APPROACHES TO
PLANNING AND DESIGN OF
HEALTH CARE FACILITIES IN
DEVELOPING AREAS

Volume 2

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\(^a\) Different aspects of a particular topic may be covered in different volumes.
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INTRODUCTION

The introduction to Volume I explained how the inadequacies of many health care facilities to the needs, resources and circumstances of developing countries had prompted a study on the planning, programming, design and architecture of hospitals and other health care facilities in developing areas and that this study was expected to lay the basis for a health care facilities technology more appropriate to the conditions prevailing in developing countries.

It is now felt necessary, in order to avoid some misunderstanding concerning the range of possibilities for application of principles and methods set forth in this and other volumes, to enunciate as clearly as possible the limitations inherent in this kind of study and the ways in which it will be tried to deal with them.

For the present study to be at all possible, it was necessary to identify a series of aspects in respect of which developing countries differ from developed countries to such an extent that specific approaches to planning and construction should be utilized. These aspects include:

- Lack of adequate financial resources;
- Lack of adequate manpower resources of various levels for planning, construction and operation of health care facilities;
- Lack of readily available external support and know-how (for maintenance, repairs, spare parts, power supply, etc.);
- Lack of adequate communications and transportation networks;
- Difficulties stemming from climatic conditions;
- Pathology different from that of developed countries.

If all developing countries exhibit several of these common features, only some countries show all of them and, more important, countries experience them to different degrees. Enormous disparities moreover exist inside a country, to such an extent that sometimes the capital and main cities, which drain most of the resources of the country in money, manpower and facilities, have problems differing barely, if at all, from those of developed countries, while the situation in the rest of the country is typical of underdevelopment.

Within the overall characteristics of developing countries, therefore, each country differs from the others, according to which of these characteristics are present and to what extent. If to these differences are added those pertaining to political conditions and social settings, which have a direct influence on delivery of health services, it becomes evident that to try to give ready-made and definitive answers to problems would result in repeating in a different way the very mistakes the study was intended to rectify; solutions appropriate to one developing country may not be relevant to another.

A comparative study of the main variations of any component of the hospital system according to the variables indicated above would consume as much time and money as is available for the present study; it therefore cannot be considered. It is consequently unavoidable that each subject be treated by an author who, despite his expertise in problems of developing countries, will implicitly refer to a few particular countries within the scope of his experience.

It should be noted that the importance of this factor varies considerably according to the subject of the paper: there are far more external elements influencing a regionalization scheme than are to be taken into account for the planning of an operation suite.
What means are available to broaden as far as possible the applicability of the methods proposed? There are several and they will be used to the maximum:

- Choice of authors with experience in varied settings; comparison of their advice with that to be found in the relevant literature or in unpublished works, especially in reports of WHO short-term consultants; review of their papers by experts with a different experience; dialogue between authors and editors;

- Instruction to authors to differentiate between principles and the various ways in which they can be applied: this is not easy in a field where theory has been evolved on the basis of the conditions prevailing in developed countries, and where the "how" has become such a matter of course that the "why" can easily be overlooked;

- Provision of some amount of overlap between subjects, taking care that two overlapping subjects be treated in different settings;

- As from Volume III, authors will be asked, whenever relevant, to elucidate those elements peculiar to the country or region considered which have a direct influence on some aspect of their subject matter;

- Case studies will be presented and will be chosen so as to show another facet of the problems treated in theoretical papers;

- The editors will always be open to suggestions and criticism from readers.

The following is an examination, in the perspective of the above considerations, of the subjects treated in the present volume.

Regional planning of health facilities refers mainly to South America. This does not mean that the discussion is applicable there only, but that, although care has been taken to emphasize principles of wide application, some details may be irrelevant to other countries. Moreover, it was necessary to describe a system where regional planning was fully applied, to the extent of complete regionalization. This system might not always be applicable but, in all cases, allocation of resources and coordination and cooperation between facilities must take place. As these two problems will be dealt with separately, they will be tackled in a different context, so that those parts that theoretically overlap with regional planning will in fact complement the present paper.

In the planning team and planning organization machinery, it was again necessary to describe a complete team and machinery which, because of financial and manpower limitations, might be out of the reach of many developing countries. But it is hoped that on the basis of this paper, once the stages of the planning process and the functions to be discharged at each of these stages are clear, it will be easier for each country to decide what short-cuts they must take and what substitutions are possible, so as to evolve a machinery and a team responsive to its needs and commensurate with its resources.

The paper on Standards and technical requirements only deals with what standards should be and what they should not be, how and by whom they should be prepared, and their scope. Readers expecting the paper to provide some standards nearer to their needs than those available from developed countries will be disappointed. They must be made aware that there are no absolute standards but only standards relative to a certain set of conditions and that each country must evolve its own standards according to what is acceptable or not, what is sufficient or not, in their own context. Any effort to go beyond the provision of a method to set up standards would lead to the adoption of inadequate regulations.

A word of caution is needed as concerns Provision for future expansion and remodelling throughout the planning process. While it is the duty of the architect to ensure as much flexibility as possible, the planner must be aware that it should not be used as an excuse for hasty functional programming; for changes have a price, which is high, and must therefore be kept to a minimum and should always be subject to a cost/benefit analysis.
The term health centre covers a whole spectrum of facilities, merging with the health post at one end and with the rural hospital at the other end. This is why in the paper on Health centres: function, planning and architecture, the first aspect has been covered in more depth than the other two, which are subject to such a number of variables as to make it difficult to treat them with the desirable breadth while keeping within acceptable limits of space. Health centres will, however, receive further treatment and will be the subject of case studies.

It is extremely important for readers to be aware that in no case should they take any method, any technique, or any plan as a model that they simply have to follow. Readers always will have to be judges of the relevance of any model, first as a whole and then in detail, to local conditions. They will have to modify and adapt the models to suit their own needs. They will even have to question them. Should they find them wanting in any important respects, the editors would be grateful for any observations: a dialogue with users is considered to be a fundamental component of the study. Comments should be directed to:

Division of Strengthening of Health Services
World Health Organization
1211 Geneva 27, Switzerland.
REGIONAL PLANNING OF HEALTH FACILITIES

PART I
FROM THE VIEWPOINT OF THE HEALTH PLANNER

Alfredo Leonardo Bravo *

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1. INTRODUCTION

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

If regional planning is to become a functioning reality, it is essential that it be based on a full and detailed study of the objectives and functions of the health system. It will also be necessary to give a role in the planning process to genuine representatives of the groups that provide the services (especially the medical and nursing professions) and of those who receive them (community and trade union leaders).

It is very common for decisions on the construction of new health facilities to be taken by the institutions providing services, under pressure of irresistible political circumstances. The result is that the facilities are constructed in unsuitable locations, their services are not adequate to the local health needs and do not meet the real health problems, and the architectural design does not allow satisfactory circulation since there has been no prior functional planning. In short, the outcome is a costly investment that does not serve the purposes for which it was constructed. All countries have examples of such monstrous or "white elephant" buildings among their installed health capacity.

The developing countries cannot afford the continued luxury of making unproductive investments while the basic health problems of the community remain unsolved despite the spiralling growth of national medical expenditure. Nor is it acceptable that, in a period of history when scientific knowledge and medical technology have reached a degree of perfection that would have been inconceivable at the beginning of the century, there should still be millions of persons with no access to any kind of health service.

Coordination of institutional resources, administrative decentralization, regionalization and sectorization to correspond with levels of care, functional programming and rational architectural design are the components of regional planning, which in turn is an integral part of the national planning of the health system.

The rational application of these measures, through a coherent process, will enable the prime objective of extension of coverage to be attained.

2. HEALTH SYSTEM

Population coverage

The ideal goal is to attain universal coverage. It must, however, be admitted that only exceptionally has this goal been achieved. Geographical barriers, climatic features, insufficiency of resources and inability to provide financing are some of the causes that prevent coverage from attaining the ideal level.

The declared coverage for the major cities of nearly all countries is 100%. This coverage is theoretical since, while there is, indeed, often recognition of the right of all citizens to have recourse to the health services in case of need, it is equally true that inadequacy of resources, the conditional nature of the right to services in social security institutions, and financial obstacles make medical services effectively inaccessible to a greater or lesser proportion of the urban population.

The situation is much more serious in rural areas, where the coverage extends to only a small proportion of the population and where, due to the fact that it is not feasible to provide full services to scattered communities with a low population density, the services are necessarily of a lower quality.
The availability of resources and the accessibility of services to the population are therefore the two essential factors conditioning the extension of coverage. As supplementary conditioning factors, mention may be made of poor utilization and low productivity of resources, which are amenable to improvement by simple administrative measures.

Determination of priorities

It is a universally acknowledged fact that the funds allotted to the health sector are never sufficient to cover all the health needs. An inevitable consequence of this financial limitation is that countries find themselves unable to solve their national health problems completely. They are thus necessarily constrained to give priority to certain problems which are more urgent, deferring the solution of others rated as less important. It is regrettable that this choice of priorities is not always the outcome of a process of scientific and social analysis but is often made arbitrarily, depending only on the decision of the health authorities and the initiative of interest groups. In order for these decisions to acquire some kind of scientific rationality, it is essential to make a statistical and epidemiological analysis of population curves, of the most prevalent causes of illness and death, of the resources available for preventing and treating diseases, of the means of communication needed to give access to these services, of the country's financial and administrative capabilities, and of the level of health sophistication of the population. Careful analysis of all these conditioning factors will lead to the setting of what have come to be called the "health problem areas", meaning those diseases or groups of diseases which constitute the main causes of mortality and morbidity in a country. In applying a problem-oriented approach it will be necessary to identify those hazards which are preventable by immunization, health and nutritional education, mass preventive examinations, etc. Secondly, it will be necessary to select those diseases for which there exists a rapid, effective, specific treatment, capable of eliminating the illness quickly and economically. It may be that in some communities there exists a disease whose incidence and prevalence are so high that it overshadows all other illnesses as a health problem and it may be necessary to organize a vertical campaign for control or eradication, as the case may be, in order to eliminate this problem or reduce it to manageable proportions before tackling the rest of the health problems of that particular community. The rationality of this approach has been demonstrated on a number of occasions. Additionally, the economic repercussions of such a course of action are sometimes very great. One example that might be cited is the construction of the Panama Canal, which became possible only after the eradication of the yellow fever which had decimated the first groups of engineers and labourers who attempted the operation.

Through this process of analysis, study and selection of priorities it is possible to establish programmes oriented towards solving the most important problems of the health sector and falling within the capacity of the human, material and financial resources of the country. It must, however, be borne in mind that the rest of the ills which afflict a population - those which have not been given very high priority - continue to exist and need to be given some consideration, even though their treatment may be limited or restricted for a certain period. In other words, these nosological groups must be neither under- nor over-estimated. This is very clearly the case in those countries whose health services are relatively undeveloped and where communicable diseases, malnutrition and infant mortality constitute a substantial percentage of the problems of the health sector which have to be accorded the highest priority and tackled urgently and immediately, since these are very obviously the problem areas of the sector. If resources are concentrated on these areas and suitable programmes are organized to reduce the specific hazards, it may be that after some years these problems will have disappeared or diminished to such a degree that within the overall statistical picture they no longer have the importance they once possessed while, conversely, other problems, such as cardiovascular diseases and tumours, which initially were not given priority, will begin to acquire marked importance as major causes of death.

This is how the machinery for selection of priorities operates: it does not mean laying all the emphasis absolutely and permanently upon a particular group of diseases and on particular methods of prevention and cure, but must constitute a dynamic process of on-going analysis of the demographic and pathological evolution of the country or region concerned leading to a re-evaluation and modification of priorities.
Human resources

In order to deliver comprehensive medical services to the urban, suburban and rural areas, one absolute prerequisite is availability of sufficient human resources to meet the demand for services from the various levels of care. Shortage and maldistribution of personnel very often become one of the insuperable obstacles to the organization of services, because of the irreducible minimum of time needed to train these human resources. The training of a physician takes eight years, of a nurse three to four years, and so on for other professional and technical health staff. This is a stage that cannot be omitted, since traditionally the delivery of services can take place only through a health team directed by a physician and composed of numerous professional and technical staff belonging to different disciplines. The problem is aggravated by the fact that in certain types of service, such as the delivery of suburban and rural care by the community physician, the basic training provided by the medical school is not sufficient and the staff have to be given supplementary instruction. In the case of the community physician, this teaching-learning process takes between six months and two years. Awareness of these inuperable educational obstacles has convinced those concerned that the extension of coverage to rural areas can be achieved only through the accelerated training of medical and nursing auxiliaries and of community leaders to serve at the primary level of care.

In the modern concept of medical care the key element is the health team; it should further be recognized that team members other than the physician are better able than the physician to solve certain specific health problems. This applies, for example, to certain simple complaints which account for the majority of consultations in ambulatory services.

Physical resources

Physical resources constitute another essential element for the organization of medical services. The emphasis must be placed on the construction of urban, suburban and rural health centres, with the object of creating the required infrastructure for the delivery of primary health care in a network of services that will bring the health team closer to the community to be served. It must be borne in mind that the rural health centre often needs to have a few beds available for delivery care and for short-term hospitalization pending the patient's transfer to a specialized urban or suburban centre.

Hospital buildings are a very expensive form of asset, since the construction and equipment of the buildings represents a considerable capital investment and the operational costs then amount to approximately a third of the initial construction cost for each year of operation. It would therefore be an error, in a programme of comprehensive medical care, to give preference to hospital care, especially as 90-95% of the problems of comprehensive medical care can be solved on an ambulatory basis. Before launching a hospital building programme it is accordingly necessary to make studies of specific demand by diseases or groups of diseases. Only if these studies show it to be justified should steps be taken to implement a building programme, which should be directed as far as possible towards the renovation of old hospitals and only as a last resort to the construction of new buildings, when the need for them is shown to be absolutely inescapable, with due regard to the real health needs and the human resources available.

It must also be borne in mind that the physical resources require maintenance and upkeep, especially as regards equipment and installations. This maintenance must be programmed for right from the planning stage, so that the equipment can be selected in consideration of the function it is to perform and staff trained in the necessary skills for the maintenance and, more particularly, the calibration of the equipment.

Administrative processes

Once the existence of human resources and physical resources has been assured, the third requirement for a health system is to organize an administrative process that will facilitate the expeditious functioning of the service and play an intermediary role in placing these resources and the existing scientific knowledge at the disposal of whoever requires them. The various stages of this administrative process are described below.
Programming. The statistical data available provide information about past experience and serve as a basis for programming future services.

A health system should include as many programmes as are necessary to meet the demand for services, in the light of the predetermined priorities. Thus programmes may be developed, inter alia, for internal medicine for adults, epidemiological surveillance and eradication of communicable diseases, paediatric care and family planning, mental health, dentistry, etc.

Each programme should be regionalized and decentralized in its implementation and have clear, precise technical rules, to enhance the comprehensive care of the population. It is useful for promoting the integration of preventive and curative activities that the head of the clinical department of the hospital should at the same time be chief of or at least advise on the community programme in the same specialty. This involves the clinicians with epidemiology and administration and broadens the working horizon of the hospital department. In countries where there exist, as independent authorities, a regional director of health and a director of the regional hospital, the function of these programme chiefs will be to advise the director of health on the planning and conducting of community programmes, without prejudice to their clinical functions at the regional hospital.

Coordination between the various departments of a given institution and between different institutions must be promoted in every possible way, since it is an essential prerequisite for planning, implementing and evaluating medical services. The use of common terminology, the adoption of uniform nomenclatures and statistical systems, common salary scales, and welfare benefits for staff (without prejudice to the establishment of financial and other incentives to work in remote and isolated locations), pooling of specialized equipment, etc., are means by which it is possible to achieve sound coordination. Such coordination is reflected in better utilization of resources and greater productivity of the services.

Decentralization. The national health system, within whose structure the services required to deliver care to the urban, suburban and rural family nucleus must be organized, is a mechanism of such administrative complexity that it cannot possibly be run on a centralized basis. Hence the need to decentralize the administrative process. This decentralization should include the extensive delegation of functions from the higher to the intermediate and local echelons, so as to produce effective decentralization in staff management, budgetary control, application of laws and regulations and, if possible, financing as well. A consequence of this will be the need to provide administrative facilities at the regional level. An important factor supplementing the mechanisms of decentralization should be the participation of the community and of health professionals in the administration of the regional and local services.

In most countries there is a marked trend in the opposite direction, i.e., towards centralization of authority, and it is not always easy to convince the powers that be of the need to decentralize the health services. There are nevertheless many reasons that justify decentralization. One that has already been mentioned is the extent of the facilities needed to provide comprehensive preventive, curative and rehabilitative services to the whole population of a country. This requires a large multidisciplinary staff which must deliver an enormous variety of services involving different technologies to a population composed of millions of individuals of widely differing cultural levels and with different health needs. The administrative machinery required to operate this gigantic service is so complex that its management cannot be centralized. Furthermore, if planning and evaluation of these services is to be conducted locally, it is essential that the implementation of the health activities also be directed at the local level, with the effective participation of the suppliers and consumers of health services.

3. REGIONALIZATION

Some systems of regionalization have as their sole objective the collection of funds to finance hospital building. In others, the main purpose is to establish a supplies system whereby the hospitals of the region can be provided economically with good-quality foodstuffs and materials through procurement in large quantities, which would not be possible if every small hospital had its own supply office. Other programmes are designed to extend the
coverage and improve the quality of the services, in order to provide adequate administrative support for the organization of campaigns for the control of specific chronic diseases, such as cardiovascular disorders, cancer, diabetes, etc.

The regionalization described below is a complex system of technical and administrative decentralization and establishment of levels of care, which range from the primary health centre at the community level to the general hospital and specialized polyclinics at the intermediate level and culminate in national medical centres where the practice of all specialties is well developed and teaching and scientific research constitute a major concern alongside treatment functions. These different levels of care taken together constitute the regional medical care system, which should be an integral part of the national health system.

A regionalized health service system has enormous advantages, not only from the point of view of better utilization of resources, but also in facilitating access of patients to the most suitable level of services in the light of their health care needs. Financial administration and personnel management is more efficient. Maintenance of equipment and installations can be extended to all the buildings of the region (hospitals, health centres, polyclinics, etc.). Supplies, both of medical and surgical equipment and materials and of drugs and food products, can be procured in bulk with advantages on the score of quality and cost.

**Characteristics of a regionalized system**

The introduction of the concept and mechanisms of regionalization into the administration of the medical and hospital services is a complex process that is not easy to achieve. The setting up of a regional health system is simpler when all the health facilities belong to one and the same institution, a situation that rarely occurs. On the other hand, with the usual institutional pluralism, it is very difficult to attain the necessary harmony of wishes and objectives for the establishment of a genuinely unified, functioning regional system. Generally, in this latter case, regionalization is partial in that it is applied to the facilities belonging to one institution, whether it be the ministry or the social security system. In those countries where private enterprise is predominant in the financing of the hospital services the most that can be obtained is financial regionalization, whether for buildings or for procurement of equipment or supplies.

From the foregoing it can be inferred that, in order to put into operation a true regionalized system of health services, it is essential that some prior conditions be met. It is, of course, easier to bring about regionalization of the health services in those countries which have a planned economy and a decentralized economic and social development administration. It is also very helpful when there exists, at the regional level, a political and administrative body with executive and coordinating authority over the regional services, not only in the health but also in the educational, housing, welfare and other fields. Even when these ideal conditions do not exist, it is possible for countries to establish a regionalized health service provided a firm political decision is taken and is backed by legislation. Measures to complement the foregoing will be the adoption of uniform administrative and information methods and statistical nomenclature and the establishment of joint training programmes for the directing and executive personnel of the participating institutions.

The supreme administration of the regionalized system may be the responsibility of the ministry of health, the national social security institution, or an ad hoc national health institution. Whatever the pattern adopted, before regionalization is introduced it will be necessary to conduct a number of preliminary studies designed to establish the creation of the regions on a sound administrative and technological basis and ensure respect for the traditions and sociocultural experience of the country. One important consideration is availability of human resources and their adaptability to regional needs.

A first problem to be settled is that of the size of the region. The factors that have to be taken into account in deciding this are geographical and administrative considerations, communications, and the size of the population to be served. In general, it can be said that the health region should be a reflection of the habits and needs of the resident population and take account of the normal pattern of movements of the people in their ordinary, everyday activities. An economic and social region is characterized by the existence of a community of
interests with regard to the production, distribution and marketing of goods. The operation of these common interests causes the inhabitants to become concentrated around the centres of production (whether industrial or agricultural) and move about along lines of communication determined by the need to sell or buy the goods they produce, or to come nearer to the centres of distribution of those goods. This is a natural phenomenon which, over the centuries, has brought about the concentration of human beings into population centres which have generally followed the routes of communication, whether by land, sea or river. This same phenomenon is applicable to health needs, for when the populations go to market to sell their products they wish at the same time and on the same trip to acquire the everyday commodities they need for their family life, while also transacting the financial, administrative or legal business stemming from their life in the community. As an integral part of their daily life they desire that there should also exist a school to send their children to, a health centre or hospital where they can get medical attention, whether preventive or curative, and advice for solving their family and social problems.

Apart from these economic and social considerations there exist other, perhaps more important, reasons of an operational nature why the health region should have the same geographical boundaries as are determined by the division of the country into political and administrative units or, better still, by the pattern of the economic and social development areas. Many advantages follow from such an approach. In the first place, the possibility arises for the regional health authorities to have their own budget. Stimulus is provided, moreover, to coordination of the health programmes with other activities in the social sector such as education, social security, town planning, housing development, industrialization, protection of the environment and of natural resources, etc., all of which facilitates the adaptation of the health system to the characteristics of other systems, within the process of economic and social development of the country and the region. Having the same geographical boundaries enables the administrative procedures of the health services to be adjusted to the patterns utilized by other public services, while at the same time facilitating exchange of statistical information with other development sectors. Finally, in some cases, the health region can include two or three economic and social sectors when their size and populations are too small to produce a large enough demand to justify the provision of the specialized services of the regional hospital.

For these reasons it is desirable that the health region should have the same geographical boundaries as are determined by the division of the country into political and administrative units or, better still, by the configuration of the economic and social development areas. Its size will therefore vary enormously according to whether the country concerned is one of high industrial concentration or, on the contrary, of wide agricultural dispersion. It will also vary with the number of inhabitants per square kilometre and the total population of the country. The size of a region cannot be the same in a country with a population of several hundred million as in a country whose total population does not exceed one or two million. In the light of all these factors it can be broadly stated that the optimum population size for a region may lie between 100,000 and 1,500,000. What really matters is not so much geographical area or population size as the distance between the homes of the population and the places where the health services are installed, and this distance should be measured not so much in kilometres as in travel time, which depends largely on the available means of communication. Ideally, the travel time between a patient’s residence and the place where he is to receive medical attention should not be more than 20 or 30 minutes. The distance therefore varies according to the standard and convenience of the transport facilities. A good ambulance service enables the radius of action of the regional services to be extended. It should also be borne in mind that a good system for communicating with and providing information to the public and the health personnel as to the various level of health care established to facilitate accessibility in relation to place of residence will permit people to use the natural point of entry to the health system in accordance with their needs. If all these studies are conducted thoroughly and methodically, regionalization will be successfully made to serve one of its purposes, which is to improve the utilization of the services and increase their productivity.

1 This size is considered as the optimum from the administrative point of view. Smaller regions serve limited numbers of people and are therefore costly to run. Regions that are too large are unmanageable. In countries with highly concentrated urban populations there may exist larger regions (for example, in the United Kingdom) and in that case the regions have to be subdivided into health areas.
Another requirement for the region is that it should be self-sufficient, i.e., that the sum of the health services available within the region should be adequate to provide preventive, curative and rehabilitative care services and look after the population in all aspects of health, sickness or invalidity. This also implies limitations with respect to the size of the region and of the population protected. In a big country, with large and highly populated regions, self-sufficiency may well be complete in the sense that the regional hospital will possess all the specialized facilities, including vascular and open-heart surgery, neurosurgery, radionuclides, cobalt therapy, etc. On the other hand, in a little country with small health regions and low population density, the regional hospitals will necessarily be restricted to the more routine medical and surgical specialties and the highly specialized techniques will be reserved for a large national centre. Indeed, in some countries it may be over-ambitious to think in terms of developing all these specialties from the outset, even at the national, let alone the regional level. In such cases, bilateral technical assistance agreements may enable superspecialized treatment to be performed at better-equipped centres in neighbouring countries.

Another indispensable feature of any region is territorial comprehensiveness, meaning that the region must comprise an urban sector, a suburban sector and a rural sector. This is the only way to meet the requirement of self-sufficiency, since the rural health services on their own will never be able to provide comprehensive care and make available the specialized services of modern medicine. For economic reasons (specifically, shortage of specialists and the high cost of diagnostic and treatment equipment), it is inevitable that highly specialized services can be made available only at national or regional hospitals where specialties are grouped and which are generally associated with a school of medicine. Facilities of that size must be reserved for the large cities only, but their specialized services should be at the disposal of the suburban and rural centres under a system of referral of patients, technical aid and scientific advisory assistance, which these large hospitals should make available to the less developed hospitals and primary care services of the rural zones and to the consulting units, polyclinics and health centres of the suburban sectors.

It follows from the above considerations that, within the region, there must be a two-way flow of patients, staff and equipment between the various levels of care. For this to take place, there has to be a clear understanding of the functions, responsibilities and limitations of each level of care. The primary care centres will refer those patients who require medical attention to the community health centres which, in their turn, will send their patients for medical advice to the polyclinics or the outpatient departments of the community hospitals. These basic services will refer those cases presenting more complex diagnostic or treatment problems to the regional hospitals or, alternatively, will receive periodic visits by medical specialists and will be able to obtain diagnostic and treatment equipment on loan in order to provide better care for their patients. For their part, the regional hospitals and other specialized services will send back the patients after diagnosis or treatment, with a case report, to ensure continuity of follow-up at the peripheral level.

If this machinery for referral of patients is to function effectively, it will be essential that the professional and technical staff, at whatever level they are serving, belong to the regional health team and have full and ready access to the scientific communications, clinico-pathological conferences and statistical information available at the more specialized centres in the region.

Regional administration

Fundamentally, regionalization implies administrative and budgetary decentralization for the purposes of simplifying bureaucratic procedures and facilitating the management of the resources of the region. The highest technical and administrative responsibility for the region will be entrusted to a regional director, who will exercise authority delegated by the central heads of the health system at the national level. The regional director should be a physician with knowledge of public health and administration of health systems and with extensive experience of both the clinical and the epidemiological and administrative aspects of medicine at the different levels of a national health system. In addition, he should have knowledge of the behavioural sciences so that he can base his decision-making on principles of modern scientific administration. It will also be necessary for him to have experience of the application of quantitative methods in the planning and evaluation of health activities so that
he can participate in the planning at regional level and the evaluation of his programmes for the purpose of reorienting or improving them in the light of their effectiveness and productivity over a given period of time. Finally, it will be desirable for him to have some teaching experience, especially if the regional hospital is associated with a school of medicine or teaching institute for other health professions. Obviously, the regional director cannot be expected to be a specialist in all these very different subjects but it is important that he should have a clear awareness of the importance of their application, so that he can obtain appropriate specialized guidance when the need arises. The training of the regional director is a long and complex process and the selection of a suitable person is essential for the success of regionalization.

In those countries where an integrated health system has been organized, there has been much argument as to whether the director of the regional hospital can at the same time be director of the health region. Theoretically, it would seem that the merging of the two activities is a formula conducive to the integration of preventive and curative medicine throughout the region. In practice, however, the workload involved in directing and managing all the services of an extensive region is so enormous that it is impossible for a single professional to cope efficiently with all these activities. Owing to the impossibility of exercising to the full all the responsibilities stemming from such extensive and varied functions, the director of a large regional hospital ultimately tends to concentrate on some of them and especially on those which constitute his main activity, namely the internal management of the hospital services, while neglecting the epidemiological and community aspects of the peripheral services. The solution to this problem would seem to be to designate the director of the regional hospital as supreme chief of the services, closely assisted by two subdirectors, one in charge of the outpatient and domiciliary services and peripheral health centres and of epidemiology, and the other in charge of the administrative services of the hospital. This is valid for large regional hospitals serving an extensive region; it does not seem economic or reasonable for small regions where the regional hospitals are also small. The other alternative is that there should be a regional director of health responsible for the epidemiological and community aspects of health care and, independently, a director of the regional hospital.¹

The most important function of the regional director is to ensure inter-institutional coordination within the health sector of the region. This task calls for particular tact on the part of the director in order to develop cooperative activities both in the planning and in the implementation and evaluation of health programmes. Coordination is important in any regionalized set-up but it is especially so in those pluralistic systems where there is participation by many institutions of the governmental public sector, the decentralized public sector and the private sector, all with different legal systems, different administrative structures and, still more important, different scales of remuneration and social benefits for their staff.

Though appropriate legislation is essential for establishing a sound administration, and this in turn implies coordination, it has to be recognized that coordination is a mental attitude which has to be communicated and taught to the staff at all technical and administrative levels of the institutions delivering health services, and also to the user groups which constitute the community served by the hospital. It is therefore desirable that coordination should be promoted and stimulated from the highest executive levels of the health institutions. Only with such backing from the supreme authorities will the regional director be able to promote harmonious and coordinated work within the region. The director has various means at his disposal to attain this result, such as: the global organization and programming of the technical work; the complementation and consolidation of the financial resources derived from various institutions; clearer demarcation of the fields of action of each institution and equitable distribution of responsibilities; distribution of complete and adequate information to the health personnel, with the establishment of effective means of communication between the different levels; and, finally, promotion of the intelligent and informed participation of the community in the administrative process of planning, implementation and evaluation of programmes.

¹ This situation is common in many countries where separation between preventive and curative medicine is the rule, but it also exists in some countries where the preventive and curative services are integrated.
It is of basic importance to obtain the participation of the clinical physicians in organizing and programming the technical work. The designation of programme chiefs responsible for each of the main programme areas and assisted by advisory groups composed of the most outstanding specialists in each area is a procedure that fosters intelligent participation and makes it possible to utilize the best talents and the knowledge and experience acquired by the professionals exercising direct responsibility for the provision of health care.

An indispensable adjunct to the function of coordinating health programmes is the responsibility that the regional director must have for promoting inter-institutional budgetary complementarity and consolidation of resources in order to utilize them effectively in solving those health problems which are most prevalent in the region and at the same time most amenable to solution with the available preventive and curative resources. Although the regional director, at any rate in large regions, will have advisory assistance with the administrative and financial aspects, this is perhaps the most delicate and difficult of the functions he must perform, since it will often mean having to reduce the resources allotted to one programme in order to strengthen another, with the aggravating factor that sometimes these resources belong to different institutions. In order to perform this function satisfactorily the regional director must enjoy the fullest confidence of the supreme authorities of the various institutions and possess sufficient authority to adopt such coordinating measures without fear of being overruled by the central echelon.

Full dissemination of information to and communication with the health personnel of the region is another condition that must be fulfilled in order to secure the participation of each individual, within the sphere of his professional or technical activity, in the body of coordinated health measures that are to result in the enjoyment of the highest possible level of health by the entire community. Another necessary condition for this participation by all the health personnel is the fair and adequate remuneration for their professional or technical work. Differences in salaries and welfare benefits between staff belonging to different institutions are a sometimes insuperable obstacle to achieving proper coordination and the necessary cooperation between the different groups. The discontent of the lowest paid groups often produces an undercurrent of protest and disobedience that frustrates the regional director's best efforts to achieve coordination.

The information and communications must also reach the members of the community served by the hospital in order to promote their participation in the health programmes. A community that is well informed and aware of its social responsibilities should become an effective instrument of cooperation and support for the activities of the health team. Frequently, however, this community participation is distorted by sectional interests trying to use the community as a pressure group to attain specific objectives which are not always compatible with the paramount aims of the health and welfare programmes. In this sphere too, the regional director will have to bring into play his skill as an organizer and his experience and knowledge of the behavioural sciences.

But communication and information are necessary not only for the logistic purposes of proper placing of patients. Statistical information must, in addition, supply the data needed to determine morbidity rates, mortality from specific causes, the course of each case and the result of treatment, its duration and, particularly, the average length of stay of patients in hospital, the utilization and productivity of the health resources and, in addition, the cost of both ambulatory and inpatient care. All these data provide the baselines for scientific, statistical, administrative or financial studies which make possible the periodic evaluation of the administrative procedures, control of expenditure and medical auditing to measure the quality of the services.

