to maintain a network of conveyance either alone or in conjunction with other government services.

The distribution services must observe the same care with regard to instructions concerning loading and shipping as have been previously mentioned with reference to packing. It must always be borne in mind that every load of medical supplies carries an element of particular risk. Few consignments leave the warehouse that do not include some highly inflammable materials, such as alcohol or ether, or other potentially dangerous substances, such as strong acids and alkalis. Of equal importance is the care required for the safe transport of delicate apparatus; and special attention must be given to radioactive agents—isotopes and radium, or cobalt stock.

* * *

It must always be remembered that the store service exists to serve the medical supplies needs of the hospital. Therefore, it is a vital part of the task of the store service to win the confidence and co-operation of the doctors, nurses, and hospital workers who use what it provides. This can be achieved only if the store service personnel consult freely and continuously with the doctors and the hospital staff concerning their needs and explain to them the policy and methods of the service. Rigid bureaucratic methods are to be strenuously avoided.
The discussion of hospital planning in this section is focused on the problems of the general hospital as defined in the previous section. It is concerned mainly with the medium-sized general hospital, whose function is to meet the major hospital needs of most of the population.
CHAPTER 5

Planning Procedures and Estimates

Steps in Hospital Planning

It is necessary to proceed in an orderly manner through a series of stages in the planning and building of a hospital. Appropriately qualified planning staff must be available at each stage and must be given sufficient time to do the necessary work in a careful and accurate manner. It is particularly necessary that sufficient time be allowed in the early stages of planning. It has been a common practice for hospital authorities to press forward too hastily in the preparation of the architects’ plans without sufficient preliminary planning. The result is always that, when the plans come under the scrutiny of the personnel who are going to work in the hospital, they are found to be all wrong. It is an expensive matter to scrap a complete set of architectural drawings; it may cost the hospital authority as much as 1% of the estimated total cost of the project to scrap the plans for a hospital, even at a fairly early stage. Time spent thinking out clearly what the requirements of the hospital are will save both money and time in the long run.

As a first step, a planning team (Fig. 4) should be assembled and given the task of preparing the architect’s brief. The team may consist of only two or three people to begin with, but will need to be enlarged as the project develops. The nucleus of the team will usually be one or two medical administrators, preferably with public health and social medicine orientation, and a lay-administrator, all experienced in hospital planning.

During the early stages of the project, while the extent of the need for the hospital is being assessed, medical and administrative personnel, with appropriate assistance in statistical matters, can work without other technical or professional members of the planning team. They will, however, soon need consultant advice from an architect. In some countries there are specialist architects employed within the national health ministry, or by the regional health office. In other countries, it may be necessary to call in consultant advice from architects outside the health service. It should be
remembered, however, that the planning of a hospital is a highly specialized matter that is outside the experience and competence of most architects engaged in normal practice. Sometimes the planning of the hospital is the responsibility of the public works' department or the ministry of construction, in which case it too often appears that the architects in charge are not sufficiently trained in hospital architecture. It will therefore be best to employ architects who are specialists in hospital building as consultants, either to the ministry of health or to the ministry of construction.

During the later stages of the project, architects and engineers from outside the health service and without previous experience in hospital building can be employed in an executive capacity, with good results; but, in the early planning stages, when consultant advice is required, hospital experience is necessary.

In most countries the administrative and medical members of the planning team will be available from among the employees of the health service, but occasionally in developing countries it may not be possible to take such personnel from their normal duties to form part of the planning team. In such cases, it may be necessary to seek men with appropriate experience from outside the official staff of the health service for this purpose. However the planning team is made up, it is essential that the key members should have sufficient time available to devote themselves effectively to the task.

The first task of the team will be to establish the need for the particular hospital under consideration in relation to the regional plan, as previously
described in this manual. This will be based on the population and morbidity data of the region; projections of changes in medical practice, population, and economic conditions in the area; and projections of the future development of the medical services. It will be necessary to define the role of the new hospital in relation to a regional plan.

At this stage it will also be necessary to determine the site. This may involve surveys of existing health facilities in the area and projections of the future development of transport, economic development, and the general building programme in the area. The planning team, which should include the architect, will need to collaborate closely with the authorities concerned with the economic development of the area and with the town and country planning authorities. At the conclusion of this stage, approximate estimates of the capital and running costs can be made and a master plan prepared.

The second stage will consist of the preparation of the architect's brief (Fig. 5). This work will involve, first, determining, in quantitative

![Diagram of the planning programme](image)


terms, the services to be provided in the hospital and, second, the preparation of schedules of accommodation based on the requirements of the services. At this stage, the team should be enlarged to include as a member the
architect who will be charged with the general design of the hospital, in addition to the administrative and medical personnel who will have formed the team during the first stage. A senior member of the nursing staff of the hospital authority should also join the team at this stage.

This second stage is most important, as the design of the hospital will become crystallized by the preparation of the schedules of accommodation. Time and trouble spent during this stage will be well repaid and will enable the whole project to proceed smoothly, with a minimum of subsequent revision. In determining the services to be provided in the hospital, it will be necessary to consult, on an ad hoc basis, senior medical specialists and members of the nursing profession as particular problems arise. If at this stage any of the senior staff members of the projected hospital have already been chosen, then they should also be consulted with regard to those services for which they will ultimately be responsible. At the end of this stage, the architects' brief should be complete. This will comprise general descriptions of the scope and functioning of each service, together with a schedule showing all the rooms required, with approximate floor areas, and notes on any special requirements or special equipment.

The third stage is the design of the hospital from the brief. This will be mainly the work of the architect. It will be necessary either to make a team of architects available from the health service staff or to commission a team from outside. The team engaged in the design may include one or more firms of architects, consultant mechanical engineers, and consultant civil engineers. The amount of work involved in the design process is considerable; from 10 to 20 architects and engineers will probably be engaged during the working-drawing stage of a 500-bed hospital; and the design costs are likely to amount to 10-12% of the building cost.

In some countries in which there is a shortage of professional architects and engineers, hospital building has been undertaken by "package deal" arrangements with large firms of contractors who operate on an international scale. Under this system the contractor takes responsibility for the design as well as the construction of the building and hires architects and engineers. From the point of view of the health authority, this system has the defect that the authority does not have the benefit of independent professional advice, and some measure of control over the design and cost of the buildings is surrendered.

During the process of design, the medical and administrative members of the planning team will operate as consultants to the architects and engineers, answering their questions and defining the requirements of the hospital in detail. The design will proceed through a series of stages. First, preliminary designs will be produced and submitted to the planning team and the health authorities for approval. These preliminary designs will probably need some modification; but, when they are agreed on in their modified form, the architects and engineers can proceed to prepare working drawings.
These working drawings will constitute a complete set of instructions to the contractor for the building of the hospital; they will show the whole of the construction process in minute detail, and will be accompanied by specifications and bills of quantities. Close and continuous collaboration is needed throughout this stage among architects and medical and nursing members of the planning team. As the drawings proceed to greater detail, the advice of the medical and nursing members of the team will be needed on a day-to-day basis by the architects. Extra costs and severe delays will be involved if there are any important modifications in the design of the hospital during the working-drawing stage.

The final stage will be the actual building of the hospital. This will be carried out by a contractor, who may be selected by competitive tender. His work will be controlled and supervised by the architects and consulting engineers. At this stage, it will be still more unfortunate if any major alterations are requested by the hospital authorities.

The time required to complete the hospital will depend primarily on the capacity of the contractor to bring large numbers of men and working equipment to the project. For example, if a hospital is going to cost £4 million and the contractor can only deploy his forces to the extent of a maximum output of £200,000 a year, then the hospital will take eight years to complete. It is therefore important, when selecting a contractor, to investigate the capacity of his firm in terms of managerial personnel and plant capacity. It will be necessary to confine the list of those invited to tender to a limited number of firms that can satisfy the health authority with respect to their capacity to work at an appropriate rate.

During the construction period, it will be necessary to set up a second team in addition to the planning team to prepare for the “commissioning” of the new hospital. This team should include one or two experienced administrators and certain key members of the staff of the future hospital, in particular, the director of nursing. If possible, the senior physician, the medical superintendent, the chief nurse, and the chief administrator should also be appointed a year or two before the hospital is likely to be finished so that they can take part in the work of the commissioning team. At this stage it will be necessary to decide, in detail, the staffing required, and to arrange for the engagement of all staff. It will also be necessary to schedule the acquisition of items of furniture and equipment down to the last teaspoon, and to arrange for their purchase and delivery at the appropriate time.

