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UNCOUPLING AND REGROUPING THE HOSPITAL SYSTEM

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CHAPTER I: THE HOSPITAL ARCHITECTURAL PROGRAM

No building system exists in a vacuum. A building system is brought into being because of the needs of a specific organization whose operation requires certain specific procedures or practices, and these procedures or practices will determine the spaces required as well as the relationship between spaces. The system in question is subject to variation in structural organization, personnel, communication networks, organizational objectives, and organizational procedures. These procedures can include formally established practices or mores of the organization as they stem from its culture but, whatever the nature of their origin, these procedures impinge on the use of the system in question and affects its performance.

The purpose of the hospital system is to bring a patient into contact with the facilities, services, and staff necessary to diagnose, cure, or prevent illness. Each of these components of the hospital system has its own set of physical requirements. The manner in which these components are grouped together determines the structure of the organization and reflects the organization's conception of order. The grouping indicates the way in which the system will be used. For instance, if the components of a university campus, which include classrooms, libraries, laboratories, student unions, faculty offices, gymnasiums, etc., are decentralized and developed into clusters containing some living units, small libraries, a few classrooms, and so on, the grouping will generate one type of form. If it is decided to concentrate and centralize these facilities, another type of form is generated. The concept of grouping an entire school district into an educational park will generate a form quite different from the prevalent neighborhood school.

In a hospital, if all doctors' offices, all ambulant facilities, and all beds are grouped together in one building, a different form is generated than if bed units, doctors' offices, and ambulant facilities are conceived of as inde-

pendent units. In the design of a nursing unit, if it is decided there should be at least sixty-four beds connected horizontally, a different form will result than if thirty-two beds were grouped together and linked horizontally with ambulant facilities. If the connections of a hospital are primarily horizontal, this will obviously generate a different form than if the connections are vertical.

It is extremely difficult to project new grouping patterns for an institution such as a hospital. The existing patterns are the result of many years of development of operational procedures. These spatial patterns have a strong hold on thinking and on attitudes and have become habitual and etched in the mind of the users. Solutions developed in response to specific needs are the exception rather than the rule. It is generally with the simultaneous awareness of a new technology and an unsatisfied need that we begin to question whether the existing methods of organization are really the best way to solve the problem. By doing so, we come directly in conflict with habits, and habits lag behind new technology. Today, the new possibilities of automation; the new possibilities for the storage and retrieval of information; the possibilities for new forms of transportation; coupled with the shortage of medical and paramedical personnel; the increased demand for health care; and the new medical knowledge available; make the architectural programmer, along with many others in the hospital organization, raise questions about existing methods and existing ideas of hospital organization and arrangement.

A most important constraint is the limitation placed on our thinking by the images in people's minds about what a hospital is like. We get used to doing things in certain ways and become victims of the tyranny of habit. It is very difficult to look at a problem analytically to see other ways to accomplish a given end.

The Prevalent Hospital Image

For the past twenty years the most prevalent hospital form has been characterized as the "matchbox on the muffin." The bed areas are located in the hospital tower (the matchbox) and the diagnostic and therapeutic services are located in the broad expandable base (the muffin). The conceptual framework for this hospital form is an outgrowth of the following premises (a) the diagnostic and treatment services of the hospital should be available for both inpatient and outpatient use; (b) they should be located on the ground floor in order to allow the outpatients to use these facilities without having to go through the hospital, causing unnecessary demands on the vertical transportation system; (c) these departments must be easily expandable, and should therefore be planned to leave an "open end" so they can be extended without disrupting the hospital operation; (d) the nursing tower should be serviced in the most efficient manner. The assumption has been that the most efficient system is provided by the design of a centralized distribution system in which materials, supplies, and food come to a central point on the nursing floors. These developments were made possible by the introduction of "elevator" and "air-conditioning" into the building vocabulary.

Hospital consultants and architects have used the "matchbox on the muffin" as a conceptual framework within which to structure the rest of their programming. The site, parking, individual zoning, and differences in scope and size of departments, make each hospital look slightly different from the others. Additional variations in appearance occur by making the matchbox round, triangular, or square, but the basic conceptual framework is the same.