Thus organized, the health region will be responsible for the planning, supervision and evaluation of the health programmes, health surveillance of the community, specialized advisory services and coordination between the respective programmes. Particularly important among the advisory functions will be those concerned with maintenance of the buildings, installations and equipment of all the health facilities of the region.
Levels of care

Within a regional health system it is essential, as has already been stated, to decentralize the field activities as the sole means of ensuring access to the services and providing every person with care of the quality to which he is entitled, as required by his state of health, sickness or disability. The administrative mechanism for translating this decentralization into reality is the regionalization described above, by means of which the whole population is ensured access to primary and basic health services and, through them, those cases requiring more complex care are selected and referred to the appropriate level according to the needs of each patient. The point of entry to the regional system will be at the level best equipped to provide whatever services the person requires. For healthy individuals, this will be the primary or basic level.

The primary level is that of minimum care, with participation by community leaders and/or health auxiliaries, and its main functions are health education of the public, immunizations, simple preventive and curative activities, supervision of pregnant women and healthy children and, sometimes, obstetrical care and referral of patients to more specialized levels. One of its characteristic tasks is stimulating a sense of individual responsibility for one's own health and mutual cooperation between members of the same community. Essential conditions for ensuring its success are, of course, health education of the public, training of certain leaders, and supervision and technical support by the higher levels of the health system, especially the basic level.

The basic level of care consists of the urban, suburban and rural health centres, where comprehensive medical services, with emphasis on prevention, are delivered to the entire population of a sector and medical care of a curative nature provided for all simple complaints that can be diagnosed and treated on an ambulatory or domiciliary basis. In order that this care should be of a good scientific standard it is desirable, wherever possible, that the health centre have a minimum of diagnostic facilities such as X-rays and simple laboratory installations. The rural health centre must have, in addition, a small number of beds intended mainly for delivery care and short-term hospitalization pending transfer of the patient to other levels of care.

Editors' note:


In 1973 the WHO Executive Board identified three levels of care and adopted for them the following definitions (WHO Official Records, No. 206, p. 113):

- "Primary care services are general health practice services which are offered to the population at the point of entry into the health service system."

- "Secondary care comprises the care provided through specialized services on referral from primary care services."

- "Tertiary care includes highly specialized services and eventually the superspecialties, such as plastic surgery, neurosurgery and heart surgery."

The five levels described by the author are retained here, however, as an illustration of the principle "adapt, don't adopt", which should always be kept in mind by the reader. The number of levels in a given country depends on the way health services are organized and utilized. It can be modified by a policy decision (e.g., introduction of community-based primary health care services).
The intermediate level of care is made up of the small 100- to 200-bed community hospitals which have basic services for medicine and surgery and for gynaecology and obstetrics, together with simple diagnostic facilities. They constitute the mainstay of the primary and basic community health sectors and their essential functions are the performance of minor surgical operations, gynaecological and obstetric care, and medical care of adults and children with complaints which, while not requiring highly specialized treatment, are not amenable to ambulatory treatment.

At the regional level there must be a fully equipped general hospital that has facilities for all the commoner medical and surgical specialities; this hospital may be attached to a medical school. It is the highest referral establishment of the region and should be self-sufficient enough, with the assistance of the other less complex establishments, to deal with practically all the medical problems of the region concerned. Only highly specialized cases requiring very complex methods for which, owing to their high cost, facilities cannot be provided in all the regions will remain outside its field of action. The greater or lesser relative development of the regional or intermediate levels will depend on the size of the population and the availability of suitable manpower.

At the central level there should be a national centre for specialized care, training and research, which will undertake the treatment of selected cases requiring a heavy concentration of resources; it will also be required to take part in the training of specialists in the various branches of preventive, curative and rehabilitative medicine.

Regionalization of teaching hospital functions

Though the teaching function is performed mainly at the central and regional facilities, all the facilities of the system should have the necessary potential for being used to train students in the health sciences.

Just as it is desirable that the teaching hospitals should participate in the provision of health care to the community and form part of the regional health system, so it is also desirable that certain regional hospitals, adequately provided with teaching facilities, should participate in the teaching-learning process and cooperate with the faculties of medicine in a decentralization of the teaching hospital function. This approach, which is being applied in many countries with great success, has innumerable advantages. Firstly, it raises the standard of hospital medical services. Secondly, it is a multiplying factor for the clinical training grounds needed in the teaching of medicine. Furthermore, the student has an opportunity to get to grips with medicosocial problems in the outpatient and domiciliary services and it may be possible to distribute the locations for practical work according to the areas of origin of the students, so that as soon as the student has completed his training in the basic health sciences, he can return to the region he came from and settle down there at an early stage for his future professional practice.

The incorporation of the community hospital as an important factor in medical education undoubtedly requires that it should meet certain essential criteria for adequately performing the teaching function, and this entails the need to establish machinery for accreditation as a medical care and teaching facility. This responsibility should be entrusted to the highest authorities of the faculties of medicine, the medical profession and the health services, in order that the accreditation should enjoy high prestige and be of unchallenged impartiality.

Organization of community health care

The organizational ideal is to be sought within the general characteristics of a regionalized and sectorized health system.

Every health region should have a regional hospital which is a medical unit where specialized services are concentrated and which serves to give the necessary scientific backing and technical support to all the local health facilities disseminated within the region, including the primary, basic and intermediate levels. The regional hospital will be required to organize health programmes in the various public health fields, each directed by a programme chief, who as far as possible should be the actual chief of the corresponding clinical
department of the regional hospital. Thus, for example, there will be a programme of medical care for adults directed by the head of the department of internal medicine of the regional hospital; a family welfare programme directed by the head of the department of pediatrics; a programme for control and eradication of communicable diseases directed by the head of the department of epidemiology or of the department of communicable diseases, if such a department exists in the hospital; and a mental health programme under the supervision of the head of the department of psychiatry of the general hospital or the director of the psychiatric hospital if there is one in the region.

These medical programme chiefs are of great importance inasmuch as they represent specialized scientific knowledge and are in a position to cooperate in the planning of the activities of all the peripheral health facilities of the region, distributing the resources so as to prevent duplication or waste and to obtain the highest possible return from them. Moreover, very often these heads of clinical departments will be the professors of the corresponding specialties if the regional hospital is associated with a school of medicine. In that case these physicians, with the prestige they enjoy in their respective specialties, will play a pivotal role in coordinating teaching and medical care activities within the region and promoting harmonious regionalization of teaching hospital functions, so that all the available resources are used for the greatest benefit of patients and of health sciences students.

The health region should be subdivided into health areas, each of which should possess a health centre which may or may not have a small number of beds, depending on local needs. It is the health centres which are responsible for delivering care to the population residing in these areas and making available to it, with particular emphasis on the needs of children, all the requisite services in the field of prevention, immunization, health education, supervision of the growth and development of the healthy child, mental health, etc. Among the adult population, these centres will, in addition, be required to undertake specific preventive activities, depending on the health problems prevalent in the sector. Over and above all this very important preventive work, the health centres or ambulatory medical units must be prepared to administer first-aid and routine treatment of easily diagnosed diseases, and must have a communications system and adequate means of transport for referring the more serious cases to higher medical centres or to the regional hospital, according to the case, for proper diagnosis and treatment of more complicated diseases.

It is these peripheral medical centres or units which provide the community physician with the field of action in which to carry out the diversity of tasks enumerated in the previous paragraph.

Each of these centres or units will have one or more community physicians, depending on the size of the population to be covered, care also being taken to ensure that the families assigned to each physician belong to the sectors under the responsibility of the corresponding health centre or medical unit.

Ideally, in the implementation of such a scheme, the community physician would provide care for a population of between 3000 and 5000 but this is often beyond the means of developing countries, where the community physician will have to care for a much larger population. In the most favourable cases and provided the demand for care allows, he should divide his time between the outpatient department of the hospital, the ambulatory peripheral services and the domiciliary services, so as to maintain continuity in the care of the patient. In addition, he should have an opportunity to take part in the scientific and teaching activities of the regional hospital with the object of developing a permanent vocation for study so as to acquire scientific knowledge and remain alert to progress in general medicine. Within this overall pattern of a national health system, regionalization of teaching hospital functions, and sectorization of direct patient care, the community physician has his allotted place in the basic services, where he can fulfil his key function of serving as the connecting link which brings the health system and the community together and through which are exercised, in their primary phase, the important functions of protection, promotion and restoration of health. In order to accomplish this important task, the community physician needs the help of nurses, social workers, medical and nursing auxiliaries and rural community leaders and, at the same time, the effective support of specialized physicians and other health professionals and workers. The community physician answering to this description must have a broad spectrum of
varied scientific knowledge, lengthy clinical experience and, above all, the necessary mental attitude and vocation for service to understand the psychological and emotional states of his patients and assume the role of true family counsellor, health promoter, and key executant of the programmes of a national health system. He must also be involved with medical education and serve as guide or tutor to students in order to transmit to them knowledge, attitudes and skills which will be indispensable in their future professional practice. Finally, he will be required to act as supervisor and advisor to the health auxiliaries and community leaders assigned to the primary levels within the sector concerned.

The enormous task entrusted to the community physician, especially if he is responsible for a large population, would be impossible if he were not helped by primary health care services covering population groups of up to 1000 or 1500 persons; in the rural and suburban zones this task will need to be entrusted to health auxiliaries, if possible, or at least to community workers trained to cope with health problems.

It must be pointed out that the primary level, entrusted to auxiliaries and/or community workers, and the basic level, under the responsibility of medical and nursing professionals, constitute a whole, since they are mutually complementary. The primary level could not exist on its own, without the technical support of the higher levels. The basic level on its own could not provide coverage for the whole community, especially in the rural areas but needs the cooperation of the primary level in order to do so.

It is very difficult to give a specific figure for the size of the population allotted to each level, since capacity for provision of care varies enormously according to the distances involved and to the human resources and transport facilities available.

Finally, to take an international view, it should be mentioned that in some parts of the world successful experiments have been conducted in bilateral cooperation between a developed and a less developed country, the former acting as referral centre for the dispatch of patients and of specimens for laboratory examination from the latter.

4. FINAL REMARKS

The objectives of the regional health care delivery system described here are as follows:

- To provide universal coverage and enable the whole population to have access to the type of services best suited to their state of health, sickness or disablement.

- To provide comprehensive preventive, curative and rehabilitative health services for whoever requires them, without financial or other bars and making the best possible use of the available scientific and technological knowledge.

- To reduce the cost of treatment, giving priority to primary care and services of a preventive and ambulatory type and reserving hospital treatment for those who absolutely need it. The hospital standard should correspond to the average standard of living of the population covered.

- To decentralize health care through a system of levels of care designed so that each person enters the system through the level best equipped to provide the form of treatment most suited to his individual needs and that all services, from the primary up to the specialized level, are accessible to whoever needs them through an information and referral system.

- To organize the "health team", composed of professional, technical and auxiliary staff in various disciplines who assume responsibility for the health of the community, acting individually at different levels but with their activities coordinated through an effective system of communication and supervision.

All these features must be taken into account in establishing the functional programme and architectural plans for the facilities as part of the process of regional planning, bearing in mind, also, that the provision of health care is a dynamic and changing process and that the architectural design must allow for this fact.
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# REGIONAL PLANNING OF HEALTH FACILITIES

**PART II**  
FROM THE VIEWPOINT OF THE ARCHITECT  

Jorge de los Rios Mazure

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1. INTRODUCTION

As shown in the first part of this paper, regionalization of health services aims at setting up in a concerted manner a graded array of services ensuring that the best care compatible with available resources is available and accessible to the population.

One of the most urgent tasks in developing countries is to increase the coverage of the important population groups that do not yet have access to health services; however, such an increase is closely linked with the development of a network of health facilities to shelter or to support various health activities.

While the first part dealt with the aims and characteristics of a regional system, the present part will show how such a system is put into practice, using as examples some achievements in South American countries.

2. GLOBAL PLANNING

The overall planning of the physical infrastructure in the health field is an integral phase in the regional, sectoral and national planning process, ending with the project for a specific health care facility; the whole constitutes a process which is schematically shown in Fig. 1. This process can be divided into three major steps, depending on whether the relevant activities are carried out at the national, regional or local level.

Global planning corresponds to the phase in which consideration is given to the general aspects, which determine, at the national level, the scope of the sector's activities and its investment requirements and the specific internal needs for the fulfillment of the sectoral responsibilities accepted.

**National level**

The national policies laid down by the government are reflected in a national development plan, which, in order to meet its physical investment needs, consolidates all the sectoral requirements into a national investment plan, taking into account the internal and external resources which its capacity to raise funds and obtain credit enables it to mobilize. The national investment plan indicates an expenditure limit for each sector, depending on the national needs and priorities.

**Sectoral level**

Stemming from the national policies and formulated in close coordination with them are the sectoral health policies, which are interpreted and made explicit in the health plan, a document that establishes the objectives and goals to be attained and specifies, in a sectoral investment plan, the needs for creation, improvement and replacement of health facilities within the financial ceiling established for the sector, plus whatever local contributions can be reckoned on.

3. REGIONAL PLANNING

An essential precondition for drawing up the health plan is to have regional plans for the sector in which specific account is taken of the needs of the area in terms of facilities and the investments that must be made in order to carry out the plan.

Regional planning has great importance as the basis for the overall planning process of the sector. Two main planning systems have emerged:

- From the bottom up: local requests are examined, screened and consolidated at regional level, thus constituting regional proposals that are transmitted to the national level. On the basis of these proposals allocation of resources to regions are decided at national level; regional and local authorities then revise their plans according to the resources allocated.
- From the top down: resources are allocated to regions by the national authorities on the basis of decisions concerning global national policy and, consequently, desirable regional development of health services. Regional authorities in turn distribute these resources to local authorities.

In both cases there is a two-way flow of information but the results are not quite the same. In the first case, the lower authorities have little power of decision on the proposed projects that will be retained but their skill in presenting their needs will influence the amount of resources allocated to them. In the second case, they have little influence on the amount of resources they will receive but more power of decision on how to utilize those resources.

FIG. 1. GENERAL PROCESS OF PLANNING A HEALTH FACILITY
In practice, however, these two flows of information are not independent of each other, nor do they take place in the strict chronological order implied in the above description. In the first system, each level will have a good idea of the policies of the levels above them and will formulate their requests accordingly. In the second system, upper tiers will be aware of the needs and wishes of lower tiers and will take their decisions accordingly. This process can reach such a point as to become a composite system, characterized by continuous interaction between different levels; this is, in fact, the most prevalent situation in Latin America.

The phase of regional planning as far as health facilities are concerned can be divided into two stages: a first stage of planning and programming of the network of facilities needed to carry out the health tasks and activities assigned to the region, and a second stage at which the general features of each facility are planned. Consideration is particularly given here to those aspects of the regional plan which relate to investments in physical construction and, specifically, those relating to the planning and programming of hospital facilities.

It is highly desirable that regional plans be implemented in the short, medium and long term. It thus becomes possible to gear the planning of physical facilities to projections of the available economic and manpower resources necessary for operating these services and to educate the community in the optimum utilization of the services available.

**Regional systems of facilities**

The planning of the system of facilities for the area is based on the needs derived from the programme. The location, type and characteristics of the facilities are adapted to the levels of care adopted for the regionalization of services, considering that each facility does not constitute an independent or isolated service but an integral part of the system (see Fig. 2). The existence or creation of each facility should be justified in so far as its functioning contributes rationally to meeting the health care needs of the locality concerned.

**FIG. 2. THEORETICAL EXAMPLE OF GENERAL PATTERN OF REGIONALIZATION SHOWING PROGRAMME AREA AND TYPE OF FACILITY**
and of the region, its activities fitting into an ordered whole which delivers the right
service at the right time, with the greatest efficiency and at the least possible cost to the
system.

Once the main lines have been drawn showing the need to create or improve installed
capacity and the main characteristics required of each facility have been determined, the
general frame of reference for necessary future investments will have been established. It
should be emphasized that the investment plan for the improvement and expansion of existing
facilities or the creation of new ones should be a direct response to real health needs and the
requirements of the area; no other consideration should influence the planning and programming
of health facilities.

A study preparatory to planning the services for the region should comprise a meticulous
general survey of the area concerned, covering the following points:

- Geographical, climatological, geological and other features;

- Distribution of the population, degrees of rural dispersion and urban concentration,
demographic characteristics and projections, migration, etc.;

- Physical integration of the region, communications systems, distances and time,
accessibility, isochrones, etc.;

- Cultural and educational levels, habits, customs, literacy, schooling, etc.;

- Income levels, regional and local types of economy, sources of production, per capita
income, family income;

- Public services available (both rural and urban), water supply and sewerage systems,
energy, disposal of solid wastes, transport, town-planning activities;

- Health situation, mortality, morbidity and fertility rates, life expectancy, prevalent
diseases, nutrition, housing, recreation, etc.;

- System of regionalization of health care in the area, participating bodies, systems of
administration and operation of the services, sectoral and multisectoral programmes,
degree of integration of activities, coordination, etc.;

- Existing health resources (physical, human and economic), expenditure on health and
its cost components, coordination of financing, degree of potentialization of the
services, census and physical and functional inventory of establishments, maintenance,
etc.;

- Coverages, size of population covered by types and source of care, levels, etc.;

- Supply of and demand for services, demand met and unmet, distribution of demand by
volume and type, etc.; and

- Local and regional prospects for development, foci of development, economic infra-
structure projects affecting the region, landholding system, settlements, etc.

The investigation, study and analysis of all these aspects should be conducted not merely
as a statistical, descriptive and critical exercise but with the aim of making a serious
contribution to knowledge of the health situation in the area and especially of how these
aspects affect the prevailing health level and conditions in the region. Obviously, it is not
always possible to carry out an exhaustive study of all these elements. In many countries,
it will only be possible to arrive at rough estimates or to work on the basis of extrapolations

1 The time it takes a patient to reach a health facility is more relevant for planning
purposes than the actual distance he has to cover. Isochrones are lines on a map showing the
distances from which the facility can be reached in the same length of time.
from experience gained in other regions with similar characteristics. The important thing is to keep in mind the directives, guidelines, standards and, especially, priorities established in the health plan, the available resources and the programmes in course of implementation or due to be implemented. These data will provide an overall picture that will enable the needs in terms of facilities and the investment requirements for the zone to be determined and their type and very broad characteristics to be fixed.

In view of the high cost of constructing and equipping premises for health care, especially hospitals, every possibility should be thoroughly explored of achieving a lasting, sound, economic and functional solution by remodelling the existing services. Consideration should also be given to the desirability of adapting specialized establishments to new functions, so as to transform them into general hospitals, before planning to build new ones. Nevertheless, since a good many hospitals in the developing countries are installed in very old buildings in a poor state of repair and differing greatly from modern buildings in functional design, it is wise to scrutinize any decision to undertake remodelling or adaptation in order not to be carried away with enthusiasm by apparent low initial cost.

Specific projects for facilities

Normally, the facilities to be created form part of a classical type of health service, i.e., a regionalized medical care system (described and analysed in Part I) comprising:

- primary level,
- basic level,
- intermediate level,
- regional level, and
- central level.

Each of these levels possesses, from the physical point of view, highly specific design and equipment features; consequently, the needs at each level with respect to environment, equipment and installations must also be planned and programmed individually in the light of the functions which the facilities are expected to perform.

Primary and basic levels. As these two levels have similar characteristics and closely related activities, their planning and programming should be studied simultaneously. Because of the nature of the service they provide, which is mainly designed for the rural areas, building and equipment needs are simple. The primary and basic levels facilitate the rapid extension of coverage to the most unprotected part of the population by constituting the spearhead for the penetration and extension of the health activities of the system. They are therefore the facilities which make the greatest demand on resources in the developing countries.

The planning and programming study should be conducted in two phases: firstly, an investigation of the localities which the regional plan indicates to be potentially suitable for coverage; and, secondly, classification and selection of facilities, taking into account the available resources.

The purpose of the investigation phase is to produce fuller knowledge of the localities as regards the following aspects:

- Characteristics, level and type of the construction work to be undertaken, identifying the requirements for erection, extension or remodelling of buildings and provision of emergency and maternity beds;

- The time required for the work, taking into account local construction materials and facilities available, with an indication of the starting and finishing dates;

- The body responsible for the work and the participation of other sectors;
- The body immediately above to which the facility will be attached functionally and administratively, for purposes of supervision, provision of supplies and referral of patients;

- Geographical accessibility of the higher-level facility, with an indication of the type of link-up, distance and time;

- The population, both local and in the catchment area, to be covered by the services.

- The building construction and equipment costs;

- The sources of financing; and

- The manpower and economic resources that are available or will have to be provided for operation of the service.

Next, a study must be conducted to grade and select facilities according to the priorities indicated by the selection criteria, of which the most important are:

- Inclusion in and support to comprehensive development programmes in the area;

- Need for the service in order to conduct programmes of the sector and degree of participation and motivation of the community for its acceptance;

- Time required for execution of work and anticipated date of opening;

- Resources, particularly human, available for operation;

- Coverage to be provided;

- Degree of accessibility, considering how isolated the area is;

- Degree of integration into the regionalized system provided for in the plan; and

- Complementarity of contributions to set up the facility.

This methodology was used in Colombia by the Ministry of Public Health (National Hospital Fund); out of 640 cases where facilities were indicated as necessary in the regional plans (sectional plans for the country), it was possible to select 270 for priority action (for details, see the Annex to this chapter).

In some cases, it proves difficult at the primary and basic levels to build health facilities by conventional methods and the use of prefabricated buildings should be considered. Before adopting such a solution, however, the following points should be examined:

- Inasmuch as services at this level do not need complicated facilities, is it possible to adapt to their use an existing building?

- Is it possible to use locally available skills and materials, complementing them by external inputs?

- May the erection of a health building be the occasion for developing at local level skills that may be useful to the community in other sectors?

- Can prefabrication be used only for that part of the facility that cannot be built locally?

- Does a cost comparison prove favourable to prefabrication, taking into account transportation costs (including breakage), durability, possibility of repairs, and cost of assembly?
- Is there an industrialized building industry in the country or, preferably, in the region?

- Will the population accept a health building whose design might be different from their traditions and, therefore, upsetting?

Provided satisfactory answers can be given to the above questions, prefabrication can be a speedy and cheap solution, especially if it can be applied on a large scale.

Self-help and community participation constitute a valuable contribution which must be encouraged and turned to account; this will be reflected in a feeling of community participation in obtaining the service, to the great benefit of its acceptance, utilization and subsequent maintenance.

The great demand for facilities at these levels and their simplicity make it very useful to have model types of project, standardized as regards their architectural design and equipment, which can with very slight modifications be adapted to the specific conditions of the sites chosen for their erection. Primary level facilities are, for example, health posts, health points, health stations, dispensaries, etc.; at the basic level there are such facilities as health centres, polyclinics, etc. The function of both levels is to provide ambulatory care and sometimes, in the case of the health centres, inpatient care for emergency or maternity cases. For the purposes of this study, the primary level is identified with health posts and the basic level with health centres.

Health posts are facilities whose running is entrusted to community health promoters or nursing auxiliaries, with periodic supervision and support by professional staff from the higher levels. Their accommodation facilities are generally limited to two or three units: patients' waiting-room, work-room, a small medicine store that may or may not be included in the work-room, and toilet facilities for public and staff. Where there is no public water supply or sewerage service, the health post must be equipped with the simplest and most uncomplicated systems to replace them, thus providing a working example of basic rural sanitation measures such as latrine construction, water supply, wastes disposal, protection from and elimination of vectors, etc. Adjoining the premises there should also be a house for the person in charge and his family to live in; this building should constitute a model which will stimulate the community to improve its housing conditions, especially with respect to ventilation, lighting, cooking methods, hygiene, provision of adequate space, use of local materials, etc.

A very practical variant solution at this primary level, particularly when the aim is to provide the simplest type of service with a health promoter in charge, is to make use of an existing room made available by the community in the school, place of worship or other building, or even in the promoter's own dwelling, providing only the minimum equipment necessary for the performance of the tasks assigned to the level.

In Peru, under the National Plan for Development and Integration of the Rural Population, the following system was used to provide minimum services at this level: the community provided a room; the National Health and Social Welfare Fund equipped it; and the Ministry of Public Health, through its educational programmes, trained a health promoter from the locality.

The equipment provided consisted of a piece of furniture, called the "basic health unit", which was divided into three independent modular sections (see Fig. 3). The modular sections were delivered by instalments for the promoter to work with as her capabilities progressed and improved. The first section was designated the "preventive module" and contained equipment, instruments, and materials needed for preventive work, particularly immunization. The module also contained a suitable quantity of basic medicines for very general use, requiring no specific medical prescription. A very elementary manual of symptomatology was provided for help and guidance in the use of the medicines. The second section that could be adjoined was the "curative module", which was delivered when the promoter had had adequate training in that field. The module contained equipment, instruments and materials for minimum curative care work, such as treatment of wounds, first aid, etc. This section included a couch, which was also used by the doctor or nurse on their visits. The third section, which could also be
added on, consisted of the "administrative module" and in it were provided the materials required by the promoter, when she had been given the necessary training, to do statistical work and draw up tables, etc. to assist the higher level. In some areas that had periodic health education broadcasts, a battery radio set was also provided so that the promoter could help the broadcasts reach a wider audience by bringing the community together between four walls. It was planned, at a later stage, to broadcast programmes concerning other sectors, such as agriculture, education, and housing, since they dealt with activities integrated within a multisectoral development programme.

Health centres usually have regular or permanent professional staff; their physical needs vary according to the range of their responsibility and influence in the area, the size of the population to be served, the primary services requiring supervision, the possibilities of access to the higher level and the human resources available. There exist two types: the health centre without beds, and the health centre with beds. Health centres with beds generally represent the second stage in the development of the original health centres, which is reached by successive extensions.

Health centres require greater facilities than health posts: they must have separate rooms for administration, consultations and treatment and, if possible, laboratory and X-ray installations. The beds, if they have them, are generally earmarked for short-term hospitalization of patients in emergencies or for referral and for hospitalization of maternity cases; if maternity cases are accepted, the centre will be provided with the necessary delivery room and annexes. The necessity of providing kitchen, laundry and store rooms for these services will depend on whether or not the patients are required to supply their own food and linen.
The health centre with or without beds must be equipped to deal with emergencies requiring temporary hospitalization, such as injuries and poisonings, and especially to administer dehydration to children pending referral to the higher level.

The plans for health centres should be very flexible so as to allow for phased expansion, which may bring the health centre up to the size of a small hospital, preferably of not more than 10 to 15 beds, with permanent inpatient facilities reserved for paediatric and obstetrical cases.

The "model designs" and standardized architecture and equipment of the health centres should facilitate their progressive development as the needs increase in their localities and areas of responsibility and as greater resources become available to the system.

Fig. 4, 5, 6, 7 and 8 show the architectural studies which were carried out in Colombia by the National Hospital Fund as an aid to the planning of health posts and health centres. The studies apply the principles of standardization and progressive development by stages.

Intermediate level. From this level upwards it is essential to conduct special studies for planning the facilities. Their object will be to pursue in greater depth the investigation conducted during the regional planning phase, to examine and analyse in detail the characteristics of the urban centre where the facility will be located and its zone of direct influence, and to define the specific function it will perform within the regional structure of services.

Facilities at the intermediate level are usually general hospitals of between 100 and 200 beds which provide care in the four basic specialties (internal medicine, surgery, obstetrics and paediatrics) and have all the relevant facilities for these. It is usual for this type of facility to start with a smaller number of beds which is then progressively increased. It is inadvisable, however, for the final capacity to exceed the initial capacity by more than 30%, since the general services have to be planned from the start to meet the final demand of the establishment. The architectural design should therefore be executed in full from the start so that the facility may be developed progressively by stages, without interfering with normal functioning and causing the least possible inconvenience to the users.

It is possible at this level for hospital design and equipment to be completely standardized, so as to obtain a "standard model"; but it is more practical and advisable to standardize basic sectors of the hospital, i.e., to construct "model units" for the various suites corresponding to the main departments such as administration, outpatient unit, auxiliary services, wards, surgical and obstetrical units, and nonmedical services. These "model units" make it possible to switch between various possible architectural solutions to the problems arising from the different characteristics, areas and topography of the available sites. Careful thought has, however, to be given to the junction and link-up between these "model units" in order to preserve the correct functional relationships between them and ensure the rational circulation of external and internal traffic for patients, personnel, public and supplies.

Fig. 9 shows a schematic diagram of model units used for the construction of hospital facilities in Peru. This system facilitated the implementation in Peru of the First and Second Hospital Plans, in which provision was made for 17 hospitals of between 120 and 300 beds each, making an overall total of over 3000 beds. Utilization of these "model units" enabled the designs for the first 12 hospitals to be completed in four months and the buildings to be constructed and completely fitted out in three years; moreover, the orientation of the personnel and their subsequent mobility were greatly assisted.

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1 By "model unit" is meant the standardized block of rooms which make up a significant unitary sector within the hospital; for example, the entire administration, the outpatient department, the auxiliary services, the inpatient department with its four basic services considered separately, the surgical and obstetrical sector, the general services. Each of these is considered as a unitary sector whose design and equipment can be standardized and they constitute "sectorized model units" whose manner of assembly can be manipulated so as to obtain a variety of overall solutions for the hospital as a whole.
FIG. 4. MODEL HEALTH CENTRE: EXTENSION SCHEMES

FIG. 5. MODEL HEALTH POST: BASIC UNIT

1 INJECTIONS AND VACCINATIONS
2 MEDICINE STORE
3 WAITING AND MEETING ROOM
4 DEMONSTRATIONS
5 WASHROOM
6 PUBLIC TOILET
7 STAFF TOILET
8 KITCHENETTE
9 DINING ROOM
10 BEDROOM
FIG. 8. MODEL HEALTH CENTRE: THIRD STAGE

FIG. 9. POSSIBILITIES FOR STANDARDIZATION USING "MODEL UNITS"
BY SECTORS: INTERMEDIATE LEVEL HOSPITAL (120 BEDS)
The planning study for intermediate level facilities requires great care and thoroughness; it is highly desirable to have methodological guides to refer to for programming the process.

A method for guiding these studies, which in broad outline can well be applied to studies needed for the regional and central levels, is described below in section 4.

Regional level. To this level belong hospital facilities located in urban centres of some importance, i.e., departmental capitals or medium-sized towns which generally correspond to the poles of development of the area and are the centre of its government and administration. This level constitutes the hub around which the health system revolves: from it radiates the region’s medical care programmes.

The regional level facility usually takes the form of a general hospital of 200 or more beds, its capacity depending on the size and requirements of the area and, in particular, on the degree of integration of the area under its responsibility and on the level of development and efficiency of the peripheral services under its jurisdiction.

These hospitals provide outpatient and inpatient care in the four basic specialties and in the subspecialties required to meet the local and area needs. The capacity and level of organization of the hospitals is such as to permit the satisfactory solution of all the specialized care problems of the health care facilities within the system and to ensure the community as a whole a comprehensive, prompt and adequate service.

Owing to the nature of the services they provide and the size of their buildings, regional level hospitals do not lend themselves to the establishment of complete "standard models"; even with the "model units" by sectors, the architectural problems cannot be satisfactorily solved. These hospitals therefore have to be planned, programmed and designed individually. Standardization can and must, however, be maintained in the design and equipment of all the most characteristic accommodation units, such as offices, consulting rooms, laboratories, X-ray rooms, operating theatres, wards, kitchen, laundry, etc., so that they can be made to comply with standards at the national level.

In most of the developing countries, investigations and studies are conducted on varying scales and in varying depths to define specific hospital standards with respect to architectural design and equipment, as a means of regulating and guiding hospital planning. As such varied analytical approaches are made to the same medical activity, the standards which result are completely divergent, when they should be the same or very similar. It would be highly desirable to make the methods of investigation, analysis and calculation as uniform as possible at the level of continental areas possessing more or less homogeneous characteristics, thereby potentiating these isolated efforts and certainly producing a major impact on the overall cost of hospital investments. The following example illustrates this suggestion: in Latin America as a whole, hospital establishments are at present under construction with provision for approximately 100,000 beds. If the more rational organization of space entailed by carefully studied norms could lead to a reduction of constructed surface corresponding to 2 m² per bed, this would represent, should the norms be applied throughout Latin America, a total economy of some US$ 50 million at an average cost of US$ 250 per m².

