Public Health Services Based in the Hospital

If a hospital is to fulfil the desirable function of acting as a centre of both curative and preventive medicine and, at the same time, provide community health care, at least part of the local public health and epidemiological services should be based in it. This will necessitate the provision of office and laboratory facilities and of a lecture room or hall (probably used for other purposes also), in which group health education of the public can take place and exhibitions can be held.

The relationship between the hospital and the public health laboratory services is fully discussed in chapter 4 (page 48) and chapter 10 (page 159). Suffice it to say here that full integration is recommended, especially in the developing countries. In the more fully developed countries, where over the years separate systems have grown up, there is something to be said for maintaining the distinction in the interest of high specialization and field research. Even so, the hospital and public health laboratories should be sited very close to one another. If possible, the public health laboratory should be within, or adjoining, the hospital precincts, as so much work and technique, especially in microbiology, are common to both, and the staffs can help one another. In England and Wales, for instance, where there are completely separate systems, much of the routine microbiology of certain hospitals is carried out, by arrangement, in the contiguous public health laboratory.

A hospital in which there is a combined laboratory service is a natural base from which to conduct special campaigns aimed at the control of widespread endemic diseases, such as malaria, bilharziasis, hookworm infestation, or trachoma.

In countries in which the population is very scattered and distances are great, the small local hospital may perforce have to provide the medical services for much of the area. In these, the medical staff will probably need to combine preventive and curative duties. However, in the cities in which regional or district hospitals are established, it is often desirable for the medical officer of health to be regarded as a member of the senior staff of the hospital and to have an office there. He is then able to promote a preventive outlook in medical staff discussions and to give advice on hospital hygiene and outbreaks of infection that from time to time occur within the hospital.

A hospital should have facilities for giving protective inoculation against diseases indigenous to the country, in particular, smallpox, tuberculosis (BCG), and poliomyelitis, which are fairly widespread.

A hospital in a densely populated area can be a very good centre for establishing a mass miniature radiography service for the detection of unrecognized cases of tuberculosis and of cancer of the lung. This should be under the direction of the radiologist. It is desirable that all miniature films be read by two people. With very simple organization, it can be
arranged that all out-patients coming to the hospital be X-rayed with the miniature apparatus. Arrangements can also be made for groups of the general public, factory workers, and others to present themselves at convenient times for miniature radiography.

The gynaecological and obstetrical out-patient facilities can easily be used for the early detection of cancer of the cervix. In hospitals in which such practice has existed for ten years or more, very promising results have been obtained. All women out-patients are examined and the Papanicolaou test is performed free of charge and without the patients' knowledge.

In many departments, such as those of dermatology, otorhinolaryngology, and gastroenterology, systematic case-finding can be organized for the early detection of cancer of the skin, tongue, and rectum.

Mention has already been made of the desirability of having on the staff a specialist in industrial medicine. In many illnesses, both physical and mental, careful investigation shows that a contributory factor, if not the main cause, is occupational; and, unless that cause or factor can be identified and dealt with, lasting benefit to the patient is unlikely. This is an aspect of hospital activities that in most countries has been but little developed, and the high relapse rate that so frequently is encountered may well be a consequence of this neglect.

The physician in charge of the department of occupational health, in addition to having an extensive knowledge of industrial diseases, needs to be familiar with the details of industrial processes, particularly those of the principal industries carried on in the vicinity of the hospital, so that he can discuss them expertly with employers and employees. He needs the personality and sense of dedication to his job to win him acceptance by both sides of industry as an impartial, friendly adviser. This is less difficult for him to achieve if he is a member of the staff of a hospital rather than engaged and paid by the industrial management. He advises employers and employees, as appropriate, on the avoidance of industrial hazards; and he must be able to convince management, through thorough knowledge of his subject, that money spent on improving industrial conditions to prevent ill health and accidents is likely to pay dividends in increased output and in savings in sick pay and compensation. One of his objects should be to reduce the load upon the casualty department of the hospital by seeing that facilities for applying first aid for minor accidents are available in factories and other places of work, and that nurses or orderlies trained in sterile technique and supplied with sterile dressings are at hand. A simple wound that becomes septic through improper handling during initial treatment often leads to prolonged invalidity.

From the foregoing it can be seen that much of the industrial physician's work lies in preventive activity outside the hospital. But he should also be readily available for consultation with his clinical colleagues on patients suffering from a perhaps obscure condition of possible occupational origin.
Although in certain cultures it may be desirable for him to treat patients himself, it is important that his therapeutic functions should not hamper his primary preventive work. On the whole, it is probably better for patients suffering from industrial diseases to be referred to the appropriate department of the hospital—dermatological, ophthalmic, general medicine, or other.

Out-patient Services and Facilities

In recent years the centre of gravity of a hospital has been shifting more and more from wards to out-patient department. Much of the investigational and diagnostic work that formerly necessitated admission to a hospital can now be carried out in a well-equipped out-patient department, with a saving of expense and avoidance of the disruption of family life that hospitalization causes. This is one of the means of keeping a patient out of hospital to which reference already has been made. Apart from investigations, much treatment of a minor character can be carried out on an ambulatory basis. This may raise some financial difficulties with sickness insurance funds or social security schemes in certain countries. These difficulties should be overcome by demonstrating to these organizations that it is in their interest to reimburse the cost of out-patient consultations as well as of hospitalization.

The out-patient department is the point of contact between hospital and community. Many patients gain their first impression of the hospital from the out-patient department; and it is important, if the patient's co-operation is to be obtained, that this impression should be a favourable one. Everything should be done to create an atmosphere of friendliness and welcome. This depends partly on the layout of the department, its furnishings and decor; but it depends even more upon the attitude of all members of the hospital staff employed therein. It must be remembered that for most people a visit to a hospital is a frightening experience, and an atmosphere of reassurance and an absence of formality should, so far as possible, be the aim. The out-patient department (and, still more, the emergency and accident department, which will be discussed later) has been appropriately described as the hospital's shop-window. The reputation of a hospital can largely be made or marred by its impression upon the patient in the first few minutes after his arrival.

There are three aspects of out-patient work that need to be considered:

1. Emergencies and accidents, which are discussed in chapter 9.

2. Unreferred patients, that is, those who have not been seen by an outside doctor, who present themselves at the hospital with a wide variety of ailments, and who regard the hospital as a kind of dispensary. Years ago, in Western Europe, such patients constituted the bulk of out-patient atten-
dances; but, as community care has developed, their number has greatly shrunk; and in some countries this type of service has practically disappeared. In many parts of the world, however, the hospital represents the only available source of medical care; and here unreferred patients must be cared for in the out-patient department.

In most of the developing countries, the out-patient department is overcrowded; and this raises tremendous difficulties. Appointments cannot be made, patients are mixed together, and any attempt to impose rules fails before such a huge attendance. The majority of the patients come either for minor ailments or for certificates, injections, or a daily dose of drugs. These services can, of course, be carried out by auxiliary personnel.

In these countries it may be advisable to plan local dispensaries within the towns, in crowded districts, administratively linked with the main hospital but physically independent. Only patients requiring specialist attendance should be referred to the out-patient department of the hospital. Such arrangements have proved their value in many countries. One such "filter" clinic may be located at the gate of the hospital itself, in which case it becomes possible to plan the hospital out-patient department on the basis of referral consultations.

As increasing provision is made for unreferred patients through care by family doctors and health clinics, the problems they present for the out-patient department will gradually decline.

(3) Referred patients, that is to say, those who have been sent by a family doctor or health clinic to the out-patient department of a hospital for a particular service (e.g., pathological or radiological examination) or for consultation by a specialist. One of the primary roles of the out-patient department is, in fact, to furnish the specialized services and facilities not otherwise available to the family doctor and so enable him to institute ambulatory or domiciliary treatment. The department also serves for the selection of patients for whom in-patient treatment is necessary, either immediately, in case of emergency, but more often by appointment when a bed is available and for the follow-up of patients discharged from the wards. It is this aspect of out-patient work (the polyclinic) that is the subject of the present section.

The structural requirements of a polyclinic are conditioned by the functions of the several parts of the department, some of which in their turn, depend upon the social and cultural characteristics of the population to be served. Quite radical alterations may therefore have to be made here and there in the outline that follows in order to meet local customs.

The out-patient department is one of the growing points of a hospital. In all too many instances out-patient departments, built in quite recent years, have been found to be too small because of the demands made upon them, the growth of new specialties, and appreciation of the possibility, indeed the
desirability, of carrying out an increasing range of diagnostic tests and "working-up" procedures on ambulatory patients. With increasing knowledge, the practice of medicine is changing very rapidly. The growing use of tracer isotopes in the investigation of many conditions is an example. An out-patient department therefore needs to be planned with a measure of adaptability in its internal arrangements and a very substantial capacity for growth. For this reason multi-storeyed buildings are not recommended (see chapter 6, page 74).

Fragmentation of any part of a hospital leads to waste of staff and, for this reason alone, is undesirable. In the case of the out-patient department, consultation among specialists is frequently needed, so it is important that all out-patient clinics be grouped together in one department. The department itself should be near to a public road, preferably one that carries a good volume of public transport to make it easily accessible to the patients, some of whom may not be very mobile. It should be near the X-ray department and the pharmacy and not too far removed from the department of pathology.

The large waiting hall, in which perhaps hundreds of patients waited for attention, has become a thing of the past. Since the introduction of appointment systems there is no need to have large numbers of patients waiting at any one time. Some kind of entrance hall or concourse is needed in which out-patients may be received and registered and from which they may be directed to a small waiting room or space serving the particular clinic they are attending (Fig. 17, facing page 85). These subsidiary waiting rooms are necessary to prevent the corridors outside the various consulting rooms from becoming crowded with waiting patients and thus impeding circulation of traffic (Fig. 18). The concourse, which should be furnished with comfortable, washable chairs and supplied with periodicals, can serve as a waiting place for friends accompanying patients and also for the disabled patients who, having seen the doctor, are awaiting transport home. In the concourse there should be a desk at which future appointments may be made. A buffet for serving light refreshments is an added amenity. Mothers attending an outpatient department for advice or treatment often have to bring their young children with them. These children can be noisy and disturbing to the patients; and a sound-proofed playroom off the concourse, in which they can be kept amused while their mothers await under examination, is desirable.

Privacy of consultation is essential. The practice of simultaneously examining several patients and taking their histories in the same room, albeit behind screens, is very undesirable for most specialties. It is usual to have a large consulting room with one or more examination rooms leading off it, but a more flexible arrangement is a series of intercommunicating consulting rooms without examination rooms at all. A consultant conducting a clinic uses one, two, three, or more consulting rooms according to the
nature of the work, his speed of operation, and the number of assistants he has. Consulting rooms on this plan do not need to be very large. They must be big enough to contain the doctor’s desk and chair, a patient’s chair, an examination couch, an instrument trolley, and a lavatory basin. In one corner should be a curtain on a rail behind which a patient can undress and dress. While one patient is dressing, the doctor writes his notes, then moves into the next consulting room to deal with the second patient, and so on. Time and motion studies have been carried out on this pattern of consulting rooms and have shown that there is no waste of the consultant’s time (Fig. 19).
Standard consulting rooms of this type can very adequately serve most specialties. However, separate arrangements need to be made for ear, nose, and throat work and for ophthalmology, though, if space is a consideration and the volume of work in these two specialties is not too large, a single consulting room suitably equipped can be made to serve the two specialties at different times. Gynaecological patients, who require rather specialized facilities for examination, can conveniently be dealt with at separate sessions in the antenatal clinic.

The adoption of a series of intercommunicating, standard, consulting rooms gives the maximum degree of flexibility of use and economy of construction. Every two or three consulting rooms should be served by a nurse's station, which need be little more than a small bays, fitted with a sink and reagents for urine-testing, a desk for patients' records, and either a small sterilizer or a space for holding packaged, sterile instruments from the central supply department. This space should also be provided with a place for the patient to sit as he talks with the nurse. Patients should come to a consultative out-patient department by appointment; and, the previous evening, their records—preferably filed in the "unit" system (in-patient and out-patient records filed together in one folder)—should be sent down from the records' department to the nurse's station serving the appropriate clinic.

A note needs to be added about appointment systems. Their success or failure depends largely upon the adequacy of the public transport serving the hospital. A hospital in a busy city with a good bus service passing the door or close at hand should be able to run a very efficient appointment system and make special arrangements for the occasional patient who has a long way to travel and cannot be sure of arriving at a stated time. If, however, a hospital is somewhat remote and badly served by public transport, a patient must perforce arrive when his public conveyance brings him, and not necessarily at the time of his appointment. A whole busload of patients may thus arrive at the hospital together, possibly two or three hours before the appointed time. The amount of public transport serving a hospital is thus a factor to consider when planning out-patient waiting accommodation. The clerk who makes up the list of appointments for a clinic session should be instructed always to leave one or two places for urgent cases, patients on whom an outside doctor needs an immediate opinion, e.g., a patient suspected of having cancer, who must not be kept waiting many days for an appointment.

A simple type of operating theatre is needed in the out-patient department so that minor surgical conditions encountered in the course of the specialist's examination can be handled and diagnostic procedures such as cystoscopy or sigmoidoscopy can be carried out. A recovery room or rooms with beds or couches is needed for patients to rest in for a while until the pain, shock, or effects of an anaesthetic have passed.
A consultant in the out-patient department often orders special investigations—X-ray, pathological, or electrocardiographic—to enable him to make his diagnosis or assess the progress of a case. In many instances this means another visit to the hospital, by appointment with the special department concerned; otherwise, the work of that department could be completely disrupted by a trickle of out-patients at all hours. X-ray examinations involving contrast media particularly need special appointments: they are time-consuming, involve preparation of the patient, and need the personal attention of the radiologist. For certain specialized clinics, however, it is often possible to make arrangements for X-ray examinations at the time the patient sees the consultant—for example, a straight X-ray of the chest for the chest physician or of a bone or joint for the orthopaedic surgeon may be taken without delay. If an ad hoc cardiac clinic is held, arrangements can be made for the electrocardiography department to have a technician in attendance to deal with patients on the spot, so that the cardiologist can see the tracing together with the patient's notes. With regard to pathological investigations, the specimen (blood, urine, swab, etc.) can usually be taken at the time of request, but the result is usually not available until the time of the patient's next visit. The specimen had best be taken in a room set aside for the purpose in the pathological department, as fragmentation of departments is most undesirable. If, however, the pathological department is not easily accessible to the out-patient department, it may be necessary to provide and equip a small out-patient pathological laboratory and have a technician in attendance just to take specimens. This, however, is wasteful of staff.

Reference has already been made to the department of medico-social service. The offices of the medico-social workers and of their clerks should be in, or adjacent to, the out-patient department. Many non-emergency ("cold") admissions to hospital are arranged, with the consent of the family doctor concerned, through the out-patient department. Some patients need advice and help in connexion with their domestic affairs prior to admission.

Like every other part of the hospital, an out-patient department depends for its success upon the quality of its staff more than upon any other single factor. It was formerly thought to be somewhat beneath the dignity of the senior medical staff to attend in the out-patient department. This is a great mistake. Out-patients are just as important as in-patients, and the work is just as interesting and rewarding. All the clinicians, including the most senior members of the medical and surgical staffs, should play their full part in the clinics of the out-patient department.

The nursing side of the out-patient department should be the responsibility of a well-qualified and experienced nurse whose primary function should be to see that the work in the various clinics proceeds smoothly. She will direct the activities of the nurses and auxiliary personnel who work permanently in the department and of any student nurses who are seconded to the department for a period as part of their training. In some clinics,
particularly the specialized ones (e.g., ophthalmic, psychiatric, and others) it may be practicable for some of the ward nursing staff to work in appropriate clinics in the out-patient department. This practice promotes some degree of continuity of care and has much to commend it when it can be arranged.

Important members of the out-patient staff are the receptionists, who make the first contact with the patients. They should be selected as much for their charm and courtesy in dealing with all sorts and conditions of people as for their savoir faire. Patients can be very exasperating people, and they may ask all kinds of silly questions; but they are often ignorant and frightened people, and they must be treated with patience, sympathy, and understanding.

Facilities for refreshments are desirable in out-patient waiting areas. Where facilities for shopping, post office, etc. are provided for the hospital as a whole, they may be conveniently sited in the out-patient area.

In-patient Services and Facilities

In-patient care for most patients can be discussed in general terms, but there are certain services that require in-patient facilities of a specialized kind. These are the paediatric, maternity, infectious disease, and psychiatric services. These four services will be discussed separately in chapters 9 and 11.

The present account deals generally with the in-patient accommodation appropriate for the other services in the hospital. Although there are certain variations in the patterns of care among the different specialized branches of medicine, these differences, so far as patients are concerned, are sufficiently slight to enable all types of patient, other than those in the four services mentioned above, to be cared for in accommodation basically similar in its plan and equipment.

There are, of course, very great advantages in having a standard nursing unit. The most important advantage is flexibility. It is reasonably certain that within the life of the hospital there will be shifts in the incidence of disease and in methods of treatment; indeed, seasonal variations in demand are of frequent occurrence. These shifts will involve re-allocating the available beds in the hospital among the various specialized units. This re-allocating can be carried out quite easily if all the accommodation is of a similar pattern. It would be difficult or impossible if each specialty had accommodation tailored in a particular way to its specialized requirements. It is also, of course, very much more economical to erect and maintain a building composed of similar units. Finally, it facilitates the practice of nursing if it can be carried on in units that are similarly arranged.

In planning the hospital as a whole, it is wise to group all in-patient accommodation together (except for the services mentioned earlier). The in-patient areas have to have easy communication with certain parts of the
hospital, particularly the kitchens, the supply and sterilizing departments, and the pharmacy. There will be continuous traffic from these departments to the in-patient units, and it will obviously be an advantage if all in-patient areas are concentrated in convenient relationship to the departments that supply them. Further, concentration of the in-patient areas will facilitate nursing organization and, in particular, will make night supervision by senior members of the nursing staff more effective.

It is common practice to plan in-patient accommodation in a fairly tall building with a central, vertical spine, through which run the lifts, conveyors, and staircases needed for vertical circulation (Fig. 20). It is also possible to plan the in-patient areas horizontally in single- or two-storey buildings, linked by horizontal corridors (Fig. 21). The latter arrangement has two advantages: it facilitates growth and change and reduces, or eliminates, the requirements for expensive vertical transportation systems, particularly lifts. It is applicable, however, only to hospitals up to a certain size. The upper limit for which horizontal planning can be effectively utilized is probably a hospital of 300 beds. In a hospital up to 200 beds in size, it has been shown that horizontal planning saves more time in most internal movement than can be achieved with a vertical in-patient block. Therefore, a horizontal layout can ensure some advantages for a hospital of 200 to 300 beds. But, if the number of beds is to be expanded in the future, it is better to plan initially a multi-storey building that could be elongated or duplicated to accommodate 500 beds later on.
The internal planning of the nursing units derives, in very great measure, from the work of the nurses. A common factor applying to every kind of ward is that it has to provide for sick human beings spending all, or part, of their time in bed under the care of a team of nurses. The traditional nursing unit from which most contemporary arrangements have evolved was the ward established by Florence Nightingale. The Nightingale ward was based on the nursing sister, or head nurse. The head nurse had from 25 to 35 patients in her charge; and her ward was, in great measure, a self-contained unit (Fig. 22). She had her own kitchen, her own stores, her own stocks of linen, china, and other supplies. She combined the role of housewife with that of nurse. All other nurses and other staff working in the unit came under her complete control.

In recent years, our concepts of nursing organization for the care of acute cases have developed beyond the simple Nightingale concept, and we
have had to alter the organization and the design of the nursing units accordingly (Fig. 23). The reason for these changes lies in the increasing complexity, technical difficulty, and responsibility of the nurse's work.

**FIG. 23**
WARD PLAN OF MUSGRAVE PARK HOSPITAL, BELFAST

It has been found that planning units for 25 to 35 patients leads to a reduction in the personal contact between nurse and patient. The nursing team tends to become specialized, and each nurse deals only with one procedure or branch of work. There is, therefore, a strong movement to reduce the number of patients in the nursing unit so that a nursing team of limited size can undertake their total care, thus re-establishing effective continuity of relationship between nurse and patient. The best size for such units is debatable, but it would appear to be between 10 and 20.

Although it is desirable, from the point of view of nursing, to plan for small groups of patients, each in the care of a nursing team, the design of a hospital for this purpose presents difficulties. The most serious of these is that it is wholly uneconomical to provide a full set of ancillary rooms—treatment rooms, kitchens, sluice rooms, and others—for such very small units. It is therefore necessary to plan for the ancillary accommodation to be shared between two or more units, and there are examples of modern hospitals planned in this way. If the classic nursing unit of 25 to 35 patients is planned, it should be divisible into two sub-units.