There will be special problems in staff training. The new hospital, unless it is to be out of date before it is finished, will certainly contain innovations of a radical kind. There will be new arrangements of the departments, and new equipment; consequently, many new working methods by staff of all kinds will be necessary. Obviously, staff cannot be transferred overnight from an old hospital with out-of-date methods of working and be put into the unfamiliar surroundings of a new hospital. It will therefore be necessary
to plan and to carry out special staff training courses to give the staff the experience and confidence to enable them to function under new conditions. The key members of the future staff may be sent for training to modern hospitals in other parts of the country or, perhaps, abroad, where the methods and equipment proposed for the new hospital may have been recently put into operation. It is important not to underestimate the difficulties that staff will experience upon moving into a new building unless adequate preparation and training have been arranged beforehand. In view of the fact that patients will be admitted when the hospital is opened, this orientation may literally be a matter of life and death.

**Estimation of Requirements**

The first task of the planning team will be to determine the broad requirements for the new hospital. Where a regional plan already exists, the new hospital will be seen as providing part of the regional service; and the services it is to provide will be related to the regional plan and, particularly, to the regional hospital, which will act as a centre for referral of some types of case. The new hospital may itself provide supporting services to health centres and rural hospitals in its area.

The initial step will be to establish the area and population likely to be served by the new hospital. This is sometimes easy, as the area may be defined by geographical features or by communication facilities. Generally, in rural areas it is fairly easy to determine the population served; but it is more difficult in metropolitan areas, or in areas with a high density of population. In the latter, there will be other hospitals nearby, and the boundary lines between the service areas of the different hospitals may often be hard to determine. There are, however, techniques for defining service areas, as has been previously noted.

Once the population has been determined, it is possible to estimate the demand for medical care. In developed countries that already have a fairly high standard of care, there are established methods for surveying the demand. These methods, however, depend on the assumption that the demand for care, which can be measured, is reasonably close to the need—that is to say, it is assumed that there is not any considerable volume of sickness that does not reach the notice of the hospital authorities in the form of requests for care. This assumption will not be valid in countries in which medical services are in an early stage of development and in which the need may be far greater than the overt demand. In such cases it is doubtful whether there is any value in trying to measure demand as it exists. It will probably be necessary to estimate the need for care on the basis of personal experience. It may be possible, however, to supplement the findings thus obtained, which are based on guess-work, by conducting an *ad hoc* survey of morbidity in the area. In any case, when the bed-to-population ratio in a region is less than one per
thousand for acute diseases, there is little chance of being wrong in extending the bed complement up to double, provided the proposed hospital is sufficiently flexible to adapt to the changing needs. By one means or another, it will be necessary to predict broadly the demand for care in each specialty. Both the staffing and the planning of the building must start from such predictions. Even if they prove to be erroneous, it will at least be known what load of work the hospital has been planned to provide for, and it will be much easier to determine what modifications or additions are necessary if the design has, from the beginning, been related to an assumed and clearly stated volume of work.

Once the assumed number of patients presenting for care in the various departments of the hospital has been established, the requirements for the hospital can be estimated. Assuming that a certain number of out-patients will present themselves at surgical clinics in a month, then the staffing of the clinic and the number of consulting rooms can be determined by making an estimate of the average length of time each consultation will require. Similarly, in determining the number of beds that may be needed for medical cases, surgery, midwifery, and other departments, it will be necessary to make estimates not only of the number of patients that will present themselves for admission, but also of their length of stay in the hospital.

As an example of the method by which the broad outlines of a service can be determined, one may consider the provision for maternity. This would be established by taking the birth rate in the population and, in the light of local culture and medical opinion, estimating the proportion of births that would take place within the hospital. Next, the average length of stay that would have to be provided for in the maternity department could be simply worked out.

From the number of beds and from the predicted number of out-patient attendances, it is possible to proceed to an approximate definition of the requirements for the medical service departments, such as radiodiagnosis and laboratories. There are available data from several countries that relate the demand for these services to the number of beds and to the number of out-patient attendances, and these can be used to give an approximate guide to the scale of provision of services in these departments. The extent to which it is proposed to make the diagnostic departments available to general practitioners and clinic doctors would need also to be taken into consideration.

At this stage in the study it should also be possible to draw up rough figures for the "population" at the hospital site, including the patients and the staff of various categories. These figures are important, for they enable approximate estimates to be made of the requirements for the non-medical service departments—catering, laundry, stores, boiler house, and others. Figures for staff population also enable the provision for staff housing to be estimated.
At the conclusion of the operations described above, it will be possible to establish, in broad terms, the volume of building required for the various sections of the hospital. It will also be possible to estimate the demand that the hospital will make on the public services, such as water, electricity, gas, and sewage disposal. An architect should be able to give the hospital authority some idea of the cost of the project in round figures at this time. Furthermore, the operational costs of the hospital and of the staff salary can be approximated. Finally, an architect with specialist knowledge of hospital planning can make a master plan for the hospital development, once a site has been chosen.
CHAPTER 6

Hospital Design

Choosing a Site

The first consideration in choosing the site of a hospital is convenience for the patients. In view of the increasing importance of the out-patient service given by the hospital, convenience of access to patients is absolutely essential, and should take priority over other factors in the selection of the site. The next most important consideration is that the site should be large enough to enable the hospital to expand and develop in the future. Past experience has shown that much valuable investment in hospital building has been thrown away when too small a site has been chosen. The result is that, at some time in the future, the hospital cannot expand sufficiently to meet its responsibilities and has to move to some larger and often remote site, with consequent waste of much that has been put into the original project. Unfortunately, the second criterion is often in conflict with the first, and must not be allowed to override it. Central positions, particularly in urban areas, are in great demand; and it is often difficult, or even impossible, to find a site big enough for a hospital in a central area. Sometimes there is a fairly well-developed main residential area, and the hospital can be sited in a central position in relation to this. Sometimes it is known that the town is going to expand in a particular direction; and it may be possible to find a large site fairly near the periphery of the present town that will, in due course, become central to the major residential area. Close collaboration with town-planning authorities is obviously necessary in choosing the hospital site.

In determining the area for the hospital, it will be necessary to have available the preliminary calculations described in the previous chapter. These will show the approximate total volume of the building, and the site area must be related to this. The degree of crowding on a site can be considered in terms of “plot ratio”. This is the ratio of the total area of the building on all floors to the area of the site. A “plot ratio” of one represents a building whose total floor area is equal to the area of the site—
that is to say, if the hospital is to be a two-storey structure, half of the site will be covered with buildings and the other half will be available for open space, access roads, car parking, and so forth. For purpose of reference, it may be assumed that a plot ratio of two to one is the greatest that should be considered for hospital development, and that this ratio is acceptable only in the centres of cities, where a high density of building is the rule. Generally speaking, it will be found that hospitals developed at a plot ratio of two to one will give a crowded site, high buildings close to one another, very little open space, and a certain amount of overshadowing and overlooking between the buildings. In suburban and rural areas, a site should be sought that gives plot ratios of 0.5 to one or less. The degree to which a site may be built up will depend, to some extent, on whether the hospital is in an urban or rural area, on the climate, and on the general character of buildings in the neighbourhood.

Thus far we have considered only the area needed for the hospital as initially built, but in most cases a site should be accepted only if it provides room for substantial future growth. In principle, the site should be at least double the area required for the hospital as it is originally planned, though there may be exceptions in highly developed countries in which the projected new hospital forms part of an already highly developed service and shares its load of work with other hospitals.

As soon as one or more possible sites satisfying the requirements as set out above have been found, they should be surveyed by the architect, assisted by an engineer. The site will need to have available, from public services, supplies of water, electricity, and, perhaps, gas. It should also, preferably, have main sewerage that is capable of carrying the hospital effluent. If main sewerage is not available, the suitability of the soil for the installation of an effective sewage plant will have to be investigated. It should also be established that the site is free from air pollution from adjoining industries or other sources, and free from insect vectors of disease. The proximity of sources of noises, such as some industrial plants and airfields, should be avoided. In hot climates, it is important that the site be exposed to breezes, and in harsh climates, that it should be reasonably sheltered. The bearing qualities of the soil will also require investigation; the risk of earth movements, geological faults, or underground mine workings has to be considered.

The Master Plan

The first task of the architect is to prepare a master plan for the site as a whole. This plan should take into account foreseeable future developments of the hospital as well as the buildings erected in the first project. An architect who has specialized in hospital construction will be able to prepare
a hospital plan once the results of the early studies, previously discussed, are available. At this stage there will be no schedules of accommodation or detailed plans of the individual buildings, but an architect with sufficient experience will be able to calculate the approximate volume of each building from the general data that are available.