In many cases the regional hospitals will be attached to faculties of medicine, necessitating special treatment in their planning and design in order to provide the requisite teaching and research facilities. It should be noted that, as every facility in the system must perform teaching and research functions at its own level, consideration should be given in all of them to providing the premises and equipment these activities require. The study for the planning and programming of regional facilities involves the same steps as have been indicated for the intermediate level, and the methodological guide described in Section 4 can be used for it, though the variety and standard of the services provided logically requires that a study be conducted in greater depth and detail.

1 By "standard model" is meant one in which it is possible to standardize the hospital completely and use a single comprehensive plan capable of being reproduced on different sites with minimum variations. Logically, this system can be applied only to small hospitals or when a complete project can be repeated owing to similarity of topography and especially of the programme requirements that must be fulfilled to meet the medical needs.
Central level. The function of facilities at this level is to provide specialized medical services for selected patients who require particular conditions of care and treatment and, in addition, to perform specific tasks in high-level research and training of specialized staff. Because of their great complexity and the high concentration of resources required for their installation and operation, together with the fact that their field of activity is generally nation-wide or covers several regions, their planning lies in part outside the scope of the regional system and belongs more properly to the sectoral planning system; nevertheless, the programming studies can again be conducted according to the methodological guide which is given below as a model for intermediate and regional establishments.

4. LOCAL PROGRAMMING OF ESTABLISHMENTS

Methodology

The most characteristic health establishments are hospitals, whether of the intermediate, regional or central level, so it seemed helpful to set out below a methodological guide for their planning and programming (Table 1). Experience of its application has been favourable, especially in respect of its adaptability for supplementing regional health plans. In order to clarify the exposition of this methodological approach, it has been presented in three parts: phases to be accomplished; most important actions or activities to be performed; and objectives to be attained.

The phase of justifying the investment is not included in the guide, since obviously the matter will have been thoroughly studied and the decision to establish the service will be firmly upheld in the health facilities plan approved for the region. The initial assumption is therefore that the level and location of the establishment have already been determined and that it is necessary only to decide on its optimum size, the details of its organization, and the combination of features needed to produce the maximum impact at the lowest cost using the minimum resources, and to plan all the stages of the erection and equipping of the building, establishing the requisite coordination with the training of staff, the administrative organization under which it will operate and the provision of economic resources for its subsequent functioning. The methodological guide presented below is intended to provide a logical and practical order and sequence of implementation, stimulating and emphasizing teamwork and coordination at every level in order to achieve the optimum end result.

Coordination

It is important to bear in mind the coordination which the methodology is designed to promote and help implement in order to obviate the situation that commonly arises with many hospitals in the developing countries, where, for example, hospital building is started without provision for full financing of the project or without considering how the building is to be equipped when it is completed. Worse still, in other cases the construction work and equipment are financed and completed and no trained manpower is available to operate the establishment. Through lack of coordination, situations also frequently arise in which the building has been constructed and equipped and the staff has been trained, but no financial resources are available for operating the establishment. The most graphic evidence of lack of coordination in the planning and programming of health establishments is the large number of half-built, half-equipped or half-functioning hospitals scattered over towns and cities in the developing countries.

A diagrammatic representation of the advantages of coordination is given in Fig. 10, which shows how, by coordinating the construction of the building, its fitting out, the provision of the necessary human resources and all the financing operations, it is possible to obtain: at the planning stage, a rational technical decision; in the studies, realistic programming of investment needs; in the implementation phase, assured availability of all the necessary resources; and, finally, subsequent reliability of operation in optimum conditions for providing a good service.
Table 1. Methodological guide for planning of hospital projects

<table>
<thead>
<tr>
<th>STAGE</th>
<th>ACTION OR ACTIVITIES</th>
<th>OBJECTIVE</th>
</tr>
</thead>
</table>
| INVESTIGATION  | - Delimitation of area to be served
- Study of community involved
- Study of health situation | To define and get to know:
- Universe of work
- General frame of reference
- Specific health framework |
| ANALYSIS AND CONCLUSIONS | - Establishment of health diagnosis
- Presentation and evaluation of alternative courses of action | - To identify problems in respect of importance and magnitude
- To define the problem field
- To determine responsibilities
- To indicate possible solutions |
| DECISION       | - Selection of alternative
- Inclusion of alternative in plans of action | - To determine responsibility vis-à-vis the problem and agree to contribute to its solution |
| PRELIMINARY STUDIES | - Medico-architectural programme
- Preselection of site
- Preliminary architectural project
- Preliminary equipment project
- Estimation of cost of: building, equipment, training of personnel and operation
- Possibility study of execution and financing | - To prepare bases for solution and harmonize them with:
Available resources
Fundable resources
Mobilizable resources |
| FINAL STUDIES  | - Selection of site
- Preparation of architectural, engineering and equipment project
- Formulation of staff training plan
- Definition of methods and systems of administration and operation
- Final studies on financing of the installations and future operation | To have all the necessary studies ready for:
- Commencing the installations
- Training the personnel
- Administering and operating the establishment provided for in the solution accepted
- Establishing a complete programme for its financing |
| EXECUTION OF INSTALLATIONS AND PREPARATION FOR OPERATIONAL PHASE | - Putting out to tender and award of contracts for construction, equipment and inspection of installations
- Execution of installations
- Preparation of personnel
- Framing of administrative and operational regulations
- Promotion of demand for the service
- Appropriation of economic resources for operation | - To have the installations, personnel, systems and operational methods required for implementing the solution
- To have informed and educated public demand
- To have funding for operational phase |
| ACCEPTANCE DRY RUN | - Drawing up of records and inventories of building and equipment
- Testing of installations
- Verification of capability of personnel and efficiency of operational methods | - To know the present installed capacity |
| OPENING        | - Initiation of activities                                                            | - To solve the problem in the way provided for |

**Determination of size**

Once the location and level of the hospital to be set up are specified in the regional health facilities plan, the determination of its size constitutes one of the most important aspects of its programming. The size is governed by the service capacity to be provided for and, in general, it can be assumed that it will depend on the number of admissions and consultations; in turn, the admissions and consultations will be reflected in the number of beds and consulting rooms that will have to be provided. The volume and capacity of the other services will be proportionate to the figures for admissions per bed and consultations per consulting room obtained as a result of the basic calculation of the size of hospital required.
FIG. 10. COORDINATION OF THE PROGRAMMING PROCESS

<table>
<thead>
<tr>
<th>STAGE IN THE PROCESS</th>
<th>ASPECT TO BE COORDINATED</th>
<th>RESULT OBTAINED</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROPOSAL</td>
<td>Construction work</td>
<td>TECHNICAL DECISION</td>
</tr>
<tr>
<td></td>
<td>Equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Financing</td>
<td></td>
</tr>
<tr>
<td>STUDIES</td>
<td></td>
<td>EFFECTIVE PROGRAMMING OF INVESTMENT</td>
</tr>
<tr>
<td>EDUCATION</td>
<td></td>
<td>AVAILABILITY OF THE COMPLETED FACILITY</td>
</tr>
<tr>
<td>ACCEPTANCE</td>
<td></td>
<td>RELIABILITY IN FUTURE OPERATION</td>
</tr>
<tr>
<td>OPENING</td>
<td></td>
<td>GOOD SERVICE</td>
</tr>
</tbody>
</table>

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There exist various methods for calculating these two factors, ranging from the simple application of indices per head of population to complicated formulae involving a number of factors such as mortality among patients per 1000 persons who are in touch with a physician, morbidity requiring hospitalization, average lengths of stay in the hospital of the area, etc.; these methods require a considerable body of statistical data, which are usually not all available or reliable in the developing countries. The following is a practical and simple way of determining bed and consulting room requirements.

Calculation of bed requirements. First, the following will have been determined or assumed: universe of work in terms of population the establishment is responsible for serving, including both the direct population of the locality and the indirect population of the catchment area; number of admissions which it is aimed to be able to deliver to both population groups; the average length of stay that it is expected to be working with; and the occupancy rate desired for the hospital. The method is illustrated by the following example:

**Data**

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Direct population</td>
<td>20 000</td>
</tr>
<tr>
<td>Indirect population</td>
<td>100 000</td>
</tr>
<tr>
<td>Admissions per year per 10 inhabitants, direct population</td>
<td>1</td>
</tr>
<tr>
<td>&quot; &quot; &quot; &quot; &quot; &quot; &quot; indirect population</td>
<td>0.3</td>
</tr>
<tr>
<td>Average length of stay (bed-days per patient)</td>
<td>10</td>
</tr>
<tr>
<td>Hospital occupancy rate</td>
<td>80%</td>
</tr>
</tbody>
</table>

**Procedure**

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</tr>
</thead>
<tbody>
<tr>
<td>Direct population x admissions/year/10 inhabitants</td>
<td>20 000 x 1/10 =</td>
</tr>
<tr>
<td>= Admissions/year direct population</td>
<td>2000 admissions</td>
</tr>
<tr>
<td>Indirect population x admissions/year/10 inhabitants</td>
<td>100 000 x 0.3/10 =</td>
</tr>
<tr>
<td>= Admissions/year indirect population</td>
<td>3000 admissions</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total admissions/year</strong></td>
<td>5000</td>
</tr>
<tr>
<td><strong>Total admissions/year x average stay = total bed-days/year</strong></td>
<td>5000 x 10 = 50 000 bed-days/year</td>
</tr>
<tr>
<td><strong>Total bed-days/year</strong></td>
<td>365</td>
</tr>
<tr>
<td>= Total bed-days with 100% occupancy</td>
<td>50 000 = 137 beds</td>
</tr>
<tr>
<td><strong>Total bed-days with 100% occupancy</strong></td>
<td>365</td>
</tr>
<tr>
<td>Occupancy desired</td>
<td>0.8</td>
</tr>
<tr>
<td>= Beds with 80% occupancy</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>= 172 beds</td>
</tr>
</tbody>
</table>

This system enables rapid calculations to be made with the above variables. The two indices of admissions, for the direct and indirect populations, can be taken as the level of coverage it is hoped to attain. The average length of stay assumed may reflect the thoroughness of the care provided. Finally, the occupancy rate of the hospital indicates the efficiency it is hoped to achieve in the use of the services.
Calculation of consulting-room requirements. The universe of work is determined in a similar way. Indices are assumed for consultations to be delivered both to the direct population and to the referral population of the area. Indications are also given of: the average number of first and of subsequent consultations given in the area; the estimated duration of each consultation; and the time during which the consulting rooms are in use.

**Data**

- **Direct population**: 20,000
- **Indirect population**: 100,000
- **Consultations per person per year, direct population**: 2
- **Consultations per person per year, indirect population**: 0.5
- **Average first consultations in the zone**: 20%
- **Average subsequent consultations in the zone**: 80%
- **Time taken for first consultation**: 30 minutes
- **Time taken for subsequent consultations**: 15 minutes
- **Hours of work of consulting room**: 6 hours

**Procedure**

\[
\text{Direct population} \times \text{consultations/person/year} = \text{Consultations per year, indirect population} \\
20,000 \times 2 = 40,000 \text{ consultations} \\
\text{Indirect population} \times \text{consultations/persons/year} = \text{Consultations per year, indirect population} \\
100,000 \times 0.5 = 50,000 \text{ consultations} \\
\text{Total consultations per year} \\
90,000 \text{ consultations} \\
\]

\[
\frac{\text{Consultations/year}}{\text{Working days}} = \text{Consultations/day} \\
\frac{90,000}{300} = 300 \text{ consultations/day} \\
\]

\[
\text{Consultations/day} \times \% \text{ first consultation} = \text{First consultation/day} \\
300 \times 0.2 = 60 \text{ first consultations/day} \\
\text{Consultations/day} \times \% \text{ subsequent consultations} = \text{Subsequent consultations/day} \\
300 \times 0.8 = 240 \text{ Subsequent consultations/day} \\
\text{First consultations/day} \times \text{time} = \text{Time first consultation} \\
60 \times 30 = 1800 \text{ minutes} \\
\text{Subsequent consultations/day} \times \text{time} = \text{Time subsequent consultations} \\
240 \times 15 = 3600 \text{ minutes} \\
\text{Total time} \\
5400 \text{ minutes} \\
\]

\[
\frac{\text{Total time in minutes}}{60} = \text{Hours consultation/day necessary} \\
\frac{5400}{60} = 90 \text{ hours consultation/day} \\
\]

\[
\frac{\text{Consulting-room hours/day}}{\text{Consulting hours}} = \text{Consulting rooms} \\
\frac{90}{6} = 15 \text{ consulting rooms} \\
\]
The calculation can be made much finer if in both cases (admissions and consultations) there are records from which it is possible to determine the admissions and consultations by specialties, replacing the global index for the population by these data. The sum total of these partial data for each specialty will give the total number of beds and consulting rooms by specialties.

Similarly, by applying practical and simple methods, it is possible to determine the number of operating theatres, delivery rooms and other facilities. Tables 2-5 show calculations of facilities required, prepared in Colombia, and covering delivery rooms, operating theatres, etc. Fig. 11 and 12 are charts of programme analyses of projects.
Table 2. Calculation of the number of labour beds, delivery rooms and annexes required

1. **METHOD BASED ON OBSERVED REQUIREMENTS**
   - It is estimated that for every 10 lying-in beds there should be 1 labour bed.
   - It is considered that for every 3 labour beds there should be 1 delivery room.

2. **METHOD BASED ON AVAILABLE LYING-IN BEDS**
   - No. lying-in beds x days in yr = lying-in beds available per yr
   - Lying-in bed days available per yr = No. deliveries per yr
     \[ \text{Average stay per delivery} \]
   - No. deliveries per yr = No. deliveries per day
     \[ \frac{365}{365} \]
   - No. deliveries per day x 12 hrs in labour bed = No. hrs labour room
     \[ \frac{24}{24} \]
   - No. hrs labour room = No. labour beds
   - 1 delivery room can service 3 labour beds
   - Example: 30 lying-in beds, average 5 days stay per delivery
     \[ 30 \times 365 = 10,950 \text{ lying-in bed days available per yr} \]
     \[ \frac{10,950}{5} = 2190 \text{ deliveries per yr} \]
     \[ \frac{2190 \text{ deliveries per yr}}{365} = 6 \text{ deliveries per day} \]
     \[ 6 \times 12 \text{ hrs labour bed} = 72 \text{ hrs labour room} \]
     \[ \frac{72}{24} = 3 \text{ labour beds} \]
   - 3 labour beds will require 1 delivery room

3. **METHOD BASED ON BIRTH RATE**
   - Population x annual birth rate = births expected during yr
   - Births expected per yr x % in hospital = No. hospital deliveries
     \[ \frac{365}{365} \]
   - No. hospital deliveries per day = No. labour beds
   - Example: population 20,000, birth rate = 32 per 1000
     \[ 20,000 \times 32 \times 1000 = 640 \text{ deliveries (births) per yr} \]
     \[ 64 \times 80\% \text{ hospital deliveries} = 512 \text{ hospital deliveries} \]
     \[ \frac{512}{365} = 1.4 \text{ deliveries daily - say 2 deliveries per day} \]
     \[ \frac{2}{2} = 1 \text{ labour bed} \]

One primipara delivery takes an average of 12 hours and a multipara delivery 6 hours. When the admission takes place at an advanced stage in labour, delivery takes only 2-4 hours, giving an overall average of 7 hours for labour, equal to 3 deliveries per labour bed per day. It is advisable to apply this formula only when the number of lying-in beds is greater than 30 or the number of hospital deliveries per year greater than 1800. In other cases assume 2 deliveries per labour bed per day.

**Cots for New-Born Babies.** Should be equal to the number of lying-in beds. Multiple births are offset by stillbirths. In nursery system rooms of 9-12 cots with adjoining workroom recommended.

**Incubators for Prematures.** In South America, the recommended number of incubators is 3 per 100 deliveries, maximum 6 incubators per ward.

**Suspected Infection.** It must be expected that in 10% of normal deliveries there will be suspected infection, and there should be a maximum of two cots per room. There must be complete privacy, aseptic conditions and there should be a small workroom adjoining.

**Isolation of Mothers with Suspected Infection.** The percentage to be applied is the same (10%) and they should be placed in isolation rooms with a maximum of 2 beds each and with work and cleaning facilities.
Table 3. Calculation of the number of surgical wards and annexe's required

1. METHOD BASED ON OBSERVED REQUIREMENTS

- It is considered that for every 50 general inpatient beds there should be one operating theatre.
- For every 25 surgical beds there should be one operating room.
- Approximate ratio between general beds, operating rooms and operations observed in one group of hospitals

<table>
<thead>
<tr>
<th>No. of general beds</th>
<th>No. of operating rooms</th>
<th>No. of operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>100</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>200</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>500</td>
<td>11</td>
<td>35</td>
</tr>
</tbody>
</table>

2. METHOD BASED ON NUMBER OF SURGICAL BEDS AND ITS RELATIONSHIP TO OUTPUT AND AVERAGE LENGTH OF STAY

- No. surgical beds x 300 = surgical bed days available per yr
- Surgical bed-days available per yr = surgical patients (admissions) per yr
  Average stay
- Surgical patients per yr = operations per day
  Actual working days
- Operations per day x no. hrs per op. = No. operating room-hours
- No. operating room-hrs = No. operating rooms
  Hrs of work

Example: hospital with 42 surgical beds and 10 days average stay
- 42 x 300 = 12,600 bed days available per yr
- 12,600 = 1260 surgical patients (admissions) per yr
- 1260 / 10 = 126 operations per day
- 4.2 x 3 = 12.6 operating room-hours
- 12.6 / 8 = 2 operating rooms

It is assumed that there are only 300 usable days in the year per bed, which corresponds to an occupancy rate of 80%.

The average duration of operations is 2 hrs, but 3 must be allowed for, including the time for preparation and subsequent cleaning of the operating room.

ACCIDENT ROOM. It is desirable to assign an additional room for accident surgery when the total number of beds in the hospital exceeds 100. Its location should preferably be outside the clean (aseptic) zone.

SURGICAL DELIVERY ROOM. When the number of normal delivery rooms is greater than 2, one of them should be fitted out as a surgical delivery room.

RECOVERY. It is considered desirable to calculate at least 2 recovery beds per operating room and surgical delivery room.

DRESSING ROOMS. The recommended figure is 4 cubicles for doctors and 5 for theatre nurses to every operating room.

CENTRAL STERILE SUPPLIES. When the number of operating rooms, including accident surgery, does not exceed 4 to 6, the central sterile supply department can be located in the block that houses the operating rooms. If there is a larger number of operating rooms, it should be more independently located so that it can cater for the other departments in the hospital which generate a larger demand.
Table 4. Calculation of the area required for the collection of laboratory specimens

DAILY DEMAND. In the outpatient department 60% of referred patients require examination with collection of specimen, 40% bring a specimen from home.

- Specimen collection work is done for 1.5 hrs in the morning for outpatients.
- 14 collections per hr. are performed, each patient requires approximately 1.5 specimens per examination, and each patient stays half an hour for the collection.

EXAMPLE. Population 100 000. 1.5 per 1000 require laboratory tests, 60% of them need specimen collection.

- 150 beds mean 75 patients requiring laboratory tests; 20% of these must go to the laboratory for collection of specimen.
- 150 outpatients x 60% = 90 patients requiring examination with collection of specimen.
- 75 inpatients x 20% = 15 patients requiring examination with collection of specimen.
- Total (90 + 15) 105 patients requiring collection of specimen.
- Each patient is estimated to require 1.5 specimen collections. 105 x 1.5 = 157 specimen collections.
- The specimen collecting section works 1.5 hrs in the mornings and performs 14 collections per hr per cubicle.

$$\frac{157}{14 \times 1.5} = 8 \text{ cubicles}$$

- 20% of the cubicles should be equipped for collecting vaginal specimens and have an area of approximately 9 m$^2$ each, the rest can be 2 m$^2$ each.

- Net total specimen collection area:

<table>
<thead>
<tr>
<th>Component</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% of 8 cubicles of 9 m$^2$ each</td>
<td>18 m$^2$</td>
</tr>
<tr>
<td>6 cubicles of 2 m$^2$ each</td>
<td>12 m$^2$</td>
</tr>
<tr>
<td>Net total cubicles</td>
<td>30 m$^2$</td>
</tr>
<tr>
<td>Work area 50%</td>
<td>15 m$^2$</td>
</tr>
<tr>
<td>Net total specimens area</td>
<td>45 m$^2$</td>
</tr>
</tbody>
</table>

- Additional calculation for waiting-room
- 90 patients come from outpatient department and require examination with specimen collection, 50% come accompanied = 135 persons.
- 135 persons who are dealt with in 2 shifts.
- 15 patients come from inpatient department and are dealt with in 2 hours.
- Outside waiting room 135 persons/2 shifts = 68 persons per shift at peak operating rate.
- Inside waiting space for 15 patients = 15/2 = 8 patients, generally in wheel-chairs.
- Each outpatient requires 1.00 m$^2$ of waiting space; 68 patients require 68 m$^2$ of outside waiting area.
- Each inpatient requires 1.5 m$^2$ of waiting area; 8 patients require 12 m$^2$ of inside waiting area.
Table 5. Calculation of the space required for medical record files for the outpatient and emergency departments

<table>
<thead>
<tr>
<th>DATA TO BE CONSIDERED</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of medical record file</td>
<td>30 cm x 40 cm x 1 cm</td>
</tr>
<tr>
<td>Size of shelving (no. of shelves)</td>
<td>Shelves must be 40 cm deep. The height of the file allows for record cases 7 shelves high</td>
</tr>
<tr>
<td>- Number of medical histories per linear metre of record case (no. of medical histories per metre x no. of shelves)</td>
<td>- 100 x 7 = 700</td>
</tr>
</tbody>
</table>

**OUTPATIENT DEPARTMENT**

- Number of consulting rooms
  - 15
- Number of consultations per day per consulting room
  - 30
- Number of consultations per year (no. of consulting rooms x no. of c.p.d. per c.r. x no. of working days)
  - 15 x 30 x 300 = 135 000 (rounded up to 140 000)
- Proportion of consultations leading to a new medical history file
  - 20%
  - 140 000 x 20 = 28 000
  - 100

**EMERGENCY DEPARTMENT**

- Case load
  - 10% of outpatient department = 14 000
- Proportion of emergency cases leading to a new medical history file
  - 20%
  - 14 000 x 20 = 2800
  - 100

**OUTPATIENT AND EMERGENCY DEPARTMENTS TOGETHER**

- Total new files per year
  - 28 000 + 2800 = 30 800
- No. of years records kept in file
  - 5
- Total number of files on shelves
  - 30 800 x 5 = 154 000 (rounded up to 160 000)
- Linear metres of record cases needed
  - 160 000
  - 700 = 228
- Surface needed for the medical records room
  - Approximately 228 m² (this will, of course, depend on the arrangement of the room)
Administrative aspects of construction

Various procedures are used in administration of the construction work and the following descriptions of characteristics of those different methods are based on personal experience. The construction work is generally done under one of the following systems.

Direct administration. The construction work is done under the direct responsibility of the proprietor and state agency concerned. This type of procedure requires a sound technical and administrative organization and the necessary staff, equipment and resources must be available. If these requirements are met, lower construction costs can be achieved but it should be noted that usually limitations of resources and excessive red tape bedevil this system,avouring constant modifications in the project through the mobility of the power of decision and delaying its execution. This, in turn, leads to global shortages of funds and nullifies the effects of partial economies in implementation. Furthermore, the method does not sufficiently encourage coordination between the construction work and the overall outfitting.

Administration under contract. A firm or professional is commissioned under contract to administer the execution of the construction work for a fee corresponding to a percentage of the investment; for this a suitable contractor must be found, with adequate operational capacity and really interested in the optimum and fastest possible implementation of the work. Generally, since the longer the work is stretched out and the more changes are made, the greater is his profit, the contractor tends to apply a system very similar to that of direct administration, with all the concomitant disadvantages.

Fixed-price contract. A contractor is awarded by public or private bid the contract to carry out the work at a fixed price and within a fixed time. This is one of the best systems but it requires very thorough studies, assured funding and stability of construction costs, which are rather difficult conditions to fulfil in developing countries.
Unit-price contract. This is similar to the previous system except that no final overall cost is fixed. The contractor may allow for the changes in the unit prices of the uncompleted parts due to rises in costs in relation to the initial costs stipulated in the original baseline budget. This is the system that is most widely used and best suited to the conditions prevailing in South America.

Turnkey contract. This is also a widely used method but controversial because of the abuses it is open to. It consists in contracting at a fixed price and with a fixed time limit for the construction and complete outfitting of a facility — generally a hospital — and is normally accompanied by provision for its total or partial financing. This method of execution is superficially very attractive but, unless very full studies have been made and the proprietor takes a direct hand in this operation, it allows the financing contractor to submit architectural and engineering projects that are costly to implement and sometimes ill-adapted to the socioeconomic situation of the country and to the medical needs programmed for. In particular, the contractor is tempted to supply unnecessary equipment, with the result that, in many cases, facilities erected under this system turn out to be very costly, elaborately finished constructions and their equipment (the main thing that interests the contractor-financier) is excessive and oversophisticated. Nevertheless, the possibility of using this system must not be ruled out for, under proper supervision and carefully worked out contractual conditions, it provides one of the best means of rapidly putting into commission very fine facilities which otherwise could be obtained only after very long delays and at unpredictable costs. A procedure for operating this system which has worked out well in practice and given good end-results is to give priority consideration to the following points in the contractual phase:

- To assume financial responsibility, within the limits of the national borrowing capacity, with suitable rates of interest and repayment dates;
- To carry out directly all the studies for the construction and equipment project in the light of the actual needs and with due regard to local conditions and limitations of resources. Only where the proprietor is not independently equipped to carry out the studies can technical assistance be accepted from the contractor-financier, the proprietor remaining fully responsible for approving the studies;
- To put the construction of the installations directly out to tender among national firms, engaged jointly with the contractor-financier, and transfer to the latter the responsibility for financing the work, subject to guarantees of execution stipulated by mutual agreement and prior to the putting out to tender. Should there be nobody at the national level fully equipped to contract for the execution of the work, mergers between national undertakings and foreign construction firms may be accepted, always provided they take place before the bidding and that the relevant findings, clauses and conditions are accepted;
- To prepare directly the equipment studies and manning tables; the contractor-financier will provide only guidance and data to facilitate selection;
- To stipulate in the contract that the contractor-financier may not use or supply material resources or equipment from abroad if they are obtainable in the country;
- To stipulate in the contract that the contractor-financier shall be responsible for supervising and coordinating the execution of the work in order to obviate subsequent dephasing or incompatibilities between the construction work and the facilities for assembling and installing the equipment. On the request of the contractor-financier, who acts as controller, and in case of proved breach of contract by the building contractor, the former may replace the latter for the completion of the work, at the same cost and with the original time-table, carrying out the operations by direct administration or with a building firm considered reliable, so that the completion of the entire process is not jeopardized. The proprietor will maintain general surveillance and right of inspection; and
- To stipulate in the contract the obligation of the contractor-financier to train national operating and maintenance personnel, providing guarantees of functioning, upkeep and availability of spares for a reasonable time.
5. CONCLUSIONS

- Regional planning and programming of establishments constitute one phase in the overall process of sectoral planning and take their appropriate place within it.

- Sectoral planning is compatible with and follows logically from national planning and the relevant development plans.

- The regional investment plan is part of the sectoral investment plan, which in turn is part of the national investment plan.

- The regional plans give rise to local projects for facilities, which require a study and a special methodology for their planning and programming; they must be governed by and respond to the requirements of the plans and programmes for development and extension of services in the region.

- Multidisciplinary participation is essential in the preparation of the plans and studies at every level. The architect who specializes in health service buildings is an important member of the working team.

- The standardization of architectural designs and equipment, on an integrated basis, through "model units" for sectors, constitutes an extremely valuable procedure for shortening construction times, reducing costs, and facilitating operation and maintenance, especially in establishments of the primary, basic and intermediate levels.

- For the primary level, possibilities of rapid, economic and satisfactory mass construction of facilities must be explored by considering very simple solutions with intensive community participation.

- The optimum size of hospital facilities will depend mainly on the facilities for ambulatory and inpatient care and community protection required by the actions and activities planned to be developed by the whole service in the medical-architectural programme, at a level of capacity and complexity commensurate with the level of regionalization and the size of the population to be served.

- Standardization of accommodation units and equipment is highly necessary and useful and facilitates rationalization of architectural designs and staffing patterns, with great advantages in respect of installation, running and maintenance costs and of training and mobility of personnel.

- It is desirable to consolidate the isolated efforts being made at country level to obtain national standards for design and equipment of health facilities. This could be achieved by convening expert committees to study and harmonize them at the international level, thereby optimizing the employment and use of resources, reducing installation, maintenance and running costs, promoting and encouraging multinational programme integration, and stimulating regional production of materials and equipment.

- It is necessary to establish methodologies for the development of investments in health facilities, identifying the stages to be accomplished, the activities to be developed, the sequence for their implementation, those taking part and responsible for carrying them out, the requirements to be met in each case and the probable time needed for implementation, establishing the coordination mechanisms necessary in the process and facilitating technical decision-making.
Annex

HEALTH FACILITIES BUILDING PLAN, COLOMBIA, 1975

A study to determine the priorities for the construction of health facilities was conducted in Colombia essentially by utilizing two data sheets, which were completed according to the following procedure:

The first data sheet (part of one is shown in Annex Table 1) was designed to investigate and study in greater depth the general conditions, the level of service to be provided and the possibilities for immediately constructing and commissioning the facility. On it was entered, in accordance with the coding system and instructions that accompanied it, the following data:

1. Number allocated to the locality, in alphabetical order by departments.
2. Name of the specific locality where the service was to be established.
3. Characteristics of the installation, specifying:
   3.1 Level required (as stipulated in the Regional Plan).
   3.2 Type of construction necessary, where: N = new, E = extension, RE = remodelling and extension. It is more practical to indicate only R and identify it as remodelling.
   3.3 Number of beds, specifying the number available or to be provided, according to the needs of the programmes and the capability of the manpower provided for operating it.
   3.4 Time-table for execution, with tentative starting date and possible date of completion (depending on construction facilities of the region and economic resources that can be allotted).
4. Place within the regionalized system:
   4.1 Name and level of the facility immediately above to which it will be attached (in order to determine the degree of supervision, control and support that can and must be provided).
5. Geographical accessibility, specifying:
   5.1 Type of communication link with the higher facility and whether it is permanent or irregular (isolation by climatic conditions, etc.).
   5.2 Distance in kilometres and time.
6. Coverage (population potentially eligible for care):
   6.1 Urban (in the locality where the facility is sited).
   6.2 Rural (in its area of responsibility).
7. Economic aspects:
   7.1 Construction, equipment and total costs; it would be desirable to add estimated costs of operation (in order to determine the amount of the investment and the running expenses).
   7.2 Source of financing, where: M = Municipal level, D = Departmental, N = National (for purposes of seeking contributions from complementary sources and determining the degree of community participation).
8. Human resources:

8.1 Available (trained and appointed).

8.2 Programmed (requested in the budget for the following year).

On the second data sheet (Annex Table 2) a study and analysis was made of the application of criteria for selection and their internal level of priority to the information obtained with the first data sheet; from the results of the overall grading emerged the final priorities to be applied. Eight criteria for selection were identified, with weightings from 1 to 5 according to the importance they were judged to have. Each criterion had three grades of internal priority, identified by letters (criteria with equal weighting had the same letter for the assessment of their order of internal priority).