The development of central supplies systems, particularly as in hospitals in the USA, can have a dramatic effect on the design of the in-patient accommodation and can provide a solution to many of the problems mentioned immediately above. The development of central supplies and central food services has now made it possible to eliminate, or to reduce to a very
subsidiary role, a good deal of the ancillary accommodation that used to form part of the old self-contained ward, e.g., the ward kitchen is reduced to a small service area, and the linen storeroom can be abolished altogether.

In a hospital planned with a full-scale central supply and delivery system, many of the traditional ancillary rooms just disappear; they are replaced by systems of lifts and conveyors with sufficient parking space in the wards for the trolleys on which the supplies arrive and on which they may remain in the unit until removed for re-stocking. In the case of linen, for example, the trolley will contain a day's supply plus provision for emergencies.

Thus, taking together the effect of the movement towards smaller units based on team nursing and the development of central supply systems, the concept now is one of in-patient accommodation that is somewhat different from that of the traditional hospital block, built up of a number of more or less independent wards. A ward floor is now thought of in terms of patient accommodation of from 40 to 60 patients, subdivided into a number of fairly small units, each cared for by a nursing team. The floor is supplied from a central area to which lifts and conveyors deliver supplies from the service departments and from which used and soiled material is removed by lifts (Fig. 24).

In plans for in-patient care, there are considerable advantages in making the rooms in which the patients are nursed fairly small. The old-fashioned rooms in which 20 or 30 sick people were grouped together had obvious
objections from the point of view of privacy and comfort for the patients. It also had the disadvantage that each of these big rooms could take only patients of one sex and, generally, one specialty. Owing to the fluctuating demands for admission, big rooms tended to reduce occupancy. For example, on any particular day there might be more beds for male surgical patients than were needed, but too few for female medical patients. The use of smaller rooms with fewer beds in each gives greater flexibility. Generally speaking, modern hospitals are composed principally of rooms for four or six patients (Fig. 25), together with a number of single-bed rooms.

An adequate number of single rooms is of vital importance, as it should always be possible to isolate certain categories of patients, particularly those who are dying or whose condition is distressing to the others. There is also a need to isolate patients with infectious conditions other than those severe infections that warrant removal to an isolation unit. It has been recommended that 20% to 25% of the beds be provided in single rooms. However, it is important that the area of the single-bed rooms should not be too small. These rooms are occupied either by seriously ill patients, who usually need bulky medical apparatus such as respirators, X-ray machines, perfusion sets, oxygen tents, or electrocardiographs, or by patients who have asked for an attendant or for a private toilet. Consequently, the area of a single-bed room needs to be practically that of a standard two-bed room.

So long as an adequate supply of single rooms is available, there is little case for two- or three-bed rooms, and it would appear better to provide the remaining accommodation in the form of four- or six-bed rooms. A nursing unit of 20 beds built up in this manner might have two six-bed rooms, one four-bed room, and four single rooms. Such a unit is very flexible in use, and can admit patients of either sex and with varying conditions if need be. If the maximum flexibility is to be obtained, each room should, if possible, have its own toilet and washing facilities. This may not always be practicable on grounds of cost, and two rooms may have joint facilities. In this case, however, these two rooms, together with their toilet arrangements, form a unit.

Apart from rooms for patients and toilet facilities for patients, other important ancillary rooms and facilities are needed. A nurses’ station is needed for each nursing unit. This station will be the headquarters of the nursing team for the particular unit and should be provided with chairs and
a desk, telephones (in sound-proof hoods or cabinets), and other facilities. A treatment room should be provided so that all surgical treatments, dressings, and other procedures can be carried out under aseptic conditions. One such room will be needed for every 30 to 40 beds. This room will be, in effect, a minor operating room, and should be provided with controlled ventilation. It will need to have attached to it clean and "dirty" utility rooms: the clean utility room will be supplied with instruments, dressings, drugs, and other materials from the central supply department; in the "dirty" room, instruments will be washed after use and packed for return to the central department.

Small service pantries may be needed to provide occasional refreshments for the patients, but the main meals will come from the central kitchen. Under most modern systems of catering, meals are served directly from the kitchen on trays or from insulated trolleys. Where there is a fully developed central supply system, there will be little, or no, storage on the ward floors. Instead, there will be parking spaces in which trolleys holding a day's stock of various supplies can be conveniently placed in relation to their points of use.

Certain facilities will be needed by the ward staff, which may include—in addition to nurses—ward clerks, assistant nurses, and maids or orderlies. Toilets and changing rooms must be provided for the staff. The head nurse or sister should have a private office. There will also be need for offices for medical staff. An interview room (which can also serve as a waiting room for the overnight stay of visitors to dangerously ill patients) and a seminar room are also useful.

In the planning of the ward, particular attention should be devoted to the routes by which used, dirty, or infected material of all kinds is removed. In principle, it should be possible to remove all such material from, or close to, its point of origin by a direct route without using the hospital corridors. In practice, this means, in tall, multi-storey buildings, the provision of special lifts directly serving disposal rooms on the ward. In single- or two-storey buildings, it may be possible to arrange for the bins containing used and dirty material to be collected from outside the building through hatches.

The discussion so far has been concerned with general problems of in-patient accommodation applicable to a large range of patients. In recent years there has been a tendency towards setting up specialized units that take patients of either sex, suffering from various conditions, through special stages of their stay in hospital. Of these specialized units, the most widely accepted is the post-operative recovery ward. This takes patients immediately after surgery and enables continuous supervision and intensive care to be given for a limited period. The advantages of having such a unit and the problem of staffing and planning it are discussed in chapter 10 (page 152). It may generally be assumed that any new hospital should be provided with
such a unit, and that this will relieve the surgical wards of the problems of immediate post-operative care.

Another special unit now generally provided is an admission ward attached to the casualty and emergency service. This ward can take patients who arrive in the accident and emergency department during the night when admission to one of the other wards would tend to wake up and disturb other patients.

In the USA a system known as "progressive patient care" has been strongly advocated and has been adopted in some hospitals. In this system, the in-patient area is divided into separate sections, often three in number. The first of these is the intensive care unit, which takes patients in acute stages of illness. The second is the intermediate unit. The third is the convalescent unit, which takes patients who are nearly recovered and need the minimum of care. The argument for this system is that it facilitates the concentration of staff and equipment in the intensive care units and that this leads both to general economy and to better service to the patient (Fig. 26). Whether or not the system does result in economy is debatable, inasmuch as it has the disadvantage of reducing utilization of space. Obviously, if the facilities for care are subdivided into sections, each capable of taking only patients in a particular category, the bed occupancy is reduced by virtue of the fluctuations in demand in each category. Whether or not this system improves patient care may also be debated. Although it undoubtedly enables a concentration of force to be made in the intensive phase of a patient's illness, it has the disadvantage of fragmenting the care of the patient by shifting him from one team of nurses to another several times during his stay in hospital. It also poses problems of nursing. No nurse sees a patient all the way through his stay in hospital; instead, each sees only one stage, and some element of job satisfaction is thereby undoubtedly lost. Some hospitals have established a section of three or four beds within each ward for intensive care.
No firm conclusion as to the merits and demerits of progressive patient care can be put forward at the present time. It must also be noted that the hospitals in which the progressive care system has been applied have usually not been subdivided into separate clinical services. Where separate clinical services exist, as they do in most countries, then the difficulties resulting from further subdivision must be considered, particularly that of poor balance of occupancy, which will become very acute. Regardless of what system is established, however, some facilities for the intensive care of patients in a highly critical condition should be provided, either in close connexion with the post-operative recovery room or elsewhere.

Facilities for Research

As was stated at the Tenth World Health Assembly, “The theme of research should permeate the whole hospital organization because it is primarily by this means that advances are made in medical care”. Research should not be looked upon as a function reserved to the big hospitals; some of the great discoveries in medical science have had a very simple origin.

Every hospital, however small, should have some office accommodation in which medical staff can work and study; and all should have a medical library, containing standard works and a selection of medical periodicals. The size and scope of the library will depend upon the size of the hospital and the interest and needs of the medical staff.

The provision of ad hoc facilities for clinical research in a district hospital should be governed largely by the quality of the medical staff. It is useless to provide and equip research laboratories in advance in a district hospital in the expectation that practical results will follow. Good research workers, with imagination, foresight, objectivity, and dedication, are mostly born, not made. When such a research worker appears on the staff of a hospital and has ideas on carrying out worth-while projects in some clinical field, encouragement and facilities should be given to him. These may amount to the erection of a laboratory and other rooms for the study of some aspect of, say, respiratory or cardiac disease, gastroenterology, or anaesthetics; and no guidance can be given in their design and equipment since both depend upon the particular type of clinical work under investigation. However, it is desirable, so far as is practicable, that the research facilities should be sited near the units that house the patients who are the object of study.

A department of clinical research, once established in a district hospital under the direction of a keen research worker, is likely to attract to itself, as assistants, others of like mind and qualities; so there is little likelihood that the work of the department will come to a standstill even if the head of it leaves the staff.
In any country, some measure of co-ordination of research should be undertaken by some central scientific organization to avoid duplication of projects and to ensure that financial aid for original work is given only to workers of proved capacity who submit a programme of worth-while investigation.
CHAPTER 9

The Special Medical Services

Accident and Emergency Services

Provision has to be made for dealing promptly and efficiently with medical and surgical emergencies, from whatever cause. In the past it has been customary in most countries for all hospitals to try to deal with emergencies and accidents of all types. Daily one reads in the press of an injured person's being "rushed to the nearest hospital", though whether the rush is in the patient's best interest, or the nearest hospital the best place, is often very doubtful. Obviously, geographical considerations play an important part. If a hospital is miles away in the country, it will, of necessity, have to deal with all types of accident and emergency and do the best it can. In cities and densely populated urban areas where, within a radius of, say, twenty miles, there are many hospitals, it is wise to designate only a limited number for the treatment of serious accidents and to staff and equip them accordingly (Fig. 27).

An accident centre, to be efficient, needs to be staffed throughout the twenty-four hours by specialists with a high degree of skill. Moreover, it is essential that one experienced accident surgeon should be in charge of it. It is no use leaving the department in the care of a junior doctor, as is so often done, instructing him to call the general surgeon on duty or his assistant in case of difficulty. The department needs to be staffed in its own right, from the consultant in charge downwards, by men whose primary concern it is to run it efficiently. The specialist in charge may well be an orthopaedic surgeon so long as his interest, skill, and experience extend to the proper treatment not only of fractures, but also of soft tissue injuries.

Every hospital must have provision for receiving and dealing with "walking casualties"—very simple fractures, cuts needing suturing, abscesses, and other minor conditions. For this, a hospital needs a waiting room; a consulting room or rooms; a series of cubicles large enough to hold the patient, doctor, nurse, and a trolley of instruments; and a small operating
FIG. 27
CIRCULATION IN AN ACCIDENT UNIT

This theatre, and that in the out-patient department, can also be used at set times for minor "cold" surgical procedures, such as injection of hemorrhoids, or circumcisions. A few beds should be available to which patients, especially those with apparently minor head injuries, can be admitted for overnight stay; and some beds or couches should be provided for patients recovering from an anaesthetic or painful procedure who have to rest for a time before going home. If desired, all these beds can be grouped together in one unit.

All hospitals are called upon to deal with medical and surgical emergencies of a non-traumatic nature—diabetic coma, suspected perforated peptic ulcer, and so forth. These are best received at the same entrance as the "walking casualties", probably through a separate door, into a waiting space with a number of examination rooms in which a preliminary examination of the patient can be made before he is taken to the appropriate ward.

It is recommended that a limited number of district hospitals in heavily populated areas be designated as major accident centres, and that the police and ambulance authorities be instructed to take accident victims only to these hospitals. The list of these major accident centres should be estab-
lished after consideration of the location of the main industrial plants and the means of communication between them and the accident centres. (In some countries, mining and oil companies have participated in the equipment of accident and rehabilitation centres, especially for the care of burns and fractures.) Such hospitals, as well as having their emergency and accident department staffed in the manner described above, need a number of additional facilities. A patient brought to hospital after an automobile accident will be shocked, possibly exsanguinated, and in need of resuscitation before any surgical measures are attempted. A special resuscitation room should be provided and should be kept permanently at a warm temperature. It should be sufficiently large to hold a number of patients on wheeled trolleys and should be divided by curtains into cubicles. Each cubicle should have transfusion and oxygen facilities. Severely injured patients should not be moved more than is absolutely necessary. Hence, it is important to have the X-ray department very near the reception area, as most of these patients will need to be X-rayed. If for any reason this close juxtaposition cannot be achieved, separate X-ray facilities must be installed in the emergency department.

When a measure of resuscitation has been effected, the patient is taken to the operating theatre. His soiled clothing is removed in an ante-room, and he is anaesthetized and undergoes any operative procedure that may be necessary. The theatre, which must be fully equipped, may be one of those in the operating wing of the hospital, or it may be a special one in the accident department.

Several other aspects of the accident and emergency service call for consideration:

(1) Hand injuries. Any serious impairment of the function of the hand may interfere with a man's ability to earn his living and spoil his enjoyment of life. In many hospitals, hand clinics have been set up to deal primarily with the prevention and treatment of septic infections of the fingers. No elaborate equipment is required, but a very strict no-touch technique is insisted upon, with the nurses and others who apply dressings being gloved and masked. To avoid contamination with air-borne organisms, the patient passes his hand through an aperture in a plastic bell-jar, the surgeon's or nurse's hands pass through apertures on the opposite side, and all dressings or other procedures are carried out under cover and under a beam of ultraviolet light.

(2) Fractures. A fracture clinic directed by a specialist is recognized as the best means of ensuring that the treatment of a fracture will end in a good anatomical and, particularly, in a good functional result. Every patient with a fracture who comes to the hospital should be seen by a skilled orthopaedic surgeon, and the patient should continue to attend his clinic until the maximum degree of success has been attained. This clinic may be
an offshoot of the accident department, or it may be part of the out-patient department. Wherever it is located, a room for applying plaster casts is required; and, as previously mentioned, ready access to the X-ray department is essential in order that the progress of healing can be closely followed. In a large hospital in a densely populated area, attendances at the fracture clinic may be very heavy, and allowances for this should be made accordingly.

(3) Burns. The treatment of severe burns is a very specialized procedure. According to the distances to be covered, it is wise to set up a few centres in the region for the treatment of severe burns. Curiously enough, patients with burns travel quite well immediately after the injury, and an ambulance journey of twenty miles does not seem to be deleterious. It is well to establish a unit for the care of burns in association with a plastic surgery centre, as skin grafting is so important. Facilities also need to be available for estimating electrolyte concentration and compensating for deficiencies and fluid loss.

(4) Poisoning. The treatment of victims of accidental or suicidal poisoning is best undertaken in centres where the staff has experience in dealing with this particular problem. The centres clearly must not be too far apart, as speed in initiating treatment is often vital. Arrangements should be such that the family doctor can reach the specialized staff at the centre by telephone.

(5) Tetanus. Though not strictly an emergency, treatment of tetanus should be concentrated in one or two centres in a region where the staff, particularly the anaesthetists, have the interest, skill, experience, and equipment for the treatment of this condition by continuous anaesthesia or other means. In some countries it has been found advisable to admit patients with tetanus to the same unit as those with respiratory poliomyelitis, because the techniques and the apparatus are the same.

The after-treatment—dressings, for example—of ambulant patients attending the accident department may give rise to difficulty. It is best carried out in the hospital where treatment was initiated; and for patients living and working near the hospital, this presents no problem. However, patients living a considerable distance away and having to appear for, perhaps, daily treatment may lose so much time travelling that they are hardly able to work at all. Sometimes a clinic exists under the hospital’s aegis near the patient’s home, and it may be possible for the after-care to be given there. In a few densely crowded factory areas, it has been found practical to send a mobile dressing station to the factories. In this way, a man may be away from his work bench for perhaps not more than half an hour and still get all the after-care he needs.
Paediatric Services

The paediatric services will constitute a substantial proportion of the whole hospital. In developing countries, the proportion of children to adults in hospital may reach 40%; even in developed countries, the proportion of children is likely to be between 10% and 20%.

As has been pointed out in an earlier chapter, the paediatric services of the hospital should form part of an integrated service to the community. It should contribute to preventive medicine and public health in the area served by the hospital. In some countries, the child health service may be organized and administered from the hospital; in others, there may be independent branches of the health services concerned with children outside the hospital, in which case it is very important for the hospital to establish close relations with any other service in this field.

In certain countries, paediatricians work in the community; in others, care of children outside the hospital is given by general practitioners. In either case, specialized care should be provided by the hospital. The medical staff of the hospital paediatric service should visit children in their homes, in consultation with the general practitioners, and should conduct, or assist in, clinics in the surrounding area. Therefore, in planning the staff for the paediatric service within the hospital, it is important to consider the outside commitments of the medical staff.

In most countries, nursing outside the hospital is undertaken by nurses from the public health service, working in collaboration with the local doctors and the hospital specialists. But it may be that, in certain cases, medical and nursing staff from the hospital may go out together to give domiciliary care to children in their homes. A scheme of this type is already in operation at St Mary’s Hospital, London, England.

Out-patient service

The out-patient service for children is an important part of the paediatric service. Out-patient arrangements for children differ to some extent from those appropriate for adults. In the first place, a child is always accompanied by his mother, and very often by other members of the family; and the mother goes with the child into the consulting room and anywhere else he may have to go in the course of his visit to the hospital. Therefore, waiting areas in children’s out-patient departments have to be larger than those for adults. Furthermore, many children’s diseases are of sudden onset, and it is important that the organization of children’s out-patient clinics should enable children to be seen without delay. It is therefore more difficult to establish appointment systems in children’s out-patient clinics than in those for adults. In the children’s clinics, more spaces have to be kept open in the appointment list to enable the clinic to accept a fair number
of patients without appointments who present themselves with urgent conditions.

Children suffering from injuries or accidents are probably best received by the accident service of the hospital; children suffering from acute medical emergencies are better received at the children's out-patient clinics, so long as they are in session. The importance of acute dehydration cases in tropical countries and, during the hot season, in temperate regions often calls for special arrangements. Separate accommodation for children attending as out-patients is to be preferred, and should be provided wherever the numbers justify it. Alternatively, special times should be set aside when individual clinics in the general out-patient department are used for children's clinics. This latter arrangement will be practicable only if local waiting places are available for each clinic. It is not satisfactory for children to have to wait in a general waiting room with adults. Because of the presence of mothers and the fact that the appointment system, if any, is less complete than in adult clinics, the numbers waiting at a children's clinic are much larger; and an extra-large waiting room, with facilities for children's play, is therefore needed.

Children attending out-patient clinics may require radiography. It is advantageous to have one of the radiographers permanently assigned to work with children, as X-ray examination of children is better done by someone who has made a practice of it. If one particular X-ray room is generally used for children, it can be decorated in an appropriate manner.

In-patient service

In-patient accommodation for children, as has been pointed out earlier, varies so greatly from that required for adults that a standard ward is not suitable. Because the plan is so different, it will probably be impossible to put the children's wards in the main ward building; it is better to plan them as a separate wing, or as a separate building linked by a covered corridor to the main ward area of the hospital. Further, the children's wards should not be too far removed from the main ward building, so that the distances over which food and medical supplies have to be brought are not too great.

Special requirements in planning for children include the provision of a large proportion of isolation rooms and facilities for mothers to come into the hospital with their children. There is also a need for large playrooms and for a schoolroom (Fig. 28). Isolation facilities are required both for children with infections that might spread to others and for children, particularly babies, who run risks of getting a secondary infection if left in an open ward.
In many countries, children's units are being planned today with something like 50% of all the beds in single rooms. This proportion is, of course, high from the point of view of nursing supervision; but this problem can be overcome to some extent by the provision of viewing windows between the rooms and the corridor. As there is a considerable variation in the number of children requiring isolation from time to time, and also in the demand for the admission of mothers, it may be advantageous to plan a standard type of room that can be used sometimes as an isolation room, sometimes as a room for mother and child, and sometimes to accommodate two children with a similar condition. Such a room has to be larger than that needed for a single, isolated child; but the advantage of being able to use all the rooms for any purpose, as required, offsets the extra initial cost.

In considering the size of the rooms for children, it should be borne in mind that many children require a full-size bed, even when quite young; and that very sick children or babies often require a considerable amount of equipment. Very tiny isolation cubicles are of doubtful value. A certain number of rooms should be provided with individual toilet facilities and an antechamber, to facilitate full barrier nursing.