If an institution is socially stable, and if its existing organizational and spatial arrangements are satisfactory for the present and near future, there is little wrong with accepting the conceptual framework as a design premise. For example, the organization and functional relationships of super markets are

pretty well worked out and need not be profoundly re-examined or analyzed each time they are programmed. The stadium is another example of a relatively stable institutional form. The requirements for such sports as football or baseball can be specified with little difficulty. It is true, though, that there are problems to solve in the design of a stadium, as the failure to solve the wind problem at Candlestick Park in San Francisco has shown. In addition to wind, there are problems of seating, sun, sound, parking, glare, crowd movement, and so on. But there are both enough existing stadiums and people who know about them, and an observant architect can learn relatively easily what the problems are and how those problems have been solved in a variety of situations.

The architect is confronted with a radically different category of design problem, however, when he must plan for an institution undergoing social change or for a completely new one just coming into being. In the latter case, his course is no longer charted for him by already known and solved problems, and an entirely new approach to architectural programming is required. The hangers for space rockets presented problems of this type. In the beginning, the architects did not even know just what the problem was, as there were virtually no precedents for such facilities. There were neither good nor bad hangers of this type in existence, and neither existing experts the architects could consult, nor a body of knowledge from which they could draw. When planning for the established institution undergoing changes, the architect must cope with these same types of problems as with new institutions but not entirely in the same way nor to the same degree. The hospital is a typical instance of an institution where some areas are relatively stable while others, like the diagnostic area and the outpatient areas, are undergoing such fundamental changes that existing rules and precedents are no longer applicable. As long as the current "image" of the hospital remains it is difficult to develop new solutions to meet the hospital's spatial needs. The difficulty of changing the hospital image is compounded by

the system by which we formulate our architectural hospital needs.

The Architectural Program

Before an architect can design a building he needs to have a program. This program, or "brief" as the English call it, is a statement which defines the requirements of an architectural problem. These requirements have been referred to as design goals, design criteria, user requirements, activities analysis, needs, and the like. Regardless of the term used, the idea is that some analysis of requirements is a necessary prelude to design activity. The program, as a document, forms a communication link between the client and the architect, establishing in a common vocabulary the objectives, scope, constraints, and requirements of a given project.

The idea of architectural program development is certainly not new. Architects have always written programs, sometimes formally, sometimes on the backs of envelopes and napkins. Earlier, the responsibility for programming in an architect's office fell to the senior executive of the firm on the theory that he possessed the necessary prestige and experience to deal with business executives, doctors, and administrators. Of more recent origin are the separate programming departments established in some of the larger offices. Programming departments are especially prevalent among those firms that specialize in particular building types, such as schools, prisons, or hospitals. Today, the increasing complexity of functional problems which the architect is required to solve requires a much more self-conscious and systematic approach to the programming process. It is only recently that programming has come to be identified as a legitimate activity separate from other design functions, but the systematic study of user requirements in any depth has not been part of the architectural tradition.

Architecture was said to have three components: firmness, commodity, and delight.[1] Firmness is the structural strength of a building, commodity is the

use of a building, and delight the visual appearance. Most evaluations of buildings have focused primarily on delight, to a limited extent on firmness, but rarely on commodity. Architectural sucess has been judged by the opinions held by the architectural magazines and architectural critics. Generally, they evaluate a building as an independent visual entity regardless of the purposes the building is to serve. Architecture has been referred to as sculpture, frozen music, and so on. The architect is heavily influenced in his decision process by the "aesthetic" standard of judgment exercised by the critic. It is only in the very recent period that demands that a building be evaluated in terms of how well it serves the building users have become frequent.

No provision is made in the standard A.I.A. architectural contract forms for compensation for this programming phase of design. Historically, the architect, when hired to design a building, was handed two things--a survey of the site and a building program. Based on these two givens, the architect was supposedly equipped to develop a solution. The present architectural fee structure allows neither time nor money for ferreting out the basic problems and their programmatic and conceptual solution. Fortunately, in the area of hospital design, there is a growing awareness on the part of hospital administrators, medical staffs, and trustees, of the importance of initial decisions. Since World War II, in particular, individual businesses and industries have been influenced by operations research, systems engineering, and management science. They expect rational, technical means to be utilized in arriving at decisions affecting their operations. They also expect adequate program formulation when they serve in the capacity of boards of directors of hospitals, museums, and other civic enterprises. This expectation on the part of clients is forcing larger architectural offices either to develop methods of analysis which explicitly adhere to rational and technical means of arriving at decisions, or at least to justify intuitive decisions on an analytic basis, even if it becomes necessary to hire various types of consulting personnel to perform this function.