In each column corresponding to the criteria selected was entered the letter indicating its assessed level of priority and then, as the score, the product of the letter indicating the level multiplied by the weighting of the criterion. Finally, the score obtained by each locality was entered on a table summarizing the gradings obtained for all the criteria. The final priorities for selection were determined by the largest number of priority levels obtained, in descending order from A to O. The criteria for selection established, and their internal levels of priority, identified by the corresponding letter, were:

1. Inclusion of the facility within the requirements of multisectoral programmes of integrated rural development in process of implementation - weighting 5:

   A. Project for facility included within areas of multisectoral plans and providing direct support for their activities.

   B. Projects included within the area of multisectoral action and requested in the regional health plan.

   C. Projects not included within the area and requested in the regional health plan.

2. Felt need of the community - weighting 5:

   A. Projects located in critical areas for social welfare specified by the Government.

   B. Urgently needed projects that cannot be implemented owing to economic limitations.

   C. Necessary projects in whose implementation the community would participate.

3. Anticipated date of opening - weighting 4:

   D. Projects in course of implementation and soon to be terminated.

   E. New projects.

   F. Projects for remodelling or expansion.

4. Operational resources available - weighting 4:

   D. Facilities with staff available and appointed.

   E. Facilities with staff requested in budget and training facilities in the area.

   F. Facilities with no staff budgeted for.
### Annex Table 1: Survey of requirements

<table>
<thead>
<tr>
<th>No.</th>
<th>Locality</th>
<th>3.1 Level</th>
<th>3.2 Type of construction</th>
<th>3.3 No. of beds</th>
<th>3.4 Starting date</th>
<th>3.5 Completion date</th>
<th>4.1 Executing agency</th>
<th>4.2 Name</th>
<th>4.3 Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Puerto Libertador (Montalbano)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>1974</td>
<td>Montalbano</td>
<td>X</td>
<td>Montalbano</td>
<td>LA</td>
</tr>
<tr>
<td>42</td>
<td>Pueblo Nuevo (Municipio)</td>
<td>X</td>
<td>X</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Sahagón</td>
<td>X</td>
<td>Sahagón</td>
<td>RA</td>
</tr>
<tr>
<td>43</td>
<td>Punta de Yanes (Ciémas de Oro)</td>
<td>X</td>
<td>X</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Cerreté</td>
<td>X</td>
<td>Cerreté</td>
<td>RR</td>
</tr>
<tr>
<td>44</td>
<td>Ebo Largo (Cerreté)</td>
<td>X</td>
<td>X</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Cerreté</td>
<td>X</td>
<td>Cerreté</td>
<td>RB</td>
</tr>
<tr>
<td>45</td>
<td>Rodania (Sahagón)</td>
<td>X</td>
<td>X</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Sahagón</td>
<td>X</td>
<td>Sahagón</td>
<td>RA</td>
</tr>
<tr>
<td>46</td>
<td>Sabana Nueva (San Pelayo)</td>
<td>X</td>
<td>X</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Cerreté</td>
<td>X</td>
<td>Cerreté</td>
<td>RB</td>
</tr>
<tr>
<td>47</td>
<td>Sabaneta (Monil)</td>
<td>X</td>
<td>X</td>
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#### KEY to Annex Table 1

- **HP** - Health post
- **HC** - Health centre
- **N** - New
- **RE** - Remodelling and extension
- **E** - Extension
- **SSH** - Social Security, Health Branch
- **A** - A level
- **B** - B level
- **LA** - Local, of A level
- **LB** - Local, of B level
- **RA** - Regional, of A level
- **RB** - Regional, of B level
- **M** - Ministry
- **D** - Department
- **N** - National
for health centres and health posts

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**NORTE DE SANTANDER**

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programme, 1973-74: grading and priorities of projects

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5. Coverage – weighting 3:

G. Facilities in places devoid of health services.
H. Facilities expanding their service capacity.
I. Facilities improving the quality of their services.

6. Geographical accessibility – weighting 2:

J. Facilities having possible link-up with the facility above them.
K. Facilities connected by rail or river.
L. Facilities with permanent road link-up.

7. Degree of integration into the regionalized system – weighting 2:

J. Facilities that complement the activities and programmes of the regional plan within the system.
K. Facilities that have no immediately superior body nearby but provide support for activities and can be integrated into the system.
L. Facilities without proper support services and whose integration into the system would present some difficulty.

8. Complementarity of contributions – weighting 1:

M. Projects with full financial coverage and concerted contributions (national, departmental, municipal, etc.) for their implementation.
N. Projects with full financial coverage provided for at the national level.
O. Projects with partial financing.

The application of the highest weighting, 5, to criteria 1 and 2 reflects the need to give particular emphasis to the development of government plans and programmes in multisectoral activities for integrated rural development and in the regional plan. Criteria 3 and 4 were allotted weighting 4 because of the desirability of timely opening of the service and rapid utilization of available operational resources. The apparently low weighting 3 accorded to criterion 5 (coverage) reflects the need to complete the training of personnel to staff these levels before providing a service which, without adequate staff, would not guarantee a minimum of efficiency and effectiveness. Criteria 6 and 7, with weighting 2, correspond to the need to extend but not abandon, owing to problems of communication, services that have recently initiated their activities, thereby hampering their own integration into the regionalized system. Finally, although availability of complementary financial contributions is in general important, in this case criterion 8 was given the lowest weighting because the sectoral investment plan had not yet been finalized.

It will be readily seen that the permutations obtained by the application of weightings to the criteria enables the final selection of the establishments to be adapted to new analytical approaches. Annex Figure 1 shows the structure of the methodology applied in the study conducted in Colombia.
ANNEX FIGURE 1. STRUCTURE OF METHODOLOGY APPLIED IN THE STUDY: NATIONAL HOSPITAL FUND, MINISTRY OF PUBLIC HEALTH, COLOMBIA, HEALTH CENTRES AND HEALTH POSTS PLAN, 1973-1974

SURVEY OF NEEDS
- At central level
- At sectoral level
- At level of other programmes of joint action

ANALYSIS OF NEEDS
- Characteristics of the demand sought

COORDINATION AND HARMONIZATION
- Ministry of Health
- National Planning Department
- INCORA (Colombian Institute of Agrarian Reform)

SELECTION OF PROJECTS
- Determination of criteria for selection
- Grading
- Assignment of priorities

 ALLOCATION OF RESOURCES
- Investment Plan of National Hospital Fund 1973
- Resources from external loans
- National Hospital Fund Budget for 1974
THE PLANNING TEAM AND PLANNING ORGANIZATION MACHINERY

Raymond Moss

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* Director of Medical Architecture Research Unit, Polytechnic of North London, United Kingdom.
1. **INTRODUCTION**

This paper is concerned with identifying the reasons behind the emergence of multiprofessional planning teams in the United Kingdom and discussing their advantages and disadvantages. The organization of planning teams is considered together with the need for planning procedures and, by way of analogy with the situation in developing countries, the United Kingdom position at the inception of the National Health Service is discussed.

The intention behind the paper is to provide a basis for progress using a particular model for comparison and discussion. What it has to offer lies in the field of problem definition to avoid the copying of extravagant foreign models, coupled with experience in the possibilities and pitfalls of the system described. By comparing and discussing organizations, methods and plans, each country should be working towards its own unique solution.

Some observations are offered regarding the general applicability of design solutions and finally some thoughts which might be of help to those without previous experience are set down.

2. **GENERAL BACKGROUND**

Of recent years the emphasis of the health care delivery system has shifted from hospital to community. But this was not the case in 1948 when, because of the war, the United Kingdom found itself with a National Health Service but no generally acceptable hospital design idea or model.

In a sense, therefore, the position in the United Kingdom then bore a close resemblance to the position in a number of developing countries now, the question being: how best can a nation with little or no previous experience organize itself to produce with a minimum of delay and at a cost it can afford the health service buildings it requires?

In that situation, something was done which today would be regarded as doubly dangerous: looking overseas for hospital design ideas or models. Such a quest is doubly dangerous because firstly, it is most unlikely that a hospital designed specifically for one country will be equally appropriate in another, and secondly, to propose a hospital in isolation from community care provision is now regarded as both inefficient and extravagant. But comprehensive health care planning was not practised in 1948 so the situation was one of ignorance being bliss.

The war had, in fact, impoverished the nation to such an extent that even though there was a need for new hospital building there was no money to do it. Paradoxically, it was this poverty which perhaps averted a number of major hospital building disasters, for, although the dangers inherent in simply copying another country's hospital were foreseen by a small number of people, it was the lack of money for hospital building that stemmed the demand for copies which surely would have arisen if resources had been plentiful. In this respect, rich developing countries anxious to build hospitals in a hurry are at considerable risk.

With minimal experience and no money to build, there was at least time to think. Looking abroad to assess the problems and possibilities went in parallel with a home-based research programme. The first properly organized and financed research unit with responsibility for addressing itself to the problem was the Division for Architectural Studies of the Nuffield Provincial Hospitals Trust. Three particular qualities characterized their work: first, design solutions were based on a thorough understanding of function; second, this thorough understanding was achieved by carrying out studies with a multiprofessional team; and third, the construction and operation of live projects to demonstrate the team's findings were more dramatic than a written report and, because the aims were stated clearly, meaningful evaluation became possible.

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Perhaps developing countries might consider establishing small, compact, centrally located research units in order to determine the specific roles and functions of their own proposed hospitals and to experiment with health care buildings in their own context. The definition of roles and functions is crucial both to briefing or programming and evaluation not only of the proposed building but of any building visited during the course of the research. When looking at hospitals in other countries it is important that the observer knows and understands the implications of what he is looking at. Pleasant but aimless strolls round foreign hospitals are usually both dangerous and expensive.

That "form follows function" was, for many years, a catchphrase among hospital planners whose job was to define the particular problem of the United Kingdom. The implication of this idea is that there is one "best" plan for any given function - a one-to-one fit. The Nuffield team put this view in context by pointing out that, although hospital planners have generally wished to believe that function has dictated design, in the complex environment of the hospital "the influence of design upon function may be very great".

This fundamental proposition has changed the whole course of hospital planning from one in which individual designers sought to create a hospital tailor-made to suit the individual process or activity into one in which multiprofessional planning teams, on the basis of their combined knowledge and experience, produce loose-fit designs which can cope more easily with the rapid changes which occur in medical and nursing practice and management. These ideas are now brought to bear routinely when evaluating hospital planning proposals. Designing for flexibility requires a deeper knowledge of user needs.

Hospital problems may be approached from two points of view. Referring again to the Nuffield Report,¹ "... One way is from the accumulated knowledge and experience of those whose daily work has been within the hospital or in hospital design; the other is by bringing to bear fresh minds and fresh methods from outside because people working in hospitals are often too close to their problems to view them dispassionately." In the event, the Nuffield team considered the two approaches to be complementary and aimed at a balance between them.

If the Nuffield proposition is accepted then, from the viewpoint of a nation or region facing the challenge of producing a series or programme of hospitals, the supplementary question has to be asked: how can such a blend of experience and innovation be achieved while at the same time making the best use of skilled manpower? One answer is by making repeated and concentrated use of a small number of highly skilled planning teams whose job is to programme, instruct and guide a variety of design teams from either home or abroad.

The planning teams' responsibilities include the compilation of the programme or brief which will spell out: the role of the hospital in the general health care delivery plan in relation to other services and buildings; the scope and range of functions and services to be included in the building; the policies for the operation and management of the organization within the building; a schedule of accommodation if possible; environmental design considerations; and a cost target. This brief or programme or, put another way, this statement of intent to create an organization and house it in a building, is usually produced by the central or regional authority to which the members of the planning team belong. Their responsibility does not end with the production of the brief; they are responsible for holding meetings with the design team during the development of the design, to ensure that aims and intentions are being met, to ensure that local or user needs are satisfied and see to it that the project is managed properly, that equipment of the required type is ordered in time, that key staff are trained in advance of the completion of the building, and that the cost and time limits are not being exceeded. Planning teams draw their data from official policy and guidance, research and development activities, general literature, and hospital users. The planning team would normally consist of specialist planning doctors, nurses, architects, engineers, quantity surveyors and administrators so as to ensure firstly, that the programme is a comprehensive statement of intent, and, secondly, that as the meetings develop there is a planning team member to answer questions on any aspect of the project. The specialists on planning teams ensure that links with fellow professionals on design teams are strong and that specialist

questions are not only understood properly but answered adequately. As planning teams represent the commissioning authority, it is taken for granted that the team will either be recruited from, or at least contain a representative of, the appropriate ministry or ministries.

When they come together, as they must frequently do, the planning team and the design team merge into one project team, as their aims are identical, and at such meetings the project secretary (see below) takes the chair. The planning team can, where required, be responsible for a whole series of projects done by different design teams, thereby using scarce skills to the best account.

The responsibility of the design team is to respond to the programme and develop the design through all stages, supervise the construction and hand over the completed building on time and within the scheduled cost. Members of the design team are building works professionals, architects, engineers, quantity surveyors and so on - in brief, the building designers.

On large projects it has become the practice and is, indeed, necessary to retain the services of a project manager, who will be a member of the project team and may be either a member of the planning team or the design team or completely independent. The responsibility of the project manager is to ensure progress on the project and to construct programmes for the completion of the various parts of the work. The importance of a detailed timetable for all stages of a project, including commissioning, cannot be overemphasized.

The multiprofessional team is thus made up of a range of professionals working together, planning and designing, and able to talk either collectively as a project team or professional to professional. Each representative of both user and designer professions provides a focus of knowledge, the doctors and nurses being continually refreshed by close contacts with, but not involved in, day-to-day hospital practice.

3. THE MULTIPROFESSIONAL PLANNING TEAM

It is worth considering for a moment the roles of the individual team members in more detail. A truly representative multiprofessional planning team combines both clients and those undertaking the work as a balanced whole, with responsibility for preparing project policies and programmes. Further, the multiprofessional planning team provides the focus for communication between hospital users on the one hand and the project design team on the other. This principle and the links and overlaps are illustrated in Fig. 1.

As mentioned above, the doctors and nurses on planning teams have close contact with, but are not involved in, day-to-day hospital practice. This means that although they are not actual users they speak on behalf of users. In this sense therefore they could be considered as "proxy" clients, but with the additional knowledge of policy and the additional skill of planning experience; i.e., proxy clients with detailed knowledge of design implications.

Clearly, doctors are key members of the client group on the planning team and, in the United Kingdom, the planning doctor has emerged as a clear-cut figure who speaks on behalf of his medical colleagues on planning matters. It is obviously impossible for every medical specialty to be represented on the team and practising clinicians are only likely to be involved in a major building project once in their lifetime; furthermore, practising clinicians would be prone to impress too strongly their own individuality on the design of their own department - a problem frequently encountered in teaching hospitals. Specialist advisors are, however, co-opted on to planning teams from time to time to give specialist advice. Their presence supplements that of the planning doctor who, through regular contact with designers, is aware of the factors which contrain the work and will serve as a foil to the more flagrant acts of medical user individuality. Because they are a member of a multiprofessional team, planning doctors are well aware also of the changing needs of nurses and administrators. For the sake of clarity and convenience the planning doctor speaks on behalf of all other doctors on planning matters and he must remain in continual contact with the practising clinicians whom he represents.
Nurses and administrators on planning teams fulfil a role similar to that of the planning doctor but it is the planning nurse who frequently occupies the centre of the stage. The reason for this is twofold: firstly, the nurse spends more time than any other class of hospital user in contact with the patient; and secondly, nurses are deeply involved in, and often responsible for, behind the scenes organization and preparation. The hospital administrator brings to bear an overall view of hospital organization and management, which includes special interests such as logistics and catering.

The multiprofessional planning teams thus include people who may be regarded as proxy clients. These proxy clients are continually in touch with and represent the views of all classes of hospital users and, at the same time, they are aware of the designers' problems. In short, the planning team is in an ideal position to communicate with three groups: those who use hospitals (the clients); those who pay for them (government or other corporate bodies); and those who design and build them (design firms, employed consultants).
For obvious reasons it is not possible to speak to every patient; indeed, recent research has indicated that interviews with patients do not produce really useful planning data. So, from the planning team viewpoint, the combined knowledge and experience of doctors, nurses and administrators, together with the environmental concerns of their design-trained collaborators, is taken as representing the patient's total needs. This is not to say that surveys of patients' needs and desires are unnecessary; rather, that the results of such surveys are additional to, rather than a substitute for, the combined experience of the team.

The above discussion has been concerned with client group representation on the planning team. There is, however, another component comprising works professionals; architects, engineers and quantity surveyors must also be represented if the communication of objectives from planning team to designers is to be of the same degree of clarity as the communication between the client group and the planning team.

These works professionals will have made a special study of the problems of hospital design and, in addition to forging the technical links between planning and design teams, they will ensure that the brief is realistic and attainable in terms of the schedule of accommodation, engineering services, costs and the programme. They will also act as policy advisors, e.g., on standards of space and environmental conditions in the various hospital departments, and as technical advisors generally to their planning team colleagues.

The climatic, socioeconomic, political, education, manpower, commercial and maintenance conditions applying in developing countries, which can vary widely from region to region, make it essential that planning teams in such countries spell out their requirements clearly. This is particularly important when foreign design teams are employed. Planning teams can, of course, be modified to suit particular circumstances and, as a start, an overseas planning team might be invited to set up a model. It cannot be emphasized too strongly, however, that a misapplication of imported expertise will result in a mistake which is not only expensive to build but a continuous and growing burden to maintain.

Whether the planning team is central or regional, the important thing is to ensure that one only builds what one needs to build and then only in the most effective and economical manner.

Even though multiprofessional planning teams have been operating for some twenty years, and a firm belief in this method is still maintained, it would be foolish to suggest that these teams have not suffered from severe growing pains. It would be equally foolish to imply that the teams working currently do not have their problems or that all the problems of interdisciplinary working are understood. Recognizing this, in 1971 the Health Services Planning and Research Steering Committee in the United Kingdom called for a memorandum setting out the need for, and possible basis of, a course of education and training for health facility planners, i.e., members of multiprofessional planning teams. As a result of studying the memorandum the Committee agreed that a Study Group should be set up and the Group reported in May 1972.

4. EDUCATION AND TRAINING FOR HEALTH FACILITY PLANNERS

In the United Kingdom most of the people serving currently on multiprofessional planning teams have learned their trade by practising it, building upon the particular sort of professional education and experience they happen to have received. While it may be true that the most effective way of educating the members of the planning team is for them to teach each other, this implies a basic skill in communication from which a sympathetic approach to, and an understanding of, the problems of the other person can be developed; a willingness to attempt to evaluate their previous work; and a continuity of association over a number of years. Unfortunately, such conditions rarely exist. All too often planning team members...

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come together with the prime purpose of putting forward their own "professional" viewpoint. For example, doctors act simply as a mouthpiece for their specialist colleagues; architects are concerned either with the aesthetic quality of the environment they are creating, or perpetuating their traditional "leadership" role; engineers frequently separate engineering from building as a result of their concern to maintain their separate but equal status vis-à-vis architects; quantity surveyors concern themselves with controlling costs, frequently in a way which, while valid to them, appears to others to be against the concept of true value for money; administrators, lacking the necessary skills for design evaluation which would enable them to control the quality of the project, concern themselves primarily with observing the bureaucratic procedures; and nurses, who perhaps more than any other members of the team represent the views of the widest range of user needs, in certain circumstances appear to be over concerned with the status of the nurse.

On the other hand, all these professions have legitimate and constructive contributions to make to the planning and design processes. For the production of an optimum design solution, it is, however, the bridging of the gaps between the areas of purely professional responsibility that become more important than narrow professional knowledge itself. Bridging these gaps appears to be a question largely of establishing a common technical language as a vehicle for understanding and finally defining common objectives. Without this common language it is not possible to approach sympathetically the problems of one's collaborators. But, if some progress has been made and there are considerably more design data to draw on around the world, why has the task of planning and designing health facilities not become easier and why have the results not improved significantly?

The real reason is not easy to find among the many possible answers. The problem of the use and meaning of words can be easily identified; but perhaps a more fundamental cause of the widening gap between professions is increasing specialization. Quite often the planning and design teams are pulled apart by increasing specialization and the use of jargon as a form of shorthand which goes with it. An editorial group preparing a glossary of hospital planning terms under the auspices of the King Edward's Hospital Fund for London found that some words were not capable of an agreed interdisciplinary interpretation. Indeed, with the increasing sophistication of planning and design concepts, the problem of language has become worse rather than better over the last few years.

In his paper to the Royal Institute of British Architects Hospitals Course in July 1960, Professor Chester posed the question: how does one plan for flexibility? Hospital designers are still posing this same question but what is interesting is that it now means something rather different. When the question was first asked, mention of the word "flexibility" triggered off, at least in the minds of most people, the ability to move easily room partitions and to extend easily those departments which were expected to have a fast growth rate. But now the position is changed; it is now necessary to specify whether building "adaptability" is required or whether the kind of "flexibility" in use is sought that will encourage multi-use and hence more intensive use of space by designing rooms which will accommodate a range of different activities at different times.

Despite our growing knowledge of the whole hospital, a further result of specialization is concentration of design effort on the "department" rather than on the whole hospital and undue concentration on the individual stages of the planning procedures. This subordination of the whole to the part has been supported, in large measure, by short courses and guidance material on hospital design and procedural problems.

Perhaps even more serious is the destruction of any frame of reference or design method which might have emerged if the members of the multiprofessional planning team had been oriented in the same direction. Because the team cannot define common problems and procedures, the frame of reference disintegrates; and because the frame of reference disintegrates, it complicates the moving back and forth which "planning" or "designing" involves. The result is that people who are supposed to be collaborators arrive at positions where they are actually opposing rather than supporting one another.

Team fragmentation and the current philosophy of learning by doing have denied planning team members the opportunity to discover as much as they should about each other, the real needs of users or the interactions between the closely woven patterns of activities which take
place in a hospital. Learning by doing has become merely doing. There appears to be little hope of this situation being halted, let alone reversed, until a fully structured educational programme exists through which all members of planning teams can pass.

The potential element of conflict is not, however, equal between all the professions involved. Doctors and nurses on planning teams are responsible for the quality of both patient care and the therapeutic environment. Architects and engineers are responsible for meeting these demands and between them designing artefacts not only for current users, but for subsequent generations of users. Hence, the users of health buildings identify architects and engineers as being the people who provide the plant that they use every day and consequently hold them responsible for failure. As a result of their continuing responsibility, architects and engineers and to a lesser extent planning doctors and nurses have developed certain common fields of interest such as user satisfaction, ease and cost of maintenance and environmental quality. Professional pride also plays an important part. Doctors, nurses, architects and engineers conceive the design and the architects, engineers and constructors give birth to it. Consequently, they feel either pride or shame or both; but their responsibility for the whole thing remains clear-cut.

The quantity surveyor sees his role as being to secure what he calls "value for money" and non-one would disagree with this aim. The questions that arise immediately are what does he consider to be value, and by what means does he set about achieving it in a way which he considers to be "economical"? The methods employed are a natural end-product of a combination of his professional education, the disintegration of a recognizable multiprofessional operational framework referred to earlier, and the excessive expectations on the part of administrators who have been seduced by an inadequate concept of cost. For the most part the task of the quantity surveyor has become cost "control" in the shallowest sense of the word. The fields he is expected to cover - i.e., building economics, cost planning, performance specifications etc. - require a width and depth of knowledge which can only be achieved fully when the rest of the planning team is very sympathetic. This is not intended as a criticism of quantity surveyors but an analysis of a situation which develops frequently. One of the most serious results of this situation of potential conflict is that operational function and the design which is intended to serve it are being pulled progressively apart; and hospital design and hospital operational efficiency are suffering as a result.

The administrator is frequently cast in the role of manager for the whole or part of the total design and building process and, because of his lack of knowledge of the design process, misunderstanding and the risk of friction often result. In many ways the administrator in planning and design demonstrates the same characteristics as the quantity surveyor and it is interesting to note that the training for administrators, like that for quantity surveyors, has not traditionally concerned itself with either user-requirement investigations or "the design process" as understood by the design disciplines. This has led to a situation in which the administrator has worked "according to the book", i.e., a defined objective has to be reached on time within a defined cost. Certainly, some team discipline which includes time and cost constraints is vital, but these constraints should be based on a real understanding of the problems.

Although it may also be true of other professions, it can be seen that the quantity surveyor and the administrator are involved in the project in ways which have no easily apparent consequences for the user of the building which has resulted from their efforts. This makes it less likely that they will identify with the project, either in the same way, or for as long as their colleagues. Hence a psychological factor operates which encourages the fragmentation of the team.

It is possible to summarize some of the problems:

(a) because planning is a multiprofessional exercise, in the process of planning the "gaps" between professional knowledge become more important than the professional knowledge itself;

(b) because planning teams lack a common language, they are incapable of defining adequately their common objectives;
because of (a) and (b), a hierarchy of words and meanings and the frame of reference that goes with them have disintegrated; and

(d) as a result, function and design have become so divorced that function-based planning and meaningful objective evaluation have become increasingly difficult.

The gaps between the various planning team professions could be partially filled by a common language, partially filled by a knowledge of the planning and design process, partially filled by theoretical exercises, and partially filled by practical experience. But the practical experience should come last, whereas in the majority of cases it has come first.

Short courses cannot reasonably be expected to bridge these gaps completely; it takes a while to gain even a nodding acquaintance with the skills involved in problem definition, and topics such as the methodical collection, sifting, storing and application of data would hardly be touched. Nevertheless, short induction courses would be most useful to "prime the pump" and especially so if run in conjunction with longer courses from which future teachers might emerge.

In fact, some action in long-term training has been taken in the United Kingdom, and in recent years a one-year full-time postgraduate multiprofessional course in health facility planning has been running at the Medical Architecture Research Unit at the Polytechnic of North London. It is too early yet to report on results but to date some 25 countries have been represented on the course. What can be said is that the countries that have sent one student have subsequently sent others; so the nuclei of many planning teams already exists around the world and perhaps training programmes could centre on them.

The question to be faced by countries with no existing expertise is how best to set about the problem of establishing multiprofessional planning teams. Perhaps the best answer is that they should be helped to help themselves. That is to say that both health care planners and health facility planners should be trained at the earliest possible moment either to undertake the work themselves or to scrutinize critically the work of others commissioned to do it on their behalf.

The planning of health services should precede the planning of health buildings. In some places, service planning and building planning are undertaken by different groups; in others, both activities are undertaken by the same group. Whatever the preferred system, students sent on full-time training courses could, on their return, take part in the work of local induction training teams. In the meantime, only firms of consultants skilled in both service and building planning should be considered if a completely new or revised start is being contemplated. Not only should the strategy for the proposed health service come first, but existing traditions, services and buildings should all be woven into the pattern of the new service where this is seen to be desirable; only then can the residual new building requirements be determined. Advice on a government-to-government basis as an aid to the selection of such firms is always available in the absence of personal knowledge.

5. BUILDING PLANNING TEAM ORGANIZATION

When organizing multiprofessional planning teams to undertake a project or a series of projects, a number of factors have to be considered such as: the roles and responsibilities of team members (discussed above); the structure of the team; the position of the team in the building finance and decision-making hierarchy; and the development of a plan of work to ensure efficiency, economy and continuity. Setting aside the last point for consideration in the next section, it is proposed here to examine the middle two points, namely, the structure of the team and the position of the team in the decision-making hierarchy.

The organization of multiprofessional planning teams and the development of the procedures to which they work become more important the larger the building programme. In the case of a single building, a thoroughgoing organization may not be worthwhile, indeed it may well be counterproductive; but, for a programme of buildings over time, an efficient organization is of the utmost importance.
The planning team will consist of the professionals discussed earlier; it will normally be under the chairmanship of an administrator; and it will have a secretary who is again normally an administrator. The team occupies a position between the bodies providing the money and establishing policy on the one hand and hospital users and designers on the other; therefore, clearly defined communication lines are essential (see Fig. 2).

**FIG. 2. COMMUNICATIONS WITH THE PLANNING TEAM**

Quite often a central government makes funds for capital development available through regional authorities, the latter being more concerned with project policy-making. This makes the lines of communication even more important and underlines the need for central and regional authorities to be in accord. When this arrangement exists the regional authority will speak both to the central department above it and to the planning team below; Fig. 2 applies equally well to this situation. Whatever the arrangement for finance and policy-making, the planning team or teams require a reference point or higher coordinating authority to which they can refer and from which they receive direction on matters of policy. In practice, a three-tier system seems to have emerged.

At the top level is a subcommittee of the higher authority (regional or national) charged specifically with responsibility for capital projects. This top-level group is known variously as the steering committee, development committee or central planning group. This is the highest level in the project planning system. In addition to coordinating information flow and standards, the central planning group has responsibility for determining planning and design policies, i.e., the nature, type and location of health care buildings, their content, servicing arrangements and building standards. This group also settles disputes which cannot be resolved at planning team level (see Fig. 3).

Below the central planning group comes the multiprofessional planning team or teams. In fact, planning seldom presents choices which are clear-cut, one level of decision-making invariably interacting with another. It is essential therefore to establish various levels of importance in decision-making and to get these agreed before starting to plan a project, otherwise all decisions will have to be taken at the highest level. Such a situation takes away the job satisfaction from the professionals doing the day-to-day work and overloads the central planning group with work, much of which it is unqualified to do. Unfortunately, lack of a clear-cut hierarchy for decision-making characterizes far too many hospital planning projects. Reference upwards must be reserved for those occasions when either genuine uncertainty or locally insoluble disputes arise. Coordination between the central planning group and the planning team is usually achieved by making someone a member of both bodies; often this is either the planning team chairman or secretary.
At the grass-roots level, carrying out detailed investigations into some aspect of function or design on behalf of a planning team, come the working parties or subgroups which often include hospital users. If planning is well organized, these subgroups can examine functional or design problems on behalf of more than one planning team. Indeed, such an arrangement has been found to be helpful where standard policies or design solutions are being sought. A subgroup may therefore work directly with a particular planning team in examining an aspect related to one project, or it may work on policies and standards applicable to a range of projects (see Fig. 4).
Coordination between planning teams and subgroups is achieved by having representation from the planning team on the subgroup, according to the subject under discussion. In this respect it is interesting to examine how the Department of Health and Social Security in London organized the investigation for the research and development project at Greenwich District Hospital.\textsuperscript{1} For that project the subgroups were kept small. Each had a common core consisting of the project secretary and either a doctor, nurse, architect, engineer, quantity surveyor, or a combination of these. Around this core, consultant advisors and users were assembled as required. This arrangement throws a heavy workload on the core members of the group who move from subgroup to subgroup; however, experience on that project showed that this arrangement worked well (see Fig. 5).

\textbf{FIG. 5. EXAMPLE OF COORDINATION BETWEEN PLANNING TEAM AND SUBGROUPS}

\textsuperscript{1} GREEN, J., MOSS, R & JACKSON, C. Hospital research and briefing problems. London, King Edward's Hospital Fund for London, 1971.
6. PLANNING TEAM MACHINERY

The complex primary task of briefing, designing and building hospitals and the complementary task of monitoring their progress, cost and general design and construction standards in such a way as to ensure that individual projects conform to the national and/or regional plan has prompted a number of countries to develop a capital projects management code. The purpose of such a code is to provide a "route-map" through the project for all parties involved and at all levels; a series of stages in the development of a project are established and their relationship to generally applicable data pointed out. The code serves as a reference point so that each planning team member can relate his tasks to those of his colleagues within the framework of a project as a whole. Indeed, some form of management code is essential where independent consulting design teams are employed so that both they and their employers know the processes involved and at what point consultation cost checks and approvals to proceed are required. The degree of detail is arguable and will depend on the size and complexity of the project, but there appears to be no doubt in principle either that a code is necessary for the management of the project or that a project manager is necessary to see that the project is carried out. The concern here is with the code or procedures to which the team work.

Some of the problems of multiprofessional working have been discussed above. One such problem is the maintenance of a clear frame of reference within which each profession can contribute to the project and here a capital project management code can help in the sense that each stage is laid down and a project "direction" established. For example, the project under development can be considered in relation to the area or region and, because future stages are identified and set down, data collected at an early stage can be assembled in such a way as to facilitate its use at a later stage. In a word, a capital projects code assists the team in looking into the future. But there are two further crucial points: the first concerns money and the second, time.

Taking the second point first, germane to the successful project is agreement to, and achievement of, a starting and completion time. Projects are made up of a large and complex set of substages which have to be completed on time and within cost limits if the whole project is to succeed. It is therefore essential, firstly, to know what the stages are and, secondly, to know how long each should take; if this is known then targets for both the parts and the whole can be set. But there is a further point: projects can be compared and it can be established at which stages some are taking, or might take, longer than the norm. The programme can then be developed accordingly. Alternatively, the case histories for a number of projects can be compared to see where time could and should be saved. In the United Kingdom the decision has been taken to make savings in time in the briefing and design stages; this is discussed below.