Toilet facilities are needed for the older children, and ample sluice accommodation is also required. Treatment rooms should be similar to those described earlier in this monograph for adult wards. Unless the central kitchen is organized to provide special food for children, it will be necessary to have ward service pantries that are somewhat larger and better equipped than those needed in adult wards. These will enable ward staff to adapt the food supplied from the central kitchen to the needs of the children under their care.
The proportion of mothers likely to come in with their children will vary from country to country. In some countries it will be 100%; in others, it may be comparatively few, although the practice is becoming more widely adopted in the developed countries in recent years. The mothers need a common room and a place in which they can do a little simple cooking and wash their children's clothes.

Some studies have been made in the United Kingdom of the minimum paediatric beds that justify a specialist staff. It appears that the minimum viable unit might be based on about forty children's beds. The number of beds in each nursing unit will depend on the nursing organization. For reasons discussed earlier, the number of patients in each unit should not be too great. In the case of children, it should certainly not exceed twenty. The nursing team required will be larger in number than that needed in most adult wards. The nucleus of the nursing team should consist of the head nurse and, perhaps, her assistant. At least these two should have special preparation in paediatric nursing.

It is desirable for the children's department to have an entrance apart from that to the parts of the hospital designed for adults. It will be necessary to provide at the entrance, for use by the out-patient department also, facilities in which children can be checked for infectious disease before they are admitted into either the out-patient clinics or the in-patient areas. A room should be available to enable any dangerously infected children to be instantly isolated and, if necessary, removed immediately to an isolation unit.

The paediatric services have a close link with the maternity services. It is advantageous if they can be situated fairly close together to facilitate contact between the staff of the two units. They should not share an entrance, as it is important to protect the nursing mothers from any infections that the children may bring in. Certain hospital facilities can, to some extent, be shared between the paediatric and maternity services. One of these is the milk kitchen where babies' feeds are prepared. Discussion of the requirements of this service will be found on page 133, where it is noted that a very high standard of aseptic conditions is required. It is therefore best to have only one such unit to serve the babies in both the paediatric and the maternity ward.

Services for premature infants

The unit for premature infants should preferably be within the paediatric department (Fig. 29). If it is in the maternity department, it should be under the supervision of the paediatrician—another reason for ensuring that the two departments are reasonably close together. The planning of this department is described on page 134.
Maternity Services

The whole subject of birth is hedged around by religious practices, customs, traditions, superstitions, and taboos, all of which must be taken into consideration when planning maternity services for a community. The in-patient accommodation needed can vary between the widest limits. In certain countries a woman may have the strongest objection to entering hospital for confinement or she may consent to admission only if she may bring with her two or three of her other young children, thus creating impossible conditions for a hospital save in cases of great urgency. At the other extreme is a country like Sweden, where almost all births take place in hospital. Between these two extremes are countries like the Netherlands, where a substantial proportion of births take place at home.

Although the proportion of births that are likely to occur in hospital may vary widely from country to country, and with it the amount of in-patient accommodation needed, there are certain fundamental principles that are of universal application in connexion with maternity services. These are the importance of antenatal supervision and post-natal examination, family planning, a service of domiciliary midwives and household aides, and the importance of instructing the mother in the principles of preserving her own health and that of her newborn child. In any country the maternity department of the general hospital needs to be linked very closely with clinics or health centres established in the community near the homes of the people, where these principles can conveniently be put into practice.

The maternity department of a district hospital may well be a wing of the general hospital, preferably with a separate entrance, as childbirth is a
physiological and not (usually) a pathological process, and it is undesirable on psychological grounds that a woman should associate a normal function with the care of sick people. However, the department should not be entirely separated from the main building because direct access will be needed for transport of meals and supplies, and women will occasionally need to be taken to special departments in the main block.

Antenatal clinic

The antenatal clinic should be situated, wherever practicable, on part of the ground floor of, or adjoining, the maternity wing. The size of the clinic will be governed to some extent by the number of times the obstetrician will wish to see a pregnant woman before delivery. A fairly usual practice for a normal pregnancy is that the woman be examined at the hospital at the time of booking for admission, again at the thirty-sixth week, and thereafter weekly until term. Between these hospital visits she should be seen at weekly intervals for urine-testing and blood-pressure measurement at the local antenatal clinic near her home. This, as has already been stressed, should be closely associated, through its staff, with the district hospital.

The hospital clinic will need: a fairly large waiting room, as attendances are likely to be large; two or three small rooms for history-taking by a junior doctor or midwife; and several consultation and examination rooms, each served by three or four cubicles for undressing (if fewer are provided, a bottleneck will result). If these dressing rooms open directly into the consulting room, the doors should be heavy and close-fitting to ensure reasonable privacy; because they are necessarily small and are used by a great many women in the course of a session, they require very efficient ventilation. A urine-testing room must be provided, with a lavatory alongside furnished with a pass-through hatch through which specimens of urine can be handed. There must also be accommodation for offices and records.

The same clinic can conveniently be used for post-natal examinations, for family-planning consultation (where this forms part of the national policy), and, at separate times, for gynaecological out-patients.

Whether or not instruction should be given on family planning is a matter governed largely by religious and political considerations. The converse of family planning is treatment for infertility, and consultations for this condition can well be held at separate sessions in the antenatal clinic, which might more appropriately be termed "women's clinic".

On the ground floor of the maternity wing there should also be an admission unit where the woman in labour is received and is given a bath or shower, according to local custom. The unit should contain one or two examination rooms. It is also good practice to have a delivery room close at hand to deal with cases of precipitate labour or women who are thought to be, or are known to be, infected.
Maternity wards

The extent of the provision that should be made for institutional confinements is conditioned by (a) the number of women who would desire a hospital bed if it were available; (b) the number of women who ought on medical grounds to have a hospital delivery; and (c) the length of stay in hospital of a normal case.

Actual admissions must, of course, be governed by the number of lying-in beds available; and, if these are insufficient to meet all requests for admission, priority must be given to women having abnormal medical or obstetrical conditions, such as heart disease, contracted pelvis, or toxaemia, as ascertained at the patient's initial examination, at the time of booking, or subsequently. In some countries all primagravidae and multiparae after the fourth child are considered to need admission. Secondly, beds should be provided, if possible, for women with unsatisfactory home conditions. These may include single girls, women living in lodgings, and others in difficult domestic circumstances. In some countries of Western Europe and in the USA, the difficulty or impossibility of securing domestic help has increased the demand for more maternity beds, which often represents a social rather than a medical need. Finally, such beds as remain can be allocated to women who wish to enter hospital for their confinement as a matter of convenience.

The nursing units of the maternity service (Fig. 30) need not differ widely from the standard units of the general hospital. They should be divided into four- or six-bed rooms or bays and single rooms. A higher proportion of single rooms may be required to deal, inter alia, with potentially or actually infected patients (failed forceps, etc.) and with patients with eclampsia, who require rooms that can be darkened.

If a policy of "rooming-in" the babies with their mothers is adopted, the rooms or bays in the nursing unit should be made a little wider, to allow space for the cot beside the mother's bed. Placing the baby's cot at the foot of the mother's bed is not recommended. "Rooming-in" has been widely adopted in recent years, partly because it gives the mother an opportunity to get to know her newborn baby, but particularly because it is thought to reduce the incidence of infection in the maternity department. The practice of having large numbers of newborn babies in a nursery at times has disastrous consequences, and the literature of a few years ago describes many instances in which epidemic gastroenteritis in the newborn spread rapidly, and often fatally. More recently, since the introduction of antibiotics, staphylococci have been recognized as a potent cause of hospital infection; and many babies born in hospital rapidly become nasal carriers of this organism, which is usually resistant to most antibiotics. From the nose the infection may spread to the skin, eyes, and umbilical cord, and to the mothers' breasts. Although there is no positive evidence in support of
the idea, "rooming in" should do something to limit the spread of infection. Some small rooms will still be needed in which to isolate infected babies or those in which infection is suspected, and for particularly noisy babies whose presence may be disturbing to the other occupants of a multi-bed room.

In some countries, a policy has been adopted that offers a compromise between the idea of a central nursery and that of "rooming-in". The maternity unit is made up of a number of sub-units, each of which is composed of three rooms (Fig. 31). The two outer rooms are for the mothers and have two or three beds each, while the middle room is a nursery for four or six children, with cots and washing facilities. There are communicating doors between the rooms so that the babies can easily be taken to their mothers for breast feeding, but the nursery can be shut off during visiting hours and at night. Glass partitions between the nursery and the mothers' rooms allow the mothers to watch their babies and the nurses attending them. A door from the main corridor into the nursery permits the nurses to enter it without disturbing the mothers. The sub-unit can easily be disinfected in the case of an epidemic.

In any maternity unit, a substantial number of isolation rooms should be set aside for the treatment of abnormal antenatal conditions—mainly toxaemias of pregnancy and acute septic conditions—unless these conditions can be treated in another department. In England the recommended figure is about 25% of the available beds, but in other countries the proportion will depend upon a number of factors, such as the local incidence of abnormalities of pregnancy and the policy with regard to hospital confinements.

The maternity unit should be provided with a milk kitchen, where supplementary feeds can be prepared under skilled and conscientious supervision. The milk kitchen should be divided into a sterile and a non-sterile section, connected only by a pass-through autoclave or some other controlled device.
The milk kitchen need not, however, be in the maternity wing; it might be better sited in the paediatric department, which is likely to make more use of its services, or in some central position in the hospital near the other supply departments.

The relation of the labour rooms to the lying-in wards has been the subject of some difference of opinion (Fig. 32). Some have argued that each delivery room should be related physically to its own nursing unit, the idea being that the same staff of midwives should look after the patient through the whole course of labour, delivery, and lying-in. Except in very small maternity units, however, this is seldom found to be practicable; and it is usually better to group together the labour rooms and the first-stage rooms (better referred to as delivery rooms and progress rooms) in one part of the wing, and to put the group under the control of a delivery room superintendent. Each pair of delivery rooms needs a wash-up room for soiled articles arranged in such a way that they can be removed without again entering the delivery room. As all instruments, drapes, and dressings should come to the department in sterilized packs from the central sterile supplies department, a sterilizing room in the delivery suites is not necessary; but rooms adjoining the delivery rooms are needed in which the obstetricians and midwives can wash and put on their gowns, caps, masks, and gloves.

A certain number of deliveries call for operative surgery, such as caesarean section; and an operating room must be available for this purpose. This is sometimes included in the maternity wing; but, except in the largest maternity units, it is hardly justifiable to build, equip, and staff an operating theatre and set it aside for the rather occasional use that is likely to be made of it. It is better to use for obstetric surgery one of the all-purpose operating rooms in the general part of the hospital.

**Unit for premature infants**

A special unit is needed for the care of premature infants, both those who are born in the hospital and those born outside who need admission and highly skilled and specialized care if they are to survive. It has been recommended elsewhere that this unit should be located in the paediatric department.

A separate, glass-walled cubicle is desirable for each infant. Each cubicle should be equipped with devices for controlling temperature and humidity (except in hot, humid climates, where the natural atmosphere is unlikely to need adjustment); and each should be connected to an oxygen supply, although the risks of retrolental fibroplasia in high oxygen tensions must always be borne in mind. As premature babies are particularly prone to infection, which may easily prove fatal, facilities should be readily available to enable the staff entering a cubicle to put on sterile gowns and masks, separate gowns and fresh masks being provided for each cubicle.
FIG. 32
RELATION OF LABOUR ROOMS TO WARDS

PLAN A

Nursing team

LABOUR SUITE

ANTENATAL WARD

POSTNATAL WARD

POSTNATAL WARD

POSTNATAL WARD

Nursing team

Nursing team

Nursing team

Nursing team

PLAN B

Nursing team

LABOUR SUITE

ANTENATAL WARD

ANTENATAL WARD

ANTENATAL WARD

POSTNATAL WARD

POSTNATAL WARD

POSTNATAL WARD

Nursing team

Nursing team

Nursing team

Nursing team

PLAN C

LABOUR SUITE

ANTENATAL

POSTNATAL

Nursing team

Nursing team

Nursing team

Nursing team
When the unit normally harbours more than 20 prematures, it is desirable to plan a nursery for those who no longer need to be cared for in incubators but who must stay some days before being discharged.

Training and organization of staff

The district hospital may have to make provision for the training of midwives, both for future work in the hospital and for domiciliary work in the community. In developing countries this question of shortage of midwives and the need for training them may present one of the most difficult problems. A school of midwifery may be associated with the hospital. In the maternity wing itself, there should be one or two small demonstration rooms where short, informal talks can be given to pupil midwives and where they themselves can study with suitable teaching aids.

Midwives can handle many of the uncomplicated deliveries; but in a large department, dealing with a high proportion of abnormalities, the services of a skilled obstetrician should always be available. A maternity unit of 60 beds will need the equivalent of at least two full-time consultants, together with their first assistants, registrars, and house officers. Such a team should be able to cope with the gynaecological and antenatal services also, and to supervise and participate in the teaching of midwives. If, however, this staff is called upon to undertake much work outside the hospital, in peripheral antenatal clinics and in domiciliary consultations, or if there is a very large turnover of patients in the hospital because of a short length of stay, the team will have to be strengthened.

The care of the newborn babies should be the responsibility of the paediatrician, not the obstetrician.

The role of the general practitioner in the maternity services is a very important one. In his office or at a clinic, he supervises much of the antenatal care of the expectant mother. He attends many women confined in their own houses and is probably in charge of the maternity beds when these are established in a small, local hospital. It is not easy to bring him into the large maternity departments of general district hospitals; for here, where pupil midwives are being trained, it is important to establish and maintain a uniform regime. It is desirable, however, that a general practitioner practising midwifery should from time to time have short resident spells in the district hospital as a supernumerary and there attend patients, under the supervision of a consultant, to keep his knowledge and skill up to date.

A special link between hospital and general practitioner is what has come to be called “the flying squad”. A doctor attending a woman in her own home may suddenly find himself faced with an obstetrical emergency, usually haemorrhage, and be in urgent need of specialist help and equipment. The “flying squad” comprises a doctor and a midwife who have their
base at the hospital and who can leave their routine duties at a moment's notice and proceed by car or ambulance to the patient's home in response to a telephone call. The car or ambulance is equipped with sterile instruments, gowns and dressings, blood transfusion apparatus, and a supply of group O, Rhesus-negative blood. The object is to apply immediate life-saving measures and to care for the woman until she is in a condition to be taken by ambulance to the hospital.

**Services Relevant to Infectious Diseases**

With the increasing use of protective inoculation and of antibiotics, most of the common infections have been brought under control to such an extent that the old-fashioned "fever hospital" has almost become a thing of the past. The modern concept is to admit patients suffering from the acute specific fevers to specially designed isolation units within the precincts of the general hospital. This unit has two functions: it admits, from outside, patients who need hospital treatment or isolation, whatever the nature of the infectious disease (except smallpox, which calls for special hospital provision), and it serves to isolate patients being nursed in the wards of the general hospital who, in the course of their treatment, develop some clinically infectious condition. Examples of the latter are patients who develop post-operative staphylococcal infection of a wound or infants in the paediatric wing who contract gastroenteritis.

The primary object of this specialized unit is to protect the community from infection. With this in view, the ideal arrangement is a separate building a short distance away from all the other hospital buildings, not merely to minimize the possibility of air-borne infection, but, more particularly, to impress continually upon all concerned the fact that the building is one in which there are infectious conditions and that strict adherence to a well-defined precautionary regime must, at all times, be observed. Where of necessity an isolation unit has to be in the main building, then very great care must be taken with regard to its location and ventilation, with the object of cutting off the unit from the other parts of the hospital.

As elsewhere, quality of staffing is all-important in the isolation unit. The head nurse or sister in charge, in addition to general training, should have qualifications in paediatric nursing, since most of the patients in the isolation block will be children. The nurses working under her should have impressed upon them the necessity of observing, with scrupulous and conscientious care, the measures laid down for avoiding the spread of infection. Appropriate instructions must also be given to cleaners and other domestic staff whose work takes them into the block.

The medical care of sick children in the isolation block will naturally be the concern of the paediatrician; adult patients will be looked after by
other members of the medical and surgical staff. One senior doctor should be invested with the authority to lay down the code of precautionary measures to be observed throughout the block. The object of this is to avoid division of responsibility and the possibility that contradictory instructions may be given to the nursing staff.

Internally, the isolation block should be built in such a way that nearly all patients will be in separate cubicles. These should be made somewhat larger than usual to enable a mother to be with her child, if this is considered desirable, or to accommodate two cots for children suffering from the same illness. Outside each cubicle should be a lobby fitted with a lavatory basin and containing a gown, to facilitate barrier nursing. The walls of the cubicles should contain a good deal of glass to make possible observation of the occupants, but the dividing walls must extend right up to the ceiling. Screens a few feet high between beds, though they may, to some extent, prevent massive droplet infection from patient to patient, do not stop minute particles of infected matter from being borne by the air from one part of a ward to another, as experiments with exposed agar plates have shown.

One or two multi-bed rooms can, with advantage, be included in the plan for groups of children recovering from the same infection.

The isolation block should be as self-contained as possible. Ward crockery should be washed and sterilized by boiling or autoclaving within the unit. Disposable items should be used as much as possible. Arrangements need to be made for bedding and similar articles to be sterilized within the unit before being sent to the hospital laundry; and dangerous fomites, such as typhoid stools, must be disinfected before being passed into the hospital drainage system. Refuse should preferably be put into disposable paper bags and go straight into the incinerator. Similarly, left-over food from patients' plates, unless there is sufficient bulk of it to warrant steam sterilization, must be destroyed in the incinerator, rather than go into the swill-tub.

In warm or temperate climates, natural ventilation by open windows is the method of choice. However, where artificial ventilation is necessary, care must be taken to maintain positive pressure throughout the building, with outlets in each cubicle, near floor level, directly to the open air in order that infected particles may not be carried by air currents from one cubicle to another.

Visitors to patients in an isolation block pose a number of problems. To allow a mother to see her child through a glass screen is not very comforting or satisfying for either party. If visitors are to be allowed into the cubicles, they must be properly gowned; and facilities for this and for the disposal of the infected gowns after use must be provided in the block.

In times of epidemic, when the resources of the isolation unit may be strained by weight of numbers, it may well be necessary to set aside some of
the standard wards in the main block for the treatment of infectious cases. In developing countries where the weather is reasonably warm, it may be wise to make provision for the temporary expansion of the isolation block on a considerable scale by the erection of tents or huts.

In all countries it is a good practice to designate for the treatment of paralytic poliomyelitis one or two district hospitals in which members of the staff—physicians, anaesthetists, nurses, and technicians—have knowledge of the special problems involved. Here the supply of respirators, cuirasses, and other equipment would be housed (and these articles occupy a good deal of space). This concentration is better than distributing respiratory apparatus to a number of hospitals, as has sometimes been done in the past. Apparatus of this kind takes much servicing to keep it in condition, and this has to be done by skilled technicians. A respirator, when required, is often wanted in a hurry; and, if it is then found to be out of order, as is sometimes the case, the result may be tragic. If regional centres are set up, as advocated, patients developing respiratory paralysis in any part of the region will need to be transferred to the centre, which will involve sending out a doctor from the centre in an ambulance equipped with a hand-operated portable respirator to tide the patient over the journey.

**Geriatric Service**

The geriatric service is essentially a community service in which family doctors, district nurses, social service agencies, and the hospital all have a part to play. The best place for most elderly, chronically sick people is their own homes, where they have their family and their familiar possessions around them. The reaction of families towards their old sick folk varies greatly from country to country. In some countries, home care by the younger members of the family is accepted as a matter of course, and the public health problem is then a very small one. Elsewhere, institutional care of the elderly chronic sick may be demanded. This is particularly the case when the rest of the family is working outside the home. Instances also frequently arise in which members of the family flatly decline the responsibility of looking after their old people when they are sick; and there may be no power, other than moral sense, to persuade them otherwise. It must be admitted that, even in the most devoted family, the care of a bed-fast, sick, old person can become an almost intolerable burden and can completely disrupt normal family life.

Populations are getting older, and more and more people are becoming subject to the degenerative and irreversible changes of old age. The provision of institutional care for all who really require it is becoming, in most countries, an increasingly difficult problem. If all sick persons are admitted to the general hospital and are treated until their illness is terminated, the hospital will slowly but surely be filled with the chronically
sick to the exclusion of the acutely ill. If, on the other hand, the chronically ill are admitted direct to a separate institution, there may be a serious risk that their conditions will be undiagnosed and the opportunity for remedial treatment lost. The middle course is the setting aside of a standard ward or wards in the general hospital to which all elderly patients likely to need prolonged treatment are initially admitted for diagnosis and assessment. The illness may be an acute exacerbation of a chronic condition and respond to active treatment, enabling the patient to be discharged to his home; but, if prolonged treatment or life-long institutional care is necessary, the patient should be transferred to another institution, a kind of hostel, preferably small (say, fewer than fifty beds) and home-like, where he would remain under the care of the same physician (geriatrician) who looked after him in the general hospital.