The master plan is really the equivalent of an exercise in town planning on a small scale. It is mainly concerned with establishing the circulation routes on the site and the relative disposition of the various departments and buildings that make up the hospital. The circulation routes on the site are of prime importance, and the success of the hospital plan depends very largely on getting them right. A hospital has two independent sets of circulation routes—external and internal (Fig. 6-7).

All the major departments need to be linked by internal traffic routes for the use of patients and staff and for the delivery of supplies from the supply areas to their points of use. A great deal of the interior traffic in a hospital involves the use of trolleys. Bedfast patients are moved on beds or trolleys; food and supplies are generally also moved on trolleys. Trolleys cannot be pushed up stairs, and all vertical circulation points within the hospital therefore have to be provided with lifts. Much of hospital planning stems from the problems of internal circulation and, in particular, the need to localize vertical circulation, so far as possible, at certain key points. It is very much more economical and efficient to concentrate lifts than to distribute them among different parts of the building. Four lifts banked together will give the same service as eight individual lifts distributed at separate points.

The external traffic within the site is considerable. Ambulances and delivery vehicles need access to the buildings at various points. Staff and visitors to patients need car-parking facilities. Although there is likely to be a point, or points, where the majority of deliveries are made for the hospital as a whole, it is also desirable to have road access to all major sections of the hospital, and certainly to any independent buildings that there may be. This access will facilitate the bringing of heavy items of equipment close to the point at which they are to be installed. It is also necessary for the use of fire engines in the event of fire in the hospital, and will facilitate the maintenance of the fabric of the buildings.

In developing the master plan, areas have to be allotted within the site for each major department of the hospital (Fig. 8). These areas should always be large enough to allow for each department to expand by additional building while remaining properly connected to the circulation networks (Fig. 9). Only if this is done will it be possible for the hospital to grow in an orderly manner. In many old hospitals in which provision for growth was not made in the master plan, a necessary addition to one department has become a malignant growth, blocking some vital artery of communication.
FIG. 6
EXTERNAL CIRCULATION ROUTES OF TWO HOSPITALS

HOSPITAL A

HOSPITAL B

- MAIN ACCESS ROUTE
- MAIN EXTERNAL CIRCULATION ROUTES
- BUILDINGS AND DEPARTMENTS

- MAIN EXTERNAL CIRCULATION ROUTES
- NEW BUILDINGS
- EXISTING BUILDINGS
FIG. 7
INTERNAL CIRCULATION ROUTES OF TWO HOSPITALS

HOSPITAL A

---

HOSPITAL B

- MAIN INTERNAL CIRCULATION ROUTES
- BUILDINGS AND DEPARTMENTS
- NEW BUILDINGS
- EXISTING BUILDINGS
Certain broad principles for establishing the departmental zones may be set forth. The parts of the hospital that are most closely linked to the community should be allotted positions closest to the main entrance to the site.

These include the out-patient and casualty services and such offices or other facilities as are needed to provide a base for domiciliary services. Next in order of distance from the entrance should be a zone allotted to the medical service departments, such as radiodiagnosis and the laboratories. These departments receive a great deal of work directly from the out-patient department and need to be close to it. Beyond this is the area allotted for in-patient care. Apart from the areas of the hospital used by the patients, there is a substantial area required for the housekeeping and domestic services—stores, laundry, kitchens, and boiler houses. These departments are best grouped together around a service yard, to which most of the delivery vehicles will go. This service area should be independent of, and can be remote from, the main hospital entrance. Staff housing, which will take up a substantial proportion of the site, can best be placed around the perimeter, to give the staff easy access to roads and public transport.
The considerations set out above will need to be related to, and perhaps modified by, the nature of the site. In many climates the orientation of buildings in relation to sunlight or to the prevailing breeze will determine many aspects of the master plan. Many sites are sloping, and this may

FIG. 9
TWO TYPES OF HOSPITAL EXPANSION

A. CONCENTRATED HOSPITAL

B. SPREAD-OUT HOSPITAL
provide both difficulties and opportunities in planning (Fig. 10). An advantage that may often be obtained from a sloping site is the establishment of internal circulation routes of different levels, e.g., it may be possible for

the in-patient areas to have a circulation system linking them with the operating theatres, radiological department, and other areas at a different level from the corridors used by out-patients and visitors. If the site is sloping, lifts will obviously be necessary; and the use of high, multi-storey buildings may prove more economical than low buildings connected by long corridors and scattered one- or two-storey lifts.

Planning for Growth and Change

The first requirement in providing for growth and change is room for expansion in the master plan, as suggested earlier; but there are other factors that need consideration. The master plan can develop in the form of a very concentrated building, making use, where necessary, of multi-storey blocks; or it can be comparatively loose, occupying more area on the ground and employing lower buildings.

The former approach will lead to a hospital which is compact and in which the distance from point to point within the hospital is minimized. There are many advantages in a compact hospital; it saves the time of the staff and helps to promote collaboration by making it easy for members of the staff to meet one another. But the more the hospital is planned as a single, massive block, the more difficult will it be to make effective provision
for growth and change. The concentration of all 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 number 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 extended, it means taking over space from some adjoining department above or below it. This will involve massive redistribution and reorganization of many departments. It is therefore necessary to weigh very carefully the advantages and disadvantages of concentrated versus diffuse types of structure. The principal factor in the decision will be the prediction of the amount of change and growth likely to occur. It may be that some sacrifice in concentration during the early years of the hospital’s life will be justified in the interests of allowing for future growth and change. The preparation of a master plan at an early stage will bring this consideration forward and enable the advantages to be weighed and a rational decision to be reached.

It is essential to consider which parts of the hospital are most likely to require room for growth and which are relatively static (see the table below and Figs. 11 & 12). The former should, if possible, be planned in

<table>
<thead>
<tr>
<th>Category</th>
<th>Velocity of growth (%)</th>
<th>Acceleration of growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-patients</td>
<td>8.7</td>
<td>+1.0</td>
</tr>
<tr>
<td>Out-patients</td>
<td>10.8</td>
<td>+4.1</td>
</tr>
<tr>
<td>Medical services</td>
<td>28.4</td>
<td>+15.3</td>
</tr>
<tr>
<td>Teaching, research laboratories</td>
<td>45.9</td>
<td>+31.1</td>
</tr>
<tr>
<td>Staff facilities</td>
<td>18.5</td>
<td>+4.9</td>
</tr>
<tr>
<td>Services</td>
<td>9.5</td>
<td>+1.8</td>
</tr>
<tr>
<td>Administration</td>
<td>23.3</td>
<td>+6.5</td>
</tr>
</tbody>
</table>

comparatively low buildings, whereas the latter may be massed together to form tall blocks if necessary. The department for which growth can be predicted with certainty is that which deals with out-patient care. The outpatient work of hospitals has expanded vigorously during recent years, and shows every sign of continuing to grow. Is therefore vital to provide for the easy extension of this department. The casualty service is also likely to require extension. In the more highly developed countries, in which economic and social advances and improvement in public health are gradually reducing the demand for hospital care due to illness, there is a continuous
### Increments of Expansion in Various Departments

<table>
<thead>
<tr>
<th>Building Units</th>
<th>Manner of Growth</th>
<th>Size of Increment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wards</strong></td>
<td>Growth by ward units of approximately 40 beds.</td>
<td>27 sq. mod. (13000 ft²)</td>
</tr>
<tr>
<td><strong>Theatres</strong></td>
<td>Growth by functional unit, i.e., one theatre plus ancillary services, plant rooms (2 sq. mod.)</td>
<td>5 sq. mod. (2500 ft²)</td>
</tr>
<tr>
<td><strong>X-Ray</strong></td>
<td>Growth by functional unit X-ray suite: 9 sq. mod. for first two and 3 sq. mod. for additional suites.</td>
<td>2 x 4½ sq. m (2250 ft²)</td>
</tr>
</tbody>
</table>
| **Out-Patients Department** | a. Consultative clinics, primary growth by groups of functional units.  
b. Theatres, see above  
c. Day hospital, small nursing units | 15 sq. mod. (7500 ft²) |
| **Pathology**    | Growth by increasing bench lengths then by laboratory units                      | ½ sq. mod. (250 ft²) |
| **Rehabilitation** | Growth of various individual facilities various sizes of increment depending on function | ⅛ sq. mod. - 2 sq mod. (125 - 1000 ft²) |
| **Hostels**      | Growth by individual rooms grouped around shared services etc., (36 rooms)       | 11 sq. mod. (5500 ft²) |

- 1 square module: 500 ft²
increase in the number of accident cases coming into the hospital. This increase results directly from the increase in motor traffic, and sometimes from mechanization in industry; and there seems no reason to suppose that further development in these directions will not cause continued increase in casualty rates.