A capital projects management code can be referred to simply as a plan of work and in hospital design practice in the United Kingdom the project-cost is also checked as the design develops. This continuous checking of costs could be considered as obsessive and as adding to the gross cost largely because of delays at the various checking points. Those who take this view argue that the procedures should be kept simple, the number of check-points kept to a minimum, and a gross sum allocated to the project to be spent as the team consider reasonable provided it is not exceeded. Proceeding in this way gives the project team great freedom and, overall, should result in a saving of time. Perhaps this simplified method of working is acceptable in the case of a single building or small number of buildings but with an ongoing programme of health care buildings where it is important to ensure that area and cost standards are consistent, that prices do not spiral out of control, and that individual projects do not suffer from undue delays, then some generally applicable plan of work or management code is essential.

The Royal Institute of British Architects were first in the field with their plan of work which set down the following stages as a form of guidance to the profession at large: inception, feasibility studies, outline proposals, scheme design, detail design (production information), and tender action to completion.
Quite soon after the publication of this plan, the Department of Health particularized a system for the processing of hospital schemes; this appeared under the codename "Capricode". The system has been brought up to date and the latest version calls for details (at Stage 1A) of the relationship of the project to area and regional strategy - a point referred to above. Capricode consists of six main stages broken down as follows:

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Outline project intentions</th>
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<tbody>
<tr>
<td>1A</td>
<td>Relationship to area and regional strategy</td>
</tr>
<tr>
<td>1B</td>
<td>Briefing of project team</td>
</tr>
<tr>
<td>1C</td>
<td>Outline management control plan</td>
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<td>1D</td>
<td>Assessment of functional content</td>
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<td>1E</td>
<td>Site appraisals</td>
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<td>1F</td>
<td>Cost and phasing</td>
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<tr>
<td>1G</td>
<td>Approval (to proceed to Stage 2)</td>
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<thead>
<tr>
<th>Stage 2</th>
<th>Planning - project and first scheme</th>
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<tbody>
<tr>
<td>2A</td>
<td>Management control plan</td>
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<tr>
<td>2B</td>
<td>Site selection</td>
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<tr>
<td>2C</td>
<td>Planning policies</td>
</tr>
<tr>
<td>2D</td>
<td>Selection of building shape</td>
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<tr>
<td>2E</td>
<td>Development control plan</td>
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<td>2F</td>
<td>Confirmation of functional content</td>
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<td>2G</td>
<td>Budget cost</td>
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<tr>
<td>2H</td>
<td>Selection of contract method</td>
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<tr>
<td>2J</td>
<td>Approval (to proceed to Stage 3)</td>
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<tr>
<th>Stage 3</th>
<th>Design and cost planning</th>
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<tbody>
<tr>
<td>3A</td>
<td>Notional cost plan</td>
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<tr>
<td>3B</td>
<td>Detailed design brief</td>
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<tr>
<td>3C</td>
<td>Sketch plans</td>
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<tr>
<td>3D</td>
<td>Equipment schedules</td>
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<tr>
<td>3E</td>
<td>Check design with brief</td>
</tr>
<tr>
<td>3F</td>
<td>Detailed design</td>
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<tr>
<td>3G</td>
<td>Pre-tender estimate and summary, cost plan</td>
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<tr>
<td>3H</td>
<td>Approval (to proceed to Stage 4)</td>
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<tr>
<td>3J</td>
<td>Preparation of tender documents</td>
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<tr>
<th>Stage 4</th>
<th>Contract and construction</th>
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<tbody>
<tr>
<td>4A</td>
<td>Contract</td>
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<tr>
<td>4B</td>
<td>Construction</td>
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<tr>
<th>Stage 5</th>
<th>Commissioning</th>
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<tr>
<td></td>
<td>(To start any time after Stage 3E)</td>
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<tr>
<td></td>
<td>Team appointment and briefing</td>
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<td></td>
<td>Management control plan</td>
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<td></td>
<td>Preparation of revenue estimates</td>
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<td></td>
<td>Preparation of operational handbooks</td>
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<tr>
<td></td>
<td>Fixing of establishment, staff assembly and training</td>
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<td></td>
<td>Preparation of final equipment schedule and orders</td>
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<td></td>
<td>Equipment and supplies assembly and storage</td>
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<tr>
<td></td>
<td>Engineering commissioning</td>
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<tr>
<td></td>
<td>Cleaning</td>
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<tr>
<td></td>
<td>Opening, public relations and publicity</td>
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<tr>
<th>Stage 6</th>
<th>Evaluation</th>
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<td></td>
<td>Of finished scheme</td>
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Capricode has evolved over a number of years and has developed into a most comprehensive management tool but clearly, in order for it to work efficiently, it requires a great deal of expert knowledge and back-up data. On the other hand, such a tool does mean that a few skilled people can work very efficiently provided they have the data to satisfy each stage of the process. This point is discussed further below.

Capricode is used whether the project is being carried through with in-house resources or commissioned consultants and, as it has now been going for some years, a considerable amount of skill has developed. In cases where the work is put out to commissioned consultants exclusively and the project(s) overseen by a small number of officials forming the multi-professional planning team, other plans of work have emerged. One such is that used by the Ministry of Health in Toronto, Canada, below:

<table>
<thead>
<tr>
<th>Stage A</th>
<th>Role study</th>
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<tbody>
<tr>
<td></td>
<td>A multi-institutional study</td>
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<tr>
<th>Stage B</th>
<th>Master programme</th>
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<tbody>
<tr>
<td></td>
<td>Role and requirements for a single institution within the role study</td>
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<tr>
<th>Stage C</th>
<th>Master plan</th>
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<td></td>
<td>Physical planning documents</td>
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<tr>
<th>Stage D</th>
<th>Functional programme</th>
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<tbody>
<tr>
<td></td>
<td>Operational policies, procedures, workloads and space requirements</td>
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<table>
<thead>
<tr>
<th>Stage E</th>
<th>Block schematics</th>
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<tbody>
<tr>
<td></td>
<td>Site plans, floor plans, sections</td>
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<table>
<thead>
<tr>
<th>Stage F</th>
<th>Sketch plans</th>
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<tr>
<th>Stage G</th>
<th>Working drawings</th>
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| Stage H | Tender call |

As in Capricode, approvals are required here also before proceeding to the next stage and again, in order for a sensible proposal to emerge, a great deal of data are required about hospital planning in general and about areas, capital costs, staffing, equipping and running costs in particular.

The study of such systems could greatly help developing countries in evolving their own capital projects management code but here again it must be emphasized that to adopt any system with only superficial modifications would be a mistake with far-reaching consequences. These systems should be considered as answers to definite problems. In each country, most data concerning the problem, especially those relating to manpower available for project management, are different; the answer will therefore be different, although the reasoning behind the problem solving process will essentially be the same.

7. RATIONALIZATION, STANDARDIZATION AND REUSE OF PLANNING DATA

Clearly, many planning and design decisions taken on one project apply equally to a number of others and it is a waste of both time and money to consider such questions over and over again once a generally acceptable solution has been agreed. Experience shows that on a one-off basis, that is, treating each hospital as if it were an entirely new planning problem, the briefing and planning time can take anything from 2 to 10 years, depending on the size and complexity of the project. This prebuilding phase is thus a fruitful field to examine in order to discover ways of saving both money and time. The Department of Health and Social Security in London has done just that. Encouraged by the Regional Health Authorities, the
Department of Health and Social Security has, over the years, developed what is known as its "Systems and Standards" approach wherein the various stages in the design and building process are formalized into a systems approach, with each stage served by a bank of generally applicable data. This technique maximizes the use of previously taken planning and design decisions and ensures that new decisions are taken into the system in such a way that they also can be reused wherever appropriate, and perhaps a previously taken decision dropped from the system.

The main stages in the "Systems and Standards" approach are as follows:

- Briefing
- Designing
- Producing (the drawings and other design information)
- Constructing
- Commissioning (i.e., bringing the hospital into use)
- Evaluating

As stated above, no matter how experienced the planning team, they can only do their job really efficiently if they have easy access to proven data at the correct stage of the project; the data bases have therefore been established bearing this point in mind. Fig. 6 illustrates the system and its supporting data banks diagrammatically. The activity data base contains agreed standard operational policies and schedules of accommodation for all the departments of a hospital together with a comprehensive range of activity data information. Basically, activity data are collected on two types of sheet known as A and B, the A sheet referring to the activity space and the B sheet to the activity units which are required within that space to make it function properly. For example, an A sheet gives the following information:

- The name of the activity space (room);
- A description of the function and location of that space under the headings: personnel, workflow, environment, location, and special equipment;
- General design considerations under the headings: room temperature, air changes, lighting intensity, power emergency, sound attenuation, internal finishes, doors, and windows.

The A sheet, in fact, gives all the building and engineering requirements; but, in addition, references are given to the B sheets, which show each piece of furniture and equipment to a constant scale, indicating preferred relationships to maintain workflow.

Sheets such as these have been prepared for every room in the hospital so that a planning team no longer has to start from the beginning but may call for existing policies and activity data and need only validate the information for its own project. Standardization in this sense, therefore, does not preclude participation or unique project decisions where these are seen to be essential; rather, it provides data for validation, with all the benefits described above. There are two other advantages; these are that cost prediction can be far more accurate and equipment requirements scheduled at an early stage so that long delivery dates can be taken into account. In fact, equipment schedules have also been computerized so that the whole system interrelates. The Department of Health and Social Security has other standards too; the two most notable are known as "Best-Buy" and "Harness" and these codenames refer to standard hospital designs.

"Best-Buy" is a standard two-storey naturally lit and ventilated hospital of from 500-600 beds and, to date, two have been built in the United Kingdom, one at Bury St. Edmunds and the other at Frimley in Surrey, "Harness" is a design system allowing a hospital plan to be produced on different sites and with different functional contents by assembling a range of

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1 Evaluation must, of course, take place at each stage. The reference here is specifically to evaluation of buildings in use.
standard departments designed to conform to an overall geometry. In this way, unique hospitals can be assembled from a range of standard parts.\(^1\) Descriptive brochures of both these systems can be obtained from the Department of Health and Social Security. The brochures are fully illustrated and give details of the activity data sheets referred to earlier.

8. BRIDGING THE GAPS

The range of hospital planning experience and data available in the developing countries varies and in this final section some suggestions are made as to how one might consider setting about the job of hospital planning taking into account the degree of expertise available.

It can honestly be said that no country, however well blessed with time, money and experience, will have enough of each to deal with a programme of health buildings on a project to project basis, so information gathered, evaluated and found to be satisfactory on one project should be available not only from project to project but also from country to country. This view is shared by the Department of Health and Social Security in London and certain international information exchanges are already under way.

At the broadest level of health care planning, there is no doubt that an overall strategic plan is the best way of obtaining value for money by ensuring that all the services and buildings work together without either undue duplication or insurmountable gaps. Unfortunately, comprehensive health care planning is still at a stage where its various practical applications have reached unequal levels of development. Some countries and individuals have made special studies of various topics and these are discussed elsewhere. Buildings form only a part, albeit an important one, of a comprehensive health service plan and no individual project should be undertaken without a basic strategy which takes account of the money and manpower available and in prospect for building, staffing and maintaining the service.

The planning of health buildings may be considered under three headings: planning personnel; planning procedures; and planning data.

Highly skilled health facility planners blend both training and experience and, as mentioned above, opportunities to fill the training gap now exist. It could be argued that a one-year course is not long enough and such a view would find much support. On the other hand, it is unlikely that key personnel are going to be spared from their important jobs for longer and it is the key people who require the most thorough training. Such training should take place away from the scene of everyday work and responsibility. If one person from each discipline had a full-time course of training then that person could form the nucleus of a scheme for on-the-job training for others. There is another alternative: a network of centres could be created for induction training of about three months duration in order to give teams a basic platform of knowledge and to make a start quickly. Key people would then take the longer course either simultaneously or following the induction course when they had decided whether or not to make a career in the planning field. From such beginnings, competent multiprofessional teams should emerge in a relatively short time; there would then be a network of people around the world who could discuss common problems and find solutions appropriate to the country of application.

It is these planning teams, together with their economic and administrative colleagues who have responsibility for health care building at a regional or national level, who fashion the procedures through which the programme is processed and monitored. Again, as stated above, procedures already exist which could be adopted as basic models and adapted to particular local problems and situations. This would be preferable to making a new start for each project. Although operational policies, activity space data, activity unit data, components, equipment, standard departments and standard whole hospitals can be obtained as a result of government-to-government negotiation, it is of the utmost importance to remember that they have been elaborated to meet specific needs in a specific environment with specific resources and that consequently they should never be used without prior careful consideration of their relevance to the situation at hand. On the other hand, they can offer a sound basis on which to build up a body of knowledge and policies which, while following the same chain of reasoning, will result in a very different end product.

A health building is an expensive tool. Not only is the initial investment important but the running costs are an ever-increasing burden that will have to be borne year after year. The planning teams and the planning organizations in each particular country therefore carry a tremendous responsibility. They must see to it that the buildings they bring into existence cover essential needs and are adapted to the cultural, technological and economic conditions of the country. Moreover, they must ensure that the ideas they have expressed in their programmes and designs can readily become a reality, answering the expectations of all and not creating problems in staffing and operation.
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1. DEFINITION AND AIMS

The terms "standard" or "norm", often used as equivalents, have been defined in many ways. The United Nations Expert Group on Methods of Determining Norms and Standards for Planning and Policy-making in the Social Sectors (1972) defined a standard as "a rule, usually quantified or at least quantifiable, by reference to which behaviour is judged and approved or disapproved". In every country such standards are valuable instruments for planning and policy-making. They may use specific guidance during rational planning and decision-making in so far as they help to determine the necessary input and output for a given service or action. They also regulate a given action by defining the target groups to be covered or the categories of producers who should comply. They are convenient tools for control purposes as they provide a yardstick against which desired performance and achieved results can be compared and evaluated.

Some standards embody an obligation: they may indicate minimum, maximum or optimum levels of achievement; or they may be imperative, restrictive or merely indicative as overall guidelines. Other standards provide information: input standards define the proportion or nature of resources (personnel, area, equipment, etc.) needed for producing the activity or service to be supplied (e.g., area per bed); output standards indicate the volume or type of production to be expected from the application of these resources (e.g., tests per month); and operational standards comprise both technical standards, which are minimum requirements for a specific method or product, and administrative standards, which create systems for administrative control and for the generation of adequate information or indicate levels of efficiency that can reasonably be expected under given circumstances (e.g., the infection rate).

This paper deals specifically with standards applied to health care facility building in developing countries. Health standards and standardization are not included, although they are closely related: health standards are among the factors which to some extent determine the input necessary in standard-setting for the building of health facilities; and it is hoped that a certain standardization, leading to more economical solutions, may be accomplished through the fulfillment of enforced standards. Standardization means the unification of materials, methods or equipment according to a predetermined model with exact technical specifications to be followed; standards indicate minimum requirements to be satisfied when action is taken towards a certain goal.

As many building standards and technical requirements can only be verified rather than quantified (e.g., the contamination barriers), the above-mentioned definition of standards might be altered as follows, in order to express the exact meaning used in this text: "rules quantified or at least verifiable by reference to which health care facility planning and building is judged and approved or disapproved". These rules should ensure properly planned and well constructed facilities, which can be efficiently maintained and operated to provide adequate health care.

In no developing country are the scarce resources sufficient to provide even the most elementary and urgent care for the whole population. Under such conditions it is imperative to put all available resources to the best possible use and a great deal can be accomplished in "brick and mortar planning":

"The material means, that is, essentially the building of physical facilities, are at the same time the most obvious, the most immediately understandable and the easiest to plan because they lend themselves to the use of standards and of industrial methods which can reduce costs and also to relatively easy operational control" (United Nations, 1971).

Appropriate regulations and licensing requirements, established by the Ministry of Health and adequately publicized and enforced, can promote better use of scarce resources and improve solutions to health problems by helping decision-makers in several ways.

Where there is a lack not only of adequate health planning but also of knowledge as to its exact meaning, standards may provide guidelines for use by health authorities charged with area-wide planning and with the guidance of individual health facilities. Standards can provide a
valuable means of integrating all aspects of medical and hospital care in government, church and private sectors in order to avoid dangerous omissions as well as costly duplication. While many standards cannot be made compulsory for private institutions in liberal settings, they could well become preconditions to obtaining necessary licensing permits or to benefiting from governmental or social security subsidies or contracts.

Where technical advice is hard to obtain and professionals without the necessary expertise endeavour to design and construct the health care facility, standards and technical requirements provide guidelines on functional and economic requirements. Architects, engineers, doctors and health workers entrusted with the planning and building process find in the standards sources of information which help them to avoid costly improvisation.

Where there are few data to guide the professional, where the available statistics are mostly outdated or faulty, and where the publications on hand are only foreign or translated, some realistic minimal standards and feasible technical requirements provide sources of reference which allow health authorities as well as producers and users of services to evaluate existing facilities and adapt them for better use.

Standards are also of great importance in those developing countries where expenditure on hospital construction and operation is rising enormously under the influence of foreign equipment manufacturers, foreign experts and ever more specialized physicians, without making the hospitals capable of helping to improve the general level of health or even increasing the quality of services rendered: standards and technical requirements which clearly define both economic and functional goals help to prevent the squandering of scarce resources on buildings and plant which are totally unsuited to local possibilities. Taking into account both human and economic constraints, physical planning standards can be a precious source of reference for the judgement of projects to be provided by foreign countries (e.g., hospitals build on turnkey contracts).

The present shift in emphasis from complex specialty care in hospitals to local primary care, from inpatient to ambulatory and from curative to preventive care can also be reflected when legislation is developed. Standards which stress not only hospitals, but also health posts and centres and which highlight the integration of the health care system instead of focusing only on individual services, provide an invaluable tool for all engaged in the decision-making process. The development of up-to-date standards can thus be considered as preventive care for health care services in so far as these standards contribute to the prevention of inefficient and costly solutions to current problems.

2. VALIDITY OF STANDARDS

Although standards can be extremely useful tools, their value should not be overrated, and experience indicates that they present quite a few limitations.

"The hidden supplier-goals build around 'standards' are increasingly rejected by the public" (Blum, 1968) as they "deter analysts and policy-makers from thinking about true social aims" (United Nations, 1972).

When they are unduly rigid or conservative, "a mere codification of existing practices, without any real assessment of needs and only a casual search for alternative means to achieve a given result" (United Nations, 1972), standards are bound to restrict innovation and improvement in design, construction and operational techniques - "A basic objection against standards is the fact that standards act in some cases as a barrier to the emergence of innovations and provide justification for whatever inertia and built-in conservatism exists in a given system. . . Standards should not close minds to the possibility that more efficient means may be available, such as the substitution of one sort of labour for another" (United Nations, 1972).

Standards are very often poorly defined or present ambiguities which make it difficult to enforce them.

They "may become obsolete for a number of reasons including changes in objectives, priorities, relative costs, and changes in the relevant technology" (United Nations, 1972).
Mainly in developing countries, standards often "tend to be . . . too high . . . imposing unrealistic claims upon existing resources" (United Nations, 1972), a problem which frequently arises when standards are based on indiscriminate use of foreign publications; blind transfer of imported standards, mainly those of the industrialized countries, without choice and the necessary adaptation can easily lead to the squandering of limited resources instead of promoting desired progress.

There is one universal module present in health facility planning, the dimension of the human body, which dictates the size of the bed, the floor surface per bed, the width of doors, the size of accommodation for patients and many dimensions in other departments such as the height of laboratory or kitchen benches, the dimension of operating and diagnostic tables, etc. As human, technical, economic and legal conditions vary from one country to another, however, different constraints are imposed upon planning processes and operating variables, making it difficult to find universal standards.

Solutions which are well adapted to one situation may be overambitious or completely unsuitable under different circumstances, as shown by the following examples.

- Possibilities and means of integrating health services differ widely depending upon the extent of government control.

- The number of beds needed cannot be stated simply in terms of the population to be covered: whereas industrialized areas may make efficient use of up to 14 beds per 1000 inhabitants, even two beds may be too much for the same number of people in underdeveloped areas, frequently remaining empty where there is a lack of health manpower and where the population by-passes the rural hospital.

- The type of building also depends largely on local conditions: a one-storey building is certainly the best solution where cheap land is available but there are no lifts or there is even no electricity.

- While the double-corridor system with proper ventilation is an acceptable solution in a moderate climate, it is terribly inconvenient where a hot climate and lack of air-conditioning calls for efficient cross-ventilation.

- A compact surgical suite with beautiful inner and outer circulation, separating clean and soiled traffic, can only function where air-conditioning is both economical to obtain and to maintain.

- Whereas complex functions can easily be accomplished and complex equipment put to efficient use when qualified personnel is on hand, the unskilled labour in developing countries calls for simple and foolproof techniques, and solid, safe and simple equipment.

- While automation used to reduce costly manpower proves to be economic in industrialized countries, it represents an extremely expensive solution where manpower is cheap, equipment must be imported and lack of maintenance finally leads to complete breakdown of the automatic system.

- Centralization of laboratory tests, pharmaceutical supplies and laundries is impossible to obtain where there are enormous distances to be covered, bad roads and unrelated competing health services.

- While in highly developed countries children normally stay alone in hospital, in developing countries accommodation has to be provided for those who frequently accompany them.

To become really useful, standards must suit local needs and customs, climatic conditions, population usage as well as available manpower and equipment. Each country must search for its own specific solutions, suited to its own conditions, and evolve norms which may even vary from one part of the country to another, when great differences in circumstances exist.
This should not, however, preclude cooperation between developing countries in setting norms: all countries with comparable problems and conditions should collaborate in studying and developing standards for similar macro-regions. A joint endeavour would not only allow for better use of the available expertise and of the costly research involved in the standard-setting process, but it would also give each developing country the advantage of a much broader approach. Such collaboration might be coordinated by international organizations such as WHO.

3. BACKGROUND MATERIAL

A wide variety of background information on needs, available resources and prevailing attitudes is required for the development of standards and technical requirements. The main factors to be considered are:

- health data on needs (e.g., prevailing health problems, disease patterns, birth rates) that take into consideration not only present conditions but also future trends in health care (e.g., the shift from stationary to ambulatory care for leprosy, from radiologic mass screening to selective screening in tuberculosis control);

- demographic data showing both requirements and prevailing attitudes (e.g., the size of the population or target groups to be covered, local customs) as well as available manpower for desired action;

- geographic data indicating the political and natural macro- and micro-regions, their climatic conditions, existing facilities and voids, as well as barriers to and means of transport and communication;

- operational data on prevailing and alternative methods, available resources and necessary safety measures, in order to assure the realistic assessment of appropriate operational techniques;

- architectural data describing prevailing building methods and available materials and resources, taking regional conditions into account, as well as giving information on alternative solutions which stress flexibility and ease of construction and maintenance;

- legal data on existing requirements concerning health facility planning and construction, including requirements concerning the standard-setting process itself, with indications of whether these requirements should be maintained, revised or cancelled;

- economic data to support solutions aimed at reducing costs (e.g., studies of life-cycle cost or assessment of economies of scale), as well as feasibility studies.

The demographic, geographic and legal data are collected in the developing country itself, but medical, architectural, operational and economic data have to be supplemented by foreign publications indicating alternative solutions and research on future trends. Whereas the lack of adequate information from within the country leads to solutions which are poorly adapted to prevailing needs and resources, the lack of input from outside can easily lead to the mere codification of existing practices or a given system backed by a strong lobby.

Where information on problems is scarce or nonexistent, it is necessary for professionals entrusted with setting standards to consult statistics, books, manuals, regulations, articles and research reports from developed countries (see Annex).

Although foreign regulations should not simply be translated for adoption in developing countries, they represent a valuable reference source where standards are to be developed from scratch: they can be used as a check-list of areas or elements which should not be forgotten.

Such publications contain useful information on various aspects of required norms as well as on the standard-setting process itself; however, it should again be stressed that background material evolved in industrialized countries can only be used for briefing purposes, as the health facility building requirements adopted in those countries in general far exceed the needs of developing regions. Only documentation relevant to problems should be selected after careful identification of the scope of standards to be set and their adaptation to different stages of development (see section 5).
4. SPECIALISTS INVOLVED

Before discussing the methodology for the standard-setting process, it seems appropriate to define who should be selected to do the work. Which professionals have the precise technical knowledge that is necessary in the setting of these standards?

Both architects and doctors are obviously essential in the decision-making process, but further expertise is needed to deal with setting standards. Schools of architecture or medicine do not teach architects and doctors to be thoroughly familiar with that most intricate operational system, the hospital, or even with smaller health care facilities. When the architect designs such a facility, the design will always reflect the quality of the programme and briefing he received from others. Even when designing a hotel, an architect would enlist the help of various experts for such areas as the kitchen, the laundry and elements like air-conditioning. A doctor has detailed knowledge of the very specific room cluster in the hospital concerned with his speciality; he probably knows little about the functional entities belonging to other specialities and to the nursing care activities, and the entire area of administrative and supply services. No single doctor is able to give advice and decide about all aspects of medical care; a specialist is needed for each individual medical section.

The wide range of services provided by any kind of health care facility and the multiple problems which arise in trying to define minimum standards for a building to house all those activities imply the need for a collective approach by an ample and up-to-date multidisciplinary team. Adequate requirements can only be set up if the professionals who deal with the everyday problems join the team to answer the many questions that arise and to participate in the research that is needed in their specialities.

This multidisciplinary approach is in no way synonymous with a huge and expensive planning team. It is unnecessary to call upon all these experts and specialists at the same time, for all kinds of standards or even for all standard-setting steps. There obviously should be a small core-team made up of those professionals who are responsible for the choice, evolution and coordination of the work: architects, when standards concerning general planning concepts, functional components and building elements are dealt with; or engineers, when technical requirements concerning the engineering elements are set up. The health facilities planning specialist, a planning and programming expert, is an important member of this core-team during the whole process of standard development. It is this specialist who can be entrusted with the coordination of the collective effort and be responsible for the overall programme and time schedule decided upon. He should know enough of those languages in which most foreign experience is published to enable him effectively to select pertinent foreign data and interpret them to other members of the team.

All the other health professionals, experts and consultants indicated in Fig. 1 need only participate when their own specialty is being dealt with, or when a specific question concerning their field of special knowledge arises during the analysis of another subject. Thus the dietician will be present while the food service is being discussed and also when nursing units and other areas serviced by the food service are being analysed.

The contribution of the bio-engineer to the development of health care facility requirements cannot be overestimated. This recently-developed profession is the only one encompassing the expertise needed to decide upon the specific requirements of special care areas, the intensive care unit, the radiology department, the surgical suite, etc. for the proper protection of both patients and staff.

It is the lack of such technical expertise and of knowledgeable people in developing communities that calls for the participation of specialists in setting the standards which will have bearing upon the future development of whole areas.

Financial constraints should not be considered as an obstacle to a multidisciplinary approach; many of the most outstanding specialists in developing countries are willing to give free advice when valuable objectives are at stake and it has been known for members of the core-team to work as volunteers where it was impossible to afford their appointment.
FIG. 1. SPECIALISTS INVOLVED IN SETTING STANDARDS FOR HEALTH CARE FACILITIES

The setting of standards is probably the only occasion when such a team can be brought together to guide future planning efforts all over a developing country. An academic study by too narrow a group cannot improve health facility conditions, as those who use the standards in remote areas for their decision-making will not be able to adapt unrealistic, academic or biased regulations to local conditions. Such theoretical standards are immediately proved inadequate and, their credibility being lost, fail to produce the desired results.

5. METHODOLOGY

The team to be entrusted with the setting of standards should proceed in a systematic manner, observing several steps in a rational sequence in order to guarantee the most efficient outcome of their work.

The essential steps depend mainly on the nature of the standards to be evolved and upon the different levels of their complexity, which go along with different stages of evolution in the health sector. According to possibilities and priorities, each developing country will start with minimal basic standards and requirements: after the identification of the scope of the standards, little more need be done than to collect clear data and approve the completed draft papers. But as new stages of development are reached, standards gradually become more comprehensive and progressively lead to the establishment of major complex norms and technical requirements. The methodology required to develop such standards consists of the following stages, which are described in detail below: identification of scope; data collection; analysis and research; graphic studies; preparation of draft papers; consideration and revision of the draft text; and approval and diffusion of the final document.

Identification of scope

Before developing building standards for health care facilities, the expert group has to decide upon: what should be regulated; which decisions should first be subjected to standards, by whom, and under what conditions; and the type of orientation required and most appropriate for desired action, whether broad guidelines or specific rules.

As economic and social factors vary widely in developing countries it has been recommended that "policy and planning should concentrate on what seem to be the strategic variables for development in a given society. This gives great importance to the role of 'diagnosis', in each country's determination of its individual development policy or 'style'; and that "policy and planning should centre attention on the real development goals of public programmes and activities, not on sectoral or administrative sub-targets, and should examine all possible means of achieving these goals, including . . . completely new approaches as necessary" (United Nations, 1972).
Taking these recommendations into account, the choice of standards to be developed should initially focus on those minimal requirements which are necessary to start action as soon as possible with simple means but without jeopardizing future development. The choice should also take into consideration the following factors:

- Standards should have an impact on urgent needs; for example, standards for health posts and health centres have a greater impact on the general level of care than technical requirements for intensive care units.

- Standards should take account of current realities: where there is a lack of nursing personnel, it is more realistic to develop requirements for the treatment of infectious cases, than to set standards specifying the number of qualified nurses per facility.

- Standards should be formulated with a view to future development; for example, it is more useful to elaborate, at the beginning, specifications concerning the site of the hospital (location, plot ratio, environmental needs, etc.) than to determine complex building details.

- Standards should first be set which are applicable to the greatest number of facilities: norms concerning the general hospital will initially be more important than those for long-term care.

Such priorities in setting standards would result in a progressive and realistic approach, linked to the stage of development, the overall situation and priorities at national level. An overambitious scope could easily lead to undue delays in action and, in some cases, to the abandonment of the whole programme.

Having decided on the kind of standards that seem to be most urgently needed and the sequence to be followed, the expert group should determine the elements to be dealt with (for example, whether the building norms for the health centre should include requirements on water supply and waste disposal) and the detail to be provided (for example, whether the text should include architectural designs and functional sketches). According to these decisions, a detailed programme and a time schedule should be elaborated to cover the steps described below.

**Data collection**

At this stage, all background material for the specific building or engineering element or functional component under scrutiny should be assembled: statistics, books, manuals, regulations, articles and research reports, both from within the country and from abroad, should be duplicated or translated for all members of the study group.

**Analysis and research**

In order to assess the applicability and implications of the suggestions put forward, to harmonize opposing views, and to search for alternative approaches, all background material should be complemented by precise information gathered through direct observation and interview or even through experimentation. Only the objective observation of local conditions, of services provided and of functions being performed makes it possible to define the environmental conditions, behavioural patterns, customs, religious and ethnic factors, and economic constraints which influence the utilization and operation of health care facilities in a particular country. Although observation, interviews and, in particular, experimentation require a lot of time, they are often the only methods of finding out what really occurs and of judging the applicability of foreign requirements to local circumstances.

A critical analysis dealing with each proposed architectural and engineering detail, and a thorough operational study dealing with individual functional components are required to decide which standards should be retained and which may be discarded; to select from international experience that which is valid in the light of local conditions, resources and customs and to omit that which does not apply (for example, is it valid to impose the use of a generator when a battery-powered lamp may be even safer as it needs less expert maintenance?); and to decide what is necessary and feasible under conditions of limited resources and what can
safely be dispensed with (for example, is it necessary to impose the use of autoclaves, or are there other simpler sterilizing techniques; is the incinerator essential or can infected waste be otherwise disposed of?).

In each specific case the study committee should consider objectively which are essential elements, dimensions and features and which are optional ones, in order to decide on what should be legally imposed, what should only be recommended, and what would best be left open to choice.

**Graphic studies**

The research on standards for building designs best suited to local needs should be complemented by graphic studies of the proposed architectural solutions for functional units. For each spatial unit, all movable and fixed equipment essential to the proper discharge of a definite function or the proper processing of a specific workload should be carefully listed, taking into account local technical and economic possibilities. These data on equipment, as well as information on the correct traffic flow, are then transferred to room data sheets designed to calculate the minimum space required (see, for example, Fig. 2). When dealing with technical services, complex traffic flow or closely related rooms (for example, radiology, laboratory, central sterile supply department, surgical suite, etc.) the graphic study should show the whole activity unit in a generic lay-out (see, for example, Fig. 3) which may be further explained by traffic charts or functional sketches (as shown, for example, in Fig. 4).