This concept presupposes the setting-up of a geriatric service with a consultant geriatrician as head of a team of junior doctors, nurses, and medico-social workers. The geriatrician would be in charge of the beds for diagnosis and evaluation in the general hospital and of the beds for the chronically sick in the neighbouring hostels, so that he should be able to arrange an interchange of patients from one establishment to another to meet clinical changes in a patient’s condition (Fig. 33). He and his medico-

FIG. 33
PATTERN OF GERIATRIC CARE

social worker would visit the elderly sick in their homes on request from a general practitioner or clinic doctor to advise on specialized treatment or, if necessary, admission to hospital.

The burden of looking after a sick old person at home year after year may lead to the breakdown in health of other members of the family. A geriatric service as outlined above can help to prevent this by arranging to admit the patient to one of its institutions for a limited period from time to time to give other members of the family a rest or the opportunity for a holiday.
Some families, especially those in which all the members are at work, can manage to cope with an elderly invalid (not bed-fast) at home if they can be relieved of the necessity of looking after him or her during the day. In cities in which the size of the population justifies it, the establishment of a day hospital for this type of patient is worthy of consideration. The old people are brought to the day hospital early in the morning; they are provided with some simple occupational therapy, which most enjoy, as they feel that they still have a useful place in the world; they are given a mid-day meal; and they return to their homes in the evening. Where day hospitals of this type have been set up, they have proved very popular and have been the means of keeping a certain number of old people out of residential hospitals.

Physiotherapy and Occupational Therapy

It has been wisely said that a patient's rehabilitation should begin from the moment he enters hospital. Not just the cure of the illness or injury, but the restoration of the greatest possible degree of function should be the goal of doctors, nurses, physiotherapists, and, indeed, all who minister professionally to the needs of the patient.

During recent years opinion has been moving in the direction of encouraging patients to undertake controlled activity and rely less on passive forms of treatment. Early ambulation, which is now an almost universal practice, is an example of this trend. The planning of physiotherapy departments should take account of this change of emphasis.

Probably the most important part of the department of physical medicine is the gymnasium, where individual and class instruction in various types of remedial exercise can be carried out under the supervision of trained gymnasts. The gymnasium (which can, if desired, be a detached building of simple construction) should be large and fairly lofty (about 5 metres high) to allow the playing of games, which many physicians regard as an admirable form of active physiotherapy suitable for the treatment of many conditions. Attached to the gymnasium should be changing rooms for male and female patients.

A most useful adjunct to the department is a pool, use of which, by bearing a patient's weight, enables weak or atrophied leg muscles to be developed, e.g., after poliomyelitis. According to the use that is likely to be made of it, and to the funds available, this pool may take the form of a sunken tiled swimming pool, with apparatus for changing and purifying the water, or it may be no more than a simple canvas bath. Whether it is placed indoors or outdoors depends upon the climate of the country.

Although the emphasis of the department should be on activity, a series of cubicles should be provided, each suitably wired, for treatment by diathermy, radiant heat, actino-therapy, and massage. The department
also needs a consulting room for the director, a room for the superintendent physiotherapist, a storeroom for apparatus, some of which is bulky, and a records office.

Some in-patients will be treated in the physical medical department, but quite a number will receive treatment in the wards. Most of the patients attending a department of physical medicine will be out-patients. For some of these, individual treatments may be prolonged, so adequate space for waiting must be provided, as must facilities for light refreshments and sanitary accommodation.

A most useful small section, which today is often added to a department of physical medicine, is one that aims to re-educate a severely handicapped person in what may be termed “daily living”. It consists of a mock-up of rooms in a private house in which, for example, a woman completely paralyzed in both legs and confined to a wheelchair can be taught, with the aid of a few simple gadgets, to get in and out of a bath without aid, or a woman with only one arm can be shown how to run her kitchen efficiently and thus regain a measure of independence. A great many ingenious devices of a simple nature have been invented to help such handicapped people and these need to be installed in the patient’s home, which again emphasizes the close contact that must exist between the hospital and life in the community. Public health personnel and social workers should work closely with this unit.

The department should be in the charge of a physician who has undergone a course of training (about three years) in physical medicine and who devotes his full time to the practice of this specialty as director of physical medicine. It is essential that the department be under direct medical supervision, primarily to ensure the safety of patients, but for another reason as well. Physiotherapy, especially of the passive kind, often gives a feeling of comfort and satisfaction to a patient long after its therapeutic value has passed. Unless someone has authority to discharge such a patient from further treatment (and the physiotherapist does not have this authority), the cases may “snowball” and the department may become choked with chronic patients who derive no real benefit from the treatment.

The director of physical medicine should be assisted by a number of physiotherapists and remedial gymnasts who will apply to the patients the physical procedures prescribed. The supervisory physiotherapist should be responsible for the smooth running of the department and the allocation of duties and should participate in the treatment of patients.

Physiotherapy sometimes has to be continued for many weeks or months. For people living far from the hospital, the time and effort spent in travelling may be considerable and, in some instances, may involve much absence from work. Where practicable, physiotherapy clinics should be set up in populous areas. These may be served by, but be some distance from, the hospital, possibly in health centres, so that the problem of travel
may be partly overcome. Such peripheral physiotherapy clinics should be staffed by the hospital and come under the immediate supervision of the director of physical medicine of the hospital.

Occupational therapy is often associated with the department of physical medicine. It is of two kinds: therapeutic and diversional.

Therapeutic occupational therapy is designed primarily to help an injured workman to re-educate his muscles and regain his skill by setting him to work under supervision on tasks similar to those on which he was formerly employed. This entails the setting-up of a workshop in the hospital grounds or in an ad hoc rehabilitation centre equipped with various types of machinery worked by hand or treadle, with tools for carpentry, and other equipment.

Diversional occupational therapy has more of a psychological than a physical impact, and is intended to help a patient get better by stimulating his interest, relieving his boredom, and making him feel that he is capable of doing a useful job. It may take a number of forms, such as basket-making, toy-making, painting, or leather work. It is usually done in the wards or in day hospitals for old people or psychiatric patients.

It is useful to make a distinction between the occupational therapy department, which is mainly directed towards improvement of the physical condition of the disabled, and the resettlement centre, in which invalids learn new tasks adapted to their remaining physical abilities. The first one is obviously a part of the hospital or of the rehabilitation centre. The second one is more highly specialized, and is equipped with heavy machinery modified to suit the abilities of the handicapped. The latter is often organized by industry under the supervision of the ministry of labour.

**Dental Department**

The dental department in a district hospital should be largely a referral centre for cases of diagnostic or operative difficulty sent to the hospital by dental surgeons either in private practice or working in clinics. The services of the hospital dental specialist are also needed for collaboration with the orthopaedic (or general) surgeon in the treatment of fractures of the jaw. In addition to the above functions, the dental specialist should exercise general supervision over peripheral dental clinics dealing with adults (especially expectant mothers) and caring for the dental welfare of healthy children.

A convenient type of layout for the dental department of a district hospital is a pair of dental surgeries with a recovery room between, the latter being fitted with basins of varying heights for patients to spit into. This pattern can be repeated if the department is likely to be a large one. The department, like other out-patient departments, should have its own waiting room. The surgeries should have sound-deadening floors and ceilings.
Two or three beds should be made available to the dental surgeon for operative dental cases needing a day or two in hospital.

In hospitals with units for plastic surgery, a dental surgeon with highly specialized training will be needed to work with the plastic surgeon in the treatment of facio-maxillary injuries. In these centres, fairly extensive laboratory facilities are required for the making of prosthetic appliances.
CHAPTER 10

The Technical Medical Services

Surgical Department

At the present time, about half or more of the patients occupying beds in general hospitals are there for surgical treatment. This proportion varies from country to country and from time to time. In recent years there has been a tendency for the proportion of surgical patients to rise, and additional operating room facilities have been added to many hospitals, even though there has been no increase in the total number of beds. The possibility must therefore be envisaged that the operating department may have to expand even when other parts of the hospital do not. In addition to the fact that there is an increase in the number of patients needing surgery, new surgical procedures are being developed, some of which require that the patient be in the operating room for a considerable length of time. Longer operations, of course, tend to increase the demand for operating space.

The operating suite

Today it is normal practice to group operating rooms together to form a single surgical department, rather than to distribute them about the hospital (Fig. 34). Formerly it was customary to provide individual operating rooms close to the various surgical wards, and this was convenient because it reduced the distance patients had to be moved between the ward and the operating room. But there are many objections to this arrangement, the most serious being that it lacks flexibility, since each operating room is for the exclusive use of one ward. It is also likely to be wasteful in that it may be difficult to arrange the almost continuous use of each operating room. Considerations of hygiene also point to the advantage of grouping the operating rooms together in a department in which high standards of asepsis can be maintained by a highly qualified theatre superintendent. Finally, the standards now
established for air hygiene in the operating room demand a complicated and expensive ventilation system; it would be difficult—indeed, almost impossible—to provide this standard of ventilation at a number of different points around the hospital.

Although the operating rooms should all be grouped together in one department, they can, of course, be used for many different kinds of surgery. We must therefore consider to what extent the various operating rooms should be specially designed. It may be said that, in general, most types of operation can be carried out in a well-designed, standard operating room. Standard operating rooms provide the maximum flexibility in use; they also facilitate maintenance. A modern operating room must be closed from time to time for maintenance. If all the rooms are for specialized surgery, then the surgeons affected by the closure of one may find it difficult to work elsewhere; but, if the rooms are of a standard type, there will be no difficulty.

There are, however, some exceptions. It may be wise, in hospitals above a certain size, to have one or two theatres that are somewhat larger than the standard size. This will facilitate certain special operations for which a great deal of bulky equipment is needed. It may also be convenient to arrange it so that one of the standard rooms is generally used for orthopaedic surgery and to provide a room for applying plaster casts immediately adjoining it. In regional hospitals in which very highly specialized operations are carried out, there may be other requirements for special rooms; but, in intermediate or district hospitals, this is generally not the case.

Although ophthalmic surgery can very well be carried out in an ordinary operating room, there may be a case for providing the ophthalmic department
with its own room. Eye surgery does not require much space; and it might be that the treatment facilities in the ophthalmic ward, with a certain amount of upgrading and additional space, could serve for ophthalmic operations and make it unnecessary for eye surgery to be done in the main operating department. If this is done, however, the standard of equipment and air hygiene in the ophthalmic operating room should be equal to that in the main surgical department.

The number of operating rooms required can be determined in round figures from the predicted number of operations per day. This figure can be determined from the number of beds for surgical patients and the expected length of stay of these patients, e.g., if there are 200 beds for surgical patients (all types of surgery) and the average length of stay is ten days, then there will be, on an average, 20 operations per day. From this the number of operating rooms can be determined once it is known how many operations per day each room can be expected to provide for. Here it is important to distinguish between operating departments planned on the American model, without anaesthetic rooms or other ancillary rooms (Fig. 35), and the European pattern, with a full complement of ancillary rooms.

American authorities, using the American pattern of operating depart- ment, calculate two or three operations per day for each room. In contrast, the European type of operating suite is usually assumed to provide for at least six operations per day, on an average. In both cases, these figures take account of weekends and holidays, and of the likelihood that the operating room timetables will not permit continuous use. Thus, for a load of 20 operations per day, seven or more operating rooms would be needed on the American plan, and three or four on the European plan.

American authorities recommend the provision of one operating room for every 50 beds. If it is assumed that half of these are for surgical patients, this amounts to one operating room for every 25 beds for surgical patients. On the European pattern, the provision is about half, i.e., one operating room for 50 beds for surgical patients. These numbers refer to the main operating department only and exclude operating rooms attached to the casualty and out-patient departments, which are extra.

The American operating suite is very simple in design. It consists often of operating rooms in pairs with a very small sub-sterilizing room between them. The procedure is as follows: Before an operation, all the required instruments, dressings, and other supplies are brought from the central supply department in packages into the operating room. The packages are opened in the operating room, and the instruments and other necessities are checked and arranged. The patient, who is probably under sedation, is brought into the operating room. He is anaesthetized in the operating room; and, when anaesthesia is complete, the operation begins. At the conclusion of the operation, and after the removal of the patient, the theatre is cleaned up: equipment and instruments are removed to a wash-up room for washing
and then are returned to the central supply department. American authorities estimate that the average time for the whole procedure is three hours.

In contrast, in the European operating suite, all the instruments and dressings are unpacked in a lay-up room and got ready on trolleys outside the operating room itself. Simultaneously, the patient is anaesthetized in a separate anesthesia room. Thus the operating room itself is not in use except for the actual period of operation. Under this arrangement it is possible for a team of surgeons to perform a fair number of operations in close sequence to one another. This explains why more procedures can be performed in European theatres than in American operating rooms in the same amount of time.

The two different approaches to operating room use and design probably arise not from technical considerations, but from socio-economic ones. In the USA hospitals are used by a large number of surgeons each of whom may do only one operation in a morning. European hospitals, on the other hand, are generally operated by a "closed" medical staff and, therefore, with a limited number of surgical teams. Each team has the use of the operating room on a particular morning or afternoon and performs a series of operations one after the other.

In determining which approach should be adopted for the design of the surgical department, consideration has to be given to the pattern of work likely to obtain in the hospital. If there is to be a limited number of surgeons and surgical teams operating for a whole morning or afternoon, then the European plan will be far more convenient. There is probably little choice between the two systems in terms of building cost, as the European operating suite probably occupies about twice the space of the American unit. Thus, the fact that there are twice as many operating rooms in an American department is offset by the size of the European-style department. However, the differences between the two main patterns of operating suites have decreased in recent years. The USPHS now advocates a patient anaesthetic and transfer room.

The European operating suite includes the following rooms and facilities:

1. The operating room itself.

2. A lay-up room. This room, which connects directly with the operating room, is used to prepare trolleys with all the equipment needed for an operation. Much of the sterilized material comes to this room in packages from the central supply department. A probable exception is the surgical instruments themselves, which may be sterilized in this room or, preferably, be put into a "pass-through" sterilizer in the wash-up room and removed from the other end of the sterilizer in the lay-up room.

3. The wash-up room. This room, opening immediately off the operating room, contains sinks and disposal lifts. All used and dirty material
goes into this room. Some items are sent away immediately by the disposal lifts; others are rough-washed before return to the central sterilizing department. The surgeon's instruments, after washing, are put into a "pass-through" sterilizer.

(4) Anaesthesia room. This room, which should also open directly into the operating room, is equipped permanently for the use of the anaesthetist; and all patients pass through this room, to be anesthetized there before being taken through for surgery. Some anaesthetic gases are explosive, and elaborate precautions are necessary to guard against sparks in the anaesthesia and operating rooms. All electrical fittings of every description in these rooms must be of special spark-proof design. Such fittings are available on the market. Precautions are also needed against static electricity. These include control of humidity in the air-conditioning system, special grounding built into the floor, and attention to the type of fabric used in the operating suite. Expert advice on these precautions must always be taken.

(5) Exit room, or exit bay. Immediately on leaving the operating room after his operation, the patient must be covered with blankets and made ready for removal to the recovery ward. It is desirable that this should not take place in an open corridor, but that a small room or space be provided for this purpose.

(6) Surgeons' scrubbing-up room: the room in which the surgeons scrub up and put on sterilized gowns, gloves, and masks.

All the rooms described above form part of the operating suite and interconnect. They are all served by the ventilating system, and it is important that positive pressure be maintained in both the operating room and the lay-up room. The pressures in the system should be such as to make it impossible for air to flow into them from any of the other rooms or, especially, from the corridor. All the air entering the operating and lay-up rooms must pass through the ventilation system, which must include filters that eliminate all dust above a certain particle size. A very low-efficiency filter or bird screen is followed in the system by a filter with a minimum of 68% efficiency in the removal of particles in the 1-5-micron range. This medium-efficiency filter seems to prolong the life of the more expensive 90% efficiency filter, which removes any organisms that could multiply in the coil of the air-conditioning equipment. Maintenance of the filters must be thorough, and their performance checked, preferably by manometers across the filter beds. It is particularly important that air should flow from the operating room into the wash-up room and be extracted from there, and not in the reverse direction. The establishment of the correct relative pressures for all the rooms in the operating suite is a difficult technical matter and requires a highly complicated design. The system should be carefully tested by smoke tests before the operating rooms are put into use and from time to
time thereafter, to make sure that the designed rates and directions of air flow are, in fact, being maintained.

It is important that movement of persons from room to room should be kept to a minimum during operations. It has been shown that movement by staff increases the bacterial counts and tends to upset the proper circulation of air. Doors should be provided between all rooms and should not be of the double-swing type. Pairing of operating rooms to enable them to share the lay-up and wash-up facilities leads to some economy, but presents difficult problems in air hygiene and in contact infection by staff from different teams, and is best avoided on that account.

In an operating department on the American plan, the suite consists essentially of the operating room and a small sub-sterilizing room. A room is sometimes provided in which the surgeons may scrub up and don their gowns, but often this function is carried out in the corridor—a practice not to be recommended.

Apart from the operating suite itself, the surgical department contains a number of other rooms. There are changing rooms, lavatories, showers, and toilet facilities for medical and nursing staff; store rooms and instrument rooms; a common room and staff rest rooms; and offices for the theatre superintendent and the anaesthetist.

In recent years attention has been given to the planning of the department as a whole in such a manner as to reduce the risk of infection being brought into the operating suite itself. This is done by establishing a clean zone, which includes the operating suites and the corridor immediately leading to them. In order to make sure that this zone remains clean, staff entering the department have to pass into it through changing rooms, where they dispose of their outer garments and put on gowns and sterilized overshoes. Similarly, the patients being brought in for operation pass through an interchange room before reaching the clean zone. Here their ward bedding is removed, and they are placed on a clean trolley and provided with sterile coverings before being transferred into the clean zone. Supplies are brought into, and removed from, the clean zone by lift, so that no porters need enter. Dirty and infected material must be disposed of directly from the wash-up rooms, and must not be brought out again through the operating suite. It can leave the wash-up rooms either by lift or by passing through a hatch to the open area or to a corridor or gallery outside the operating surgical department and completely cut off from it.

The equipment of the operating suite requires careful study. The operating rooms themselves are now, in many countries, provided with anaesthetic gases and suction piped from a central supply system. These rooms also require a variety of electric points to which various items of equipment used by the surgeons can be connected. The choice, position, and arrangement of these services in the operating room is a matter of highly specialized design, to which great attention should be directed.
The use of a central sterilizing and supply department reduces the problem of over-heating from sterilizers within the operating suite. The only sterilizers now required are small, high-speed, automatic autoclaves designed to sterilize the surgeons' instruments only. These are, however, a source of heat, and special measures must be taken in the design of the building and its ventilation to make sure that this heat is effectively removed. Otherwise, it may cause serious discomfort to the staff and interfere with the operation of the ventilation system.

The usual size of operating rooms is approximately six metres square, which is adequate for most purposes. Domed shapes have been advocated for operating rooms, but these present serious disadvantages when compared with the simple, square room. The most serious of these disadvantages concerns the ventilation. The best systems of ventilation all involve the passage of a strong current of air across the room, often downwards, sometimes from side to side. It is much more difficult to arrange for this air flow in dome-shaped rooms. Further, the corners of a square room provide useful space for trolleys and other items of equipment that can thus be kept out of the way of the surgeons.

Natural lighting from windows is not recommended for major operating rooms. The lighting of the operating zone is generally by specially designed movable lamps suspended from the ceiling. These lamps give effective illumination and can be swung into any desired position. Systems have been proposed for lighting operating rooms by fixed fluorescent lamps or by a very large number of separate lights disposed over a domed ceiling. These, however, are less flexible in practice than the traditional, movable lamp, and have not gained widespread acceptance.

Sometimes closed-circuit television cameras are provided as an attachment to the overhead lamp fitting. In some operating theatres suspended X-ray apparatus is also provided. Sometimes a glass-enclosed gallery overlooks the operating room to house various items of monitoring apparatus and technical staff.

It is common to find that insufficient space has been allowed in the ancillary rooms in operating suites. Investigations of the tasks carried out by the theatre staff in preparing for, and cleaning up after, operations show that substantial space is needed for wash-up rooms, lay-up rooms, and so forth, if good aseptic and hygienic practice is to be observed. As a rough guide, it may be assumed that the combined areas of wash-up room and lay-up room should be equal to that of the operating room itself. The surgeons' scrubbing-up room also needs to allow sufficient space for the surgeon to spread his arms while his sterile gown is put on.