Theoretically, the programming phase of design allows for exploration into the nature of the problem and the projection of alternate design solutions. Instead, this phase is largely devoted to the identification of quantitative variations on the theme; the theme itself remains untouched. A lot of thought goes into the determination of the number of beds and the number of X-ray rooms, but no fundamental thought goes into evaluating the validity of the pattern of hospital organization. Most architectural programs are formulated in the following manner.

The List of Rooms and the Prototype Plan as Building Programs

A variety of institutions--including universities, government agencies, and hospitals--make use of what is virtually an identical process in the preparation of their architectural programs. When it has been decided to construct a new building, the agency administrator sends a questionnaire to his department heads asking them to determine the space they will need in the projected building. The department heads, in turn, ask their assistants and secretaries to obtain this information. They measure their existing facilities, and, if existing space seems inadequate, they ask for more. Someone in the agency may attempt to estimate future growth, but the agency personnel frequently will be satisfied if they are given enough space to handle their present work load without feeling crowded. Anticipating that their requests will be cut, the department heads, and then perhaps the agency head, ask for more space than they think is actually necessary. The result of this process is a "book" which lists the rooms or spaces required and the size and function of each. Based on generally known costs per square foot, the list of room sizes will be translated into a rough budget of the building's estimated dollar cost. This crude process is the present basis of many architectural programs. The program is thus developed before the architect begins to work, and, upon being hired, he is handed the book containing the list of rooms.

A list of rooms is obviously not sufficient information for design development. To supplement the "list of rooms program," various institutions and governmental agencies have developed what are called prototype plans. These are actual plans which show how the list of rooms should be arranged for various institutional types of buildings. The United States Public Health Service, following World War II, developed prototype plans for hospitals of various sizes. These plans showed the room arrangements, the relationships between departments, and the furniture and equipment to be used. These plans were copied and buildings were constructed all over the United States based on these prototypes.[2]

The architect reader of the list of rooms program or the prototype plan has little understanding of how the rooms serve the purpose of the organization. He also has little understanding of the work processes and activities that are to take place in the rooms and in the building as a whole. He does not understand the functional relationships between most of the rooms. He does not know the bases for room sizes or the size of the total building.

It is very difficult to abstract the important relationships required in the design of a building from a prototype plan. An understanding of these relationships is necessary because it is generally impossible to copy a plan without modifying it to the conditions of site, climate, existing buildings, traffic patterns, and other facilities in the area. In practice, many mistakes have been made in just this way. Important relationships which may have been understood by the designer of the prototype plan can easily be misunderstood by the architect trying to squeeze the prototype into another context.

When specific room sizes are given, and the relationships of these rooms to each other are specified, the architectural form is essentially determined. A program which has listed room types and sizes has predetermined implicitly, if not explicitly, what activities are to go on in the building, the scope of these

activities, who is to work in and use the building, and the spatial and operational organization of activities within it. Both the list of rooms and the prototype plans reflect the existing organization and performance of the institution to be housed. When a department head and his secretary anticipate future space requirements on the basis of their existing space needs, they are also measuring their existing work program and their existing organizational pattern. Both the prototype plan and the list of rooms are conceived within the framework of the existing hospital image, and are, in effect, a documentation of the existing form.

Various Methods Used for Program Development

Because of the present inadequacies of the programming process, many large organizations, such as American Telephone and Telegraph, the Bank of America, Safeway Stores, some medical schools, universities, and industries, hire "in-house architects." The major job of the in-house architect is to become totally conversant with the problems of his particular organization and, hopefully, to translate its needs into programmatic form for other architects to carry out. The emergence of "consultants," particularly in the hospital field, is another attempt to fill the programming vacuum. The hospital consultant may come from a variety of backgrounds--architectural, administrative, or medical. The function of the consultant is to bridge the gap between the design architect and the client, and to articulate the needs of the organization. More recently, the systems engineers trained in the space industry are trying to enter the hospital programming field.

The Conceptual Framework

The complexity of the hospital system requires that the architectural programmer--no matter whether he is a systems engineer, an in-house architect, a consultant, or a member of an architectural firm--develop a conceptual framework

within which to organize the components of the system. Unless there is an agreed upon framework, it is impossible to proceed with the programming process in greater depth. A detailed program analysis for a vertical transportation system is useless if the conceptual framework requires the linking of people and materials on a horizontal level. All programs are written with a conceptual framework in mind, although the framework is not always clearly stated as such.