**FIG. 2. ROOM DATA SHEET FOR FLOOR PANTRY OF CENTRALIZED FOOD SYSTEM**

![Diagram of room data sheet]

1. refrigerator
2. storage cabinets
3. work counter
4. counter with sink
5. portable stove
6. cart

**FIG. 3. GENERIC LAY-OUT FOR CENTRAL STERILE SUPPLY**

![Diagram of generic lay-out]
These graphic studies should not be considered as proposed type-plans but as the cheapest and minimal acceptable solutions. They are designed to help in the process of dimensioning for the various units.

Preparation of draft papers

This is the moment of final decision when the solutions arrived at by critical analysis and detailed graphic studies are translated into precise concepts. At this stage all subjects that have been studied are summed up in definite requirements.

Where it is necessary to explain a position or approach adopted by the committee in relation to the subject dealt with, this should be done in a preliminary note or an introduction. The first chapter of the text should give precise information on the scope of the standards or requirements and their specific aim. A second chapter could define, if necessary or convenient, the terminology used in the text, each definition constituting a separate item. One single word should correspond to each definition and vice versa.

The next chapter should state general requirements which apply to the object of the norm as a whole. Here could appear such general requirements as:
"Every design for the construction, extension and remodelling of a health care facility should be based on a detailed programme specifying:

(a) functions and activities to be discharged in each functional unit,
(b) space required for each room,
(c) basic equipment necessary in each room."

or

"The design shall indicate the exact site of basic equipment in order to ensure that:

(a) mechanical, electric and sanitary connections are correctly located,
(b) doors and windows are in the correct position,
(c) circulation space for stretchers, beds and trolleys has been provided."

The following chapters should present the various specific requirements concerning both programming and architectural solutions, dealing individually with each functional component and each building and engineering element. For each functional entity, the text should comprise the specific conditions to be met, as well as a programme for both indispensable and optional activity sets or rooms, with concise explanations of the activities and the essential equipment needed.

The text should be as simple, clear, concise and homogeneous as possible. Similar requirements should be presented in the same manner, and the style should be completely impersonal, direct and objective. The numbering of the requirements as well as all digits, units, formulas and notes should follow established norms.

An appendix to the standard should contain the graphic studies, in the order that they are mentioned in the text. The lack of literature dealing with planning and design of health care facilities in developing countries makes it useful to present pertinent room data sheets and generic layouts to illustrate the minimum requirements, even though there is a danger that they may be copied without due regard to local conditions. Research has clearly indicated that the lack of graphic aid to promote better understanding of the requirements can easily lead to a worse design than the misuse of a layout.

For an extensive text, an alphabetic index should be included, after the appendix, to facilitate reference to specific subjects.

Review and revision of the draft text

At this stage the whole text should be duplicated and submitted to a number of competent professionals in the health care field for comments, criticism and suggestions. This unofficial and critical review of the draft text is of great help in revealing whether the standards are acceptable by and comprehensible to those who will be affected by them; in disclosing biased decisions; and in revealing mistakes.

It very often happens that a phrase which seems quite clear to those who have discussed it for hours may be ambiguous to others. For example, "locker room with toilet for each sex" can be interpreted as "an individual locker room with toilet for each sex" or "a common locker room with an individual toilet for each sex", which is obviously nonsense; "dining area not less than 0.50 m² per bed (for servicing in three shifts)", meaning "an area of 0.50 m² multiplied by the total number of beds, permitting each meal to be served to the patients divided into three subsequent groups", may be interpreted either as "an area of 0.50 m² per total number of beds divided by three".
After a reasonable time lapse, the draft papers that have been returned with written suggestions should be examined by the committee, each suggestion discussed in detail and the draft text corrected, where necessary, to reflect the consensus of the group. After this final revision, the text is ready for official approval and publication.

Approval and dissemination of the final document

The final document developed by the study committee should then be submitted for approval by the competent authority and, finally, published and distributed. This step is of great importance: the better use of limited resources will only be achieved by the dissemination of requirements and standards to all offices, departments, organizations, schools and professionals concerned.

6. ENFORCEMENT OF STANDARDS

The United Nations Expert Group on Standard-setting in Social Welfare (1974) considered the enforcement of standards to be inseparable from their formulation: "A consideration of the means of enforcing standards should be an intrinsic element in the standard-setting process; ideally there should be a built-in self-enforcement system". The extent to which building standards can be enforced varies with: the agents who should comply with the standards (for example, governmental agencies, private institutions); the sanction or reward with which the standards are linked; and the nature and complexity of the standards to be applied, i.e., the expertise required in detecting noncompliance.

While, in a liberal setting, it seems more difficult to make building standards compulsory for private institutions than for government services, there are nevertheless several methods of enforcement which can easily be applied to the private sector. These methods take a number of financial and moral forms, for example, the granting of rewards such as public subsidies conditional upon the observance of the standards, and the increase of service rates paid to the institution; and the application of sanctions such as the refusal to licence for operation or contact, and the denial of accreditation by a governmental or nongovernmental agency entrusted with the survey of health care facilities (for example, in the USA the Joint Commission on Accreditation of Hospitals in Chicago).

In developing countries, the professionals and agencies able to exercise control over health facilities and detect cases of noncompliance with standards are as scarce as the professionals needed for the actual planning and building process. While this would imply that standards in developing countries should be limited to an absolute minimum to allow for efficient enforcement, it should not be forgotten that standards are not only tools for control purposes but, as indicated above, they are just as important as instruments for planning and decision-making. In developing countries, detailed building standards for health facility construction would be of little use if their value were to be judged solely on the extent of possible enforcement; however, properly formulated standards can accomplish much towards the building of more appropriate health facilities by providing information and guidance. Much deficient planning and many wrong decisions result only from a lack of knowledge. It should therefore be stressed that the lack of enforceability and sanctions in developing countries should not deter standard-setting or the formulation of more intricate requirements.

7. REVISION AND UPDATING

Even extreme thoroughness and great efforts do not preclude mistakes. There are invariably both printing errors and conceptual faults in the final document. The conceptual faults are often revealed through the feedback of information regarding the problems which arise when the norms are put into effect. At the same time, the functional and technological advances in the health care field are such that many technical details quickly become outdated. In order to keep the standards relevant and useful it is thus essential that they be periodically re-evaluated and updated where necessary in the light of new conditions. Even basic minimum standards may become obsolete when a new stage of development is reached (for example, more sophisticated needs will lead to an increase in the floor area required per bed) and as new methods are introduced (for example, the width of doors must be increased when stretchers are abandoned in favour of beds for patient transport).
The lack of adequate updating to keep pace with technological and organizational progress may lead to building requirements which are based on such out-of-date concepts that they become a hindrance to proper planning instead of promoting it. For example, a particular piece of sanitary legislation was recently found to contain requirements for short-term general hospital buildings such as: "The total number of beds in each nursing unit shall not exceed 24"; and "On floors where patient rooms are located there shall be provided at least one pantry for every 12 patients with a minimum floor area of 4.00 m², and one bathtub and one shower for every 12 beds"; and "Obstetrical facilities shall provide an operating room even if the hospital has other surgical facilities". If applied, these standards would certainly lead to costly and inefficient staffing patterns and an incredible waste of bathtubs and pantry equipment. To prevent such obsolescence and ensure the continuous efficiency of standards, it is recommended that explicit procedural provisions for periodic re-evaluation of standards be provided.

Only the implementation of well formulated and up-to-date standards and technical requirements will improve the quality of health care facilities in developing countries, lower life-cycle costs and provide a safe environment for both patients and staff.

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Annex

SOURCES OF INFORMATION

An abundant literature dealing with the functional, architectural, economic and safety aspects of health care facility construction is available from such sources as:

- hospital associations, e.g., in the USA the American Hospital Association in Chicago, which has published a Hospital Literature Index quarterly since 1950, and the Catholic Hospital Association in St Louis;

- health administration centres, e.g., the King's Fund Centre in London, England, and the Deutsches Krankenhausinstitut in Düsseldorf, Federal Republic of Germany;

- university programmes in health administration, such as those listed by the Association of University Programs in Health Administration, Washington, DC;

- Her Majesty's Stationery Office, London;

- United States Government Printing Office, Washington, DC (United States Public Health Service publications);

- World Health Organization, Geneva;

- French Ministry of Health;

- The Kellog Foundation, Battle Creek, Michigan, USA;

- Swedish Institute for Hospital Care, Stockholm;

- National Projects and Study Research Institute on Projects for Health Buildings, USSR Ministry of Health, Moscow.

Articles and research reports can also be selected from the various abstracting services listed below:

- Abstracts of Hospital Management Studies, published by the Cooperative Information Center for Hospital Management Studies of the University of Michigan, Ann Arbor, MI, USA;

- Hospital Abstracts, prepared by the Department of Health and Social Security, London;

- Hospital Abstract Service, published by Physicians' Record Co., Berwyn, IL, USA;

- Informationsdienst Krankenhauswesen, prepared by Deutsches Krankenhausingstitut, Düsseldorf, Federal Republic of Germany.

In most developed countries there are also codes, standards, specifications and minimum requirements, which are readily available from:

- standards organizations, i.e., the International Organization for Standardization, and the national standards bodies that it comprises;

- professional or scientific societies, international and national;

- all health authorities.

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1 It is fully realized that, due to the multiplicity of fields involved in hospital planning and construction, as well as to language barriers, the above list is not as representative as would be desirable. It is given as it stands on the grounds that incomplete information is better than no information at all. We shall be glad to publish in a subsequent volume further relevant sources of information made known by our readers or gathered by us.-ED.
PROVISION FOR FUTURE EXPANSION AND REMODELLING THROUGHOUT THE PLANNING PROCESS

Nils Nilsson*

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1. INTRODUCTION

This paper describes the overall planning process and how requirements for expansion and remodelling can best be maintained throughout the various project stages in establishing a health care institution.

In the past it was normal for the briefing, design, and construction of a project to progress simultaneously. Gradually, however, the planning process has become more and more isolated, meaning that there are very distinct limits, even administratively, between the various stages of a project. The ideal situation is for the briefing, design work, and construction stages to overlap thereby, once again, permitting continuity and hence introducing flexibility throughout the entire planning process. The present situation goes some way towards fulfilling this aim.

Experience has shown that it is not necessarily easier to expand or upgrade an existing and functioning institution, than to design, build, equip, staff, and start up a new establishment. The problems associated with modifying an existing institution would be substantially reduced if that institution were designed to permit adaptation to new roles. This highlights the need for a design which offers the possibility for change throughout the entire life of the project, and which incorporates scope for future extensions and adaptation to new roles even when the health care establishment is built and running.

Ideally, it should be possible for a health care institution to be able to accept new functions depending upon requirements. Design can play a significant part in this by allowing for easy future adaptation and expansion. In developing countries it is likely that health care institutions will be subject to substantial changes according to financial and medical developments. It is therefore the object of this paper to describe the necessary steps, design criteria, and checks, which should be gone through when planning a new hospital, or when considering the expansion or remodelling of an existing health care establishment. Only in this way can the many interactions involved in creating a properly coordinated hospital plan be fully understood.

Many of the principles set out in this paper have been used in hospital designs in Scandinavia, elsewhere in Europe, Africa, and the Middle East. Most design concepts are therefore suitable for general application in developing countries, provided that adjustments are made for climatic or other variables. There are two separate design problems: expansion and remodelling. They are closely interrelated and are treated together, as the possibilities for future change should be taken into consideration at each stage of the planning process. The necessary steps in planning for future expansion and remodelling must therefore follow a careful strategy which, at each stage, closes as few options for future change as possible.

2. MAJOR CONSIDERATIONS

Flexibility

A hospital, or even a small health care establishment, is a complex institution with a relatively long lifespan as regards its buildings. It is therefore inevitable that during its lifetime, the various functions within its fabric may need to be reorganized to meet changing circumstances, different treatment techniques, technical improvements, and financial opportunities. A health care establishment is not, and should never be regarded as, a complete and definitive entity, for not only may financial opportunities alter, but the emphasis on sectors of treatment may be radically modified. Not only may there be substantial departures from an original design brief during the planning process, but political decisions may significantly influence the role of the institution. Not only may the importance of individual departments change substantially as a result of external decisions, but the functions provided by the establishment may be upgraded or relocated. Consequently, the possibility of reorganizing or extending certain hospital facilities whilst leaving other functions undisturbed is very desirable. These changes, the rate of which may markedly accelerate in the future, demand accommodation with an extremely high degree of flexibility in its usage.
The need for flexibility depends on the character of the function involved and the likelihood of individual functions changing. The type of flexibility required, however, depends on the extent of changes which must be accommodated and their time-scale. The scope of changes within a hospital is therefore not solely confined to permanent structural alterations, but also concerns arrangements of a more temporary nature which may be required to meet organizational variations.

In exploring how best to meet these demands, it is important to determine the two forms of flexibility which are needed. In this paper they are called: "short-term" or temporary flexibility, and "long-term" or permanent flexibility. Both these forms are interrelated but they are concerned with organizational problems of quite different scales. Not all functions within a hospital will require the same degree of flexibility.

Short-term flexibility. Short-term flexibility is required within hospital departments to meet irregularities in patient treatment, disease patterns, epidemics, and the like. The concept of temporary flexibility implies that the capacity of a ward or department in different patient categories may be adjusted. This can, of course, be achieved simply by organizing existing wards into different groups but this is often far from satisfactory. Instead, flexibility may be achieved by utilizing existing adjacent accommodation, which by virtue of its design is suitable for a number of different functions.

To obtain this form of short-term flexibility implies suppression of the idea of a typical clinical department with a fixed number of beds for each specialty. It should also be recognized that short-term flexibility may complicate nursing organization because specialized teams would have to deal with a variable number of patients. Neither of these factors, however, is far from real practice in the average nonflexible hospital.

In general, the activities most adaptable to short-term flexibility are likely to be those in the outpatient department and the adult medicosurgical wards. The laboratory unit may also be able to accept a high degree of flexibility as bacteriology, serology, histology, biochemistry, parasitology, haematology, and mycology can be performed in standard rooms, with only virology requiring special facilities and a fixed location. The intention here is to show that most of these activities can take place interchangeably in common accommodation, with only organizational demands dictating the specific location of each function. Conversely, the less adaptable functions are those in the operating suite, the radiology department, the paediatrics unit, and the obstetrical department with its delivery suite, although even some of these functions can offer limited short-term flexibility to meet changing accommodation needs. Some interchange, for example, is possible between paediatric wards and medicosurgical wards, which can be linked together by a series of intermediate rooms normally used for children 5-14 years of age. These rooms are then used for whichever category of cases requires additional accommodation. Flexibility is also possible between medical wards and isolation rooms for infectious diseases. In this case, patients with tuberculosis and typhoid can be accommodated in between. Flexibility should also exist in moving patients from long-term care to intermediate care, with transition rooms forming the link.

It is therefore clear that room layout and hospital organization play a substantial role in providing for short-term flexibility. This level of flexibility presumes, however, that all functional changes are retained within a single department; the growth or decline in the capacity of a particular unit can thus be absorbed by intermediate activities rather than involving transpositions between main functions. When the demands for growth or change extend to adjoining departments, the effects of subsequent alterations and adjustments are more pronounced. To try and solve the associated problems it is necessary to study first the needs of long-term flexibility.

Long-term flexibility. Whereas short-term flexibility is needed to meet internal organizational changes, long-term flexibility is needed for changes of a more permanent nature in departmental size and location. All major hospitals are faced with the continual problems of expanding the capacity in different departments, or updating aging accommodation. In hospitals in developing countries, which are often built in successive stages according to finance, population growth, or staff availability, the problems will certainly not be less. To fit in many of these extensions, it is usual for some of the hospitals' activities to be moved around.
The provision for the extension and relocation of functions is not just a question of simple building work; changes also affect the many utility services and the delicately balanced system of communications.

This is the problem in its simplest terms, but it is equally important to determine the degree of flexibility which will satisfy the long-range goals for various activities and which hence dictates the type of structure.

**Flexibility within the building structure.** To ensure either short- or long-term flexibility in a building structure implies that the building can adapt to substantial changes; however, experience has shown that flexibility as a prime requirement in a building, allowing post-construction modifications, tends to be expensive.

Flexibility in a building can be achieved in two quite different ways. The building may either be designed so that it is capable of being adapted physically to different functions - this could be called an "adaptable" building - or it may be designed in such a way that different functions can be accommodated without structural alterations - i.e., an "universal" building.

Adaptable buildings with freely arrangeable internal spaces have, of course, been built but they have frequently caused other problems, particularly with sound-proofing and services, as well as being costly. The universal building on the other hand embodies the opposite approach to accommodating the many functions. Basically, it entails a design suited to the average requirements of all functions, which are then modified to a greater or lesser extent to fit the available accommodation. The immediately recognizable disadvantage with this system is the difficulty of deciding the degree of general application which does not hinder functional efficiency and yet at the same time does not waste too much space.

Both short- and long-term flexibility make demands on the building structure and in both cases it is advantageous if the building can be adapted to its new role with the minimum of structural and technical work. Nevertheless, long-term flexibility is more likely to require complex changes than short-term flexibility, which can usually be accommodated with simpler modifications. In both instances, though, it may often be easier to adapt the new function to its accommodation, than vice versa. In such cases, the more universally usable the floor space, the better chance there is of meeting new needs with the minimum of disturbance. Universal building flexibility, however, does not simply involve the finished building and the technical services feeding the various units; it begins with the inception of the project.

**Flexibility during planning.** The planning of health care institutions normally occupies an exceptionally long time, often as much as 20% of the initial lifespan of the building prior to major remodelling. In developing countries the need is for the establishment of health care facilities in the simplest, quickest, and most economical manner. Consequently, long project-planning must be avoided.

Experience shows that during the hospital planning and design period there are as many requests to change the medical programme or the disposition of functions as during the operational period of the finished building. It is therefore of the utmost importance that maximum flexibility for design changes is maintained throughout the entire planning period, particularly during the latter stages when hitherto postponed decisions have to be taken.

Whilst no amount of briefing deliberations will ensure every possible opportunity for future change, careful programming can certainly help to reduce the need for future structural works when accommodating functional changes. Fig. 1 shows the theoretical "life" of a building, from its briefing, design, and construction, through its initial intended lifespan, to the major remodelling of functions within the existing building fabric.

A 100% flexibility would be required to provide for every conceivable circumstance but, in practice, such a demand is highly improbable as changes of that amplitude are unlikely to be necessary. In any event, there is a gradual reduction in the scope of opportunities for flexibility during the entire life of the building. During the planning stage, when the maximum need for changes occurs, there will inevitably be a decline in overall flexibility as the
design is finalized. Then, during the construction stage, flexibility will be a critical balance between adjusting to new demands while implementing fixed functions and keeping to timetables and cost limits. Immediately after being commissioned the hospital has perhaps its highest post-construction flexibility but, as changes take place over time and extension opportunities are used up, the "flexibility curve" will progressively drop, a process graphically illustrated in Fig. 2.

To the concept of flexibility should be added the important design requirement that it should be possible to build the hospital in easily workable stages, according to available finance. What can be afforded today is perhaps quite different from the future availability of resources; therefore, there should always be ample scope in the hospital and hospital system to allow for progressive improvements in buildings, services and standards, as financial resources allow. It is worth remembering, however, that sufficient finance for hospital projects, even in developed countries, is increasingly difficult to obtain. In many developing countries already limited finance is being eroded by exceptionally high inflation rates, particularly in the building sector. This problem therefore raises particularly the question of selectivity in the building design.

Durability

In order to choose the most efficient degree of flexibility in a hospital building, components should be planned according to their life expectancy.

Every building contains certain elements which are extremely difficult or even impossible to change and which are expected to remain unaltered during their useful life. Usually this applies to the "structure-related" elements (load-bearing structure, foundations, roof, etc.) and to the main technical services; these are referred to here as the primary building structure. Those parts of the building which have a short life and which are independent of the main structure can be termed "activity-related". They are more easily adapted to changes in function or activity and the inherent quality of these elements is flexibility.

Durability, unsurprisingly, has certain implications for building costs. Fig. 3 shows the approximate average proportional distribution of costs in a typical hospital. While proportions vary slightly from project to project, there is a marked tendency for the "activity-related" sector to increase. The structure-related costs represent a much less important part of the total costs if the total costs of the building during its entire lifespan are considered, rather than the initial construction costs; this is due to the permanence of the structure. While the permanence of the activity-related elements varies considerably, it can be considered to represent on average about a third of the permanence of the structure-related elements.

Consequently, since the structure may only be changed to a limited extent, it should not be designed for special functional requirements but should instead offer universal application, within the given cost limits. In addition, due to the permanence of the structural elements, it is considered essential that they should be as independent as possible of the activity-related elements. The design limitations on other variables, such as room, wall, and door components, can then be decided independently of the main structure and be based instead on the needs and resources at each stage of the planning process.

3. THE PLANNING PROCESS

It is perhaps worthwhile first to define the activities of the whole planning process. This is particularly important where complex construction is involved and where the planning/construction process is long. It is just as important, though, to adopt similar procedures for shorter projects.

Considering the general rise in building costs as well as annual inflation, it may be advantageous to begin certain stages of the planning or construction process as soon as possible, in order to shorten the entire building period. With an overlap between the various planning stages, which assists in speeding up implementation, flexibility within the building layout takes on an added importance.
FIG. 1. THEORETICAL LIFESPAN OF BUILDING

FIG. 2. FLEXIBILITY OF BUILDING DURING PLANNING, CONSTRUCTION AND RUNNING

FIG. 3. APPROXIMATE AVERAGE PROPORTIONAL DISTRIBUTION OF COSTS IN A TYPICAL HOSPITAL

FIG. 4. TELESCOPED DESIGN PROCESS

STRUCTURE-RELATED 35% ACTIVITY-RELATED 65%
- Primary building structure 35%
- Electrical 10%
- Plumbing 15%
- Mechanical 15%
- Secondary structure and finishes 25%
- Equipment and furniture 15%

Stages: end product
- BRIEFING
- DESIGN & PRODUCTION DOCUMENTS
- CONSTRUCTION
- COMMISSIONING

Activities

WHO 77535

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While flexibility is a suggested aim in the building design, general flexibility throughout the entire planning process is essential to facilitate expansion and remodelling exercises.

**Telescope principle**

A building structure which is designed on the "universal" principle and which allows a rapid movement of functions from one part of the building to another offers particular advantages in the management of the design process. The ability to delay decisions on the final location of certain functions while the remainder of the building is being designed and to make limited late changes in location even when the building is finally designed or under construction reduces the problems of modification for both the architect and project manager. Since the location of most functions is variable, it is possible for the entire design process to be telescoped, with one element of the design being carried out independently of others or fitted into the overall modular structure when appropriate. Such a flexible design process can thereby offer substantial time savings in establishing a health care institution. The process is graphically illustrated in Fig. 4 but, in order not to make the figure unnecessarily complicated, the feedback actions have been omitted. It is clear, however, that constant feedback will take place between each stage and activity.

**End-product of stages**

Fig. 5 illustrates the basic procedures and various interactions related to the building process. A description of each planning stage and the nature of the activity associated with it is given below.

The purpose of the work, the decisions to be reached, and the tasks to be undertaken at each stage of the planning process for health care institutions can be described as follows:

- **Briefing:** to ensure that the project is feasible in functional, technical and financial terms, by undertaking assessments and providing recommendations which will help to determine the form in which the project is to proceed; to carry out necessary studies of functional, site, and constructional considerations, as well as building layout and costs, to reach decisions and ensure integration in national/regional health plans; the outcome of this stage will be a report to the client with recommendations on the composition of, or adjustments to, his brief;

- **Design documents:** to determine the general approach to layout, design and construction in order to obtain approval on proposals concerning the planning arrangement, appearance, construction method, outline specification and cost; to develop the feasibility study further and carry out the studies on functional and constructional considerations regarding infrastructure, building design and costs necessary to reach decisions; final development of the design brief, building design and layout, and preparation of the cost plan;

- **Production documents:** to prepare drawings and other production information needed for the final detailed decisions on carrying out the work and for obtaining the necessary tenders; preparation of final production information, drawings, schedules and specifications, bills of quantities and tender documents for distribution to contractors;

- **Construction**;

- **Commissioning:** to hand over the building from contractor to client and bring it into operation in one or several stages, gradually building up to the design capacity as installations and finishing works are completed;

- **Running:** maintaining the building in operation; undertaking over time a programme of modifications in order to satisfy new medical routines; modification will probably be strictly limited during the building’s initial lifespan but changes may be needed later to accommodate greater patient numbers or new functional requirements.
4. ACTIVITIES IN THE PLANNING PROCESS

Within the various stages of work described above, there is a matrix of interrelated activities between the various components of the planning process. Each of these activities requires the collection and analysis of information from which final proposals can eventually be drawn. The different activities in the various stages of the building process may be summarized as follows:

- functional considerations;
- site considerations;
- constructional considerations;
- building design and layout;
- furnishing and equipment;
- staffing;
- cost plan and phasing;
- management.

While some of the above activities (in particular, staffing and management) will continue throughout the lifespan of the building, they are included here because they have direct implications for the planning process.

Some general examples or applications have been given, as illustrations, in the text; these should not be read as recommendations but rather as examples to stress the various ways of improving flexibility.
**Functional considerations**

Functional considerations are mainly dealt with during the feasibility study and design stages although much of the detailed work on finalizing the room-function programme is often carried out as late as at the production documents stage of the project.

**General concepts.** In the initial stage of the building process, the status of medical facilities in the referral system should be clearly stated. For instance, the terms "regional", "intermediate" and "local" could be used to refer to hospitals at regional, district, and divisional levels, but there may need to be subdivisions of these categories to take account of irregularities. At the same time, the context of the policies and main objectives provided by the national health care plan should be stated. This should include information on:

- The administrative organization of the health care system;
- The size of population served;
- The distribution of staff, based on the present and planned training capacity, and the likely availability; and
- Target bed numbers.

**Department functional programme.** The main functions and facilities for the health care institution should be carefully defined to provide basic information for the design programme. The proposed department functional programme for the facilities should substantially be a summary of the dimensioning information gathered from various sources during the initial phase of the planning process.

To plan satisfactorily for future expansion and remodelling, it is most important that the source of detailed information collected for the department functional programme is stated. An estimate of the likely location and scale of future expansion needs would also greatly assist the planning team.

In general, the department functional programme should describe and quantify the main functions of the health care institution. For example, a small or large hospital could, when fully developed, contain the following departments: inpatient department; outpatient department; diagnostic and treatment department; and central services department.

The department functional programme should describe the activities in each department, the numerical requirements (such as the number of beds or the number of examinations to be undertaken), the staff organization, the main interdepartmental links and internal connexions, and the floor space requirements.

The department functional programme for the inpatient department should include the proposed basic distribution of beds for the current and subsequent plan periods. The inpatient department could include wards for medicine, surgery, obstetrics, paediatrics, isolation, and other purposes such as psychiatry, orthopaedics, burns, and ear, nose and throat.

The outpatient department should be capable of handling the likely number of patients which can be expected per day, and could for instance include medical, surgical, gynaecological, dental and maternal and child care clinics, a casualty unit, an admission unit, and a pharmacy.

The diagnostic and treatment department could for example include a laboratory together with units for radiography, operating, intensive care, sterilization, delivery and physiotherapy.

Finally, the central services department is likely to include an administration unit, a kitchen and laundry, a central store, plant rooms, a maintenance unit, mortuary, and staff changing accommodation.

**Room functional programme.** To permit the maximum number of different activities in a given space, room dimensions should be standardized and adapted to average needs, thereby increasing the opportunity for room functions to be changed very considerably without the need for structural alterations.
Basic information upon which the choice of room dimensions is made should be provided in a room functional programme. The scope of the activities within each hospital unit, the special requirements on finishes and installations, and the nature and position of fixed equipment and furniture should also be tentatively specified.

From the department functional programme and the room functional programme, a comprehensive inventory of floor spaces for rooms and circulation space can be compiled.

**Planning considerations.** Considering that the likely future development of most hospitals will be towards providing an increased number of beds, supplementary functions, and specialties, planning should envisage the maximum provision for future extensions and improved space standards. A clear definition should be sought of the likely demands on the hospital site, the individual ward units, and other supporting facilities. Attention should also be paid to the coordination between different departments during each phase of any subsequent extension, to ensure that it does not interfere with the continued efficient operation of the institution.

The accessibility of each hospital department and the internal circulation is a further factor which should be clearly determined. The need to separate different flows in the hospital should also be examined, together with the requirements for outpatients and visitor waiting areas.

In addition, to create a pleasant environment for both patients and staff, particular attention should be given to the relationship of the hospital buildings, and the character of the spaces between them. For instance, courtyards may help to improve the general appearance of the hospital by providing visual and psychological relief, while the use of single-storey buildings will help ensure a human scale and reduce the institutional atmosphere.

**Site considerations**

There are a number of important site factors which require considerable study if the opportunities for future expansion and remodelling of a health care institution are to be successfully exploited and maintained.

Firstly, there is the need to examine the available site and its environs. Is the existing site large enough to accommodate any future growth or rearrangement of the hospital? If not, what are the prospects of acquiring further adjacent land? What legal formalities must be gone through, and how long will this take?

In order to allow for the anticipated expansion requirements, a site of sufficient size to provide for changes and with extension possibilities should be selected whenever possible. The advantages of a large enough area cannot be overemphasized, for this too will add to the opportunities for flexibility by giving scope for alternative expansion arrangements.

It should, however, be remembered that there is no ideal site and that even with sophisticated synthesis techniques the choice may finally be based on relatively simple considerations.

**Climate.** Climatic conditions vary significantly from location to location with respect to temperature, prevailing wind direction, rainfall, and humidity. The hospital layout and construction should therefore be arranged to satisfy general situations but should allow for certain alterations and adaptations to meet microclimatic demands. In many tropical locations, for example, the orientation of buildings will depend both on the sun and on prevailing wind directions.

**Topography and soil.** The hospital layout and construction should also be designed to adapt to the topography of the site. For instance, a layout using single-storey buildings on a shallow sloping site can accommodate changes of level by relatively short and simple ramps in the connecting corridors, thereby avoiding sophisticated systems for transporting patients and goods. It is important, however, to remember that the site slope can be the first hindrance to flexibility. A slope of more than 1:10 will invariably cause design problems for
circulation and will make the application of single-storey buildings debatable. Even poor soil and ground conditions may inhibit flexibility by restricting the opportunities for different directions of expansion due to extra foundation costs.

Accessibility. Accessibility is another factor of paramount importance and careful consideration must be given to the location of a hospital if it is to give effective service. Sometimes the selected location will be the only town in the area; when several alternative locations are possible, the most central one should be chosen. The choice of location is part of the area-wide planning. Once a decision has been made, it remains to select a suitable site. This should be at, or close to, a nodal point on the regional road network. The availability of public transport will further increase the hospital's patient catchment area.

Infrastructure. Since adequate or even minimal utility services may not be available at many sites, their provision will require considerable study in each hospital project. To ensure reliability, the following utility services should be designed to cope with both site conditions and climatic extremes: water supply; waste and surface water drainage; electricity; refuse disposal; and telephones. The most important of these is undoubtedly water; the reliability of an adequate water supply may be a critical factor in maintaining hygiene standards and even determining the scale of future expansion.

Adequate drainage to ensure proper sanitary conditions and prevent the spread of infection is also needed but this will largely depend on technical solutions; alternative forms of waste water disposal should be investigated. Adequate provision should also be made on all sites for storm water drainage. An adequate supply of electricity can usually be provided by diesel generators, and the supply can be increased in response to demand.

Legal formalities. Prospective hospital sites should be chosen with a full understanding of existing development proposals which may affect medical functions, and should be large enough to provide for the anticipated expansion of the hospital. Ownership of sites must be clearly established by reference to the local land register and any rights of way determined from the local authority.

Constructional considerations

Consideration at the briefing stage of the available construction opportunities will identify the areas requiring further attention during later stages of the project.

Building methods. Many new building designs have involved solutions which are too sophisticated from a constructional point of view. For instance, construction systems using beams and columns with movable partitions have frequently resulted in uneconomical building costs, stemming from a failure to recognise the limitations imposed by local conditions. Even excluding maintenance, many practical building problems have occurred with such systems, especially regarding stability, noise transmission and the provision of technical services.