The recovery ward

It is now general practice to provide, as part of the surgical department, a special ward for the reception of patients immediately following sur-
gery. Patients remain in the recovery ward for varying lengths of time, depending on their condition and on hospital policy in this regard. When they are judged sufficiently recovered, they go back to their own wards in the hospital. The length of time for which it is desirable to retain patients in a recovery ward is debatable. In some hospitals it is the policy to keep the majority of patients for a comparatively short time, perhaps an hour or two, until they have recovered consciousness, and then to return them to their own wards. In others, the recovery ward keeps the patients for longer periods, in some cases up to 24 hours. After certain types of operation, intensive post-operative care may be needed for a prolonged period.

The number of beds needed depends on the number of operations performed in the operating suite each day and on the hospital’s policy regarding how long the patients should remain in the unit. The usual provision is about three beds per operating room. The bulk of the beds are generally arranged in a single, open room. A nurses’ station is in this room, very close to the beds; and there are facilities for oxygen and suction at each bed. One or two beds may be provided in cubicles, or curtained-off recesses. Space for the storage of instruments, and a sink are also necessary. Except where policy dictates that patients should stay in the unit for several days, there is no need to provide food service or toilet facilities for patients.

The post-operative ward is generally under the medical supervision of the consultant anaesthetist, as much of its work is concerned with respiratory function. Special nursing staff, under an experienced sister, is assigned to the ward. As most of the patients are unconscious during the greater part of their stay in the ward, continuous supervision is essential. Monitoring equipment can be grouped in a central or lateral glass cubicle.

The recovery ward should be as close as possible to the operating rooms, but it should be outside the “clean zone”. It cannot be conveniently placed within the clean zone because there is a certain amount of traffic of nurses and supplies between the ward and the rest of the hospital.

### Intensive care unit

The facilities and staff needed for intensive care are similar to those required in the recovery ward. An intensive care unit can therefore be advantageously provided in, or closely linked to, the recovery ward. The arrangement of the unit should be similar to that of the recovery ward, as described above. The unit should accept all types of patients when their condition is critical enough to require intensive care.

### Department of Radiodiagnosis

The department of radiodiagnosis is one of the departments of a hospital whose growth can be confidently predicted, hence there is need for generous
planning in the first place and for allowance to be made on the site for considerable expansion to meet future developments in the specialty.

Reference has been made elsewhere to the undesirability of fragmentation of a department within a hospital, and nowhere is this more true than in the diagnostic X-ray department. X-ray machines are costly and have a short life before becoming obsolete. They should therefore be put to the greatest possible use during their lifetime. Radiographers are scarce, so their skilled services should be used to the maximum. Neither of these desiderata is going to be achieved if X-ray rooms are not centralized within the hospital so that staff and apparatus are not wasted.

The X-ray department needs to provide services for in-patients, out-patients, casualties, and patients referred for X-ray by private practitioners. It should therefore be sited between, or readily accessible to, the ward blocks, the out-patient department, and the accident and emergency department. Convenience of access to X-rays from this last department is of the utmost importance to avoid unnecessary handling and transport of badly injured people.

It is desirable that the department should be organized so as to have a "hot" and a "cold" side. The "hot" side will deal at all hours with accidents and emergencies brought to the hospital. When practicable, it should also deal with certain cases coming from the out-patient department, such as return fractures, orthopaedic cases, and those requiring chest films. This avoids the necessity of return journeys and, in some instances, may relieve a patient's anxiety. The "cold" side (which will not, of course, be physically separated) will deal by appointment with patients from the wards, from the out-patient department, and from general practitioners, particularly patients who need preliminary preparation, such as barium examinations, intravenous pyelograms, and other examinations involving the use of contrast media.

The X-ray examination of general practitioners' patients and the furnishing of reports should be accepted by the hospital and regarded as one aspect of general community service. All hospitals, however small, should be capable of "run of the mill" radiography; but the central regional hospital and, probably, some of the larger district hospitals should also have provision, where appropriate, for angiocardiography, neuroradiology, and other highly specialized procedures.

So far as possible, general purpose machines should be installed, as they increase the flexibility of the department. Sometimes the mistake is made of installing more than one X-ray apparatus in a room, which means that only one can be used at a time. The X-ray machine rooms should be rectangular in shape and about five metres by four metres in size. The number of dark rooms should be kept to a minimum to economize in staff. The conventional pattern has been to place a dark room between each pair of X-ray rooms and to have a pass-through tank to a wet-viewing room or
space; but, in a large department, a single dark room to which cassettes are sent on a conveyor belt is a better arrangement (Fig. 36). Better still, if funds permit, is the installation of automatic processing units, which almost dispense with the need for dark rooms and their technicians and with wet-viewing facilities, as the films are developed and dried in a very short time.

Ample waiting space is needed in the department for patients on wheeled beds or trolleys from the wards or the accident department, for ambulatory out-patients and patients referred by appointment by outside doctors, and for patients—probably clad in dressing-gowns—who are undergoing serial

**FIG. 36**

ALTERNATIVE LAY-OUTS OF X-RAY DEPARTMENTS

**LAY-OUT A**

WAITING

CONSULTANT  ANGULAR ACCOMMODATION

X-RAY  CHANGING

**LAY-OUT B**

WAITING

CONSULTANT  ANGULAR ACCOMMODATION

CHANGING

DIAGNOSTIC  X-RAY

CHANGING

DIAGNOSTIC  X-RAY
examinations that may be spread over several hours. For this last group, separate sitting rooms should be provided for each sex. There should also be plenty of cubicles for undressing (about four to each X-ray room), as shortage of these can be a serious bottleneck.

For barium examinations, a suite of rooms is required that consists of a barium kitchen, a room for each sex for rectal wash-outs, a W.C. for each sex, and one or two small rooms in which patients can lie down and rest before going home.

Adequate office and ancillary accommodation includes a record office for registration of patients; space for the filing of current X-ray films (films of previous years can, if desired, be filed in some other, but conveniently accessible, part of the hospital); a small room for the storage of unexposed films (this must be protected against stray radiation to prevent fogging); and a room with a sink for the storage of reagents and for the making-up of solutions. Mobile X-ray machines will be needed, and storage for them should be provided in the department. Each radiologist needs an office, generously equipped with viewing screens or boxes, where the reporting on films may be done. As the radiologist may do his reports at odd times, in addition to during routine reporting sessions, a dictating machine is desirable. Office accommodation for radiographers and for secretaries is also needed.

A word should be said about radiation hazards. The radiographic rooms should be designed and the apparatus placed in such a way as to reduce scatter to a minimum. The radiographer making the exposure should be protected by a lead-glass screen, either in the same or in an adjoining room. If a great deal of screening is contemplated, the installation of one or more image intensifiers should be considered.

In large regions where there are many hospitals, it is a good plan to have attached to the central regional staff a competent physicist or electronic engineer who can advise on the layout of new departments, diagnose faults in apparatus, and, with the aid of a Geiger counter, detect stray radiation in the various X-ray departments of the region's hospitals. Such an expert can more than justify his salary; and it is highly desirable not to be completely dependent upon commercial firms for an expert opinion on such matters.

Mention has been made elsewhere of the desirability of installing a stationary miniature X-ray set in large and busy hospitals. It should be housed in its own small suite adjacent to the main X-ray department, and should have its own waiting space, machine room, and small office. All out-patients and casualties (if they are not too ill) should be passed through it, and it will usually serve for taking anteroposterior chest films of patients referred for this purpose by outside doctors. In such cases, it is good practice to make two anteroposterior exposures, one for the hospital and one to be attached to the report that is sent to the doctor. The additional cost is trivial.
Department of Radiotherapy

In a short work of this nature it is not proposed to describe and discuss the planning of a department of radiotherapy, but it may not be out of place to sound a note of warning. Radiotherapy is a dramatic method of treatment. Through the medium of the popular press it has been brought much before the public; and the possession of a department of radiotherapy may be held by some to enhance the prestige of a hospital or of certain members of its staff. This should be the very last reason for considering the establishment of such a department.

Radiotherapy in highly skilled hands can accomplish wonders. In less-skilled hands, it can be a menace; for an incorrectly planned course of treatment may not only bring about serious and painful results to a patient, but may also deprive him of hope of successful treatment if later he comes under more skilled care.

The key to a department of radiotherapy is a team of highly trained and experienced staff—radiotherapists, physicists, and technicians. The establishment of such a department should not even be contemplated unless it is quite certain that such people are available or can be obtained.

The layout of the department calls for a very high degree of technical knowledge. Rooms containing modern supervoltage machines need very heavy protection of their walls and ceilings to avoid injury to persons in other parts of the hospital, and special measures need to be taken for the safety of the staff. Any laxity in these precautions may be calamitous, and involve a hospital authority in very grave consequences.

The radiotherapy resources of a country in terms of men and material should be concentrated in a small number of large departments. The trend towards the use of betatron and cobalt therapy can only reinforce this view. Admittedly, this will entail travelling on the part of some patients; but, for many of them, life itself is at stake; and the quality of the treatment received will compensate for the inconvenience and hardship of travelling. A simple type of hostel accommodation in the neighbourhood of the radiotherapy centre will be appropriate for many.

The centre itself should be based in a first-class general hospital, as patients needing radiotherapy will be suffering from a variety of conditions, and the radiotherapists will need the consultant opinion of a variety of specialists in deciding upon their line of treatment. Except in large radiotherapy centres concentrating on the treatment of malignant disease, it is not necessary or, indeed, desirable to set aside a special group of beds for treatment by radiotherapy, as these may tend to be occupied by patients suffering from a heterogeneous collection of abnormal conditions of very mixed pathology. In the large cancer centres, however, it is desirable that special wards should be set aside for patients receiving radiotherapy, and
that they should be under the direction of nursing staff familiar with the
after-effects of radiotherapy.

The method of selection of patients suitable for radiotherapy needs some
consideration. If it can be avoided, it is not fair to send possibly severely
ill patients to the radiotherapy centre merely for an opinion as to whether
or not radiation treatment is indicated. In a well-organized radiotherapy
service, a radiotherapist from the centre should pay regular, periodic visits
to the major hospitals within reasonable distance and consult at the bedside
or in the out-patient department with the physician or surgeon in charge of
any patient whose condition may call for radiotherapy. If the radio-
therapist agrees that radiation is indicated, the patient is transferred to the
centre for his course of treatment, after which he goes back to his district
hospital or to his home. Follow-up, which is most important in these
cases, can be carried out locally by the radiotherapist on his periodic visits
to the district hospital.

The size of the staff of radiotherapists at the centre should be large
enough to permit one of them to pay visits to outlying hospitals, for this is a
most important part of the service. It also has, incidentally, an educative
value for the clinicians of a district hospital in making them more aware of
the possibilities of radiotherapy and of the types of condition likely to
respond to such treatment.

Of course, if distances are too great—say, more than three hours' journ-
ney for the radiotherapist—it may not be possible to implement a
service exactly as suggested above.

Radioisotopes

Radioisotopes are used both diagnostically (as tracers) and therapeu-
tically in medicine. As in the case of high-voltage radiation, their use
must be controlled by highly skilled personnel, or disaster may follow.
Radioactive isotopes should not be issued to any hospital unless it has
adequate resources in staff, accommodation, and equipment to ensure that
they are used with safety. These resources include the services of a physici-
trained and experienced technicians; a suitably equipped laboratory for
handling the substances, with counting apparatus for measuring radio-
activity; and a protected room or cellar for storing excreta until such time
as they may safely be discharged into the hospital drainage system. Except
under the most unusual circumstances, it is wise to restrict the use of
isotopes for therapeutic purposes to the few hospitals that have departments
of radiotherapy, for there most of the necessary facilities should already
exist. But, even in such hospitals, special ward accommodation needs to be
provided, for patients treated with isotopes become radioactive themselves
for a time; and special precautions need to be taken for the collection,
storage, and treatment of their urine and faeces. Most of the isotopes used
in medicine have a relatively short half-life, so the period during which special precautions must be taken for an individual patient is usually not very long.

Isotopes used for diagnostic purposes (tracers) are given in very minute doses, so the risk of accident is correspondingly less. When it is desired to use tracers in district hospitals and there is no department of radiotherapy, it is probably best to construct a small isotope laboratory in connexion with the biochemistry laboratory.

Laboratory Services

Broadly speaking, medical laboratories may be divided into two groups: hospital laboratories, which are concerned with tests for the diagnosis, prognosis, and response to therapy of disease in individual patients; and public health laboratories, which are concerned with the origin, spread, and control of disease in the community. Members of hospital staffs are interested in laboratories as diagnostic tools; public health personnel are interested in them as measuring rods of community health. There is a tendency to set up two sets of laboratories to serve these two functions, but there is much overlapping of function between them. The individual patient is a member of the community, and the health pattern of the community is reflected in the hospital population. Strictly speaking, the individual and the community should not be considered as separate problems. A unified approach is encouraged if one laboratory service undertakes functions related to the health of both.

Arguments may be advanced to support separate hospital and public health laboratories or, alternatively, to establish a single laboratory service. It is assumed here that, especially in developing countries or those in which expansion of health services is taking place, the arguments in favour of a unified laboratory service outweigh those against it. The present observations are based on this assumption. It is also assumed, for purposes of discussion, that the comments to follow refer to the establishment of laboratory services in a large, general hospital that acts as a referral centre for the smaller hospitals in the area. Research laboratories are not considered here.

Provision of a unified clinico-pathological and public health laboratory service at the intermediate hospital level involves a dual function of which cognizance must be taken in planning the laboratory, selecting the equipment, and recruiting, or training, the personnel. Much economy can be achieved if steps are taken to avoid overlapping in function, personnel, and equipment during the planning stage.

Thought should also be given at the planning stage to the allocation of functions and responsibilities at the regional, intermediate, and local laboratory levels. This allocation will vary from one country to another according
to their degree of development, service demands, and availability of staff. Local laboratories will be responsible primarily for the simpler diagnostic tests and for public health bacteriology. Intermediate laboratories will, in addition, carry out the more complex diagnostic laboratory tests and be responsible for such public health work as the bacteriology of water, milk supplies, virological investigations, and public health toxicology. The central (regional) laboratory will deal with the full range of diagnostic and public health work. In some circumstances, it may be desirable for investigations in virology, toxicology, and complex biochemistry to be confined to the central laboratory. The exact allocation of functions can be made only when all circumstances are taken into account, including the training of specialized personnel.

**Planning laboratory services at the intermediate level**

No specific or uniform detailed plan that would be applicable under all circumstances to the planning of a hospital laboratory can be laid down. The detailed requirements and design will vary according to many factors, such as the service load, the nature and prime function of the hospital, the presence or absence of specialist clinics, the available financial support, and many others. The following comments deal, therefore, with broad principles, not with detailed planning.

Detailed planning can be carried out only after due consideration of all the factors involved and after consultation among the medical authorities, architect, engineers, and those members of the health staff who are responsible for laboratory services. There are, however, five fundamental principles that apply to all hospital laboratories irrespective of their size, complexity, or design.

The hospital laboratory is a valuable investment and an economic asset to the health services. Only too often hospital administrations tend to exercise false economy in the allocation of proposed laboratory space; only too often they fail to realize the magnitude of the reduction in running costs of a hospital that is made possible in terms of in-patient days by a well-planned, efficient laboratory. The average length of hospital stay is reduced by a rapid return of laboratory results, which facilitates early diagnosis, permits a more rapid patient turnover, and accurately controls treatment. By an efficient service to out-patients, the laboratory also reduces the number admitted solely for laboratory investigations. The sum total of patient-days thus saved represents a considerable economy. Still further reduction in over-all hospital costs is achieved by the fact that a dual-purpose laboratory will be involved in immunization schemes, early diagnosis of cancer, and other public health measures in the community that reduce the individual patient-load on the hospital. These potential savings are often overlooked when space, equipment, and personnel for a laboratory are being planned.
Hospital laboratories should be planned on generous lines, not only for the reasons mentioned above, but also because of the rapid development of diagnostic laboratory methods and the resulting increasing demands for space and personnel for laboratory services. It is false economy to plan a laboratory that will require extensive alterations and additions within a few years.

Hospital laboratories, because of the nature of their work, particularly in relation to microbiology, require ample floor space so that the occupational health hazard to staff may be reduced as much as possible. This is especially true with respect to the provision of an adequate common room and of a room for changing clothes. These are often overlooked, and the staff is often exposed to potential respiratory and gastrointestinal infections that, with foresight at the planning stage, might have been avoided. Laboratory accidents, too, can be reduced if overcrowding is avoided.

A close relationship between the intermediate hospital laboratory and the central laboratory, on the one hand, and the local laboratories, on the other, is a basic feature of any successful laboratory system. By the same token, a regular, reliable, technical check-system within individual laboratories and among the various laboratories of the region should be established from the very beginning. Such a system is essential for the maintenance of standards and the accuracy of results.

Finally, it has been said that the surest way for a laboratory to acquire a bad reputation is by failure to send out results promptly. For this reason, an intermediate (or any other) laboratory must, from its inception, inaugurate record and reporting systems that avoid the bottlenecks that tend to plague busy routine diagnostic laboratories.

Functions

The technical functions of a laboratory should be considered not only in terms of the hospital in which it is situated, but also in relation to the area that it serves. It will be concerned with diagnostic laboratory tests not only for in-patients and out-patients, but also for special service clinics, for medical practitioners in the area, for the public health services, and, possibly and desirably, for certain aspects of industry. Because of these multifarious responsibilities, the laboratory will have to carry out toxicological studies and physiological function tests as well as haematological, microbiological, biochemical, and histopathological investigations. Depending on the degree of development that has been achieved, some of these technical functions may be reserved for the central laboratory; but they must be foreseen and provided for when the laboratory is being planned.

The intermediate laboratory has an important training responsibility. It will be responsible for training and refresher courses for staff not only for its own use, but also for the local laboratories in the area. Further reference to the training of personnel is made on page 166.
Supervision of local laboratories is a third function of an intermediate hospital laboratory, and will be carried out by the laboratory director as part of his administrative duties. This supervision involves four activities: (1) receipt and consideration of regular (monthly) activity reports from the local laboratories; (2) regular visits to local laboratories for supervision and control by the director and the chief technician; (3) interchange of staff for periods of special training; and (4) organization of a technical check system to maintain accuracy of technical results. The intermediate laboratory will also be required to act as a pool from which technicians may be drawn to cover periods of leave, sickness, or emergency in the smaller local laboratories in the area.

Routine clinicopathological and public health laboratories are the basic sources of much information of inestimable value in applied medical research. Fundamental basic research may, by its nature and requirements, be confined to central and specialist laboratories; but every laboratory should be encouraged to carry out research projects related to the daily routine activities in which it is engaged. Investigations of this type have demonstrated disease patterns that have provided a firm basis for future fundamental investigations into racial, genetic, nutritional, and environmental factors in demographic pathology. The support of applied research in diagnostic laboratory services should not be looked upon as a luxury but should, in principle, be accepted by every health administration as the very basis upon which the standard and the vitality of its laboratory service will depend.

**Organization**

The intermediate hospital laboratory must serve public health as well as hospital requirements, but should be under the control of a single pathologist-director, who will be responsible for the administrative direction of the laboratory services for the whole region. At a later stage, the volume of administrative responsibility may demand the appointment of a full-time laboratory director with minimal, or no, direct technical responsibility. It is desirable, however, for all professional laboratory directors to continue, so far as possible, to be active in some aspect of the technical work.

The clinicopathological laboratory is responsible for haematological, biochemical, microbiological, and histopathological investigations, primarily for the hospital, but also for the diagnostic and public health needs of the area. The public health functions of the laboratory, because of their nature, will be carried out mainly in the departments of microbiology and biochemistry. This dual function requires some modification of the organization, structure, and personnel of these departments; but the inclusion of public health and hospital diagnostic activities in one laboratory
service will more than compensate for any minor organizational disabilities that may be incurred.

The modern hospital diagnostic laboratory includes four main departments: microbiology, biochemistry, haematology, and histopathology. Depending on the extent of the services rendered, each of these departments may comprise a varying number of subdepartments, e.g., exfoliative cytology, toxicology, blood transfusion, or others.

The accommodation required and the planning of the laboratory are dealt with on page 168. It is important at all stages of planning to keep in mind the need for a free and logical flow of specimens through the laboratories and for an expeditious system of communicating results to the wards and clinicians. The planned flow of specimens and results becomes doubly important for specimens requiring multiple investigations in several departments, e.g., bacteriology, biochemistry, serology, and cytology of cerebrospinal fluids. This problem may be dealt with: (1) by planning an orderly transmission of the specimen from department to department; (2) by arranging for the receiving office to divide the specimen upon receipt and to send a portion to each department; or (3) by making an arrangement for such specimens to be examined in their totality by a suitably trained technician capable of carrying out all the investigations. The final decision as to the method to be adopted depends upon local circumstances. The important point is to foresee the situation at the planning stage and to make arrangements to meet it.