There is a prevalent notion among hospital consultants and architects that the functional program of a hospital can be designed first, the architectural program second, and that both of these programs can then be followed by the design solution. This procedure is in fact recommended by the American Hospital Association in their booklet on hospital planning procedure.[3] In an effort to be very analytical, the assumption is made that a functional program can be developed outside of a conceptual framework. This is not the case, all the functional programs I have read presuppose their own structure. This idea of separating the functional program from the architectural program probably stems from the notion which has pervaded architectural thought since Louis Sullivan coined the phrase, "form follows function." Form, function, size, and organization are integrally related and must be treated as a whole, and together they must form the structure of the organization.

A Systems Approach

To develop a form for a multi-service organization like a hospital requires a systems approach. The word "system" has, unfortunately, taken on many different meanings. In this book it means, primarily, that there are a variety of ways of answering the needs of a hospital problem. Some answers are organizational, some are environmental, some are technological, and some are spatial. No answers occur in isolation; organizational answers affect spatial solutions, spatial solutions affect personal relationships and efficiency, and so on.

Furthermore, there are almost always alternate ways of answering the needs of a system--that is, there will not be just one organizational approach, but several, not just one possible physical arrangement, but several.

The questions I ask when studying a system are:

1. What is the desired end or function of the system;
2. What are the relationships of function, form, organization, and size, within the system;
3. What are the sets of interrelated activities which make up the system;
4. What are the links in the structure of the system;
5. How are the links related;
6. How are the parts of the system structured and organized?

Here, a systems approach means a state of mind more than any of the specific mathematical, scientific, or technological methods which often are given that label. Primarily, it means an approach in which the parts of a system are recognized as parts and are related to their larger whole--an attitude which sees that the problems of a subsystem may not be solvable within the boundaries of the subsystem.

Whether we are dealing with an individual facility or a group of facilities, no aspect of the health problem can be treated in isolation. Whether patient beds, servicing systems, information systems, or ambulant care is considered does not matter--all must be looked at as part of the health picture.

In order to design for a system, its needs and the needs of its subsystems have to be identified. It is only in response to needs that an organization is developed and a physical plan formulated. Each subsystem has its own set of problems which must be solved, and an ideal solution for one may be in conflict with what is good for another or for the organization as a whole. The final choices must be made in terms of what is best for the system as a whole.

A System is No Better than Its Technicians

A system is no better than the ability of persons to utilize it properly. A superior physical plant, poorly utilized, is often less desirable than an inferior plant which is more closely related to the training and technological capacities of personnel working within the system. Nurses, who are trained in certain techniques and operational procedures, cannot be expected to function in environments drastically different from those in which they were trained without a period of re-education. Training programs must be projected along with new technology, and the success or failure of any spatial system cannot be evaluated unless the evaluation includes the capabilities of the persons using the system. The office of Stone, Marraccini, and Patterson, of San Francisco, designed identical tray make-up lines which were installed in two different hospitals. The time required to serve the same amount of food in one hospital was double that in the other. Obviously it was not the physical plant that made the difference, since both were identical, but, rather, it was the training of the persons working in the kitchens. Another example is from the Kaiser Hospitals. The nursing unit is designed so that the main corridor is essentially a work corridor for the nurses, and visitors use another corridor on the outside or periphery of the hospital. Instead of having a centralized nursing desk supervising thirty to sixty beds, each nurse is located in the corridor directly in contact with the eight persons she is responsible for. The nurse trained to work in a central nursing unit cannot fit into the Kaiser system without a period of retraining. Space, people, and machines are all components of the total system. A space designed to serve one set of operations with a particular staffing pattern may become intolerable if the operations or staffing pattern changes.

The Program as a Design Hypothesis and Design as a Decision-Making Tool

Every programmer has the problem of translating the architectural program to

the design team. This is so difficult that many architects feel that the programmer must also be the architect responsible for, at least, the early stages of design. Those favoring this role for the programmer argue that he is the one who has the benefit of understanding the nature of the problem. It is true that there is often both a loss of continuity of thought and a misinterpretation of intention in the process of translating a program to the designer. This may be compensated for, however, if a sufficient degree of rapport and overlapping exists between the work of the programmer and that of the designer, but there is always the possibility that the form implications in the programmer's mind will not be perceived by the designer who read the program. There is also the danger of a conflict in the attitude of the architect toward the decision process of the program planner. The difficulty is frequently compounded when an outside consultant is called in from another organization. The consultant often prevents the architect from coming in direct contact with the personnel of the organization and thus precludes his working with them and really understanding their needs.