The medical service departments, particularly the radiodiagnostic service and the laboratories, will generally need to be extended. The demand for these services by the clinical staff is continually increasing as new methods of diagnosis and treatment become available. Therefore, these departments, too, should be planned to allow for substantial growth and should, if possible, be at ground level, or in two-storey buildings.

On the other hand, the accommodation for in-patients may, in many instances, not need to be extended to any comparable degree, if at all. There is hence relatively little objection to planning the in-patient accommodation in the form of multi-storey buildings. There are many practical arguments for doing so, as the services required on each in-patient floor can be conveniently and economically designed to run up and down in a vertical building, e.g., lifts can be planned to deliver food trolleys to the ward servers on every floor. The lavatories, bathrooms, and sanitary rooms can be placed one above the other, making use of vertical ducts for plumbing services.

Although it may not be necessary to increase the total amount of in-patient accommodation within a hospital, it will almost certainly be necessary to redistribute the accommodation among the different clinical depart-
ments, whose relative requirements for beds are likely to change within the life of the building. This can best be provided for by having on each floor a single, general-purpose arrangement, capable of taking any category of patient; then, shifting a user from, say, medicine to surgery on a particular floor will not involve any structural change. For reasons that will be set out in the next part of this book, certain in-patient accommodation—that for children, maternity, infectious diseases, and psychiatry—will require special planning. As a result, the in-patient accommodation for these services may best be planned as separate wings apart from the main block.

Considerations Based on Climate

In certain climates, buildings have to be heated in winter or cooled in summer; and, in some areas, buildings may need both heating and cooling, at different times of the year. Wherever this is the case, running costs can be reduced by concentrating the buildings as much as possible. The more spread out the hospital, the larger is the surface available for heat loss or heat gain and the more expensive is the maintenance by artificial means of the desired internal conditions.

The expense of cooling by air-conditioning is very great, far exceeding that of heating in most climates. Therefore, wherever air-conditioning is deemed to be necessary, the building should be designed in a compact manner as possible. The cooling costs will be directly proportional to the volume of the building, so the volume should be kept down by the use of low ceilings and by restricting the size of rooms to the absolute minimum. It is of vital importance that the decision should be taken at an early stage as to whether cooling by air-conditioning is required, as the whole design of the building will be affected by this decision. When in a hot climate it is concluded that air-conditioning is unnecessary or impracticable, then the design of the building must be carefully considered in order to get the maximum natural cooling. In hot climates, air-conditioning will always be needed for operating theatres and, very often, for recovery wards, labour rooms, X-ray rooms, and other special areas.

There has been considerable research on the design of buildings for various tropical conditions, and the results are available in the form of recommendations. It is worth noting that the design of a building for comfort in a hot, humid climate is totally different from that in a hot, dry climate. Broadly speaking, in the former air movement past the body is the main objective. The buildings should be light and open and planned so that even the slightest breeze can pass right through the buildings at low level to cool the occupants. It is impossible to plan highly concentrated hospitals for use in hot, humid climates without recourse to air-conditioning. In hot, dry climates, the nights are cool, and the object of the building design is to
HOSPITAL DESIGN

Protect the occupants from the fierce heat during the day. Buildings in these climates are therefore massive, with heavy walls and small windows. The heavy walls absorb the daytime heat and dissipate it at night. The small windows keep the amount of radiation entering the building to a minimum.

The orientation of buildings in hot climates is of critical importance. Generally speaking, they should be planned so that the long sides of each building face north and south. Sun falling on the buildings from the north or south is fairly easily controlled by horizontal louvres or awnings; sun from the east or west, which strikes the building at a low angle, is almost uncontrollable, and should be confined to the end walls. It is also well to plan so that the ends of blocks contain staircases, or other accommodation not in permanent use, as these areas will be hotter than the rest of the building.

In developing the master plan, attention must be given to the relation of buildings to each other with regard to sunlight and shade. In cool climates, where sunlight is desirable, buildings should not be planned so as to cut off one another's light. In hot climates, the buildings can be planned to shade each other to some extent. The shadows cast by the sun can be studied by means of models on a device known as the heliodon, which simulates the movement of the sun. Architects concerned with the building of hospitals in tropical climates should take care to familiarize themselves with the great mass of valuable information now available on design for comfort.

In temperate climates, where the winters are not very long or very severe, it will not be necessary to give great weight to the problem of heating in relation to the general plan of the hospital, which can be designed primarily with other considerations in mind. But in climates of extreme cold and long winters, where the cost of heating is heavy, some thought should be given to making sure that the general plan results in a reasonably compact building.

The methods used for heating and ventilation of the hospital are important, as bad design can increase the risks of cross-infection. It has been shown that massive ventilation is very advantageous in reducing this risk. In warm climates, massive natural ventilation is easily obtained and is desirable, in any case, for comfort. It will therefore be wise to rely, in hot climates, on natural ventilation as much as possible and to have recourse to air-conditioning only under extreme conditions.

In cold climates, the ventilation of hospitals during the winter presents difficulties, as sufficient ventilation is apt to cause undue cooling by the introduction of cold air from the outside. It has been found in Scotland, for example, that, during the winter, ventilation rates in hospitals are extremely low because of the reluctance of staff and patients to open windows.

There is a tendency to install artificial ventilation in hospital buildings. With artificial ventilation, the air can be warmed before it enters a room; and good ventilation can be maintained even in very cold weather. But artificial ventilation for hospital use requires very careful design. Systems normally installed in buildings such as offices or hotels are not satisfactory.
in hospitals, and may dangerously increase the risk of cross-infection by transmitting contaminated air from one part of the hospital to another. Any proposal for artificial ventilation or air-conditioning in hospital buildings must, therefore, be submitted to expert bacteriological criticism before adoption.

Certain areas of the hospital must always be provided with artificial ventilation or air-conditioning. These include the operating theatres and any other areas in which open wounds are exposed to the air. These areas must be ventilated by special means to give a high degree of air hygiene. The design of a ventilating plant for these purposes is highly specialized, and must be entrusted to an expert.

**Light and Colour**

Most hospitals are lit by windows; but the amount of light coming in has not, until recently, been subject to scientific control. Recent research has enabled us to define natural lighting and to consider the design of windows to give the best results. Whereas old hospitals were sometimes underlit, many modern hospitals are overlit. Very large areas of glass can produce severe discomfort from glare and can also result in overheating of the building during the summer and in cold draughts during the winter.

It is important that patients lying in bed should not be exposed to too large an area of sky in direct view through the windows. In many tropical countries it is best if the view of the sky is completely cut off by shading devices; even in temperate climates, too much sky can cause serious discomfort. Control of glare from windows requires great care in design, and various special arrangements have been proposed for this purpose. It is therefore important for the architect to consider the design of the windows in the light of criteria that are now known to be good for hospital purposes.

Criteria for the artificial lighting of hospitals by night have also now been established. Study has shown that most of the methods of artificial light at present on the market are unsuitable for hospital conditions, and special fittings and equipment are available that provide artificial light in the form appropriate for hospital purposes. A note of caution is in order with regard to fluorescent lights: these may give rise to difficulty for doctors and nurses who have to assess a patient’s condition partly by reference to his skin colour.

Emergency arrangements for providing artificial lighting by a stand-by plant, in the event of a failure of electric power from the main source, are always essential.

The colour used internally on the walls, ceilings, and floors of a hospital is an integral part of the design of the building and should be determined by the architect. The general lighting of a room is greatly affected by the
colour scheme, and it is necessary for the colours to be considered simultaneously with the design of the windows if the best effect is to be achieved. Colour can make all the difference between a depressing or disquieting atmosphere and a restful or a pleasantly stimulating one. There now exists an international colour notation, and colours can be specified in relation to this.

**Visual Impact of the Hospital**

Hospital buildings are very large. In a town of small or medium size, the hospital will very likely be many times as large as any other building. As the hospital is very often set in a residential area among buildings of a domestic scale and character, the contrast between its size and the small, scattered houses around it may be very violent. In the past, hospital authorities and architects have been quite willing to treat the hospital as a massive and imposing monument. More recently, however, architects and town planners have felt some concern about the disruption of the visual scale caused by very massive hospital buildings. It has also been felt by some hospital authorities that a huge, monumental building is the wrong symbol for the modern hospital, which wishes to stress its links with the community and its human, personal character, rather than its power and glory as a temple of healing (Fig. 13, below, and Fig. 14-16 facing pages 84 and 85).