The biochemistry department is concerned primarily with quantitative and qualitative biochemical estimations on blood and other fluids for the purpose of diagnosis. Depending upon the organization of the hospital, it may also be necessary for this department to provide subdepartments to deal with enzyme chemistry, the biochemistry of hormone diseases, and other special investigations. A service for physiological estimations, such as basal metabolic rate, electrocardiogram, and oxygen saturation, may also be necessary if these estimations are not carried out by the clinicians. But, generally speaking, the determination of basal metabolism and electrocardiography and encephalography are under the control of the clinician concerned, at least in large hospitals. Facilities may also be needed for use of radioactive tracer elements. In addition to the above, a biochemistry laboratory associated with public health responsibilities requires a subdepartment of toxicology.

The department of haematology is primarily concerned with the morphology of the blood and bone marrow, but will require several subdepartments. Most important of these is a blood transfusion service, which will be responsible for the regional organization of the blood bank for the area. It will also provide the immuno-haematological services required for blood grouping, the investigation of auto-immune reactions, and an antenatal observation clinic in association with the obstetric department.
In some countries the blood bank is a separate organization, which collects and distributes blood, is responsible for the associated laboratory work, and has little, if any, relationship to the hospital laboratory service. Elsewhere the haematology department of the hospital laboratory bears this responsibility. Under these conditions, the department of haematology, in addition to handling blood from a central bank, has to organize a local panel of donors and include in its laboratory plans facilities for the administration of blood transfusions. It acts as an intermediate station in the transmission of equipment, blood, and blood products between the central and the district laboratories. Stocks of equipment should be kept at the central laboratory, but it should be the responsibility of the intermediate laboratory to ensure that the local laboratories in its area are adequately supplied.

Haematology also requires a subdepartment to deal with the particular problems of blood coagulation and the haemorrhagic diseases. In a large intermediate laboratory, a further subdepartment to deal with tracer radioisotopes as diagnostic tools in blood dyscrasias may be necessary, but it is probable that this will be a function of the central laboratory.

The histopathology and morbid anatomy section also involves supervision of the hospital autopsy service. Although it is desirable, for the convenience of the pathologist, to have the autopsy room reasonably close to the laboratory, it is not essential. The planning of the mortuary should, however, be carried out only after consultation with the pathologist who, in a busy hospital, will spend a considerable proportion of his time in that area. The standard of medical practice in a hospital depends in no small measure upon the standard and comprehensiveness of its autopsy service. Every effort should therefore be made to arrange a service that will be able to carry out autopsies on all patients dying in the hospital.

In addition to the autopsy and surgical pathological services, there are two other functions that are the immediate responsibility of this department: frozen sections and exfoliative cytology. When a pneumatic tube system is provided in the hospital, it may be used for sending the specimens to the laboratory. In this way the specimen reaches the pathologist without delay and is dealt with promptly in an area in which all facilities are in constant readiness. However, for certain specimens a tube system has been found unsatisfactory. In those instances, the pathologist must perform some procedures in the operating block.

Exfoliative cytology has, in recent years, become a regular feature of laboratory services. In most hospitals it originates in the pathology department; occasionally it is associated with the morphologists in the department of haematology. Not infrequently, it is organized by clinicians, especially gynaecologists, who have a special interest in the field. In view of the facts that it is mainly concerned with the diagnosis of malignant disease and that its findings require confirmation by a formal biopsy, it is
desirable that this service should be organized under the department of histopathology.

As already stated, the microbiological department is an essential part of a hospital laboratory. But, in the broader context in which this monograph is cast, it should be planned, in addition, as a public health laboratory service for the region. This will mean an extension of its responsibilities beyond those of the usual hospital laboratory, which is mainly concerned with the identification of organisms as causative agents of disease in a particular patient. The public health responsibilities of such a laboratory call for the establishment of a related department of epidemiology concerned with the community as a whole, with the continued observation of communicable disease patterns, and with the environmental source of infection in particular patients admitted to the hospital. Such an epidemiological section should not be concerned exclusively with communicable diseases: the community patterns of many other diseases, such as neoplasia, nutritional deficiencies, and metabolic disorders, also lend themselves to epidemiological analysis, and should be the concern of this subdepartment. A further responsibility of this section and of the department of microbiology would be the investigation and control of hospital sepsis throughout the area.

Subdepartments to deal with virology, mycology, and parasitology should also be established. Depending upon local circumstances, a subdepartment of medical and veterinary entomology, to work in conjunction with that of epidemiology, might also be required.

Although subdepartments are not required for such functions, the control of sterility in the central sterilization and syringe services would be the responsibility of the department of microbiology.

The question is often raised, in planning hospital laboratory services, whether they should be centralized or should have substations in wards and in out-patient and special clinics. Provided the system for submitting specimens to the laboratory is expeditious and the laboratory has adequate space, equipment, and personnel, there is no advantage to be gained by establishing substations. There are, indeed, many disadvantages, including a lack of direct supervision by the pathologist, duplication of space and equipment, increased costs, extravagance in staffing, and a risk of lowered standards of technical accuracy.

**Personnel**

Laboratory staff may be divided into the following categories: graduate (medical), graduate (science), technicians, laboratory assistants, administrative staff, and auxiliary staff. The first three groups are considered professional personnel.

In the hospital laboratory, the senior pathologist should also be the administrative head, but it is important that he retain personal responsibility
for some aspect of the technical work. It is essential that his status be equivalent to that of the senior professional heads of clinical departments (physicians, surgeons, and others). His position should be that of a consultant to the clinicians with whom he is associated in the hospital and to the public health and general practitioners in the area.

The number of other medical staff members depends upon the volume of the work and the size of the various departments. So far as possible there should be a fully qualified professional (medical) head of each department. Department heads, in addition to their general training in pathology, should have had considerable postgraduate experience in the specialty of the department. In a large hospital, they should have consultant status.

One of the important functions of a hospital laboratory is the training of personnel. An adequate number of trainee pathologists should therefore be included on the professional staff. The trainees, to obtain a thorough grounding in general pathology, should circulate through the various departments, after which they should concentrate on one of the specialties of pathology. Their training should include lectures, practical experience, and the fundamentals of laboratory administration.

Science graduates will carry a greater or lesser responsibility according to their seniority and will be concerned with the subjects for which their academic training has particularly prepared them (bacteriology, entomology, biochemistry, and so forth). Suitably qualified science graduates may be appointed as heads of the departments of biochemistry and microbiology. Specialist personnel will also be required to head some of the subdepartments such as epidemiology, toxicology, or parasitology. These may be medical or science graduates, according to the needs of the section.

The backbone of any diagnostic laboratory service is the fully trained and registered technician. Training of such technicians varies from country to country. In some, it is by a full-time, systematic course, which may, or may not, be followed by a period of practical experience before registration is granted. In others, full-time training and practical experience alternate over a period of several years. In still others, the basic training is by an apprenticeship system, supplemented to a greater or lesser degree by formal instruction. Whatever method is adopted, the practical experience is all-important, and should never be subordinated to a theoretical course of training.

The number of laboratory technicians needed varies according to the work-load and the number of trainee technicians in the laboratory. It may be assumed that a figure of 1000 tests per fully trained technician per month is a fairly average maximum number, but this takes no account of the nature of the tests carried out nor of the amount of teaching and demonstration for which the technician is responsible.

The fully trained technician in a large hospital laboratory tends to become specialized in the work of one particular department. This makes the technician more expert in the subject, and is to be encouraged, up to a point.
However, there should always be a proportion of technicians sufficiently familiar with the work of all departments to be able to take over in emergencies or to meet the needs of the less-specialized local laboratories when sickness, leave, resignation, or emergencies make this necessary.

Laboratory assistants may, or may not, have the same standard of general education as technicians. Their laboratory training is confined to the mastering of a few techniques, often of the repetitive type, and their duties may be confined to one department; but their technical skill and assistance are essential in any laboratory. By practical experience and a systematic course of training, laboratory assistants may be enabled to obtain full qualification. Their number will depend upon the volume of the work in each department and will, to some extent, also depend upon the number of trainee technicians in the laboratory.

The administrative staff is responsible for the receipt of specimens, typing and filing reports, care of stores, bookkeeping, recording of the laboratory work, and other general administrative duties. Administrative staff should have training and some insight into the particular problems of a laboratory, and should be made to feel that they are members of a health team, not merely clerical workers.

Auxiliary staff members are concerned with general maintenance of the laboratory, care of animals, preparation of glassware, general caretaking duties, and so forth. Their duties require no special training except in the matter of animal care. This is a skilled occupation, and the personnel responsible for it should have courses of training in animal husbandry and management, animal diseases, breeding, hygiene, and similar related subjects.

Design of the laboratory

Site

Much difference of opinion exists concerning the site of a laboratory in the general hospital plan; but there is no doubt that, if it is to serve its main purpose, the laboratory should be easily accessible to the clinicians. For this reason it should be connected to a main traffic artery of the hospital so that clinicians can pass its doorway as they go to and from the wards. It is also important that it should be readily accessible to the out-patient departments and special clinics.

Despite these requirements, however, it is of primary importance that the laboratory should be built in such a way as to be capable of expansion as the need arises. Siting of a laboratory in a multi-storey building between two major departments or wards will ultimately lead to strangulation of the laboratory or costly rebuilding and resiting. A single- or double-storey building connected to the main traffic artery is probably the most economical and functionally useful, provided the site allows for future expansion. The
location should also favour rapid transmission of specimens to the laboratory. Placement of the autopsy accommodation should be subsidiary to that of the laboratory, not vice versa.

Inclusion of public health responsibilities in the laboratory should not be used as an argument for placing it outside the hospital perimeter. It will best serve the community, as well as the hospital, if it is situated in the hospital complex or, at the very least, within the hospital grounds. From the hospital point of view, the former is undoubtedly the better position.

The plan

A certain degree of flexibility is desirable in planning a laboratory so that future changes, brought about by new methods or laboratory demands, will not involve expensive alterations. It is doubtful, however, whether the high cost of an internal structure permitting complete flexibility is justified. The problem can be met at a reasonable cost by designing the laboratory and its fittings on a suitable module, by using standardized fittings, and by having the service submains piped and ducted in such a way that they are easily tapped in the event of future alterations. Adequate vertical ducts for services are essential, and supply service pipes in false ceilings are preferable to floor ducts.

Laboratories should be so orientated as to have adequate natural lighting, without excessive direct solar irradiation; for this purpose it is undesirable to have windows facing east or west; it is wise to place such neutral areas as staircases, stores, and change rooms at the eastern and western ends of the building, if possible.

The over-all planning of the building should ensure that each departmental head has office space immediately adjacent to his laboratory, rather than at some distance from it.

Temperature control is of great importance in laboratories, and provision should be made for heating or cooling according to the prevailing climatic conditions of the region. Heating by means of floor or ceiling panels has many disadvantages, unless special precautions are taken. Perimeter wall radiators are probably the best means of heating available. The radiators should not be placed under the work benches, but should be installed as suitable wall fittings.

In the department of microbiology, full air-conditioning should be installed so that windows may be kept closed; but it is important to ensure that the air circulation from this department is not connected in any way with that of the remainder of the hospital.

The floor plan of the laboratory must make provision for the following:

(1) Laboratories for each department, i.e., histopathology, haematology, biochemistry, and microbiology, together with such subdepartments as are required.
(2) Associated service areas, such as rooms for media preparation and cold storage; facilities for washing up, sterilization, and storage; and unassigned laboratory space. The last may be used for research, guest scientists, new types of investigation, or expansion of laboratory services. Store rooms should occupy approximately 10% of the total floor area, and locally controlled storage space (i.e., storage space actually located in the various laboratories) should amount to approximately 25% of the total storage area. Particular care must be taken to provide ample space for storing specimens in the department of histopathology. A small museum for the display of interesting morbid anatomy specimens is also an advantage. It is recommended that laboratory storage space should not be used for a dual purpose, such as storing pharmaceuticals as well as laboratory supplies.

(3) Office accommodation for the graduate and technical staff. This space should be planned in close contiguity with the laboratory to which it is related.

(4) Staff facilities, including a common room, library, clinicopathological conference room, changing rooms, and toilet facilities.

(5) Patient accommodation. Provision must be made for waiting rooms, examination cubicles, and toilet facilities. These become particularly important in laboratories in which blood transfusion panels exist and to which ambulant patients are referred for such services as venesection, bone-marrow aspirations, basal metabolic rate tests, and the collection of faeces for tests for amoebeae.

(6) Administration. This accommodation includes the receiving office (at which specimens are received, numbered, and registered) and space for secretarial and typing staff and other administrative personnel. It must therefore be planned in such a way that the flow of specimens to the laboratory, on the one hand, and the return of reports to the wards, on the other, are rapid and easy.

(7) Animal accommodation. Accommodation for animals should be planned in a nearby but separate building, and will vary according to the type of animal to be housed. In air-conditioned buildings with an adequate cut-off air lock or ventilated lobby, animals under experimentation could be placed in the main laboratory building.

Because of the extreme variation in requirements between one country and another, it is not possible to give dimensions or details with regard to the above facilities. In drawing up local plans, however, every effort should be made to foresee future expansion and development and, particularly, to anticipate new methods, such as those associated with the use of radio-
isotopes and automation of laboratory procedures. Automated procedures are developing rapidly, and anyone designing a new laboratory would be wise to include provision for such procedures in the plans. They require, above all, ample space and complete flexibility. The latter is achieved by installing bar power and trough drainage systems so that apparatus may be repositioned freely and frequently without having to install new power and drainage points.

*Physical structure*

In all laboratories there are special requirements for floor and wall surfaces, lighting, ventilation, and other physical features that must be kept constantly in mind during the planning stage.

Floors should be of a resilient, resistant material. The junctions of all walls with floors and ceilings should be covered; and the finish of the walls must be hard, impermeable, chemically resistant, and washable. Tiles, as a wall finish, are desirable only where there is likely to be a great deal of moisture, as in the washing or sterilization rooms. In these rooms a moisture-resistant flooring such as quarry or vitreous tiles is preferable. Cement floors are moisture-resistant, but are cold and unyielding.

Fire hazards should be foreseen, and two doors should be planned for each laboratory in which highly inflammable chemicals are to be used. Chemical laboratories should, if possible, be situated on the ground floor. Doors should open outwards. Special, and separate, storage space must be provided for inflammable substances. There should be fire extinguishers in every laboratory, and other fire-fighting apparatus in the adjacent corridor. Showers located in certain dangerous areas are advisable for the protection of personnel in case of fire or splashing of acid.

Lighting should, so far as possible, be of natural origin, as noted above. In order to arrange this, it may be necessary, in single-storey buildings with deep laboratories, to supplement window lighting with a suitably designed roof and overhead lighting.

Artificial lighting may be of the incandescent or fluorescent type, but care must be taken to avoid glare. This can be achieved by ensuring that the lights are above eye-level and that the finish of the walls, ceiling, and furniture does not cause excessive reflection and glare. Concealment behind glass or plastic ceiling troughs gives a pleasant, diffuse light that avoids the difficulties caused by shadowing in laboratory work.

Laboratory lighting is improved by the use of light pastel shades for furniture and room surfaces. The colours may also be modified and enhanced by a wise selection from the range of fluorescent tubes. On the benches, the light intensity may reach 250 to 500 lux.

The design of laboratory windows depends upon many factors, including the geographical site of the laboratory, prevailing climatic conditions,
presence or absence of air-conditioning in the laboratory, and average solar irradiation. As a general principle, as noted above, it may be accepted that natural lighting by means of adequate window space is desirable; but natural lighting must be tempered by prevailing climatic factors. In hot climates with long hours of bright sunshine, excessive solar heat and irradiation must be excluded. In hot, humid climates, window design depends upon the degree of air-conditioning. The successful utilization of natural lighting in certain climates may call for external louvres, deep eaves, or other means of modifying the degree of irradiation. If protective louvres are necessary, it is better that they be external, vertical, and adjustable to prevailing climatic conditions.

Windows that have inward swinging sections are dangerous if they are adjacent to work benches; hopper-type windows avoid this difficulty. The need to provide insect screening must be considered in some geographic areas when the type of window is selected.

During the planning stage, thought should be given to ease of communication between departments. This is best achieved by an intercommunication system installed at the time of building.

Fittings and fixtures

The essential working space of a laboratory is the bench, which may be of the wall, peninsula, or island type. A wall bench should not exceed 70 cm in depth, but there are advantages in constructing an island or peninsula bench of double width. A bench of this type can be fitted with a large sink at the free end and with a narrow, central disposal trough, surmounted by a reagent shelf or shelves. In this way, the working surface is not interrupted and valuable bench space is saved. Service pipes should run under the back of wall benches and between the two halves of peninsula benches. Benching should be so disposed that work with microscopes can be done on benches running at right angles to the window wall. The tops of the benches used by seated workers should be 80 cm above floor level; those at which workers stand should be 90 cm. Most benches for biochemistry and a small proportion of those for microbiology should be 90 cm above floor level.

Benches should be constructed in unit lengths according to the module of the building. They should be planned for maximum flexibility so that, if it becomes necessary to rearrange the laboratory fixtures, the benching can be easily dismantled and relocated.

The choice of material for bench tops runs through the whole gamut of wood, metal, and laminated plastics. For wash-up sink units and certain special purposes, such as benches for the preparation of organs for histopathological examination, there are great advantages in the use of stainless steel tops. Certain other procedures, such as those of haematology,
permit the use of laminated plastics. For the construction of general-purpose laboratory benches, quality hardwood offers many advantages and, if it is adequately prepared and maintained, is more durable than most materials.

Interchangeable standard cupboards and drawer units are used as supports for the bench tops. They are attached to the bench tops by screws, thus making for flexibility if it is desired to move the benches and fittings. A set of drawers of double width, in which burettes and similar pieces of glassware can be stored, should be included in each laboratory; it is wise to include several such units in the biochemistry department. In planning the under-bench units, one should leave adequate knee space at intervals for the convenience of the workers.

A small office space used conjointly by the technical staff of adjacent laboratories is a useful feature, but the same purpose may be served by including a desk area in each laboratory.

Gas taps and power outlets should be mounted on a base board at the back of the wall benches or beneath the lower central shelf of a peninsula bench. Power plugs should be of the type with built-in, easily replaceable fuses and should be sufficient in number to provide a plug outlet for each piece of electrical apparatus.

Much work-bench space is saved if the laboratory is planned in such a way that one of the wall benches can be used as a "service station" on which all the centrifuges, water baths, colorimeters, or other apparatus used in common by all the workers in the laboratory may be placed. This bench requires numerous power outlets if it is to be effective. It is useful to install the vibration-free balance bench on the same wall. The section containing centrifuges should be isolated from the remainder of the benching and from the wall by a narrow gap.

Basins for washing hands are essential in all laboratories, and should have "elbow type" taps. Other taps in the laboratories should be of the swan-neck type or may have various combinations of swan-neck and bib-valve outlets, according to requirements. Hot water connexion are required only at the basins for washing hands and at the wash-ups sinks.

Waste-pipes must be acid resistant, and it is wise to use polythene piping between the sink outlet and the connexion to the main drainage pipe from the room. Sinks may be of porcelain or stainless steel, depending on local cost and suitability.

Laboratory hoods, especially those in the biochemistry department, should have forced ventilation. This is accomplished by the installation of an extraction system, which may be of the positive centrifugal or ejector type. The latter avoids damage to the fan and motor by corrosive fumes; but the same purpose may be achieved in the more efficient, centrifugal system by using a sealed motor. The type of ducts used depends upon the nature of the fumes. The ducts should, so far as possible, be without
bends and should lead the fumes directly to the atmosphere; they should exit above roof level and away from windows or ventilation intake points.

Culture hoods, with ultraviolet lighting (in the department of bacteriology) and wall cupboards (in all laboratories) are installed according to requirements.

**Equipment**

Without entering into details beyond the scope of this monograph, it is not possible to deal with individual items of equipment. The principles to be kept in mind are that capital equipment should be as versatile as possible and that, when several units of major equipment are purchased (e.g., microscopes), these should be of the minimum number of types consistent with efficiency. Interchangeability of spare parts is a matter of considerable importance in the economical operation of a laboratory.

Standardization of equipment is an economy not only in individual laboratories, but throughout the whole service. It is best achieved by arranging for bulk purchase through the stores department of the central laboratory. Recommendations regarding equipment from the pathologists and senior technicians in the local and other laboratories of the area should be considered annually when the budget is being drawn up and tenders are called for.

A requisition system ensures the distribution of capital and minor equipment and of consumable stores from the central to the intermediate and thence to the local laboratories. Any other system tends to lead to unrelated oversupplies and shortages, with inevitable irregularity in cost structure.

Automation of such procedures as tissue processing, electrolyte and other chemical determinations, slide staining, and glass washing should be considered, when possible, to cope with the shortage of technical staff that now faces most laboratories. It should be remembered, however, that automated equipment is costly to install, requires a high level of technical skill on the part of the staff, and can be a serious source of embarrassment if it is not backed up by competent service from the suppliers of the equipment.