All of these programming endeavors are based on the assumption that it is possible to write a verbal program defining the organization and its requirements, prior to the design process. A written program is at best a starting point for defining the problem and setting forth a hypothesis for its solutions. Each program must be tested in rough design form to expose unforeseen issues, relationships, and constraints. A rough design will in turn become the hypothesis reformulating the program. The programming process must be viewed as a series of cycles which proceeds from a written program to a tentative design, from a tentative design to a further clarification of the problem, and, finally, from this clarification to a new written program.

The idea of using the programming and design process as decision-making tools is contrary to the accepted practice which assumes the functional program

is written first, the architectural second, and the design last. This current procedure allows for no interchange or feedback between the designer and the nonarchitect members of the planning and programming team. In actual practice, the client rarely arrives at program decisions except in the most general terms prior to the design process. It is only as a design develops and takes on visual form that a client begins to see the implications of the ideas stated.

Program Development is a Collective Enterprise

The role of the architectural programmer is to act as a catalytic agent causing the members of an organization to examine its needs. The development of an architectural program is a collective effort in which both the architectural programmer and the various participants from the hospital organization change and grow as a result of the exchange of ideas required to arrive at spatial organization, and functional decisions.

The composition and size of the group required to develop a program for a hospital will vary depending on the nature of the hospital, the stage of program development, the information required at the specific stage, and the organization of the programming procedure. The members will include the hospital administrator, the medical staff (nurses, aides, and orderlies), technicians and office workers, maintenance and mechanical personnel, and the architects. Consultants will be brought in on city planning, traffic, kitchens, computers, laundry, mechanical and structural engineering, sociology, anthropology, social work, medical records, and public health. The consultants should include patients from every economic group and every ethnic background and in all degrees of sickness and health. Various methods have been developed for creating this dialogue between the architectural programmer and the hospital organization. The effectiveness of the dialogue depends on the genuine desire for this interchange on the part of both parties.

A successful dialogue was held between many disciplines in the development

of the architectural program for Stanford Children's Rehabilitation Hospital in Palo Alto, California. The methods used to create this dialogue may have value for other institutions. The hospital had been in operation for years in old buildings which, although inefficient, were informal and pleasant. Before attempting to formulate any structured questionnaires or organized interviews, I observed the existing hospital in operation for about a month, talking informally to all members of the staff, the children, and the children's parents. I attended group meetings held by the staff, and admission and discharge meetings; ate lunch and dinner at the hospital; went on recreational activities; and generally observed the daily operation. At the end of the month I knew a good deal about the people in the hospital, their ideas about medical care, and their hopes for the future hospital. The staff was unusual. It was the first time in my total hospital programming experience that everybody thought about the children's needs first. Doctors' and nurses' convenience was never posed as a main criteria for design development. The staff regularly held multi-disciplined meetings of social workers, psychiatrists, nurses, psychologists, pediatricians, neurologists, therapists, and other professionals to discuss each child as his case warranted. The inclusion of an architectural programmer seemed logical and natural. Based on the information gathered in the month of observation and informal talks, it was possible to formulate a rough program outline which presented questions and assumptions pertaining to the goals, constraints, size, and the desirable relationships of the parts of the new hospital.

The format developed for this first program booklet was such that each page had an adjacent blank page for comments by the staff members. This book was given to every staff member with the directive that time be spent, both individually and in groups, discussing ideas presented. Fifty of these books were returned to the architectural programmer, and in each case the blank pages were

covered with notes containing ideas and suggestions which were then studied by the architect and discussed again, both individually and in groups. The second program book was then formulated, based on these new ideas, and given to all of the staff for further study. The administration then organized a series of all-day meetings away from the hospital, so that the staff could concentrate without interruption for the purpose of ironing out disagreements. During these discussions, ideas were clarified, conflicts resolved, and decisions reached. It was only at this point that the conceptual program was presented. The second stage of program development occurred as the design concepts were tested and more precise requirements defined. All of the disciplines working in the hospital were involved in the program formulation. Each participated from the very beginning and was consulted on the general conceptual framework as well as on specific questions concerning their own particular domain. As a result, the final program was the collective effort of all those in the hospital.