Materials and structural systems. Experience has demonstrated that building materials and methods of construction must be chosen to suit local conditions. The rise in building costs has proved to be particularly rapid in developing countries in recent years and is likely to continue. This does not mean that the cheapest building materials should always be used. Locally available products may even be dearer than some of their imported equivalents but their advantage for a developing country is a valuable saving in foreign exchange.

The choice of room dimensions, discussed below, also involves practical constructional details as well as a full understanding of the variety of functions which the room might have to accommodate.

A variety of so-called standard modules has been developed for the construction industry and the application of one of these helps to simplify construction.\(^1\) The internationally

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accepted construction module dimension is "M", equivalent to 10 cm. The vast majority of construction products, fittings, technical equipment and service installations are now based on multiples of this M-module, with the 3M-module being adopted for further integration. In Europe, by way of example, framework modules may vary from 60-90M for beam spans between columns, to 120-150M for floor slab spans. Extensive economic and technical studies have shown that these dimensions for the load-bearing framework of the building provide the best relationship with construction skills and cost effectiveness; however, while these primary module dimensions are appropriate for use in Europe, the optimum module will vary significantly from country to country, depending on such factors as the standard of building technology generally available, the quality of building materials and the cost of labour.

In developing countries, where the application of, and dependence on modular prefabricated building systems is not so great, modular construction may still offer design benefits. When deciding on the primary module, consideration should be given to whether a single modular dimension should be applied throughout the hospital or whether different dimensions for each group of main functions would lead to certain advantages. A single module may not provide an optimal use of space for some functions nor make full use of available space for others, but an attempt should be made to find the best overall spatial solution. The use of two, three or more different module dimensions would reduce the scale of compromise necessary in different departments and although there might be an increase in building cost per square metre, as well as increased production management problems, there might well be a saving in the total floor space and hence in overall costs.

The planning and design of the engineering installations such as water, drainage, electricity and gas to set positions is of great importance to assist in maintaining the requisite flexibility. The aim is that it should be possible to make alterations to parts of a building, within the design module, with only minor adjustments to engineering installations. A grid of main engineering services greatly facilitates changes and the dimensions of this grid are best determined by coordinating the depth and grouping of rooms. It is even more advantageous if this grid is coordinated with the main grid for the structural framework. Fig. 6 gives an illustration of such a process.

FIG. 6. HOSPITAL DESIGN BASED ON M-MODULE
In many developing countries, building skills may impose certain limitations on construction methods, with the result that the choice of building systems lies between a load-bearing cross-wall or peripheral-wall construction; or a beam and column construction using either wood, steel or concrete, with panel curtain walls of suitable materials. Both forms of construction have their respective advantages and disadvantages regarding speed of erection, phased construction, need of a contractor, and flexibility; selection should always try to achieve the greatest advantage taking into account prevailing climate, economics, and site factors.

The load-bearing wall system allows step-by-step construction, thus building rates may be matched to abilities and finance. A beam and column construction usually requires completion of the main structural elements before other work can commence, thereby involving the use of a contractor and large project stages; however, panel curtain walls can be of a quality suited to conditions, needs and resources. For certain simple buildings, traditional construction methods for walls, floors and roofs may be quite acceptable but with more complex buildings the use of load-bearing cross-wall buildings can speed up construction and show cost savings over conventional systems of approximately 10-15%. Although this form of construction does not allow total flexibility for the internal layout, it still permits, through careful choice of dimensions and repetitive building units, accommodation suitable for a wide variety of uses. From a practical point of view, even the small alterations which are possible provide adequate scope for change and the system allows for relatively small stage-by-stage expansion.

It should be borne in mind that the costs for renovation and remodelling work can often be equivalent to those for new building. Therefore, when choosing a suitable structural system which allows for future expansion and remodelling, it is important to consider structural methods which suit local building skills.

Manpower constraints. Building materials should also be chosen according to local availability and the capacity of the local labour force. Contractors may be needed to assist with most of the structural and technical aspects of the construction but a degree of "self-help" may be possible at some stages if adequate supervision can be ensured. Whichever construction system is used, consideration should be given to organizing a training programme for building workers, particularly if a pilot project is started to test specific design or construction details.

Maintenance constraints. Maintenance can be an expensive item in the annual running costs of a building; however, the need for excessive future building maintenance can be avoided by careful design and properly supervised construction. Estimates for costs of future maintenance should take into account the likely increase in the cost of capital replacement items. This should influence the choice of original construction materials. Careful handling and the proper treatment of materials may also increase the opportunities for their reuse when the building is remodelled.

Building design and layout

Building design and layout is mainly undertaken during the design and production stages of a project.

Master plan. All analyses aimed at providing for future expansion needs and remodelling are included in the hospital master plan. This is an essential document to guide future decisions and act as a basis for discussions, changes in programme needs, building layout, and preferred phasing.

The hospital master plan should indicate the stage-by-stage grouping or change in the grouping of functions, the distribution of individual buildings and the communication between them. It should also show the directions and limits of changes associated with likely future phases of expansion or remodelling. The master plan should also specify the scale of utility services which are necessary at various stages. Internal site circulation and landscaping are minor elements but these will also contribute to the final environment of the site and project.

Within the master plan, the architectural and engineering concepts for the project may be evolved from criteria developed using the following principles as a basis:
- Grouping of main functions: the future rearrangement and extension of departments and buildings would be facilitated if hospital functions were grouped into the following zones: wards, medical services, admissions, central supplies, and other hospital services (Fig. 7);

- External circulation: the hospital layout should establish appropriate access and entrance arrangements to facilitate easy patient/visitor orientation and special consideration should be given to the needs of disabled patients both inside the buildings and in the grounds;

- Scope for extension: consideration should be given to the likely future development of the hospital in providing an increased number of beds, supplementary functions and specialization; the expansion plans should ensure the maximum interaction between all hospital units during each phase of any extension, depending on whether the structure expands peripherally, upwards, or internally into undeveloped spaces within the layout.

The main features of any expansion or remodelling should be considered in the context of the master plan. Just as evolution of the hospital's medical programme requires a careful analysis of the overall functions, so must the design of each element in the programme be examined for its effect on the rest of the complex.

The orientation and relative limits for new buildings should be defined taking account of site constraints, climatic demands, and existing buildings. The choice of layout for expansion of an established institution largely depends on the arrangement of existing buildings, usually created by historical circumstances.

Fixed points of access may also help provide a starting-point for the design, since it is best if all patient and visitor movements can be concentrated. The layout is then provided with an identity and orientation to which other functions can be related. If the hospital is particularly large, it is desirable to separate pedestrian entry and access for service traffic.

Concerning layouts suitable for varying tropical climatic conditions, the following principles can be applied: an open-plan layout for "hot-humid" climatic areas; a compact layout for areas of "hot-dry" climate; and a compact layout for "upland" regions.

In all layouts for tropical situations, the long axis of buildings should preferably be oriented east-west unless site conditions dictate otherwise, in which event additional solar protection will be required. To suit a wide variety of topographical conditions, layouts should be adaptable to sites with less than ideal topography. Special layouts will, however, be necessary for hospital schemes with irregularly shaped sites, existing artefacts or buildings, or landscaping features which it is desirable to retain.

Just as the site layout requires careful organization in order to achieve a logical arrangement of the numerous specialized departments, within a working building it is also necessary to rationalize the requirements of internal accessibility by first grouping the main functions.

Layout, internal circulation and scope for extension (Fig. 8). From an analysis of the special needs of a hospital, a series of criteria can be established for this functional grouping. These criteria, which are aimed at providing for the most important interconnexion of departments and functions, concern the anticipated flows of persons and goods into, between, and through various sections of the hospital. As a result of this analysis, which must include a careful consideration of the internal circulation arrangements necessary to each department and the access possibilities afforded by the site, the relative positioning of the medical departments will usually be established. At this stage, the location of the central service functions will probably still be undecided.

Hospital layouts can take several forms, depending on particular needs and conditions. Each has certain advantages and disadvantages which must be carefully balanced but the basic choice of hospital form lies between a spread layout, either as a linear or nuclear grouping, or a concentrated multilevel structure.
A single-storey building has certain advantages for future changes as against a high-rise structure. These include: simpler construction techniques; a higher degree of expansion flexibility for individual units; and horizontal communications, which are easier than vertical communications since they require no mechanical aids; in developing countries, lifts are very often a source of endless difficulties.

In developing countries, the possibility of using locally available materials and skills for the construction of single-storey structures is an important argument in favour of such structures. Nevertheless, a low-rise hospital structure has the disadvantages, as against a high-rise structure, of a less dense concentration of functions, a larger site area, and a possible cost penalty for utility services.

While multistorey buildings are a current vogue for larger and more complex institutions, their limitations for progressive expansion and remodelling make them less than ideal for most applications, particularly in developing countries. Since present funds are often only adequate for construction of the basic hospital structure, future flexibility and scope for extension are major considerations. Consequently, a single-storey arrangement of department buildings is to be preferred if the site conditions allow. Such a spread layout, however, tends to start involving excessive distances for internal communications and services once the hospital size exceeds about 150-200 beds. Therefore, above this bed number it is necessary to reduce the overall area of the hospital by introducing some limited vertical arrangement for certain departmental functions so that the most important communications are maintained within reasonable limits. Since it is usually the outpatient and diagnostic and treatment departments that require the greatest scope for flexibility, it is normally the inpatient wards which are the most appropriately constructed in a multilevel form. In such cases, provision of a ramp to reach higher levels can prove useful when lifts break down.

Floor plans. In preparing the design of a hospital layout, the first step is to draw up a systematic grid based on the most appropriate building dimensions. The various hospital departments and units can then be fitted into the grid spaces, according to the location requirements of other determining factors and the interrelationship between functions. Appropriate circulation flows of staff and patients to the various department functions can then be superimposed upon this functional grid.

Within this structural framework a series of standard rooms can then be arranged, their dimensions tailored to average needs and their layout based on either a single or double corridor system.
A single central corridor arrangement is more universally adaptable, since it offers the possibilities of daylight to all rooms, an important consideration when there are only a few rooms where artificial lighting is preferable. This system also allows different room depths to be used on either side of the corridor, with a resultant increase in both flexibility and the scope for expansion.

The double-corridor system, on the other hand, provides a more concentrated room layout but this restricts future remodelling and expansion in that changes to one room affect neighbouring rooms. It also seriously impairs daylighting to the central rooms and requires more sophisticated ventilation and other technical services. It is therefore less suitable for warmer climates where cross ventilation, for example, is an important requirement.

Specifications. During the latter part of the design process it is necessary to finalize all technical details connected with the building and its services. This involves the preparation of working drawings showing structural details, facade elements and the like. Schedules and drawings also have to be prepared of all finishes and the materials to be used.

Even at this late stage it is still essential carefully to build in opportunities and scope for future change and expansion to the main structure and systems; but, in the various rooms where function-related components are fairly easy to change, experience shows that it is better to design for present needs and not invest too heavily in technical details for future requirements. Flexibility here is often adequately provided for simply through standardization.

Utility services and room design. The provision of internal utility services is always a major problem associated with future expansion and remodelling. In a conventional hospital building with a concentrated layout for treatment activities, the uncertainties associated with future expansion require either overdimensioning or duplicating services in many sections in order to reduce later large-scale changes. This is a wasteful process which results in certain sections of systems being underutilized and in unnecessarily complicated routings to achieve connexions. In such buildings, adaptation of the services for new functions can be a very costly undertaking.

If a spread layout is adopted for the diagnostic and treatment department, the essential utility services require substantially longer runs. This can, of course, involve a cost premium but it is often no greater than for the duplication and overprovision in a conventional hospital building. An advantage of a spread layout is that only when a section of a department needs to be expanded must the appropriate section of the utility services be extended.

The design of communications and technical services requires solutions that can be improved or changed depending on technical developments and economic resources, without disturbing the building structure. Thus the routing, positioning and form of installation for cold water distribution, electricity supply, rainwater and sewerage should be studied and standardized to provide maximum opportunities for future extension.

The concept of remodelling and of how flexibility can best be provided extends from the overall building layout to the design of individual rooms. It is therefore important to evolve room designs and dimensions which can accommodate considerable variations. One example of this is the use of movable partition walls (Fig. 9), another is the use of multipurpose units (Fig. 10), the "universal" building referred to above.

Alterations to room sizes by the removal or installation of walls can be organized by rearranging non-load-bearing walls or by a system of movable partition screens. Both these systems, however, require complicated and expensive solutions to provide sound insulation and sanitary connexions. Where technical expertise and building skills are limited it is particularly difficult to achieve an acceptable result using this type of system.

An intermediate solution where partition walls can be arranged without excessive alterations is obviously preferable. In many cases, systems with load-bearing walls have shown themselves to be particularly suitable for application in the lower tier medical care establishment. In the "universal" building, room dimensions are chosen to allow for the greatest general application of uses, thereby permitting an interchange of functions with the minimum of structural alterations. All room activities can then be adjusted to this limited number of
standard dimensions which fit the uniform module and satisfy the majority of user requirements. Only modifications to equipment and services are then required at a future date to rearrange rooms and interchange various hospital activities. This procedure permits the maximum interchange of different activities between rooms, even though some may have slightly too much floor space and others too little for ideal conditions. The resultant accommodation is nevertheless usually acceptable.

The points made here serve to illustrate just how complex a hospital structure is, being composed of elements which are interdependent and interrelated. It is easy to see that a change in one element is likely to trigger off a whole series of subsequent changes and adjustments before the system settles into equilibrium again. It is clearly essential to keep these disturbances to a minimum since hospital services must be maintained at all times.

**Furnishing and equipment**

The functions of standardized rooms are essentially determined by the furnishings and equipment provided. When the dimensions of furniture are also carefully chosen and standardized, interchange between various rooms will be simplified, thereby increasing the possible applications and functions for which the rooms may be used.

While the standard of equipment may finally be decided at each project stage, locally made building materials, standard fixtures or other products should be used whenever possible. Specialized fixtures and medical equipment, however, will probably have to be imported until suitable indigenous products are available. The choice of modular-designed items, from whichever source, will increase the flexibility in arrangement and change of location.

The aim of the interior design should be to create the best possible working conditions for staff and to reduce patient tensions associated with hospitalization. Within the limits set by medicotechnical considerations, the gap between an institutional environment and the out-of-hospital surroundings familiar to the patient should be reduced as far as possible.

**Staffing**

Any health care plan has to be compatible with the existing number and distribution of staff in medical institutions and the present and planned training capacity of the country. The plans for expansion and improvement of existing health care institutions and the provision of new establishments, likewise, have to be geared to the operative programme of staff training. Such operational limitations can be accommodated through the progressive phasing of hospital projects.
Cost plan and phasing

Throughout project design and construction, continuous comparisons should be made of the costs and effectiveness of different materials, structures, roof coverings and finishes. Cost comparisons should also be made of several different proposed building layouts, in an effort to obtain the most economical yet appropriate solution. Such experience can be immensely valuable when evaluating later plans for expansion and remodelling.

Management

The steps in the planning process and the associated actions which stem from it require a complex set of arrangements. They also circumscribe the methods of communication that must be set up and maintained, and the rational order of considering problems and reaching decisions in good time.

For projects of extraordinary complexity, size, and duration, such as a large hospital, where the brief is never really finalized but constantly develops and changes, management should be supervised by a team. On smaller projects, the management task may be smaller but it is still desirable to maintain continuity throughout all stages of the project.

The reasons for design decisions and the lessons gained from a scheme should be carefully documented, with notes on how to do things next time. It is often interesting to compare the final product with the original design brief to see what compromises have proved necessary and whether the design intentions have in fact been achieved.

In a project which continues over several years, there should also be a continuous record of policy and design decisions. Although lessons are often learned too late to be incorporated into a scheme, the greater the flexibility of the design, the greater the chances are of adjusting to new demands and of allowing modifications during the course of the project. Nowhere will a record of experience and original design intentions be more important than in schemes concerning expansion and remodelling.

5. CONCLUSIONS

In order to make the most effective use of the limited investment resources allocated to health care, facilities should be planned so that they can be readily adapted to changes at any time during their lifespan.

Concerning the overall project planning process, attention should be given to reducing the separation between different stages and to increasing the overlap of activities so that the steps in planning become increasingly telescoped. In this way, only the essential programming or design work necessary at each stage need be undertaken, resulting in a considerable saving in time, resources, and manpower.

As regards building design, the best way of providing for changes resulting from expansion or remodelling seems to be by incorporating universal flexibility, thereby permitting multiple use of the spaces within the building. In this way most functions are not tied to a single location but can be moved around at almost any time without the need for changes in the building structure. Permitting such flexibility in the building structure increases flexibility during initial planning and allows the entire planning process to be telescoped, thereby speeding up implementation. This type of building also offers long-term flexibility by allowing for expansion or remodelling without major alterations to the primary building structure. This kind of flexibility is the major difference between the "universal" building and the "adaptable" building referred to above. The durability of the structure-related and activity-related elements in a "universal" building is such that this type of building usually offers the best overall solution for future expansion and remodelling.

The following check-list of principal design points may assist in increasing the opportunities for future expansion and remodelling at all stages of the planning process:

- Buildings should be of such a general design throughout the health care institution and constructed in such a way that they can accommodate the maximum number of alternative functions;
- Building dimensions should be standardized throughout the structure so as to fit the overall planning grid;

- Room dimensions within each main departmental grouping should also be standardized wherever possible and should be chosen to accommodate the maximum number of different functions;

- The dimensions of fixed equipment and furniture should be standardized to permit use in the multipurpose rooms;

- The site layout should make provision for building extensions in alternative directions, as well as providing scope for the future extension of individual units;

- Building materials, methods of construction, and construction systems should be chosen according to local availability, skills, and conditions;

- Single-storey buildings should be employed whenever possible to simplify construction and increase the opportunities for future extension possibilities; and

- The planning layout should allow maximum flexibility throughout the entire planning period.

It is important that both planners and architects do not consider their work as finished with the completion of a building or with its renovation or extension. It is essential constantly to monitor experience, results and performance. This feedback, together with updated information on medical, technical and economic developments, will ensure improvement in each successive project.
HEALTH CENTRES:
FUNCTION, PLANNING AND ARCHITECTURE

Abou Zeid Rageh

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* 4 Shawarby Street, Kasr El-Nil, Cairo, Egypt.

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1. SURVEY OF GENERAL CONDITIONS IN THE DEVELOPING COUNTRIES

Sociological change

Agriculture is still the main source of living for the majority of populations in the developing world: some are engaged in several other types of work such as fishing, hunting, animal husbandry and industries directly related to agriculture. The majority of the developing countries still have an agricultural civilization, deeply rooted in their past and closely identified with a river or valley cult. People live in villages or in country towns which serve as administrative, industrial and service centres for the surrounding villages. Human settlements are close, as in the case of Egypt, India or some parts of China, or far apart and isolated, as in the Sahara or in the Arabian Peninsula. Poor communications systems make it difficult to reach these far-away settlements.

Until recently the social order was quite stable or even static. The individual had his well-secured place in the social structure of his community and life moved in a well-known and predictable cycle, even if it were interrupted from time to time by floods, epidemics or earthquakes. But, lately, new factors have begun to affect this long-stable life and their gradually increasing influence has led to fundamental changes. These factors are: great increase in population at an accelerated rate; ease of communications at many levels bringing about direct contacts with other cultures (distances are shrinking and the new knowledge and experience gained through contact with other cultures and ways of life are vastly expanding); and introduction of socioeconomic development with particular emphasis on industrialization and provision of education and health services.

A whole complex of problems has come into existence: hardly anywhere in the developing countries has reasonable integration between the new and the old taken place. Societies live in what might be called "cultural dualism".

There is a high rate of emigration from rural areas to urban centres. Although official employees dealing with health and agriculture and education groups go from the towns to work and live in the villages, the majority of them come on a temporary basis and are anxious to be replaced by others and to leave.

The town cannot digest all its newcomers. A few of them are drawn to the centre but the majority are driven outward by strong social and economic centrifugal forces, and they remain on the periphery of urban life. Rapid urbanization brings with it serious problems - lack of adequate housing, water supply and sewerage and unhealthy environmental conditions - creating a potential danger of epidemics, communicable diseases and other health hazards.

The traditional pattern of life in the village and in the town is fundamentally shaken and it will take some time before new order emerges. Villages and towns in developing countries are generally characterized by several features: difficulties of communication, lack of integration between different sectors of activities, widespread illiteracy, low economic level, poor nutrition, and low productivity.

Demographic pattern

The familiar pattern of developing countries is a high fertility rate and a high infant mortality rate with 15-20% of the total population composed of children below 5 years, as compared to 8% in developed countries. This demographic picture is both a cause and a consequence of underdevelopment. Both sexes marry at a young age, particularly the females; the majority of women marry at the age of 15 years and the majority of men at the age of 18.

The level of education is low. As facilities become available, people think first of male education but in general they are favourable to the education of both sexes. It is known from experiences in developed and developing countries that increasing female education is an important aspect of the total development process. Increased education tends to raise the age of marriage and set forces into motion towards lower fertility and lower infant mortality, a situation in which population growth can be maintained with less damage to the health of mothers and thus to their unborn children. All indications point to the dangers to health of an early marriage followed by frequent pregnancies.
Traditions, culture, religion, and health

The concept of health, sickness and death is closely interwoven with the beliefs, traditions and faith of the community. Because of strong family ties people refrain from going to health centres or hospitals located outside the sphere of their ordinary life. They fear exclusion from their families and friends and death away from their homes. In some countries mothers refuse to leave their children alone in hospitals and they stay with them. In many parts of the world it is forbidden for men and women to mix. Each has to go through a separate line of circulation in health centres, outpatient departments and hospitals. Moslem women avoid exposure to male doctors.

Local medicine is a combination of folk, spiritual and modern approaches. Currently in many parts of the developing world, particularly in rural areas, a religious leader, magician, or even the barber is the pivot of health system. Frequently he is the first to be consulted and his services include preventive medicine and family advice. In general he depends in his practice on local medicine, traditional techniques and mystic rituals. Information on the cause of diseases in the modern sense is almost non-existent. Many people believe in jinn, devils, demons and evil eye, all of which may cause illness or death. It is common for them to confuse symptoms and causes.

It is nevertheless quite clear that the general tendency is now towards more willingness to accept modern cures. In many areas no major cultural blocks were found to modern cures. But there is still a great misunderstanding of modern medicine and doctors. The peasant does not seek medical advice unless he is very sick and has exhausted all the means of local and traditional medicine. Probably women are more oriented to a mystical and spiritual outlook on disease than men and rely heavily on home cures suggested by neighbours and old people. The trend towards modern medicine starts with the husband, indicating his importance as an agent of social change. In their orientation towards new social and cultural values, people are making a slow shift from static fatalism to dynamic realism. This change will reflect favourably on their attitude towards doctors and health services, in terms of less resistance and more cooperation and participation.

Traditional belief does not necessarily run opposite to the requirements of modern hygiene. Religions, for example, call for cleanliness, an orderly life, and advocate basic health principles. Any health programme has to fit into the pattern of life of the people, be suitable to their culture, in accordance with their traditions and acceptable to their minds, so that it can work from within and bring about the required change and improvement in their health condition. The people have to have an active role in the health programme and should participate in all its phases. If one useful item of traditional life is removed during the course of improving conditions of life, then the obligation exists to replace it with some other item that will perform the same social function.

The fact that the health centre functions within the community should not be underestimated. The health centre should thus be an integral part of the community's social framework. Much depends on the attitude or possibly on the commitment of the health group. There must be constant interaction between the centre and the community. If the centre fails to take a positive role in the life of the community, the people tend to bypass it and go somewhere else whenever they need medical treatment.

Health conditions

It is notable that health conditions vary considerably from one class to another in each country but it is evident that the conditions among poverty groups in different countries are basically similar. There exists a core disease pattern consisting of faeces-related and airborne diseases.

Children's diseases dominate the health picture. Half of all deaths in developing countries are of children under 5 years of age. The presence of several diseases in one person is a common phenomenon. There are also other important diseases which are limited to particular geographical areas, such as malaria, trypanosomiasis, schistosomiasis and onchocerciasis.
Environmental and public health conditions

Public health problems in developing countries include:

- lack of clean water: water is supplied by wells, cisterns, or streams which can be easily contaminated by human and animal excreta.

- lack of drainage facilities: dirty water and sewage gather in smelly open pools, which favour the breeding of mosquitoes; most of the homes are without latrines.

- inadequate garbage and solid waste disposal: waste and excrement are thrown in the street or around dwellings.

- poor lighting and ventilation in homes: the homes are built with dry mud and have only small holes as windows; some are without windows at all. The peasant women cook over a fire built on the ground without smoke vents.

- animals in the home and ineffective insect and rodent control: chickens and other birds and animals move freely inside the house, and stables built near the home are breeding places for insects and flies.

- poor food handling and other unhealthy practices: insufficient attention is given to cleanliness; food is stored unprotected, together with personal effects, fuel and dried dung; dishes are put away and reused unwashed.

It is clear that improvement in these environmental conditions is the cornerstone of any health programme. What is really needed for these communities is development on all fronts: education, agriculture, social affairs, culture, housing and health.

2. THE HEALTH CENTRE IN A COORDINATED SYSTEM OF HEALTH SERVICES

It is now widely accepted that health care, in terms of preventive, curative and restorative functions, is a socioeconomic service. Health affects and is affected by the socioeconomic condition of the community, and the maintenance of health and the fight against disease are important factors in fulfilling socioeconomic policy. Morbidity affects both attendance at work and the quality and quantity of work, and premature deaths involve waste of human investment. Basic health services, especially in rural areas, should therefore be given a high priority during the early stages of socioeconomic development since rural economic development cannot be accelerated without the development of adequate health services.

The health centre is established to provide an integrated health service and, at the same time, it is an important organ in the socioeconomic development of the community it serves. It is the first echelon in the chain of health care, closely related, administratively and functionally, with other facilities at higher levels in a coordinated system of health service.

The health centre acts as the first line of defence and action, and provides essential preventive, curative and restorative services to the population. Since no opportunity to promote health care should be missed, preventive, educational and curative work must be carried out whenever the family or the individual are in touch with members of the health team, either in the health centre or at home.

Patients who need specialist care may be referred to a polyclinic and those who need hospital care may be referred to a rural hospital, district general hospital or specialized medical centre according to their needs.

Statistics, family planning, maternal and child care, nutrition and sanitary units are closely linked to higher and central units. A data and information flow to central units helps in the formation of policies and in planning. Local staff should be periodically trained in adapting new and developed techniques in delivering health services.
The vertical link with upper levels of health facilities should be coupled with equally important horizontal coordination of health services with other services at local level. It has become an universally accepted fact that socioeconomic development of a community cannot be achieved without coordination of services at all levels and in all directions.

The health centre activities should be interrelated with the following services in the area:

- education, usually consisting of a primary school, a day nursery, an adult education centre and a workshop for teaching rural crafts;

- social services, with a public meeting hall, public library, playground, youth athlete centre and social insurance office;

- agriculture, which consists of a demonstration field and facilities for animal breeding, dairy and farming industries, and control of agricultural pests;

- a cooperative society, which supplies farmers with seeds and other goods and helps them in marketing their agricultural produce.

All these services could be housed in several buildings linked together in one rural social centre located in the village and easily accessible to all villagers.

The present health centre can be considered as being that part of the front line of an overall integrated health programme where all curative, preventive and public health services are grouped together under one roof.

The size of a health centre depends largely on several factors such as:

- catchment area, number and type of population and their growth;

- the functions of the centre and the interrelationship of its various activities;

- coordination of health service with other social, agricultural, and educational services in the area;

- the present and future availability of personnel;

- means of communication and proximity to urban centres; and

- the system of coordinated health services for the entire region.

The size of rural health centres varies from a small subcentre to a rather big unit with 10 to 20 beds for inpatients. Experimental units have been set up combining the features of a health centre with those of a rural hospital to provide a rural community of 15 000 persons inhabiting 3-5 villages with medical, educational, agricultural and social welfare services. These combined units were designed to provide the basic services - medical, agricultural and educational - to rural communities in one setting, with inpatients' wards of about 20 beds, a small operating theatre, a delivery room, and other services for examination and treatment. It is evident that such combined units can be provided only in so far as the corresponding staff and equipment are readily available.

In order to be run efficiently and economically, a health centre has to serve a population of about 5000 in rural areas. Far smaller community subcentres could be established and placed under the supervision of a health centre. In urban areas, where the population density is much higher, a health centre should serve about 20 000 inhabitants. The difference between an urban and a rural health centre is mainly one of scale, not of function.

The design of a health centre must allow for future expansion. Extra services will be added with the improvement of socioeconomic conditions of the community.
3. FUNCTIONS OF THE HEALTH CENTRE

Maternal and child health services

A large proportion of the population in developing countries is in the young dependent age group. The much higher rates of maternal and child mortality and morbidity are mainly the result of poor nutrition, widespread infectious diseases and lack of proper health care for mothers. Moreover, excessive reproduction places a heavy burden upon mothers. Mothers must be given assistance before, during and after pregnancy. Such care, together with the spacing of pregnancies, is important for both the mother and the child. Changes in knowledge, attitudes and practice with regard to maternal and child care depend on person to person communication. Contact by the health team is a proven and effective method of improving family health conditions.

Information on resources and on the attitudes and needs of families should be collected. Experience has shown that health services for mothers and children are more likely to be accepted and used when they are attuned to the cultural heritage, beliefs, and customs of the people.

Maternal and child health activities should cover:

- the recognition and primary management of common diseases and problems in the area;

- elementary health education with special emphasis on nutrition, child-bearing, childrearing and fertility problems;

- antenatal care to be carried out either at home or in the health centre: screening expectant mothers, identifying high-risk cases and abnormalities, and making arrangements for such mothers to be sent to rural hospitals;

- assistance during delivery;

- after-care for mothers to be carried out either at home or at the health centre: provision should be made for postnatal examination and, whenever needed, distribution of simple medicines, food supplements, and some types of contraceptives;

- infant care: examination and follow-up should be made at regular intervals and facilities should be provided for immunization against communicable diseases, and for educating the mother in hygiene and nutrition; and

- the pre-school-age child: follow-up care should be carried out with special provision for nutrition, dental health and mental health.

School health programmes

Children of school age constitute a relatively accessible and adaptable segment of the population. Children learn health instructions and when they become adults they apply this knowledge to their own families.

Besides the screening of the children, the most important element of the school health programme is health education. This is a matter not merely of developing curricula and materials, but also of insisting on high standards of cleanliness in school, of introducing healthy diets into the school lunch programme, of improving water supplies and latrines, and of seeing that the children understand and use these improvements. Children should also be encouraged to participate in community health action programmes.

Some aspects of a school health service are:

- health supervision and care for school personnel and children;

- education on family life, environmental health, cleanliness and nutrition;
- mental health and education of handicapped children; and
- dental health.

**Family planning**

Practices that help the family to avoid unwanted births, to bring about wanted births, to regulate the intervals between pregnancies, to control the time at which births occur in relation to the age of the parents, and to determine the number of children in the family are of great importance to the individual, the community and the nation. Services that make these practices possible include education on family planning, the provision of contraceptives, the management of infertility, education about sex and parenthood, and marriage counselling. The emphasis given to any of these aspects in family planning services varies from one country to another according to local conditions and policies.

Family planning can contribute considerably to the health of the mother and child and to the social well-being of the family. When children are not born at optimum times they will not be well cared for and they will not have a good chance of normal growth and development.

In countries with a low per capita income and a slow rate of capital formation, a rapid rate of population growth may constitute an obstacle to social and economic development. Smaller family size and a reduced rate of population growth will contribute positively to socioeconomic development. Family planning will bring about a balance between possibilities on the one hand and growth of population on the other.

All categories of health centre personnel, administrators, clinical staff, health educators, maternal and child care groups and statisticians can contribute to family planning. Family planning information, counselling, and care can and should also be available to patients suffering from malnutrition, tuberculosis, diabetes and other conditions in which pregnancy could constitute a medical hazard. Public health nurses, midwives and auxiliaries working in maternal and child health have close associations with mothers and families at home and in the health centre, thus they have unique opportunities for encouraging couples to accept family planning. Their case finding and counselling are based on an intimate understanding of a family's structure and relationships, socioeconomic situation, and desires. Many women are unaware that they can obtain assistance with the timing and spacing of their pregnancies; many people are unaware of the implications for the health of mothers, children, and families, of uncontrolled pregnancies, and many are in need of an explanation of the methods available and most suitable for themselves.