Breakdown of services should be avoided by the maintenance of an adequate stock of stores and by the institution of an equipment replacement system for the local laboratories in the area. Such a system will effect an economy by making it unnecessary to keep spare apparatus at the local laboratories and will minimize delays due to breakdown of apparatus. In making a choice of apparatus, careful consideration should be given to the ability of the sales agents to ensure adequate service and a satisfactory supply of spare parts.
Record system

It has already been stated that an expeditious method of issuing reports is essential if a laboratory is to acquire a good reputation and serve the purpose for which it is intended. It is equally important that the record system should be beyond reproach. It should be planned in such a way that: (1) individual results can be obtained quickly by name or reference number; (2) results or work-load of a department or subdepartment can be analyzed on request; (3) previous reports on any given patient can be easily obtained for comparison with current results; and (4) costs of certain examinations, departments, or subdepartments can be assessed at regular intervals.

Storage of records becomes a steadily increasing problem in most laboratories, but this can be solved by introducing a punch-card data system from the beginning. The use of microfilm also saves much space.

In the maintenance of records, it is of advantage to have a system of regular monthly reports from the local to the intermediate and thence to the central laboratory. Such reports should show the volume of work done in each department and should include statements regarding staff, new developments in the laboratory and the service they are rendering, suggestions regarding improvement of the service, an analysis of public health trends in the area as reflected in the laboratory results, and a progress report on research projects that are under way.

* * *

The above comments are a statement of general principles in the planning of an intermediate hospital laboratory. Details will depend upon local conditions, and can be decided only after a survey and complete analysis of all the factors involved. The survey and analysis should be compiled by those members of the department of health, especially the pathologist, who are responsible for the laboratory services. These authorities should be consulted during the planning stage, and at regular intervals thereafter, by the architect, the engineer, and all others concerned with the design and construction of the laboratory.
CHAPTER 11

Psychiatric Services
in the General Hospital

General Principles

Psychiatric services in the general hospital should, if possible, include: an out-patient department; liaison services for contact with mental hospitals, long-stay annexes, pre- and after-care facilities, and general and psychiatric community services; day and night treatment facilities; and an in-patient unit.

The out-patient department must be the main entrance to the whole of the psychiatric services in the general hospital. Developments in psychiatry point in a direction that emphasizes preventive rather than curative activities, aiming, through out-patient treatment, at avoiding admission to hospital except for diagnostic purposes and short-term therapeutic programmes. If possible, the psychiatric staff in the in-patient and the out-patient services should work in close collaboration.

The psychiatric out-patient department can easily be located in the out-patient department of the general hospital. The psychiatric service should, of course, have its own consultation and waiting rooms; and a number of small rooms are needed for staff members—psychiatrist, psychologist, nurse, social worker, and liaison officer. An appointment system for the patients is indispensable. Emergencies can be dealt with in the same manner as in other departments; often they call for admission of the patient to surgical or medical services.

Liaison services for contacts with general practitioners, public health workers, mental hospitals, long-stay annexes, pre- and after-care facilities, and general and psychiatric community services are of primary importance for the integration of mental health into public health, of psychiatry into medical service, of the whole health service into the community. In the developing countries, the early identification of severe psychosis and the sending to hospital of acutely ill patients present special problems.
A "day" hospital should be an integral part of the psychiatric service of the general hospital (Fig. 37). It can be set up in the community, in connexion with the general hospital, but outside its precincts. In some places, day hospitals are autonomous institutions or are part of a mental hospital or a community service. The USSR introduced this important new type of treatment facility as early as about 1930, followed by Canada and Great Britain. The day hospital is suitable for patients who have good surroundings and families that can have them home at night, but who, although not disturbed enough to need in-patient treatment, are too disturbed to be able to work in the community or to be at home all day and be treated as out-patients.

A psychiatric night hostel is a natural extension of the day hospital. The night hostel provides care for patients in need of psychiatric help who, for financial or other reasons, cannot afford to take time off for hospitalization. It is also suitable for the patient who has already had successful hospital treatment and is able to return to work but who has such inadequate surroundings or family life that he should be cared for in the evening hours. In this case, the patient can sleep at the night hostel. He comes in after finishing his work, has various kinds of socio- and psychotherapeutic individual and group treatment in the evening hours, and leaves the hostel early in the morning after a night's sleep.

Both treatment facilities aim at an average stay of two to three months, which is equal to the average duration of stay of the psychiatric in-patient in the general hospital. About 10-20% of psychiatric patients can be cared for as day or night patients.

The same rooms and wards can be used in turn for the day and the night patients. Facilities can be provided for social club activities in the evening hours for patients from the out-patient department, perhaps together with those for the night hostel patients. Occupational therapy and other service departments of the psychiatric unit can be used for both the day and the night patients, except when the general hospital plans its day unit outside the hospital precincts. Although the latter solution has advantages in the process of rehabilitation and resocialization, it must be stressed that
the differentiation of types of patient may necessitate having day and night patients in a special unit, which forms part of the ward. Another day unit and night hostel and a social club—all three in the same premises—should be planned outside the hospital but be served by the staff of the psychiatric service of the general hospital.

Day hospital and night hostel patients can mingle freely with the in-patients, yet different kinds of approach are needed in their treatment. Modern psychiatry tends to differentiate treatment methods and facilities as much as possible, and this has consequences architecturally and administratively.

Stress should be laid on early, intensive treatment of practically all types of patients. Although some psychiatrists formerly advocated the exclusion of patients with certain disorders from admission to the psychiatric ward of a general hospital, most nowadays recommend probable length of stay as the criterion for admission. Emergency cases and patients requiring short-term treatment should be admitted regardless of the diagnosis. If it seems probable that the length of stay will exceed ten weeks to three months, it is preferable for the patient to be admitted to a mental hospital, provided that it has good diagnostic and therapeutic facilities. Conditions requiring medium- or long-term care require an intensive rehabilitation programme, which is usually better provided in a rehabilitation centre or a good, well-equipped, small mental hospital, with a qualified staff and adequate treatment facilities, than in the psychiatric unit of the general hospital.

Admission of the patient to the general hospital at an early stage of his illness could be promoted by domiciliary services; more awareness of mental health problems by general practitioners, fostered by close cooperation between the unit and the general practitioners (the same applying to the psychiatrist working in the community); provision of both day and night facilities at the general hospital; and the work of the public health and district nurses, mental welfare officers, and others. Most patients will come to the hospital on a voluntary basis, but it might be advisable to take some patients under legal order for a limited time.

It must be possible for mental hospitals to send patients to the general hospital for diagnosis and for short-term treatment. Good co-operation is of as much importance between mental hospitals and general hospitals as between the general hospital and community services.

Although one might wish to keep some patients for more than three months, one has to bear it in mind that keeping too many patients too long would defeat the purpose of early and active treatment for a still larger number. Among the types of disorder that can be effectively treated in the psychiatric unit of a general hospital are attempted suicide, psychosomatic diseases, incipient puerperal psychoses, senile confusion, alcoholism, many kinds of personality disorders and acute personality difficulties, anxiety states, and marked tension.
Inasmuch as the principal aim of the unit is to restore the patient to a normal social life as soon as possible, stress must be laid on the necessity of having a small, active, home-like, and cheerful unit in pleasant, attractively furnished surroundings. A relaxing atmosphere in a comforting physical setting is the first condition for good treatment.

Practically all the patients will be ambulant and will need beds only for their night’s sleep and for occasional daytime rest. Provisions for sleeping are only a background for treatment, but they have to be carefully designed. Small but comfortable one-person rooms are desirable for most of the patients. There can be some two-, three-, or four-bed units, but only a few of them.

Some facilities should be made available for the occasional noisy patient. One or two sound-proof and carefully designed “separation” rooms, which might also be used by patients who are not too disturbed, should suffice.

There is no need to separate the sexes except with respect to bedroom and washing facilities. Patients wear their usual clothes. They should all have their meals together in family-type dining rooms.

The unit should be essentially an open-door one. Closed, locked doors invite disturbed behaviour. Of course, it must be possible to lock a room on occasion; but, with enough well-trained and skilled personnel, such a situation can be a rare exception. A friendly and permissive atmosphere will, in general, prevent deviant behaviour to a degree that renders restrictive measures unnecessary. If such behaviour should occur, it should be treated as an emergency such as can take place on medical or surgical wards. Much attention should be paid to good personnel and, above all, to the “atmosphere” of the unit. With proper knowledge, skill, and morale, the personnel should be able to deal quickly with an emergency.

Individual and group psychotherapy; drug therapy; occupational, art, and recreational therapy; mingling of the sexes in group activities; a small library; plays; and, if possible, a cafeteria and other amenities of “outside” life will keep the patients active and directed towards a quick recovery. There should be many contacts with family and friends. Extended visiting hours should be allowed. For women, facilities for doing their own laundry and, perhaps, some cooking would further the homely touch that is so important as a basis upon which to build other treatment. The activities should include creative and useful work. If possible, patients should participate in the daily duties of the household, and not be passively watching television or listening to the radio. A large, comfortable day-room can be of great help; this room should be inviting, because the tendency of the withdrawn and relatively inattentive patient to retreat into fantasy must be reversed if therapy is to be successful.

The medico-legal aspects of psychiatric care vary greatly from country to country and from place to place. As stated above, patients under some form of commitment should not necessarily be excluded from the psychiatric
ward of the general hospital. Good diagnosis and treatment can prevent the patient's being sent to a custodial ward, a mental hospital, or, in some places, a gaol, provided there are good relations between the staff of the general hospital and the authorities.

Architectural Considerations

Size of the unit

It is reported in the USA that today 70% of all psychiatric admissions are to the psychiatric units of general hospitals. Canada reports 50%. In British literature one reads of attempts to determine how many psychiatric beds a general hospital should have to meet present requirements; a reasonable estimate seems, in most instances, to be 10% to 15% of all the beds in the general hospital. All writers agree that, if a community requires large hospitals and, in consequence, the psychiatric department of the general hospital is also relatively large, then separate units of not more than 16 to 24 beds should be established. If the psychiatric department has 100 beds, it should comprise four or five units.

Location

If possible, the psychiatric department should be located on the ground level or near it. No special requirement needs to be met with respect to nearness to the services of the general hospital, inasmuch as almost all the psychiatric patients are ambulant. However, it is important that the department should not be hidden, but placed in an area that permits a free exchange of patients, personnel, and visitors.

It is advisable to treats the psychiatric unit as a separate wing of the general hospital, but physically linked to it. When the general hospital is built according to a pavilion arrangement, the psychiatric unit should be established in a pavilion in the grounds of the hospital. Ready access to some outside space such as gardens and a small playground is highly desirable.

Design

Most of the considerations that architects should take into account in planning the psychiatric in-patient ward have already been covered. Recommended is a team approach in which architects, psychiatrists, nurses, and administrators exchange ideas and discuss all the problems in an effort to ensure that a proper functional design will result.

Flexibility in the design is indispensable in view of the evolutionary processes in the field of psychiatry in general, and in hospital psychiatry in particular. Sound-control (through insulation and absorption) is very
important. The opinion is frequently expressed that restful colours should be chosen for mental patients, but there is much to be said for a lively, attractive, and imagination- and attention-provoking decor. The whole impression of the unit should be that of a home or a comfortable hostel, rather than of a hospital in the usual sense of the word. Much light, fresh and cheerful colours, ample day-spaces, writing rooms, and cozy rooms where patients can meet relatives, religious counsellors, mental health officers, district nurses, and others are important.

There must be good balance between facilities for active and intensive treatment, in which group dynamics can be fostered and a real unit can be created, and facilities that permit the patient to have some quiet relaxation and privacy.

Many small, one-bed rooms are desirable; larger bedrooms should be subdivided by means of curtains or cupboards to give the patients privacy (Fig. 38 and 39). Patients who are physically ill can—as at home—be

FIG. 38
BEDROOMS FOR PSYCHIATRIC DEPARTMENT

BEDROOM A

BED
DESK
CUPBOARD
CURTAIN

BEDROOM B

BED
DESK
CUPBOARD
WC

nursed in their rooms. Alternatively, one of the larger rooms can be temporarily transformed into a kind of sick-ward. If necessary, transfer of the patient to one of the other wards of the hospital should be considered.

One or two isolation rooms should be enough for a unit of 24. As previously mentioned, these should be designed so that they can be used
for the ordinary, quiet patient, too. The special design of the isolation room entails attention to sound-proofing and extra safety measures (to prevent suicides). Well-qualified nursing personnel and modern drugs, when indicated, can help in dealing with transitory periods of unrest.

![Psychiatric Ward Diagram]

It is highly desirable that a unit for 24 be built so that it can be subdivided into smaller units, say two for 12 patients each or, better still, four for six patients each. The doors should open inwards so as to keep the corridors uncluttered and in full view.

If possible, a hairdresser's and small beauty parlour (perhaps shared with the rest of the hospital) should be included in the design of the unit.

The architect need not pay much attention to wards for insulin or electroconvulsive therapy. The latter can, if necessary, be administered in the patient's own room or in one of the doctor's rooms. Insulin can be given in a bedroom or, if there is room available, in a small, well-designed ward that could also be used as a sleeping room for some patients.

**Staffing the Psychiatric Service**

In staffing the psychiatric unit, one must bear in mind the manifold functions of the psychiatric services in general hospitals. The principal therapeutic resource of the psychiatric service is the number, skill, and
interest of its staff. Numbers are important, but quality is even more so. Knowledge and skill and ability to teach skill to others are needed.

Some remarks have to be made concerning the nursing staff, which has to be present, in three shifts, and work the whole day with the patients. The nurse/patient ratio must be high in the psychiatric wards. Work with psychiatric patients takes much time for each of the patients personally, as nurses play an important part in the socio- and psychotherapeutic team approach to mental illnesses, apart from their function as nurses in the traditional sense.

The psychiatric unit needs a strong, permanent nucleus of experienced, well-trained nurses. But it is important that nurses from other departments work with the psychiatric nursing staff. By the same token, psychiatric nurses should work from time to time in other departments.

Student nurses should be assigned to the unit only under the direction of a graduate nurse competent in the teaching of psychiatric nursing. It is important that student nurses' experience should not be considered primarily as a part of the staffing, but rather as an educational programme. Attendants, aides, and orderlies will also be needed; and proper in-service training is necessary for all of this staff.

The same remarks apply to the psychiatric social workers as to the nursing staff, to some extent. Social workers have to operate both within and outside the hospital: within, in close co-operation with medical and nursing staff; outside, as part of the community services team.

The composition of the psychiatric team will be simple for small units but somewhat differentiated when the service becomes larger. Administrative, socio-therapeutic, and individual and group psychotherapeutic functions tend to become divided, which requires co-ordination under the competent leadership of a full-time psychiatrist, who would be in charge of the whole service, or of a team of psychiatrists, in the case of large services. Part-time psychiatrists—preferably from the community and the mental hospitals—who could each take responsibility for a part of the psychiatric work (psychotherapy, group discussions, supervision, training, teaching, and so forth) could contribute to the work of the hospital team.

Experience in community work and ability to work in a team, plus stability and interest, are fundamental attributes of the psychiatric staff members, who have to work closely with general practitioners and various medical specialists. This is particularly true at a time when psychiatry, in the interests of the patient and thus also of psychiatry itself, is being re-integrated into the whole of medical science. Clinical psychologists are indispensable members of the team, and clinical sociologists can also make a significant contribution. Occupational, recreational, and art therapists play an important role, as they, like nurses, spend so many hours a day with the patients, during which they observe them, give the patients an opportunity to express themselves, to communicate and to interrelate.
Ancillary personnel and even well-trained and closely supervised "community volunteers" can be used effectively on the staff of a psychiatric department today. Good staff supervision and assistance, especially in psychiatry, are of the utmost importance, because all staff members work under constant emotional pressure.

Education and Research

Apart from the general hospital’s functions in education, teaching, and training at the university level (performed mostly in regional teaching hospitals), in-service education and training are necessary for personnel of the psychiatric staff. When the general hospital is a teaching hospital, psychiatrists, psychologists, psychiatric social workers, nurses, and occupational therapists should share the teaching and training duties. Whether or not the general hospital is a teaching hospital, it is wise for the staff of the psychiatric unit to participate in teaching the interpretation of behaviour; personality growth and development; clinical psychiatry; and the biological, psychological, and sociological aspects of personality formation and disturbance. This can be accomplished through lectures and, especially, group discussions, for the staff of the psychiatric services and for the staff of the other departments as well.

Medical students and students in psychology, social work, nursing, and other relevant fields can profit from the presence in the general hospital of a good psychiatric service. In many general hospitals, clergymen, teachers, jurists, and parents also get information and education through group discussions with members of the psychiatric staff.

The research programmes of the whole general hospital, and especially research in psychiatry, all of which should be directed towards the study of the whole man, can be promoted and enriched by a competent psychiatric service.

Summary and Conclusions

L. A. Osborn,¹ writing about psychiatric services in general hospitals, states, "In the hospital practically all patients can be managed under general hospital conditions. Such hospital conditions must be functionally designed for the purpose... Modern psychiatry is essentially the personal aspect of medical practice." He describes patients in general as "insecure people trying to find assurance", and stresses the fact that the symptoms that may deter hospital administrators from admitting psychiatric patients to general hospitals may often be simply an expression of the fact that they are still more insecure than patients with somatic diseases. A staff that is instructed in the meaning of the symptoms that can occur in psychiatric

patients can deal with them adequately so that the patient need not give more
trouble than can be tolerated in a general hospital setting. This same writer
also stresses the point that the psychiatric unit has to work as openly and
freely as possible: "If illness takes away a person's capacity to act freely,
with self-direction, the treatment programmes should be calculated to restore
this capacity."

Psychiatry as a basic medical science, as a field of therapeutics, and as a
branch of public health and preventive medicine can also play its part in the
general hospital's endeavour to improve education, training, and research.
The general hospital can, by having its own psychiatric facilities, help the
community in detecting, diagnosing, and treating at an early stage patients
who are then still relatively easy to treat.

What has already been written above about the psychiatric unit demands
a great deal of special consideration on the part of the administrative direc-
tion of the general hospital. The location of patient records after discharge
calls for careful study, especially since psychiatric files contain much inform-
ation about social and emotional facts and circumstances, disclosure of which
would do serious harm. Treatment in a modern psychiatric unit requires
some autonomy for the psychiatrist-leader of the team, but close co-opera-
tion between the general superintendent (administrator, director) of the
hospital and the psychiatrist-in-chief is of the utmost importance in order to
prevent the isolation of the psychiatric department and unnecessary difficulties
in communication and integration. A psychiatric unit in the general hospital
is most effective when it offers a service that is indispensable to the operation
of all other services.
CHAPTER 12

Non-Medical Services and Facilities

Storage in the Hospital

In developing countries, it is not always possible to ensure a regular and quick delivery of supplies. Therefore, the hospital administrator often sends an order at periodic intervals—one, three, or even six months—and receives only a part of what he has requisitioned. This unfortunate practice has many drawbacks. First, it becomes necessary to organize the storage of a great bulk of material on the spot; and the problem of keeping under safe conditions such supplies as anaesthetics, dangerous chemicals, and thermostable preparations is similar to that in the national central stores. Second, there is a natural inclination to ask for more than necessary because previous experiences have shown that the delivery can be made weeks, or even months, after the expected date. Consequently, there is a tendency to accumulate more than is actually needed in order to avoid the risk of running short of essential items. This may lead to waste or to serious accidents so far as items having a limited life are concerned.

Finally, one has to consider what kinds of items have to be stored centrally and what others can, or must, be obtained locally. For some of them the answer is easy. It would be ridiculous, for example, to have central stores of fresh eggs or milk from the country and to send them back to a local hospital. A great deal of food can be bought locally through annual contracts with farmers. For other foods, such as rice, potatoes, or spaghetti, the central store could doubtless obtain lower prices from a wholesaler, but the cost of conditioning and transporting and the risk of deterioration in hot climates must be taken into consideration. The same is true for many utensils, such as crockery, glassware, and furniture, which can be obtained locally and thus save the cost of packaging and transporting and avoid the risk of breakage.

All these problems must be solved on a practical basis, and may lead to allowing local hospitals a purchase budget of their own, which necessitates some measure of control. It is often recommended that inspectors be

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attached to the national or regional central stores and visit the local hospitals, control their purchases and contracts, inspect their stores, examine their requisitions, and take measures against an undue accumulation of items. In any case, a competent storekeeper and a well-organized and strict administration of stores are necessary.

There should be only one hospital store; and it must be of adequate size, as determined by the planned intervals for deliveries. It must have convenient access and unloading facilities for lorries.