The virtue of the Stanford Children's Hospital Experience is that those concerned with the social, medical, and psychological requirements of the environment were brought in to establish planning policy from the very start. It was only after the fundamental decisions had been made as to how to group the children in the hospital and relate them to the hospital school, to medical examinations, and to therapy programs, that consultants were brought in on food service, laundry, and mechanical and structural engineering. Thus, the method used placed priority of function on social requirements, unlike the customary method which develops service and distribution patterns first, and then allows the social requirements to follow as adjuncts to the plan.

An architectural hospital program goes through several stages of development and requires different forms of expert consultation at each stage. The first stage requires that the programmer develop an understanding of the nature of hospitals, their history, the function they play in society, their organi-

zational structure, and the evolution of their physical forms, and be able to analyze what is wrong with current hospital design patterns. The understanding of a building form also requires an understanding of the social, economic, political, and technological context in which it was built. The intentions and actions of architects are conditioned by the culture of their period and place. In turn, our own cultural and individual experience inevitably influences our interpretation of past intentions and actions and makes objective evaluation difficult. Evaluation is further complicated by the fact that a particular architectural design is influenced not only by general cultural factors, but also by factors specific to the particular project, namely, a particular budget, site and set of government regulations, and a particular architect and client.

The second stage requires that the boundaries of the particular project be established. The particular goals of the hospital must be understood to the fullest. Among the questions one must answer are: (1) what type of institution is it to be; (2) what will its particular role be within the larger health picture; (3) what will its responsibility be for health in the neighborhood, city, and region; (4) what will its specific research and teaching functions be? The constraints affecting the project, such as zoning, building codes, governmental regulations affecting hospital design, site restrictions, budget, and other factors which might interfere with the accomplishment of the desired goals, must be identified.

The third stage is largely quantitative and requires identification of the number and type of patients to be served and the scope of service to be offered. The amount and type of this service must be estimated for a projected five, ten, and twenty year period, as well as for the immediate situation. If demographic trends, characteristics of the people, disease patterns, and other indexes are known, they will help project the medical service required. This information

must be translated into bed needs, ambulant requirements, numbers of surgeries, X-rays, etc. A knowledge of other available medical facilities in the area and the services they offer should enter into the decision making. The projection of medical requirements is essential for all forms of medical services and should be developed on a regional basis. Some state as well as some regional voluntary hospital planning committees have assessed bed needs and the corresponding services required, but none has gone beyond this to include the entire range of preventive and ambulant services.

The fourth stage in program development requires that the architectural programmer understand the requirements of the hospital users, including the technical requirements of the various operational activities and their relationships to each other. There are a variety of techniques by which to study the activities or processes involved in the various hospital systems, but the underlying purpose an activity is to serve is the first step to be grasped, whatever the method of approach decided on. Methods of operation of most activities can be studied in existing institutions, which give valuable comparative information on which to derive new systems or perfect existing ones. Each medical activity must be studied in terms of the overall process. The diagnostic and therapeutic departments of hospitals, particularly, have been studied independently from the way in which the patient arrives at the department and what happens to him when he leaves the department. The studies of these departments have stopped at their "front doors." It was a new approach for architect Robert Jacobs to look at the surgical department in terms of an overall process which included the preoperative patient as well as the postoperative patient. As a result of this type of approach, Mr. Jacobs developed the significant idea of developing preoperative units as part of the surgical team.[4]

The fifth stage requires that a conceptual framework be projected for the

design team to use as a starting hypothesis for testing the form. The sixth, seventh and, possibly, eighth stages involve recyclings of the process until the overall team of architectural programmer, architectural designer, hospital user, and various consultants feel that the framework is there for further development.

This book is primarily concerned with the first phase, or the conceptual phase, of program development. The next phase must be spent in developing the system of transportation and circulation, the method of distribution of supplies, and the detailed planning for all of the functions.

The Users of the Hospital System

The most forgotten user of the hospital system has been the patient. This situation is true of an entire spectrum of public and institutional building, is one of the serious defects in our architect-client-user system, and accounts for many of our decision errors. The client may be a city, a corporation, or a school district. The user may belong to totally different economic and social groups, with different life styles and opinions. The client and architect decide on the physical life environment for the users. This combination has not proved effective. Decisions on dormitories made by architect and school administration are often rejected by college students. Decisions on public housing made by city officials and architects make gloomy and dangerous living environments. At every turn architectural solutions fail to satisfy user requirements. Inadequate design solutions are not totally the fault of the architect, for the real decision-makers are often small bureaucrats, city officials, and administrators. Their universal image of a hospital culminates in a tower which, in effect, is a monument to their endeavor, and bears no relationship to size, function, form, or organization. They are equipped neither to analyze nor to visualize, yet they may control the decision process.