It must be pointed out here that activities concerned with the provision of family planning services require continuing care and an appropriate schedule of check-ups after first contacts.

**Nutrition**

Undernourishment and malnutrition are serious problems in most of the developing countries. They are one of the most important causes of morbidity and mortality, particularly among infants and children of pre-school age. Poor diets and inadequate nutrition are not always dependent upon the production and availability of the right type of food but often follow inadequate knowledge about diet and food. Most of the nutritional problems could be largely prevented with effective health education programmes and adequate supplies of the right foodstuffs at a price within the reach of the people, accompanied by satisfactory handling, storage and distribution arrangements. Nutritionists should have a detailed knowledge of the food-consumption level of the community. They should also understand the factors which decide diet patterns, such as attitude and economic needs of the people, weaning practices, availability of foodstuffs, and local methods of cooking and preparing food, so as to be able to evolve practical methods of improving nutritional status by changes in local production of foodstuff and improved methods of preparation. Where it might be difficult to have a nutritionist available at a health centre, other staff should have a good knowledge of these matters.
Control of communicable diseases

Communicable, including parasitic, diseases have a high prevalence in developing countries and the health centre has an important role to play in their control by reducing their incidence by a series of preventive measures and by alleviating their consequences by therapeutic activities.

Its functions in this respect are fourfold:

- providing a safer environment through sanitation activities (see below under section on environmental health);

- promoting healthful life practices and timely recourse to the available health services through health education (see below under section on health education);

- carrying out an effective immunization programme. The work should be planned systematically to include all vulnerable age groups in the population. Immunization should be coordinated with maternal and child health, and school health. The local health centre can deal with many aspects of the control programme using its own resources; and

- providing medical care to the sick. Early diagnosis and prompt treatment are vital in communicable disease control (as for typhoid and diphtheria) not only in reducing the danger to the patient but also in preventing further spread through the community. The health centre will undertake simple laboratory procedures but will send specimens to be examined in larger laboratories. Local staff will encourage and facilitate reporting, undertake simple epidemiological measures for tracing the sources and channels of spread, and provide instructions for home care and isolation of the patients and quarantine of contacts, where such measures are indicated.

It can be readily seen that a great part of these activities must be carried out outside the health centre, often by mobile teams whose main functions will parallel the functions of the health centre:

- organization and implementation of disinfection, insecticidal and rat extermination activities;

- health education of the population; obtaining its active support and training people chosen by the community for simple health activities;

- immunizations; and

- prophylactic medical examination of children (particularly the under-fives) and of lactating mothers; active case-finding programmes for diseases such as syphilis, tuberculosis, malaria, hookworm, yaws and trachoma; collecting material for bacteriological diagnosis of carriers; first-aid to patients in emergency cases.

This work will mainly be the responsibility of medium-grade medical and health personnel, mostly auxiliary and primary health care workers.

It should not be forgotten that one of the important responsibilities of local health officers in the control of communicable diseases concerns the zoonoses (i.e., diseases of animals transmissible to human beings). The adequate control of these diseases requires close working relationships with veterinarians and their assistants in the area.

Launching of mass campaigns

Major problems require large-scale control campaigns by specially trained teams of experts. The local staff, however, should lay the ground work for these mass campaigns.
Health personnel in the local health centre can provide valuable information and help: knowledge of the area and of the people's habits and beliefs, clinical and epidemiological data, accommodation of staff and storage of supplies, cooperation in educational activities and in introducing mass campaign personnel to the community. They can also carry out certain aspects of the operational programme itself, e.g., administration of vaccine, home visiting and other preventive and curative procedures.

Local staff should also have special training during the campaign so that they can undertake contact tracing, follow up cases when the intensive campaign is over, as well as participate in the evaluation of results. An educational programme may be necessary to ensure the cooperation of the people in measures to deal with epidemics.

**Environmental health**

Environmental health starts with the individual human dwelling and covers the entire living surroundings. It includes not only the wide control of environmental hazards but also the development of healthy environmental conditions that will contribute to the protection and welfare of the whole community.

Sanitation programmes intended to improve environmental health are usually the responsibility of a full-time sanitation staff working in conjunction with the local health team. In the absence of such specialized personnel, however, other staff of the health centre should take charge of the most pressing environmental health activities. These cover the following areas:

- provision of safe and clean water supplies in adequate quantities;
- collection, treatment and disposal of waste water;
- disposal of solid wastes;
- introduction of adequate latrines and facilities for bathing and laundering;
- treatment of soil pollution;
- clearing wastes from the streets and open spaces and cleaning polluted ponds;
- vector control;
- food control;
- house and settlement planning; and
- air pollution control.

These activities entail taking part, even if only in an advisory capacity, in endeavours in the fields of agriculture, water conservation, land drainage and housing development. A sanitary officer in a village must be ready to take part in surveys of housing conditions and be sufficiently trained in local building methods to advise on everyday problems of construction and repair.

It is important that all environmental health personnel be trained in health education techniques in order to teach people the principles of environmental health so that they may develop both a proper understanding of their own needs and healthy personal habits. The laboratory in the health centre should have enough facilities for sanitary and environmental health investigation.

**Health education**

The aim of health education is to persuade people to adopt and sustain healthful life practices, to use health services available to them, and to improve by themselves - individually and collectively - their health status and environment.
It is well recognized that the attainment of changes in health behaviour is conditioned by social, psychological, and economic realities and by the amount and quality of available health services. It is not an easy process to educate people to change their health behaviour or to improve their environmental conditions. Some social and cultural characteristics of the population can present serious barriers to the achievement of change in health behaviour. Among these characteristics are low educational level, traditional dependence on government to solve all problems, low opinion of the government employees and unsound health beliefs and practices rooted in superstition and folk medicine.

Health education should always be based on a sound knowledge of the sociocultural context of the community and on a thorough knowledge of its relationship with local health problems. While the services of a health education specialist are desirable at every level, all health workers should have continuing opportunities to develop skills in the use of health education methods and should never forget that they all have health education responsibilities. Every effort should also be made to get schoolteachers, social workers, and agricultural workers to contribute to the health education effort.

Communication media used for health education must be chosen to suit the cultural orientation of the people. Drama, singing, films and other similar methods of communication have proved to be effective channels in communicating health ideas and desired health practices. But person-to-person contact and group discussions could be the most effective and direct way of reaching people.

Medical care

The various functions outlined above are mainly oriented towards prevention; however, preventive and curative medicine should go hand in hand. The pill of preventive medicine must be covered with a sugar coating of medical care, even though the pill is in the long run the more important constituent. To the ailing patient, medical care is more important than actions geared to his long-term needs, whose aims he will not be able to understand.

What ought to be offered at the health centre is elementary medical care and emergency medical care with the support of specialized services from other larger health facilities in the region. In other words, health centres should provide both initial as well as definitive treatment of minor illness and initial treatment (first-aid) of major or complex illness, with referral of patients for definitive care to larger polyclinics or hospitals.

Transport facilities for moving sick patients to hospitals for specialist care are an important part of local services. Where referral is made difficult by the remoteness of facilities of higher level and by difficulties of transport, the health centre should be provided with a small number of beds for temporary inpatient care.

Treatment should be given along with an adequate health education programme so that the treatment is not just an end in itself but an introduction to prevention. It is essential to provide a small pharmacy and a simple diagnostic laboratory and other facilities for clinical examination and treatment.

The maintenance of records for statistical purposes

Statistics are needed for the following purposes:
- to assist in administration and coordination of health services;
- for the short- and long-term planning of services;
- for measuring accomplishment in terms of effectiveness and efficiency; and
- for research purposes.

The emphasis given to each of these particular requirements will vary from country to country. In the developing countries, greater stress will be laid upon statistics for planning and distribution of services.
Initially, the health centre must have at its disposal several kinds of data. Some of them, such as population records, number of inhabitants grouped by locality, information about the community (e.g., housing, sanitary conditions, educational facilities and general economic, agricultural and industrial conditions) will in most instances be available from governmental offices. Should this not be the case, an effort has to be made to secure the most important data, as they are necessary to determine the role of the health centre. Information is required to assess the dependent population, attraction rate, and coverage, and for the setting of priorities.

Another set of data is necessary to record the activities of the health centres. These data have a dual purpose: on the one hand, they constitute personal records for the patients treated; on the other hand they allow the assessment of the work of the centre and planning for its future activities. The data consist of birth, death and emergency case registers as well as individual patients' records. They should be designed in such a way as to make it possible at a later date, and at regular intervals, if needed, to establish morbidity records.

Training activities

The health centre will have various degrees of involvement in in-service training, the training of primary care personnel, and field training of students in medicine, nursing and other health professions. It is not the place here to enlarge on these functions, especially in view of their dependence on local situations. They must, however, be taken into consideration during the planning process in order that the facilities necessary for their discharge be taken into account.

4. PERSONNEL AND PATTERN OF ACTIVITIES

Availability of health personnel

There is an obvious shortage of doctors and other health workers in all developing countries; also, doctors prefer to practise in cities, where they have access to numerous hospitals and diagnostic facilities. Low income, inadequate educational opportunities for their children, limited social life, and lack of stimulation from professional associates are obvious reasons for resisting serving in villages. Relevant incentives in this field must be found, as no health programme can be successful without satisfied health officers.

These incentives cannot only consist of material rewards. A coordinated health system covering the whole region would allow local doctors to exchange professional knowledge and experience with their colleagues in bigger health facilities. Doctors should be provided with living facilities in the health centre and be led to adapt to a rural environment, to take it into account and to work through it.

In order to take advantage of the skills of the doctors in the most efficient way it is necessary to make use of medical assistants as much as possible. Many diseases can be treated by health workers who have had a training simpler than that of a fully qualified physician. In small communities, where it would be uneconomical to employ qualified physicians, medical assistants can do very useful work.

Staffing of health centres

The type and number of staff in a health centre depends on its size and functions. The various types of staff to be found in a health centre are enumerated below (this does not mean that all or even most of these staff will be found in any one health centre and, according to the volume of work, some functions may be merged):

- physician with supervisory duties;

- public health nurses, whose services include home nursing, health education, maternal and child care, school health, family planning, prevention and control of communicable diseases and medical care;
- assistant nurse-midwives, who also may take part in all services provided by the health centre. They mainly work on maternal and child health, family planning and medical care. They also carry responsibilities for domiciliary maternity care. Women often find it easy to communicate with female nurses;

- health visitors, whose duties are related mostly to school health services and medical care;

- health educators, who, besides their own educational activities, supervise the health education component of the work of others;

- family planning assistants;

- sanitariums and assistant sanitariums;

- laboratory assistant;

- clerical and statistical staff; and

- ambulance drivers and labourers.

Activities of health team in health centre

A group of researchers recently carried out a field study to analyse the tasks performed during one week by each member of the health team in six selected health centres in Egypt. These centres provide more or less comprehensive health services, including preventive health services, medical care, and maternal and child health services, as well as environmental work. This study was sponsored by the WHO Regional Office for the Eastern Mediterranean and the High Institute of Public Health, Alexandria University.

Table 1. Distribution of activities for all personnel in six health centres in Egypt during one week

<table>
<thead>
<tr>
<th>Activities</th>
<th>Percentage of total man-hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical care</td>
<td>30.2</td>
</tr>
<tr>
<td>Maternal and child health</td>
<td>16.5</td>
</tr>
<tr>
<td>Environmental sanitation</td>
<td>4.4</td>
</tr>
<tr>
<td>Control of communicable diseases</td>
<td>2.7</td>
</tr>
<tr>
<td>Vital and health statistics</td>
<td>6.3</td>
</tr>
<tr>
<td>Administrative and clerical work</td>
<td>32.2</td>
</tr>
<tr>
<td>Other work</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

It appears from Table 1 that clerical activities rank first among the activities of the health team and consume almost one-third of the total working time. Next in order comes medical care followed by maternal and child health services. Communicable disease control ranks last among the activities, having a share of only 2.7% of the total working time of the health team.

Table 2 shows relative shares of the health team members within each area of activities. From this table it is clear that the assistant nurses and midwives have the biggest share in the areas of medical care (33.1%) and maternal and child health (69.1%). They have the second share in the area of administrative and clerical activity (23.2%), almost equal to the clerks (23.8%). The sanitariums and their assistants have the biggest share in environmental
Table 2. Distribution of working time (percentage of total man-hours) in the activities of six health centres in Egypt by category of personnel

<table>
<thead>
<tr>
<th>Category of personnel</th>
<th>Communicable disease control</th>
<th>Vital and health statistics</th>
<th>Environmental sanitation</th>
<th>Maternal and child health</th>
<th>Medical care</th>
<th>Administrative and clerical work</th>
<th>Other productive work</th>
<th>Total productive time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician</td>
<td>24.5</td>
<td>5.3</td>
<td>1.5</td>
<td>12.2</td>
<td>24.2</td>
<td>14.8</td>
<td>11.3</td>
<td>16.0</td>
</tr>
<tr>
<td>Head nurse</td>
<td>2.5</td>
<td>6.4</td>
<td>-</td>
<td>17.7</td>
<td>6.9</td>
<td>5.5</td>
<td>2.8</td>
<td>7.5</td>
</tr>
<tr>
<td>Assistant nurse/midwives</td>
<td>10.6</td>
<td>12.4</td>
<td>-</td>
<td>69.1</td>
<td>33.1</td>
<td>23.2</td>
<td>12.0</td>
<td>30.9</td>
</tr>
<tr>
<td>Laboratory assistant</td>
<td>1.3</td>
<td>5.1</td>
<td>1.3</td>
<td>0.8</td>
<td>13.3</td>
<td>10.2</td>
<td>5.2</td>
<td>8.3</td>
</tr>
<tr>
<td>Sanitarian</td>
<td>18.7</td>
<td>4.6</td>
<td>76.1</td>
<td>-</td>
<td>-</td>
<td>3.7</td>
<td>18.1</td>
<td>6.8</td>
</tr>
<tr>
<td>Assistant sanitaryian</td>
<td>28.4</td>
<td>23.1</td>
<td>9.4</td>
<td>-</td>
<td>0.4</td>
<td>9.1</td>
<td>6.7</td>
<td>6.2</td>
</tr>
<tr>
<td>Health visitor</td>
<td>-</td>
<td>1.4</td>
<td>10.4</td>
<td>-</td>
<td>9.9</td>
<td>8.2</td>
<td>21.2</td>
<td>7.8</td>
</tr>
<tr>
<td>Dentist</td>
<td>-</td>
<td>0.4</td>
<td>-</td>
<td>-</td>
<td>10.8</td>
<td>1.4</td>
<td>14.1</td>
<td>4.8</td>
</tr>
<tr>
<td>Clerk</td>
<td>14.0</td>
<td>41.3</td>
<td>1.3</td>
<td>0.3</td>
<td>1.4</td>
<td>23.8</td>
<td>8.7</td>
<td>11.8</td>
</tr>
<tr>
<td>Total personnel</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
sanitation (85.5%), also in communicable disease control (47.1%). These two groups, assistant nurse/midwives and sanitarians, evidently carry a considerable portion of the work. Each of the laboratory assistants and clerks share in all areas of activities in variable degrees. The physician and head nurse also share in almost every area. The health visitor and the dentist, newcomers to the health centre, are limited to their own work and do not share much in other areas.

A considerable part of the activities is performed outside the health centres, either at home, in the market place, at school or in the streets and open places of the village (see Fig. 1).

While the above information came from a certain area with particular human and environmental conditions, the conclusions reflect the general trend in health centres in other developing countries which have broad similarities in attitudes and socioeconomic problems.

Conclusions related to the design of health centres may be summarized as follows. First, all areas of activities are interflowing through one another and there is no clear division of labour among members of the health team. Beside doing mainly his own work, each member contributes to the activities of other members of the team; consequently, the health centre should not be composed of isolated compartments. More than one activity can take place in the same space and staff members should not be statically located in their rooms but able to move from one area to another as the work requires. The health centre should thus present flexibility in use of space and in performance of work by the staff (see Fig. 2). Secondly, curative activities still consume more of the staff’s time than preventive activities. Poor health conditions engender pressing demands for curative services so that the balance gets tipped towards the curative side; the health centre cannot avoid meeting these demands. Thirdly, the health centre serves also as a sort of headquarters for a considerable amount of work which takes place in the community itself.

A study of activities in health centres is a prerequisite to planning as it answers several crucial questions:

- For health centres of different sizes and with different functions, what is the proportion of working hours devoted to various broad activities or definite tasks?
- Which different types of staff are needed and in what proportion?
- What are the spaces needed to discharge these functions?
- What are the interrelationships between these functions and consequently what layout will be more convenient?

As conditions vary from place to place, it is necessary to undertake such a study in each country (or rather for each region, as conditions may be similar in two different countries while different in two different regions of the same country). The results of the study will make it possible to evolve a few patterns of health centres which will serve as a guide, although the necessity of taking into account the special features of each case cannot be dispensed with.

5. DESIGN AND ARCHITECTURE OF HEALTH CENTRES

Areas and spatial relationships

Similar and closely related activities should be grouped together in one area. All areas should be located in relation to one another to allow direct communication and easy flow of patients, staff and services. The design and the structural system should allow maximum flexibility and expandability; a health building should in fact be an "indeterminate building".

All activities in the health centre may be grouped into four general areas:
FIG. 1. RELATIONSHIP BETWEEN HEALTH CENTRE, COMMUNITY AND HIGHER-LEVEL FACILITIES

FIG. 2. RELATIONSHIP BETWEEN ACTIVITIES AND SPACE IN A HEALTH CENTRE
- Waiting area, which both in layout and size will depend on local tradition, size of the health centre and patient flow as determined by the working system of the health centre. The waiting area may consist of a single waiting area for both sexes; a double waiting area, one for each sex (in this case they may be located on both sides of clinical rooms as shown in Fig. 3); there may be an additional special waiting area for maternal and child care; and, in the case of large health centres with a great variety of services, more waiting areas may be warranted. Toilets for each sex should always be provided.

- Clinical area (see Fig. 3), which consists of examination and treatment rooms. The bigger the health centre, the more specialized facilities (such as maternal and child care room, dental treatment room, labour room, etc.) will be needed.

- Supporting services area (see Fig. 4) which consists of laboratory space, which might vary from a small counter for microscopy to a fully-fledged laboratory (about 18 m² per 1000 tests per month); pharmacy and integrated or separate storage area for other supplies; pantry or kitchen, which may even be used for training purposes if big enough (about 20 m²); and cleaner's room (or at least a cupboard).

- Office area (see Fig. 5) for clerks, sanitarians, health visitors and others (minimum of 4 m² per person).

In larger health centres there may, in addition, be an area for the inpatient care of emergency cases awaiting transfer or for deliveries; in that case, there should also be at least two rooms with toilet and shower facilities, as well as a clean working area for the nursing service and an area for disposal of dirty linen, etc.

The relationship between these areas is illustrated in Fig. 2 above. In this diagram the nature of work in the health centre is translated into a spatial relationship. In the centre is the clinical area with which the other areas are directly connected. As these other areas are also interconnected, patients, staff and services can easily move from one area to another. Patients go to the supporting services area for laboratory tests and to receive their medication. Both patients and the public should have easy access to the office area where the health centre office issues birth and death certificates or where official permits licensing restaurants, shops and market places are delivered by the sanitarians of the health centre. Sanitarians use the laboratory facilities in the supporting services area for public health tests.

The spatial relationship diagram may be translated into various architectural schemes. Five health centre layout schemes are shown as examples (Fig. 6-10): the first three for small centres and the last two for large centres.

**Architectural programme**

The architectural programme should only be prepared after the operational policy of the centre has been established. This operational policy will determine:

- the functions to be carried out both inside and outside the centre, which will lead to an indication of which units (e.g., examination rooms) will be necessary;

- the expected volume of attendance and of outside activities which will indicate the workload in each unit;

- this workload, together with the knowledge of the output of each staff member concerned, will allow the determination of the number of staff necessary and the number of elements needed in each unit (e.g., the number of examination rooms);

- the flow of patients, staff and supplies;

- the administrative policy; and

- the supply system, including catering and laundry arrangements.
FIG. 3. CLINICAL AREA AND USERS AREA
FIG. 7. LAYOUT SCHEME FOR SMALL HEALTH CENTRE

A CLINICAL AREA
B USERS' AREA
OFFICE AREA
D SUPPORTING SERVICES

FIG. 8. LAYOUT SCHEME FOR SMALL HEALTH CENTRE

A CLINICAL AREA
B USERS' AREA
OFFICE AREA
D SUPPORTING SERVICES
FIG. 9. LAYOUT SCHEME FOR LARGE HEALTH CENTRE

- CLINICAL AREA
- USERS' AREA
- OFFICE AREA
- SUPPORTING SERVICES
FIG. 10. LAYOUT SCHEME FOR LARGE HEALTH CENTRE

- CLINICAL AREA
- USERS' AREA
- OFFICE AREA
- SUPPORTING SERVICES
Each functional component needs a minimum of space for operational efficiency. The following are usually considered as minimum areas for the main components:

Examination room, about 10 m² (see Fig. 11)
Treatment room, about 12 m² (see Fig. 12)
Bedrooms: with 1 bed, 10 m²
   2 beds, 7 m² per bed
   4 beds, 6 m² per bed
   6 beds, 5 m² per bed
Rooms for interviews (for family planning; health visitors; nutritionist; and social worker), 6-10 m²

A much lower space allocation is, however, often found in developing countries. When such is the case, it would be advisable to compare carefully the advantages and disadvantages of the current space allocation before deciding whether to keep or to change it.

Two examples of architectural programmes for health centres are given below. These should be considered strictly as examples and not as types of programmes; a programme has meaning only when accompanied by a complete description of the operational policy and the workload to which it is meant to respond. As the examples concern fairly simple facilities, they are not much more than schedules of accommodation. For more complex facilities, more elaborate programmes are needed.

Example 1

Health centre serving a community of less than 2500 inhabitants.

Ambulatory facilities only.

Staffed by one health worker. A mobile health team (doctor, nurse, sanitarian and health educator) visit it about once a week.

Programme:
- Waiting area with toilets.
- Office utilized for admission, medical records, storage and distribution of drugs.
- Treatment room.
- Examination room (also used as doctor's office).
- Meeting room (for health education and staff meetings).
- Sanitary inspector's office (used also for sanitarians and for storing sanitation equipment and supplies).
- Microscope counter.
- Pantry.
- Staff toilets and shower.
- Cleaner's cupboard.

Total area 147 m²

Note: A school is to be erected near the health centre for practical training of the population in latrine and septic tank building.

On the basis of the above programme, a plan such as that shown in Fig. 13 can be evolved. Again, it is only an example and not a type plan.
FIG. 11. FURNITURE AND EQUIPMENT REQUIRED FOR EXAMINATION ROOM

1, coat hooks; 2, scales; 3, examination couch; 4, couch cover dispenser; 5, mobile examination lamp; 6, disposal; 7, desk; 8, chair; 9, waste-paper bin; 10, wash-hand basin; 11, worktop; 12, high-level storage; 13, low-level storage; 14, equipment trolley

FIG. 12. FURNITURE AND EQUIPMENT REQUIRED FOR TREATMENT ROOM

1, examination couch; 2, couch cover dispenser; 3, stool; 4, mobile examination lamp; 5, disposal; 6, shelving; 7, equipment trolley; 8, desk; 9, chair; 10, sink and drainer; 11, high-level storage; 12, worktop; 13, low-level storage; 14, refrigerator
Example 2

Health centre with beds.

Outpatient capacity up to 100 patients per day.

Staffed by two to three nurse/midwives and one administrator.

The centre is visited periodically by a mobile health team.

Inpatients are cared for by their relatives.

Programme:

Ambulatory care and administration

- Waiting area.
- Office for admission and medical records.
- Storage for demonstration material.
- Examination room (also used for sterilization; samples will be taken in the examination room).
- Treatment room.
- Laboratory.
- Preparation and distribution of drugs.
- Sub-waiting area for laboratory and preparation and distribution of drugs.
Drug store.
- General store.
- Toilets and shower.
- Staff toilets.

Obstetrics
- Delivery room.
- Sluice.
- Shower.
- Toilets.
- Duty and tea kitchen.

Inpatients
- Two 2-bed wards (men).
- Two 2-bed wards (women).
- Sluice.
- Toilets and shower (women).
- Toilets and shower (men).

Fig. 14 shows an example of the type of plan that could be evolved from the above programme.

Site and location

The importance of a proper site for a health centre cannot be overstated. A centre improperly located on an unsuitable site will always operate under a handicap. The location should be convenient to the people it will serve. It has been observed that services are made use of, to a large extent, by inhabitants of the village where the centre is located while those living beyond 3 km from the centre hardly benefit from it. On the other hand, in towns, the network of public transportation should be taken into account. Proximity to a cemetery is undesirable for the health centre site. The direction of the prevailing wind must be considered, since natural ventilation is necessary. Careful attention should be paid to the topographic configuration of the site and the nature of the subsoil should also be carefully investigated.

The site should allow future expansion of the building of at least 100% in building area and still retain attractive grounds, the psychological effect of which on users' welfare, public goodwill and staff morale cannot be overestimated. The site should be properly planted with trees, grass and flowers to promote a cheerful and relaxing attitude of mind.

Building materials

Local materials and traditional building techniques should generally have priority as they are cheaper and generally better adapted to local conditions and habits. One exception, however, is clay. Although clay is a common building material in many rural areas of the world, is cheap, easy to shape and has a good thermal insulation value, it should be avoided whenever possible as it is not strong, cannot stand rainy climates, is easily affected by underground water and does not permit a high standard of cleanliness. In countries where Chagas' disease is prevalent, its use is dangerous.

Recent research has helped in exploiting to the utmost basic local materials for low-cost building. For example, soil, sand and cement, in a ratio of 3:5:1 by volume, mixed with water and cast into blocks (called landcrete blocks) on site either by hand or by machine in the same way as concrete blocks are cast, has proved to be a solid building material with
relatively high bearing capacity. Walls may be whitewashed for sun reflection. Sun-dried brick may be used in combined techniques with cement plaster on both sides. The plaster is held to the walls by a mesh of fine wire-netting or by a layer of reeds. Baked brick or stone are most suitable when they are available. Floors may be made of plain concrete or landcrete mixture; in some areas of the building, for example, in clinical rooms, utility rooms and toilets, the mixture has to be covered with tiles. Roofing is a more difficult problem. In many cases materials used for roofing are not available locally. Concrete hollow tiles and precast concrete units are used; brick vaults have also been successfully tried.

In general, building materials should be economical, durable, easy to clean and to maintain, sanitary and with good appearance. They should also be easy to handle on site, without the need to be carried mechanically to be put in place.

The use of local building material is advantageous with regard to maintenance, as local skill is likely to be found for necessary repairs. If the health centre is built with local materials and is well kept it will serve as a standing example to the people of how to utilize properly the available materials in order to have better homes and good living conditions.

Equipment should be simple, robust, unsophisticated, easy to handle and service.
Climate

There is always a temptation to design a standardized model for a health centre and then plant it all over the country. The climate is not, however, always the same in all the regions. A design which is suitable in one area might not be suitable in other parts of the country. A building which is not adapted to climate will cause great discomfort, particularly in hot countries, to both the team working in the building and to the public using it.

In a hot climate - as is the case in most areas of the developing countries - the long axis of the building should be in the east-west direction. Cross-ventilation should be provided for every room that is permanently used. It has two main advantages: it produces a cooling effect; and, in hot, humid regions, it decreases the humidity through air circulation.

Fully enclosed areas must be avoided. Regarding internal ventilation, different means could be applied. A wind-catch catches the wind where it is strong, clean and cool. The wind-catch consists of a chimney-like air passage with a large opening high up facing the prevailing wind. Set inside it is a sloping metal tray filled with charcoal that can be wetted by a tap; the air flows over this baffle and is thus cooled before entering the room. The wind-catch device can lower the indoor temperature by 10°C.

In order to improve climatic conditions, solar heat gain may be reduced by whitewashing the walls to reflect sunlight, extended roof construction to provide a shadow or by using double roofs and double external walls to allow air circulation through the outside shell of the building.

In regions with cool nights and a high day temperature, the external walls have to be built thick and from materials capable of storing the solar heat during the day and of postponing the transmission of heat until the night hours.

Climatic conditions are improved considerably in pavilion-type buildings with an inner court. If the court is shaded by trees there will be a reduction in temperature, and there will also be cross ventilation due to the differences in temperature inside and outside the building.1

Architectural character

The health centre should reflect the local character of architecture. Every community has its own concept of form, of space and of their interrelationship, as well as having its individual feeling for scale and proportion. Architecture and ornaments carry the rhythm of a given culture, civilization and historical heritage. The architect should understand and fully appreciate local architecture. He should follow in his design and planning basic local characteristics of buildings. The health centre should not be alien to its surroundings; it should come out of local life, expressing local spirit and character. A building designed in such a way gives its users a feeling of cosiness, friendliness and belonging. Architecture, in a sense, is a part of the general process of health care.

6. ANNOTATED BIBLIOGRAPHY

BOECKER, M. Planning and building of health care facilities in rural areas in view of climate, building material and building techniques. World Hospitals, 11: 218-224 (1975)

Although not specifically dealing with health centres, this paper contains useful considerations on climate, building materials and techniques and on the advantages and drawbacks of prefabrication.


There is no cutoff point beyond which the big health centre with beds becomes a small rural hospital, therefore many of the problems treated in this book will be found to be relevant to health centres.


Description of the staff of the health centre and of its duties, together with a listing of its main functions. Very useful sample forms, list of equipment and various instructions to be found in appendices.


The most comprehensive work available on health centres in developing countries, including training of staff, staff duties, equipment, construction of buildings, and provision of essential services. It is written in a clear and straightforward manner.


After a brief historical exposé of the development of the health centre concept, with special reference to Kenya, the author analyses its functions, staffing, external activities and training component.


Description of an institution whose three functions will be: to set up a model health centre in rural settings; to serve as training unit for all categories of medical and para-medical staff associated with health centre questions (details of principles and syllabus are given); and to act as a research institution in the form of a "community health laboratory".


Differences in the functions of the health centre in developing and developed countries are explained. The place and limitations of buildings in the health centre concept are examined, as is the role of the community in their provision. Evaluation of policy concerning catchment areas as well as difficulties about the determination of their radii are discussed.

INDIA. MINISTRY OF WORKS, HOUSING AND SUPPLY. PANEL ON HEALTH BUILDINGS.  *Report on primary health centres in rural areas*. New Delhi, National Buildings Organization, 1961

In addition to standard designs and a model plan, many interesting details are discussed.

INDIA. MINISTRY OF WORKS, HOUSING AND REHABILITATION. PANEL ON HEALTH BUILDINGS.  *Report on urban health centre buildings*. New Delhi, National Buildings Organization, 1963

Referring to a health centre with 15 beds, the various functions of the centre are examined, together with the space requirements for the discharge of these functions.


To many, the health centres described will seem to be rather lavish; however, the paper is useful in reviewing the varied activities that take place in a health centre as well as their implications in terms of staff and facilities.


In addition to Chapter 3 (The health centre) and 4 (The architecture of hospitals and health centres), many items are directly related to activities mostly taking place in health centres.
Brief definition of the rural health centre; description of its activities; enumeration of its staff; list of its equipment; and plans of prefabricated rural health centres.


Describes the functioning of the health centre; its role and the duties of the various categories of staff in relation to the different health problems.

TAKULIA, H. S. ET AL. The health centre doctor in India. Baltimore, Johns Hopkins, 1967

The aims of the study were:

"1. To determine the opinions of selected groups responsible for directing health centre activities and educating physicians about: (a) actual working of health centres, (b) primary health centre doctor's role and his problems, (c) problems in recruiting and training doctors for rural health centre service.

2. To identify problems in present administrative patterns of the health services and to suggest alternatives for administrative reorganization."

TORFS, M. E. Provisional reference lists of equipment and supplies for peripheral health services. Geneva, World Health Organization, 1975 (unpublished document SHS/75.2)

These lists are especially useful as they indicate the desirable equipment and supplies according to types of health units, both static and mobile, and staffing pattern.

WHO Technical Report Series, No. 83, 1954 (Methodology of planning an integrated health programme for rural areas; second report of the Expert Committee on Public Health Administration)

In this report will be found a clear and still perfectly valid description of the functions to be performed at local level.