**Fig. 13**

**THE SCALE OF A HOSPITAL RELATED TO ITS COMMUNITY**

To some extent, the consideration of planning for growth and change, as discussed earlier, tends to soften the visual impact of the hospital. The parts of it that form its front door or shop window are the buildings for out-patient care, reception, and emergency care. These will almost certainly be located nearest to the entrance to the site, and may very well be
planned as comparatively low buildings, in the interests of future growth and flexibility. The more massive buildings for in-patient care will be set back behind them, and thus be somewhat less imposing and terrifying.

The architectural handling of the design will also affect the visual impact of the hospital. The architect has the opportunity, in planning the hospital, to give visual expression to the human units of which the hospital is composed, or to 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 façade of the building; or, by giving each unit an identical series of windows, he could carry uniform architectural treatment over the whole. If he does the latter, the building will look powerful and monumental; if he chooses to do the former, the building will be more irregular in appearance and will look smaller and more human in scale.

Hospital Engineering

In developed countries, about a third of the cost of hospital building goes into the mechanical engineering services—heating and ventilating, electricity, lifts, and communications. These services form the circulation and nervous systems without which the hospital cannot function. Therefore, the contribution of engineers to the design is of capital importance. Their help will be needed at an early stage, when the approximate demand for water, electric power, fuel, gas, and sewerage is being estimated. Their advice will be needed on the choice of site and on the master plan for the hospital. Later, they will have to design systems of heating and ventilation, lifts, and telephonic and other communications.

Engineers will have to concern themselves not merely with the installation of all the mechanical equipment, but also with its subsequent maintenance. They should advise the hospital authority on maintenance problems at a very early stage in the design. They should advise against the installation of any machinery or equipment for which maintenance arrangements cannot be guaranteed. Decisions on these matters may affect the master plan of the hospital, and they should be considered at an early stage.

The engineers must also collaborate with and advise the architect on the space that will be needed in the building to house the mechanical services. This space must be of sufficient size to allow not just for present services, but also for any future services that may be required. The mechanical services must be planned so that easy access can be obtained to all equipment for repairs and maintenance without disruption of the daily function of the hospital. As previously noted, provision must be made for stand-by power in the event of a general power failure at the main source.

All these considerations point to the fact that a modern hospital can be built and operated only if the town in which it is located is sufficiently well
equipped with electric power, potable water, sewers, and other technical infrastructures. In addition, competent personnel must be available to maintain the mechanical and electrical equipment; and spare parts and other essentials for repair must be obtainable. All of these resources must be fully developed and at the disposal of other institutions as well as the hospital; it would be unrealistic to think that an isolated and self-supporting hospital could bear the cost of such technical services only for itself.

Hospital Hygiene

Another important factor in hospital design is the special attention that must be given to conditions of hygiene. Although hospitals exist to treat illness, they can, and often do, act as reservoirs of infection. Wherever accurate surveys have been made, it has been found that a substantial proportion of patients acquire infections during their stay in hospital that they did not have on admission. It has recently been estimated that about a million extra patient-days in hospital result from the 1.5 million operations performed in Britain each year because of post-operative sepsis. Apart from additional suffering or inconvenience, the cost of extra patient-days in hospitals as a result of cross-infection bears heavily on the patients themselves, on sickness insurance, or on the national health budget. It is therefore essential to take reasonable precaution in the design and organization of hospitals to minimize the risk of infection.

In addition to the risk to patients and staff, hospitals can also prove a danger to the community if the arrangements for waste disposal are inadequate. The hospital's sewage may contain dangerous organisms. In many countries outbreaks of typhoid have been traced back to pollution of the water supply by hospital effluents. The approval of health authorities should be sought with regard to hospital sewerage and disposal installations.

A few years ago, the introduction of antibiotic drugs substantially reduced the dangers of infection within the hospital. As a result, many precautions in the design of the buildings and in the methods of work by the hospital staff were abandoned or neglected. Unfortunately, in more recent years, strains, particularly of Staphylococcus, have developed resistance to nearly all antibiotics known at the present time. These resistant organisms tend to establish themselves in hospitals, whose staff often become carriers. It is therefore more necessary than ever to pay the strictest attention to all available methods of control of infection.

The first line of defence must be appropriate training of all staff in correct methods of work. Staff must be trained in aseptic techniques for use in all surgical procedures and in "barrier" nursing of infectious patients. It may be extremely useful to secure the permanent advice of a technician with an engineering background in order to control and periodically survey
all the many vulnerable points of the hospital, such as sewers, drains, faucets, lavatories, sinks, and so forth. The design of the buildings can also do a great deal to facilitate safe working by the staff.

One of the most important matters in planning a hospital is to consider the disposal routes of all waste and infected material. In every part of the hospital where patients are treated, there will be infected material to be disposed of. In wards there will be the patients' bedding and infected utensils, and other waste material of various kinds. Operating rooms and surgical treatment areas will have infected dressings, dirty instruments, and soiled linen to dispose of. In principle, it should be possible to take infected material away from its point of use without contact with any clean supplies coming into the unit and with minimum handling by hospital personnel. In the nursing units, soiled linen should preferably be taken immediately from the patient's room to a disposal room, from which a lift or other special route is available to a reception point where the linen can be sterilized or otherwise dealt with to make it safe. Dirty materials should, in general, go into a bin, bag, or other disposal container at its point of origin and remain in that container until it reaches a point at which it is sterilized or incinerated.

It has been demonstrated that chutes are to be avoided at any cost, because they cannot be cleaned and disinfected. Moreover, because of the possible difference in atmospheric pressure between the upper floors and the basement, clouds of dust can circulate through the chutes. Chutes should be replaced by small lifts or vertical conveyors of the "dumb-waiter" type.

It should be noted that under no circumstances should nurses or other persons concerned with the care of patients be required to sort or count soiled linen. The disposal route from the wash-up room serving the operating theatre should be direct to the central sterilizing department, and should not pass through the operating room or any other room in the operating suite.

Blankets used on patients' beds are a special problem, as the wool blankets traditionally used cannot be sterilized or laundered without becoming felted and rapidly destroyed. Therefore, it is preferable to use blankets of cotton or other material that can be boiled.

Cleaning methods can help or hinder hygiene. Sweeping and dusting as traditionally performed are dangerous. They spread dust in the air and raise the bacterial count. Wet cleaning by approved methods and vacuum cleaning by approved types of machine with special filters must be the methods adopted.

Surgical instruments and bowls have, until fairly recently, been sterilized in boiling-water sterilizers at various points in the hospital; and dressings have traditionally been sterilized in drums in autoclaves. These methods have not proved adequate, however, and in recent years this type of steriliza-
FIG. 14
A UNIFORM FACADE WITH MONUMENTAL EFFECT

FIG. 15
ONE WAY OF ACHIEVING A LESS FORMAL EFFECT

Photograph by H. de Burgh Galway. Reproduced by permission of the Editor, The Architectural Review.
FIG. 16
THE EFFECT OF STRUCTURE


FIG. 17
AN OUT-PATIENT WAITING SPACE

Photograph by John Donat, A.R.I.B.A.
HOSPITAL DESIGN

85

tion has given place to sterilization in a central department serving the whole hospital. It is recommended that new hospitals should be planned, from the start, with facilities for central sterilization. Under this system, all objects that require sterilization are supplied in sealed packages from the central department to the point of use. After use, non-disposable items are returned to the central sterilizing department for re-sterilization. In recent years many new disposable articles of equipment (e.g., syringes and needles, surgical bowls, and sputum mugs) have come on the market. It may be found more economical to use these items than to incur the cost of cleaning and re-sterilizing the conventional equipment after each use.

The planning and operation of the central sterile supply service require expert technical advice. However, several authoritative reports that give guidance on the subject are available. It should be noted that the adoption of a central sterile supply service, which has gained favour on grounds of improved safety, may have economic advantages as well. It affects the planning of the hospital radically, inasmuch as it eliminates the need to provide sterilization facilities in the nursing units, out-patient and casualty departments, and many other points within the hospital. In addition, this type of sterilization avoids the damage to paint that sterilization with boiling water causes.

There is one exception to the range of materials that should be sterilized centrally: the surgeon's instruments used in major operating theatres. Because so many surgeons like to have their own individual sets of instruments, it is generally more convenient to arrange for these to be sterilized in a room adjoining the operating room. All other requirements for operations, including dressings, bowls, syringes, and so forth, can be supplied to the operating room from the central sterilizing department.