Much of the planning of hospitals has been instigated by Doctors. Their focus has been on the reduction of the amount of steps they have to travel. The desire to reduce travel time both within the hospital and between the hospital and office is partially responsible for the outcropping of medical buildings around hospitals. The location of several hospitals within a few blocks of each other enables a doctor to have several hospitals available for his patients so that he will not become dependent on the whims of one medical group. The consequence of this has been much duplication of hospital facilities, although a few places are trying to work together on buying supplies, dietary services, etc. In a few cases each hospital has attempted to develop its own specialties and refer patients to the hospital providing the required medical facility, instead of duplicating it.

Most doctors seem to share the same image of a desirable and efficient hospital. Doctors' parking should be directly outside of the doctors entrance. Adjacent to the entrance provisions should be made for obtaining the laboratory and X-ray diagnosis for all of his patients. The doctor should be able to immediately take an elevator (with no waiting) to a nursing unit. All of his patients should be grouped in this unit. Adjacent to the unit on the same horizontal level would be his private office. And adjacent to this remote office would be examination and treatment rooms for both private and clinic patients. The notion of easy communication between the various medical specialties is a secondary goal.

The implication of the above for planning is to build larger and larger medical complexes so that all of the services the doctor renders will be located on one site. There is no doubt that the provision for doctor's efficiency of operation is vital to the patient's well being, but the patient also needs a voice. The architect is essentially an idealist and sees himself as playing a key role in the shaping of civilized life.[5] If he is to fulfill this

image he must considerably reinforce his knowledge of and responsibility to the user.

Today, the hospital is being discussed as a dynamic force for health education--a place for preventive medicine as well as for curing the sick. Expanded ambulant facilities are projected, and it is anticipated that in time the indigent patient, as such, will disappear and that one grade of health care will be provided for all. But despite these new goals, we are still operating with old images.

The purpose of this book is to demonstrate how some of the factors affecting health and hospitals require the development of a new conceptual framework within which to develop our programs and designs. Chapter II is a discussion of the history of hospitals, how they became what they are today, and some of the faults in the current hospital prototype. Chapter III deals with the changing role of the hospital and discusses some questions of objectives and constraints which affect our attitudes and design solutions. Chapter IV is concerned with user requirements; the emphasis is placed on patient needs, particularly with respect to the rising ambulant patient and the relatively new, short-term psychiatric patient. Chapter V suggests an approach for uncoupling the system in order to allow ourselves to examine spatial alternatives without being hampered by preconceived notions of hospital design, and speculates about alternative ways of grouping the hospital system. Chapter VI is an example of a conceptual program development for an urban hospital. Chapter VII deals with the methodology required to study and understand the hospital system.

CHAPTER I: FOOTNOTES

1. Sir Henry Wotton, Elements of Architecture. He is adapting Vitruvius, Book I, Chapter III. See the discussion of these concepts in Geoffrey Scott, The Architecture of Humanism (New York: Doubleday Anchor Books), pp. 15-17.

2. American Hospital Association, Manual of Hospital Planning Procedures (Chicago: American Hospital Association, 1961).

3. United States Public Health Service, Elements of the General Hospital (Washington: U.S. Government Printing Office, May 1950).

4. Robert H. Jacobs, "Surgical Suite Locker Room Design and Procedure," American Institute of Architects Journal, 38 (September 1962), pp. 83-85; "The Surgical Center," ibid. (November 1962), pp. 79-87.

5. Robert Gutman, The Questions Architects Ask, A Mimeographed Report of Rutgers University's Urban Studies Center (1966), p. 10.

CHAPTER II: THE HOSPITAL IN ITS HISTORICAL AND CONTEMPORARY CONTEXT

The architectural programmer can only be effective in helping determine the direction of a specific project if he is armed with a general knowledge of the numerous factors which have affected the development of a particular institutional form. This chapter will discuss the history of hospitals, their organizational structure, the evolution of their physical forms, and faults in their current pattern. We will try to show how the architecture of hospitals is influenced by their history; the cultural context in which they are built; by politics; economics; and the medical, structural, and industrial technology available. These factors help mold the general image of what a hospital should be. This general image in turn affects the decisions which are made in the specific context of the development of plans for a particular hospital. A specific hospital design will also be modified by the particular role of the hospital in the health facility picture; the particular site, budget, building codes; and the particular image carried by the particular architect or client.