Stores are one of the most likely sources for the outbreak of fires, and special safety measures against fire, including automatic sprinklers, should be installed. The common practice of using a basement for storage is dangerous from the point of view of fire. The storage of highly inflammable substances is subject to special requirements in most countries.

Catering Service

Hospital catering has to serve both patients and staff. The total number of staff in a modern hospital is roughly equal to the number of beds, so the number of meals served to staff will be at least equal to that served to patients.

Generally speaking, it is now considered best to centralize the catering and to prepare all the food in one central kitchen. This is much more economical than equipping and staffing a number of separate kitchens to serve various parts of the hospital. There is a limit to the advantages in centralizing catering, however; and in the very largest regional hospitals, it may be desirable to have two kitchens serving separate parts of the hospital but using central stores and preparation.

It is impossible to overestimate the importance of good food for the patients. Many patients will require special diets, and all will benefit from getting the right food in an attractive and appetizing form. The standard of hospital food varies greatly from country to country, but in any new hospital the aim should be to achieve the highest practicable standard.

The planning of the kitchen and catering service is a highly technical matter, on which expert advice should be sought. New techniques of food preparation and food service are continually being developed, and advantage should be taken of the latest knowledge when planning a new hospital.

The standard of hygiene in the hospital kitchen must be maintained at a very high level, and kitchen staff need special training in food hygiene. Wash-basins should be freely provided at many points in the catering department in order to encourage hand-washing by the staff.

Today it is general practice for the food to be taken to the wards from the central kitchen in heated trolleys. The various dishes may be placed in bulk containers in these trolleys and ladled on to the patients’ plates on the
ward; alternatively, individual trays containing a meal for each patient can be prepared in the kitchen and transported to the ward in trolleys or on conveyors.

The latter system is much in use in the USA and provides an exceptionally attractive form of service from the patients' point of view. It does, however, require a high level of mechanization within the main kitchen, where the food is often put on plates on a moving belt. It also requires effective systems of transport that bring the trays very rapidly from the kitchen to the patient. This problem may be simplified by employing heated pellets, but this solution cannot be used for child patients or for mental or geriatric patients. The technical problems involved in this system are considerable, and in some countries may be insuperable.

Bulk service from heated food trolleys is a comparatively simple system and can give good meals. With this system, the plates and cutlery have, in the past, generally been stored and washed up in the ward servers. Now, however, most new hospitals have centralized facilities for washing crockery. Each ward receives two trolleys from the central kitchen, one containing the food, and the other containing clean plates and eating utensils. At the conclusion of the meal, both trolleys return to the central kitchens, and the crockery and cutlery are washed up and stored there.

Central washing-up has much to recommend it. An efficient mechanical washing machine using steam sterilizes the crockery and cutlery as it washes them; and this is, of course, important in the hospital. Machines of this type are uneconomical in ward servers, as the amount of crockery and cutlery to be washed would not justify their use. The removal of washing-up from the ward also reduces the noise and nuisance to patients, and the number of persons who have to work in the wards.

In addition to providing meals for patients, the central kitchen generally provides meals for the staff. Staff dining rooms can usually be planned so that they are immediately adjoining the kitchen and thus facilitate service. Traditionally, in many countries special dining rooms have been provided for different categories of staff; now, however, this is no longer recommended. Instead, a range of different types of dining room can be planned, some on the cafeteria principle and others with waitress service, the price of the meals then depending on the amount of service and the type of menu provided. All should be open to any member of the staff who cares to use them. A certain number of small private rooms should also be planned so that staff members who have visiting colleagues from other hospitals can dine in private. If cafeteria and restaurant facilities of the type proposed here are available on the hospital site, in well-designed buildings that can open on to terraces and gardens, then there will be no need for catering facilities in the buildings provided for housing the staff.

Considerable space is needed for the catering services and the staff dining rooms that they serve. Any subsequent expansion of the hospital,
or increase in the number of staff it employs, will involve further demands on the catering services, and the buildings may therefore need to be extended.

The kitchens require a delivery entrance from the service yard so that food supplies can be delivered directly to them. The best site for the kitchens is probably at ground level. On a sloping site, it is an advantage to plan ground-level kitchens so that they have access to the ward building at basement level. Precautions must be taken to prevent kitchen odours from reaching other parts of the hospital.

The dietitians will be responsible for food for patients on special diets and will require a section of the kitchen set aside for the preparation of these diets. They will also advise the hospital administration on general dietetic measures in relation to hospital catering; and they may have a role in the out-patient department, assisting in certain clinics. They will also have responsibilities in public health and health education in the area served by the hospital.

**Facilities for Administration**

**Office and committee rooms**

The hospital administration will require a considerable amount of space. There must be offices for the administrative staff, the medical superintendent, the director of nursing, and all their respective assistants and secretaries. Meeting rooms are needed for the various committees needed to run the hospital. To the extent that the hospital undertakes responsibility for public health work and for the management of services to the community, further office accommodation will be required for the administration of these activities.

**Records department**

A hospital records system is of vital importance if the hospital is to fulfil its responsibilities effectively. Sufficient space and adequate staff must be provided so that the records department can discharge its obligations.

Various systems may be used for the keeping of patients' records. In principle, it is desirable that there be only one central file for each patient, whether he be out-patient or in-patient. From this it follows that the record-keeping must be centralized under the direction of a records officer. The past practice in which the various clinical services kept independent records is not to be recommended. Under a centralized system, a patient
visiting the hospital for the first time is given an identification number, and a file is opened in his name. On all subsequent visits, his personal file is used, and such additional notes and records as are necessary are added to it.

The central records office needs adequate and well-planned storage for the patients' files. There must also be effective index systems so that, when a patient gives his name, his records can be found immediately.

Although the records are all stored centrally under the control of the records officer, they are sent out to the various departments of the hospital for use by the medical and nursing staff whenever the patient attends as an in-patient or an out-patient. The record folders for all the patients in the ward at any time will be on loan from the records department to the ward concerned. They will be kept in the nurses' station, and can be conveniently filed in a specially designed records trolley, which can be wheeled around the ward from patient to patient during the doctor's visit.

The appropriate records for out-patients attending clinics by appointment can be got together before the clinic begins and held in readiness by the nurse or clinic receptionist. Then, as each patient goes into consultation with the doctor, his records are put on the doctor's desk. When patients arrive at out-patient departments or the emergency ward without previous appointments, their records, if they have visited the hospital previously, have to be found by the records staff and sent as quickly as possible to the department concerned.

Because records have to be sent frequently to out-patient, and sometimes to casualty, departments, it is necessary that the records office be located as close as possible to these areas. It should also be convenient in relation to the wards, though this has somewhat less priority than proximity to the out-patient department, as there is usually less urgency with regard to in-patients' records.

Accommodation for the records office should include a main records room (for which considerable expansion should be planned, as the records accumulate), an office for the records officer, and offices for his staff.

As records accumulate with the years, space for storage may become a problem. Generally, records are removed to a more remote storage area after five to ten years. It is also possible to microfilm old records, a procedure that reduces storage space enormously.

A pneumatic tube transport system connecting the records office with departments using records can be installed in larger hospitals. Where this is available, the records department can be more remote from the out-patient department if need be.

In developing countries, where trained record librarians are few and the out-patient load is very great, it may be best to concentrate effort initially on introducing an effective in-patient record system. Out-patient records can be brought into the system later.
Housekeeping and Maintenance Services

Laundry

Most hospitals have their own laundry, though there is a tendency, under regional planning, to centralize the laundry services of a number of hospitals. There are considerable advantages in doing so, in terms of economy of building and operation. Therefore, an intermediate, or district, hospital either may have its own laundry or may make use of the laundry services within the region. In the latter case, it will have a linen room where dirty linen is sorted and sent out and clean linen is received.

Laundry arrangements are very important from the point of view of control of infection. The dirty linen from the wards and operating theatres may be heavily infected; and even ordinary used linen, such as sheets and pillowcases from the wards, may be a source of serious danger unless carefully handled.

The first principle to observe in laundry arrangements is that dirty and clean linen should be kept entirely separate, both in the laundry or linen room and at the points of use. In general, ordinary soiled linen should be placed in strong canvas bags at its point of origin. The bags, when full, are tied up and despatched by an appropriate route to the laundry or linen room. Seriously infected linen should be put in a metal bucket, or other container with a lid, in a disinfectant solution. On receipt in the laundry or linen room, the linen can be rendered reasonably safe for subsequent handling by passing it through a modern washing machine. Any linen thought to be dangerous should be immediately tipped into a washing machine and laundered. When the linen emerges from this process, it should be safe for the linen room staff to count and sort for despatch to the laundry.

The design, equipment, and management of the laundry itself are matters for expert advice. The clean linen will go to a “clean” section of the linen room for sorting and return to the point of use.

Under the centralized stores and supplies system advocated elsewhere, the various units and departments of the hospital do not themselves maintain stocks of linen. Instead, they receive daily, or at other intervals, trolleys containing stock for an appropriate period. This stock is the responsibility of the central linen or stores department, which subsequently collects the used material, removes the trolley, and replaces all the items used. Under this system the responsibility for protecting stocks against loss is primarily that of the central department, which reports the disappearance of linen in the various units, should this occur.

Boiler house

In cold and temperate climates, where the buildings require heating, a central boiler house for the whole hospital site is likely to be needed.
Engineering advice should be sought concerning the requirements and design of the boiler house. Traditionally, steam has been piped throughout hospitals and used for many purposes, especially for sterilizing equipment. Today, local sterilizing is rare, and it is often possible to dispense with a general steam-supply system. However, steam is needed in the laundry, and is desirable in the kitchen and in the central supply departments, where most of the sterilizing takes place. These departments may well be planned in fairly close proximity to the boiler house. There is now no need for steam supplies to be taken to other parts of the hospital.

Depending on the type of fuel, appropriate facilities for its delivery, storage, and handling to the boilers have to be provided.

There may be a certain amount of fumes, and perhaps smoke from the boiler chimney; the boiler house should therefore be sited so that the prevailing wind blows away from the hospital buildings.

Incinerator

An effective central incinerator to handle all the hospital’s combustible waste is needed on the site. This, also, should be sited in relation to the prevailing wind.

Workshops

The hospital is likely to have its own maintenance staff to look after the building and the equipment. This staff needs workshops and storage space.

In some countries the maintenance of the more complex items of equipment may be organized regionally.

Mortuary

The subject of disposal of the dead is hedged around by religious, social, and cultural beliefs and practices. Whatever these may be, however, it is necessary to provide within the hospital or its precincts a place to which a dead body can be moved quietly and discreetly, in order that other patients are not upset. It is also necessary to see that the body can later be removed from the hospital, for burial or cremation, by some exit screened from the view of patients and others in the hospital.

The actual extent of the mortuary provision will vary widely according to climate and local custom. In the developed countries, it is usual to provide a mortuary with an adequate amount of cold storage for bodies and rooms equipped for post-mortem examinations. The post-mortem rate, that is to say, the percentage of bodies subjected to autopsy, is regarded as one of the indices of the efficiency of a hospital. In a hospital of 500 to 600 beds, two post-mortem rooms would be adequate.
There are, however, many countries in which a post-mortem examination runs counter to religious belief or is highly repugnant to local sentiment, and an autopsy in such places will probably be performed only on rare occasions, to establish the cause of death—possibly in connexion with criminal proceedings. In such countries the provision of post-mortem rooms can be reduced to a minimum.

In many tropical countries it is the practice for burial or cremation to take place on the day of death, so that provision for cold storage is hardly necessary. In countries in which a substantial portion of the population is of the Jewish faith, a separate room should be planned for the watcher who remains with the body until its final disposal.

Adjoining the mortuary and opening into it, there should be small chapel where relatives can view the body. The chapel should be entirely non-denominational, and should be tastefully and soberly furnished so that the last impression the relatives receive of the deceased is one of quiet dignity in death. Adjoining the chapel and opening into it, through a door, should be a waiting room (with toilet facilities) where relatives may wait while the body is being wheeled in and arranged on the bier in the chapel for viewing.

The room where the bodies are kept should open into an autopsy room or rooms. These should have a water-impervious floor, sloping to a drain, and tiled walls, so that the whole room can be easily washed down. It is advisable that the drains remain open in order to allow for cleaning and disinfecting with a broom and a bactericidal solution. Adjoining the autopsy rooms should be an office or small laboratory for the pathologist. All these rooms should be carefully screened against insects, and special attention should be paid to the screens in order to avoid penetration by rats and other pests.

When in the general design of the hospital it is practicable to site the mortuary suite so that it is easily accessible to the department of pathology, this is certainly a convenience, so that specimens removed at autopsy can be readily conveyed for examination to the laboratories of morbid anatomy and histology. This juxtaposition is by no means essential, however. The first consideration in the siting of the mortuary is that it should be out of sight of patients and visitors and that access to and egress from it should be screened as much as possible.

Staff Housing and Training Facilities

Staff housing

Once the approximate numbers of staff of various categories have been determined, it is necessary to consider what provision will be needed to house staff on the hospital site. Today it is not considered essential, from
the point of view of the function of the hospital, for more than a rather small number of people, who are actually on duty, to reside within the hospital site. However, in the majority of cases it is not practicable or economical to expect staff members, particularly nurses, to find accommodation outside; and it is therefore generally necessary to build substantial accommodation for the nursing staff, the actual size depending principally on local conditions. In a few places, accommodation close to the hospital site may be freely available, in which case a fairly large proportion of the staff may live out. However, even then it is likely that student nurses will need hospital accommodation within the site.

Housing for student nurses should be in the form of a hostel or hostels. Traditionally, these hostels have included large communal areas, dining rooms, lounges, game rooms, etc., and have formed a small, enclosed community. Today, the tendency is in a different direction: student nurses are encouraged to go outside the hospital during off-duty hours and to seek their recreation in the community. It is therefore not considered necessary, or desirable, to provide more than a small sitting-room and a utility room on each floor of the students’ quarters, where they can wash their clothes or prepare light refreshments.

Housing for the senior nursing staff and for lay hospital personnel should preferably take the form of one-room flats, plus a certain number of larger flats for use by married staff members or by staff groups who choose to live together. These larger flats should have private kitchens. Such an arrangement is very much more flexible in use than the old system in which accommodation was specifically designed for various categories of staff. With the arrangement proposed above, flats or flatlets can be allocated quite freely to doctors, senior members of the nursing staff, technicians, and others, in accordance with the demand at any particular time.

There will be no need to provide communal kitchens and dining rooms in conjunction with any of the staff housing so long as the proposals for catering made earlier are followed. Generally speaking, in planning staff housing the aim should be to give the same sort of accommodation as would be available within the community and to avoid institutional living.

Training facilities

A training school for nurses should include lecture, demonstration, and seminar rooms. It can be planned as a separate building. There may also be a need to provide similar facilities for physiotherapists, radiographers, and other members of the technical staff, should the hospital provide training for them. The latter could well be grouped with the nurses’ training school.

A library with space for reading is desirable in such training schools.
Special Amenities

It is necessary to provide for sports and other staff amenities on the hospital site. These are often lacking in hospitals or, in the past, have sometimes been provided exclusively for the use of nurses or doctors. In future hospitals it will be better to have facilities for sports and other leisure activities available for all staff members.

The standard for these amenities should meet those of similar ones provided by industry and commerce in the areas surrounding the hospital. Unless these staff amenities are of an adequate standard, the hospital is likely to have great difficulty in recruiting lay staff in sufficient numbers.
Epilogue

The following is a recapitulation of a few of the points made in the text that are regarded as being of outstanding importance.

1. Before embarking on a spectacular hospital building programme, countries should ensure that the basic health services—environmental, preventive and domiciliary—have reached an adequate level.

2. It is the staff that makes the hospital, and any country contemplating the building of a hospital should be certain, well in advance of undertaking the project, that staff of all categories adequate in number and in quality will be available for its needs—and this without seriously depleting the personnel essential for proper extra-hospital health care.

3. Hospitals should not be left isolated, but should be co-ordinated with a hospital service based on a regional concept. This hospital service, in turn, should be closely integrated with preventive, ambulatory, and domiciliary health services, both somatic and psychiatric.

4. Planning a modern hospital is a highly specialized job; and, at a very early stage of the project, the advice of an expert architect and an engineer should be sought, preferably both with international reputations in hospital planning. The design of the hospital must conform to the climate, culture, and pattern of disease of a country; the mere copying of a design that has proved successful in some other country is likely to invite disaster.

5. A hospital is dependent upon a number of public services—water supply, electricity, telephones, public transport, and, preferably, sewerage and gas. Before a site is chosen, it is of paramount importance to be sure that the necessary public services are available, or will be made available, in sufficient supply to meet the hospital’s needs.

6. It is essential that servicing facilities and spare parts for mechanical and electrical equipment be always readily available. If this is impossible to arrange, it may be necessary to dispense with such equipment and to fall back on simpler devices. As has been pointed out elsewhere, it may be
better to push a patient by hand on a trolley up a ramp to a higher floor than to risk a breakdown of a lift that cannot be repaired quickly.

7. Wherever circumstances permit (and this applies especially to developing countries), laboratories for hospitals and for public health work should function as parts of an integrated laboratory service.
Annex 1

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ROEMER, M. I. & SHAIN, M. *Hospital utilization under insurance*. Chicago, American Hospital Association, 1959 (*Hospital Monograph Series*, No. 6)

This monograph aims at analysing the factors determining hospital utilization with particular attention to the influence of insurance covering hospital expenditures. Sixteen factors operate directly and indirectly to influence hospital utilization. These are grouped under three main headings: patient, hospital and physician.

ROSENFIELD, I. *Hospitals. Integrated design*, 2nd ed. New York, Reinhold, 1951

A classical study on hospital architecture especially designed for integrating the many departments in the main structure. Most of the examples are drawn from North American hospitals.


These three books represent part of a series of lectures for doctors on the organization of public health services. They describe the system of state health planning in the USSR and the development of a network of medical institutions in urban and rural areas. Real indices are given of the requirements and standards of the health services.

STRAUS, P. *L'hospitalisation des enfants; une étude de pédiatrie sociale dans l'agglomération parisienn*e. Paris, Ministère de la Santé publique et de la population, 1961 (*Monographie de l'Institut National d'Hygiène*, No. 23)

Survey of the factors leading to admission of children in three paediatric hospitals in Paris. Study of morbidity, housing conditions, multiple admissions, social factors, isolation, slums, influence of doctors and maternal and child health centres, psychological factors.

Series of technical publications on the different aspects of hospital planning and on the various departments. This documentation makes up the standard requirements for American hospitals requesting grants-in-aid from the Federal Department of Health.


Planning and organizing progressive patient care in a general hospital from the intensive care unit to the long-term care wards and home care. Specification and requirements of each section.


Encyclopaedia on the contemporary trends of hospital architecture in many countries. Numerous plans, photographs and drawings concerning especially large and specialized hospitals and health institutions.


Guide to architectural planning which aims at explaining what is done in a required area or combination of areas, what persons within this area(s) are expected to do, and what special equipment and physical conditions are required. Excellent material for functional design.


This book is made up of two main parts: (1) epidemiology of hospital infection and (2) control of hospital infection. The first deals with the main living organisms responsible for human infection. The second part proposes an approach towards administrative measures, design and practical use of operating theatres, management of wards, antibiotic and antiseptic procedures and epidemiological techniques.


Annex 2

LIST OF REVIEWERS

Dr A. L. Bravo, Director General of Health, Santiago, Chile
Dr J. C. J. Burkers, International Hospital Federation
Mr H. Calsat, International Union of Architects
Dr J. Desbordes, Director, Laboratory of Microbiology, Ministry of Public Health, Paris, France
Dr A. Engel, Director-General, Royal Medical Board, Stockholm, Sweden
Dr C. M. Fleming, Dean of the Faculty of Medicine, Medical Faculty Office, The University, Glasgow, Scotland
Dr J. Fry, General Practitioner, Beckenham, Kent, England
Mr D. A. Goldfinch, International Union of Architects
Dr S. Halter, Directeur général de l'Hygiène au Ministère de la Santé publique et de la Famille, Brussels, Belgium
Dr H. J. Hugo, Planning Consultant, Rehabilitation Association for Injured Workmen, Johannesburg, South Africa
Dr E. Martin, Directeur de la Policlinique universitaire de Médecine, Geneva, Switzerland
Dr R. L. Mehra, Medical Superintendent, All-India Institute of Medical Sciences, New Delhi, India
Prof. N. Pesonen, Director General, National Board of Health, Helsinki, Finland
Dr G. Silver, Chief, Division of Social Medicine, Montefiore Hospital, New York, N.Y., USA
Dr Z. Stich, Institute of Social Medicine, Faculty of Medicine, Charles University, Prague, Czechoslovakia
Mr W. Vetter, Architect, Lausanne, Switzerland

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