In planning operating rooms and treatment areas generally, it is of vital importance to separate clean and dirty areas and to ensure that clean material goes directly to its point of use without coming into contact with any used material or with personnel concerned with the handling of used material.

Proper techniques by staff and effective sterilization of instruments, bowls, and dressings will combat infection arising from contact. But many infections are air borne, and air hygiene is a vital part of hospital design. Patients and staff may be infected by air-borne organisms through the mouth and nose. Open wounds are particularly subject to infection from air-borne organisms. Hence, air hygiene must be considered as affecting the atmosphere in the hospital as a whole, and particular regard must be paid to it in operating rooms and treatment areas in which open wounds are exposed to the air.

In so far as the general areas of the hospital are concerned, it is important to ensure a good general rate of ventilation, and standards have been established for this purpose. The arguments for and against artificial ventilation have already been considered. It should be noted, in addition, that isola-
tion rooms should be provided with special ventilation arrangements to ensure that contaminated air from them does not reach other parts of the hospital. The ventilation of operating rooms is a highly technical matter on which important research has recently been conducted; it is now possible to specify with considerable exactitude the requirements for the special ventilating system needed in operating rooms. Such systems need very careful design by engineers, and should be subjected to bacteriological control.

When hospital sewage is not passed into the public sewage disposal system, it requires treatment by an effective disposal plant kept under continuous bacteriological control. All hospital drains, including those from wash basins and baths, must be fully enclosed. A central incinerator should be provided in which all infected material is destroyed. Opportunities should be taken whenever possible to use disposable materials, which can be destroyed.

The Architect’s Brief

Thus far the discussion has been confined to broad principles of hospital planning, many of which would need consideration before a master plan for a hospital could be prepared. The next stage in an actual project would be the preparation of the architect’s brief. At this point it is necessary to go into the needs of every service and department individually and in great detail, always bearing in mind the general principles governing the plan as a whole.

It is necessary to consider, first, the function and organization of each section, whether it be the surgical service or the catering department. It is essential to decide on controlling principles and to reach decisions on methods of working before attempting to draw up schedules of rooms. At this stage advice should be sought from people with practical experience in the running of the various services. It is important, however, to pose problems in a general form to those advisers and to press them to think afresh—to consider not only how they have organized their work in the past, but also how they would organize it for better service to patients, or for greater efficiency, if free to think things out from first principles. Unless care is taken at this point, there is a risk that the architect’s brief will reflect, with minor improvements, some old building in which the adviser has worked for many years and which enshrines methods of work that are out of date or otherwise unsatisfactory.

Medical science is proceeding at such a prodigious pace that many modern hospitals are out of date by the time they are built. It is of the utmost importance in planning a hospital that a large measure of imaginative foresight should be brought to bear in an endeavour to identify the probable growing points and to plan the greatest degree of adaptability in those services that seem most likely to expand.
Undue weight should not be given to the demands of individual clinicians, who may base their requirements on past experience and present accommodation rather than on anticipated future needs. Like many other expert professionals, doctors tend to be individualistic and to have strong likes and dislikes for certain methods and procedures. It is a mistake to tailor a department to the idiosyncrasies of a particular clinician (as is so often done) unless he happens to be a man of extraordinary wisdom and foresight. The hospital will still be standing after he has passed on. In the detailed planning of a department, it is usually better to seek the opinions of several hand-picked, distinguished consultants in the specialty—not necessarily those who will work in the new hospital—with the object of obtaining a balanced view.
CHAPTER 7

Staffing the Hospital

The strength of a hospital is the strength of its medical staff. Many a hospital of world-wide repute is indifferently housed, and owes its reputation solely to the quality of its medical staff. Bricks and mortar and modern equipment, desirable as they are, do not in themselves make a first-class hospital. Indeed, there are hospitals of recent origin in various parts of the world, excellently built and equipped, but standing partly empty because of lack of adequate staff.

A hospital may appear to be an imposing monument; and, in some places, for reasons of national or local prestige, there may be a temptation to erect a handsome building without giving sufficient thought to the staff, the driving force that will make it work. This temptation should be firmly resisted. Ultimately, a hospital, like a man, is judged by its works, not by its outward appearance; and it is a poor monument that fails to perform the function for which it was created.

In considering the setting-up of a new hospital, one of the first things to which the planning authority should give serious thought is the question of staffing. It should be established beyond all reasonable doubt that medical, nursing, and technical staff of sufficient quality and in sufficient numbers will be available or able to be secured. If the medical staff is strong, the nursing, technical, and other staff needed is likely to be attracted by the quality of the work.

Mention has already been made of the desirability, in determining the size of a new hospital, of deliberately underestimating rather than overestimating the need; indeed, it is most important that a hospital should not be planned on such generous lines that it will drain medical manpower from the at least equally important, though less spectacular, preventive and domiciliary medical services. Moreover, in planning the staff of a hospital, careful regard should be given to those members whose base is the hospital but whose work lies mainly outside the hospital, in preventive and other community health services.
Medical Staff

The medical staff of the wards and departments of the hospital should be arranged wherever practicable on a team basis, particularly in the main specialties of medicine, surgery, and obstetrics and gynaecology. In many developed countries it has been found that a team composed of a specialist physician or surgeon with an experienced assistant and one or two recently qualified assistants, all working full time, can look after about sixty beds and the associated out-patient services. This proportion may, of course, vary according to circumstances. However, if staff duties include teaching, much extramural activity, and time-consuming research, the team would need to be augmented or the number of beds handled per team decreased.

Junior medical staff, that is, all below the rank of consultant or specialist, should ordinarily be appointed on a full-time basis. Consultants or specialists should either be appointed for whole-time duty, or else the times and periods of their hospital attendance should be very clearly defined and conscientiously observed, so that the claims of private work will not be permitted to conflict with hospital duties.

In the staffing of the various departments of a hospital, there are two systems in vogue: the parallel system, and the hierarchical system. In the parallel system all the teams in, say, the department of medicine are considered to be equal, and each follows its own line of practice without much reference to the others. In the hierarchical system, a head of the department, or chef de service, is appointed; and he, without interfering with the detailed handling of patients by his colleagues, determines the general lines of policy his department is to follow. This he does after consultation with his colleagues, if he is a wise man. In some departments a head is almost a necessity—for example, in professorial units, where these exist, and in departments of pathology, radiology, and obstetrics, in which the training of technicians and midwives is undertaken. Here, it is essential to adopt an agreed-upon and uniform code of procedure if students are to be properly trained. The hierarchical system of staffing of all departments is recommended for developing countries.

Reference has already been made to the role of a hospital in post-graduate medical training. After the immediate post-qualification period as a house officer, which is now fairly universal, many ambitious young doctors wish to remain in the hospital for an additional two, three, or more years, with a view to improving their knowledge and experience. This they may do in order to make themselves more skilful general practitioners, or they may consider embarking on the arduous course that ultimately leads to specialist status. In either event, they are extremely valuable people on the medical staff of a hospital, often capable of undertaking a considerable measure of responsibility. Their in-service training serves a double purpose:
it improves the standard of medical skill of the nation's doctors, and it helps
enormously in the staffing of the hospitals.

In some countries in which the establishment of small local or rural
hospitals is needed to serve small towns or groups of villages, medical
staffing may create a problem, as doctors tend to congregate in the large
cities, where greater opportunities await them. To overcome this difficulty,
it may be necessary to offer financial inducements for medical and other
staff to serve in the smaller hospitals.

Nurses

It is recommended that a nursing consultant be selected very early in
the planning of a new hospital. A nurse with experience in public health
is desirable. Such a nurse can offer practical suggestions from her experience
in working with patients in their homes, as well as in the hospital. The
chief nurse in the national health department of the government would
probably be qualified to render this advisory service to the planning team,
or she could recommend a colleague who could give capable assistance.

An early assessment should be made of the availability of nurses and
other people in the community who might be employed as personnel for the
hospital. This assessment should be included as part of the survey of the
community that is made to determine the need for the hospital.

The nursing consultant could arouse the interest of trained nurses living
in the area who might become staff members when the hospital is opened
for service. No opportunity should be overlooked in recruiting personnel
from the very beginning, for staffing is the greatest problem facing those
responsible for the administration of the services of the new hospital once
it has been built.

Nursing aspects of patient service areas

During the early planning, the nursing consultant should study and
define the aims and functions of the nursing department of the hospital and
of each of the nursing services related to the medical services specialties
that are to be provided. Since nurses are responsible for providing the
greatest part of the direct care to patients, it is necessary to set forth the
objectives of the nursing service realistically.

In planning a new hospital, the curative aspect of medical care is apt to
take precedence; but, if rehabilitation is to be a major aim of the hospital
as a whole, then this, too, must be included in the plan for nursing.

The physical design of the ward units controls the pattern of staffing.
For example, team nursing, progressive patient care, or any other pattern of
nursing activity calls for appropriate architectural layout of the ward.
Another consideration is the recent concern regarding the incidence of
hospital-acquired infection, which has stimulated much research and has resulted in new requirements in architectural planning, as well as in the development of new techniques and new training methods for nurses. Nurses assisting in the architectural design of wards, operating rooms, and clinics should study carefully the wealth of excellent material available on the control of hospital infection.

Specific planning for the physical features of patient-care areas is discussed in greater detail in the last part of this monograph.

**Organization and administration**

Once the physical design of the nursing units has been decided upon and the placement of the hospital services has been established, planning the organization of a hospital nursing service may begin.

One of the first steps that may be taken in planning the nursing department is making an organization chart showing the nursing services to be provided. In making such a chart, the nursing consultant should consider in an orderly way the categories of personnel needed to care for the patients on each ward. She can work out, at the same time, the authority to be assigned to supervisors and head nurses, and the lines of accountability. The organization chart should show each category of nursing worker and establish the level of responsibility and working relationships on the wards and in the out-patient department.

It is generally accepted that a good nursing service depends upon strong supervision of each nursing unit, no matter what type of nursing management seems best suited to the new hospital. Several types of successful ward management have been, or are being, used in a number of countries. Among them are the traditional supervisor/head-nurse (assistant-matron/ward-sister) plan, and the newer concept of the nursing team plan (graduate nurse responsibility). In another recent plan, called progressive patient care, patients are grouped according to the severity of their illness. Hospitals are being built to accommodate this plan as well as the team nursing plan.

It is highly recommended that the graduate nurse be given a strategic position of responsibility for bedside care at all times of the day and night. The quality of nursing care depends upon this nurse. However, it is recognized that sufficient numbers of nurses are not available in any country of the world. Attempts to find a substitute for the nurse take many forms.

In some countries, the present practice is to depend upon the services of students to provide some of the nursing care to hospital patients. In others, the staffing pattern is constructed without consideration of the service the student nurse gives on the ward. Careful thought should be given before a decision is made to establish a school of nursing, or to staff the hospital wards with student nurses.
The clinical experience of the students should be selected through close co-operation between the teachers of the school of nursing and those responsible for nursing service. Supervision should be provided to ensure safety for the patient and an adequate learning experience for the student.

The nurse can also be given assistance through the use of the formally trained auxiliary worker. This worker has proved to be a very effective assistant in some countries, but does not take the place of the trained nurse.

In the interest of establishing and maintaining the stability of staffing, the assignment of nurses to an individual hospital service should be the rule, in so far as possible; and nurses should not be moved about too often. 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 absences of personnel or an especially heavy workload of very ill patients requires the service that a trained graduate nurse can give. Moreover, present emphasis upon the psychological problems of illness would justify the rotation of all nurses to the psychiatric ward for a planned, in-service introduction to the care of the patient with mental problems.

The availability of nursing staff varies greatly from country to country, and each country must work out its own staffing pattern, based upon the supply of workers and the training that can be provided for them.

In order that a high standard of nursing care may be established and maintained, the nursing consultant, or the director of nursing of the hospital, when appointed, should develop written procedures to serve as a guide for the nurses of the various units of the hospital. Several manuals or guides will need consideration early in the planning of the operation of a nursing department. Representative guides of this kind will be found listed in the annotated bibliography on pages 197-205.

**Administrative Staff**

**Director**

Whether the administrative head of a hospital should be a doctor or a layman is a vexed question about which universal agreement has not been reached. The important factor is that, lay or medical, the administrator should be thoroughly versed in hospital administration and should possess those qualities of mind and spirit that make for smooth working of the
hospital and encourage all staff members to give willingly of their best. The business side of a hospital, important as it is, is not its primary reason for existence.

A hospital is essentially a medical institution; and, logically, one would expect the head of it to be a doctor, just as one would expect the captain of a ship to be a sailor or the head of a school to be a teacher. The separate heads of the departments of a hospital may be individually brilliant, but some kind of medical co-ordination is needed to make the hospital function as a whole and to bring the appropriate sum of its resources to bear on the needs of the individual patient. This co-ordinating function is a very difficult one for a layman to carry out, deficient as he is in technical knowledge and experience. Moreover, as was pointed out in one of the technical discussions at the Tenth World Health Assembly, a medical administrator is in a more favourable position to encourage the development of preventive medical work in association with the hospital as a whole than is a layman.

The WHO Expert Committee on the Organization of Medical Care, in its first report, 1 decided unequivocally in favour of a medical administrator, employed full time and preferably without clinical responsibilities. There is something to be said, however, for a medical administrator’s undertaking a limited amount of clinical work himself so as to keep in practical touch with the developments of medicine and to avoid becoming a purely “office doctor”.

Other administrative staff

If the head of the hospital is a medical director, as is recommended, he should have as his deputy a layman thoroughly trained and experienced in hospital administration from the business or “hotel” angle. The deputy and the staff under him should assume responsibility for such matters as the general maintenance of the fabric of the building and the operation of the kitchens, stores, and laundry. The deputy may act as secretary to the governing body of the hospital and may supervise the clerical staff. He should, in fact, relieve the medical director of non-medical administrative duties and leave him free to advise on hospital policy; co-ordinate the medical services of the hospital; deal with medical staff within, and medical agencies outside, the hospital; and supervise the medical records department, the pharmacy, the medico-social workers, and—through the heads of the respective departments—the technicians employed therein.

The finance officer, who should be a qualified accountant, is responsible for keeping the hospital accounts; for advising the governing body on financial policy and the control of expenditure; for departmental costing, where this is in operation; for preparing the annual estimates and budget;

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for paying accounts, salaries, and wages; and for all other matters of a financial nature.

The lay administrator (deputy director) and the finance officer will need staffs, often quite substantial in number, with appropriate office accommodation to enable them to carry out their functions. A secretarial staff attached to the medical director and the hospital clinicians is very necessary. It is false economy to be parsimonious in the provision of medical secretaries, as one of the surest ways for a hospital to acquire a bad name among outside doctors is by failure to send out medical reports promptly on the conditions of patients, especially on discharge.

Professional and Technical Staff

Medico-social workers

It is generally recognized that social and domestic difficulties play no small part in the causation of disease; they may precipitate an illness or retard recovery. A medico-social department under the direction of a trained medico-social worker who can collaborate with the clinicians is a virtual necessity in a modern hospital; without it, much of the skill and energy of the doctors and nurses may be wasted. In a hospital of 500 beds or more, it is desirable that there be several trained medico-social workers, together with their clerical assistants; but the demand for them is in excess of the supply. One sometimes hears it said by the governing body of a hospital that a department of medico-social service is an extravagance that the hospital cannot afford. It is far greater extravagance not to afford one.

A medico-social worker, in addition to her basic training in social science and her practical experience in hospital work, needs to have knowledge of local conditions, customs, traditions, and general mode of life of the people among whom she works. She must also be fully informed concerning the various social agencies whose help she can invoke on behalf of her patients. Her work should be linked with that of the public health and social services of the area.

A general hospital that has a department of psychiatric medicine will probably need one or more psychiatric social workers, whose functions with regard to patients suffering from mental illness are similar to those of the medico-social worker with regard to patients suffering from physical ill health.

Physiotherapists and occupational therapists

The modern trend in physiotherapy places far less reliance than formerly upon the traditional therapeutic measures of heat, massage, actino-therapy, and electrical stimulation. Although these have their place in certain
conditions and a physiotherapist should be adequately trained in their application and have knowledge of the circumstances in which they are likely to be of value, the encouragement of controlled, active movements on the part of the patients themselves is usually regarded as the best way to restore function. The training and outlook of physiotherapists should be oriented in this direction.

Occupational therapy covers a fairly wide field. For diversional work, intended mainly to arouse a patient's interest and to take his mind off his illness, the occupational therapist should be able to give instructions in such crafts as basket-making, toy-making, simple weaving, needlework, and, perhaps, drawing and painting. Occupational therapy designed to enable a sick or injured workman to return to his former, or a similar, job needs the services of a craftsman-teacher skilled in metal and woodwork and in the handling of the kind of machinery found in a factory.

Pharmacists

The chief pharmacist is in charge of the hospital pharmacy and supervises the accurate dispensing of drugs prescribed by the doctors and the making-up of stock mixtures, lotions, and ointments in common use. It is no longer profitable in most cases to manufacture, in the pharmacy, pills and tablets; but, if the pharmacist has the necessary training and experience, it may be desirable (and it is certainly economical) for him to prepare the various sterile solutions used in the hospital for intravenous transfusions (saline, glucose, and others). For this he would need a dust-proof, air-conditioned room, apparatus for the production of pyrogen-free, distilled water, and the autoclaves necessary for ensuring sterility.

In some countries the pharmacist is responsible for biochemical assays, leaving other pathological examinations to his medical colleagues. There is nothing against this practice, provided the pharmacist and the pathologist work closely together.

The pharmacist is responsible for keeping the stock-books and registers prescribed by the laws of his country with regard to certified poisons and addiction-producing drugs. It is also his proper function to order (usually through the appropriate supplies department) and to check on receipt all pharmaceutical supplies, appliances, and dressings.

Radiographers

The senior radiographer is responsible, under the supervision of the radiologist, for the smooth working of the X-ray department, for the keeping of registers, and for the ordering, checking, and safe custody of films and reagents. Requests for replacement of apparatus, tubes, and other expensive items should be the function of the radiologist. The radiographer
should be responsible, under the radiologist, for all the radiological apparatus everywhere in the hospital.

**Laboratory technicians**

A pathological laboratory attached to a large hospital and dealing, perhaps, with specimens both from the wards and departments and from public health and other sources outside the hospital is likely to be divided into sections dealing with microbiology, blood chemistry, haematology, morbid anatomy, and histology. Each of these sections needs its own staff of technicians and laboratory aides. All technicians, however, should be trained in all branches of pathological work so that they can, when necessary, be interchanged.

The chief technician, working under the direction of the pathologist in charge, should assist in the training of technical staff, allocate work within the department, be responsible for seeing that the necessary records and registers are properly kept, supervise media-making, and order and check reagents and minor equipment. Expensive apparatus should be requisitioned by the pathologist.

In developing countries, one of the greatest difficulties is obtaining an adequate supply of skilled, non-medical, professional and technical staff. This personnel takes several years to train, and an insufficient number can gravely impair the quality of a hospital's work. For instance, delays caused by shortage of staff in the X-ray department or pathology laboratory may have serious consequences for patients and may increase, unnecessarily and wastefully, the average length of stay per patient. Inaccuracy due to lack of sufficient technical skill or hurried work because of understaffing may have even more dire results.

It is essential, therefore, that, at an early stage in its programme of hospital expansion, a country should create conditions of employment—including a promotion ladder—that will attract to, and retain within, the service the intelligent young men and women needed to fill these vital posts. Moreover, as recommended by the WHO Expert Committee on Health Laboratory Methods,¹ “in the largest hospitals, laboratory units with satisfactory facilities for the training of technical and auxiliary personnel should build up a corps of skilled laboratory workers which can be used, in turn, to establish laboratories in regional, intermediate and finally local and ‘rural’ hospitals”.

**Dietitians**

A dietitian is a necessity in a modern hospital. He (or she) is in charge of the diet kitchen and supervises the special diets required by patients with

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diabetes or with renal, gastric, or other disorders. He also has a most useful function in the out-patient department, instructing patients—referred to him by physicians—in ways and means of preparing in their own homes the types of diet prescribed for them.

The dietician advises on the nutritive value of the ordinary hospital diets supplied to patients and staff, and may be called upon to give mass instruction on nutrition to groups of people as part of the hospital’s programme of health education. His training is scientific rather than commercial, and his concern is mainly food values.

Catering officers

A catering officer is a man (or woman) who has been trained, preferably for many years, in the commercial aspects of purveying foods, possibly in hotels or restaurants. He should be familiar with the techniques of mass food management, including the purchase, storage, preparation, and service of food. Whether he is authorized to purchase or whether this should be done through the supplies department is a matter for local arrangement, but the catering officer must be aware of the best markets in which to buy. He is responsible for the quality and palatability of the food served to patients and staff, but he should take the advice of the dietician with respect to its calorific value and vitamin content.

Records officer (records librarian)

One of the indices of efficiency of a hospital is its ability to produce full and accurate medical records of patients who have been under its care. The accurate filing, indexing, and storage of medical records call for skill and experience. This is probably best obtained by seconding a potential records officer to a hospital where there is an established medical records department noted for its efficiency.

A records officer must have intelligence and training of a fairly high order if the medical records are to be subjected to statistical analysis or data processing. He (or she) should have sufficiently high status to be able to approach physicians on the staff to draw attention to any obvious omissions in the records of individual patients. Other essential personal qualities of a records officer are integrity and a capacity for keeping strict confidence about the records entrusted to his care, inasmuch as some of them may contain intimate details about the lives of patients.

Other Staff

It is not proposed in a work of this kind to go into detail about the domestic and maintenance staff that is required in a modern hospital. The
tendency today is towards mechanization, that is, the substitution of mechanical devices for the human hand and human eye in order to save labour. It must be remembered, however, that the further this process goes, the greater the number of highly skilled mechanics, electricians, and others who will be needed on the staff to maintain the complicated equipment and to deal promptly with breakdowns that could bring the work of the hospital almost to a standstill.
Part III

PLANNING INDIVIDUAL SERVICES AND DEPARTMENTS
CHAPTER 8

General Medical Services

Extramural Services Based on the Hospital

The hospital should be the centre of a network of clinics and services functioning within the community itself and regarded as a projection of the hospital's activity beyond its own walls and extending into the homes and workplaces of the people.

Domiciliary services

The relationship of general practitioners to the hospital has already been touched upon in chapter 1 (page 21). General practitioners should be made to feel welcome at the hospital serving the area of their practice and encouraged to know personally the members of the senior staff to whom they can turn in case of difficulty. Inviting them to participate in meetings and ward rounds at the hospital helps to bring this about. Reports on patients referred for a consultant's opinion or admitted to the wards should be sent to the family doctor promptly, especially on a patient's discharge; otherwise, he may be at a grave loss in undertaking subsequent treatment. The general practitioner should be able to look to the hospital for X-ray and pathological reports on patients or specimens sent to the appropriate department in cases in which he wishes to continue treatment of the patient at home. He should have this privilege without necessarily having to refer the patient for a consultant's opinion first. A service of this kind maintains a doctor's interest in scientific medicine, and can be a factor in relieving the patient-load on a hospital.

Provision of such services for general practitioners makes certain structural demands upon the hospital. The waiting accommodation in the X-ray and pathological departments must be planned so that it can cope with the patients referred directly by general practitioners. A lecture room or hall for clinical meetings is very desirable in any hospital, though, at a
pinch, part of the out-patient department can be used for this purpose, as clinical meetings can conveniently be held in the evenings when the department is not in use.

In some countries it has been proposed to provide consulting rooms for general practitioners within the premises of the local hospital serving a small community. Such a procedure would realize a sort of group practice centred on the community hospital.

A medical library containing standard works of reference and selected medical periodicals is essential in any hospital, and local general practitioners should be given access to this.

Domiciliary midwives may reside in the hospital or may live elsewhere. In either case they should be able, in cases of obstetrical difficulty, to look to the hospital for help (either directly or through the family doctor, according to local custom) and for the provision of appliances and sterile dressings or maternity outfits.

**Health clinics**

Clinics promoting the health of expectant and nursing mothers and of children must necessarily be sited near the homes of the people they serve. The same is true of clinics for the detection and control of tuberculosis, venereal disease, and other endemic conditions. Health clinics may come under the direct control of the hospital, but usually they are administered by a separate authority. In either case, however, if they are to function with the greatest efficiency, it is essential that contact between hospital and clinic be established and maintained through the staff, even when the clinics are situated many miles away from the hospital serving the area.

The doctor in charge of the clinic should, from time to time, spend a few weeks in the appropriate department of the hospital to stimulate his interest and keep him up to date. The nursing staff of the hospital and of the clinics should also be in contact with each other. The consultant obstetrician, the consultant paediatrician, the consultant chest physician, and others from the hospital should pay periodic visits to clinics in the area to advise on difficult problems. It is often the case, of course, that the consultant chest physician of the hospital is also in charge of the tuberculosis clinic, and that the assistants of the chief obstetrician are responsible for maternal and child health clinics.

There is much to be said for establishing a health clinic within the hospital grounds in order to provide personal health services in the area immediately surrounding a regional or district hospital. Such a clinic has all the resources of a large general hospital immediately available; it is staffed by hospital personnel, who thus have the preventive aspect of disease kept constantly before them; and it is invaluable in the education of undergraduate medical students.