A Brief History of the Hospital

Hospitals, in the very general sense of special services for the care of the wounded and sick, have probably existed since men first engaged in violent battles and wars. Even civilian hospitals have a long history, especially if one considers the ministrations of Greek and Jewish temples. In the sense of special buildings, hospitals can be traced at least as far back as A.D. 31 to the "Pool of Bethesda" where shelters were erected for the sick and crippled who came to drink the water. The teachings of Christianity, however, rather than military or medical requirements, for many centuries were responsible for the construction of hospitals. "The Council of Nicaea (A.D. 325) instructed the bishops to establish a hospital in every city that had a cathedral..."[1] The hospital at Caesarea, built around A.D. 370 from an endowment by the Emperor

Valens, and one in Rome, established by the wealthy Roman matron Fabiola, are two early examples. These institutions cared for the sick and those suffering from the effects of poverty and hunger. Medieval monastic orders were also responsible for the development of many hospitals. The crusaders established hospitals along the routes they traveled and created special knightly orders whose function was to operate the hospitals.

In the early centuries of the Christian era, hospitals were objects of a charity whose purpose was to help the sick and needy. In later centuries, however, this motivation became corrupted and gifts to hospitals were simply another means of buying a place in heaven. The church hospitals shared in the general decline and corruption of the medieval church. Hospital funds were misused and the limited medical techniques of the day were replaced by prayers to the saints for miracles.

The architectural form of the early hospital reflected its purpose. Since its purpose was to isolate the sick from the community and to provide a place for the poor to die, the hospital took the form of a large fortress secreted away in the country or behind walls in the city.

Descriptions of the early hospitals are hair-raising. In Notes on Hospitals, Florence Nightingale quotes from M. Husson's "Etude sur les Hôpitaux" on the Hôtel Dieu, a Parisian hospital: "'In 1515, there were only 303 beds at the Hôtel Dieu, in each of which, from want of space, are generally seen eight, ten, and twelve poor in one bed ...'"[2] She goes on to note that "...notwithstanding the use of multiple beds, ...the number of sick so far exceeded the bed accommodation that the beds, in 1530, were occupied by relays of patients, and that forms were provided on which the sick, whose turn it was to be out of bed could rest in the meantime."[3] The goals of such hospitals were isolation and agglomeration and the result was fear, dread, and death. "As late as 1788, the death rate among patients at the Hôtel Dieu in Paris was

25 per cent, and that of the surgeons and attendants from 6 to 12 per cent a year."[4] Sir John Pringle in his book, Diseases of the Army, claimed that hospitals were the chief cause of mortality in the army. In the Crimean War, at the badly drained and ventilated hospital at Scutari, 42 per cent of the patients died.[5]

Because of such conditions, Florence Nightingale could begin her Notes on Hospitals with the following statement:

> It may seem a strange principle to enunciate as the very first requirement in a Hospital that it should do the sick no harm. It is quite necessary, nevertheless, to lay down such a principle, because the actual mortality in hospitals, especially in those of large crowded cities, is very much higher than any calculation founded on the mortality of the same class of diseases among patients treated out of hospital would lead us to expect.[6]

She attributed the faults of the hospital mainly to deficient sanitation, lighting, and ventilation, and to overcrowding. Along with Lister and the followers of Pasteur, Florence Nightingale helped to get hospitals literally cleaned up.

Under her influence the architectural form of the hospital changed, and the pavilion form came into vogue. The essential feature of pavilion construction was the breaking up of the large hospital into a number of separate units, or hospitals, connected to each other, at most, by light, airy passages or corridors. The pavilions were to be arranged to provide a means of dividing the sick and obtaining external ventilation and access to sunlight. Pavilions also were to serve as a convenient means of communication. Florence Nightingale made a proposal based on her understanding of sanitary ventilation and administrative problems, that each pavilion ward have from twenty to thirty-two patients. Her reasons for arriving at these sizes were that they promoted good ventilation and ease of supervision. She wrote:

> It does not appear as if the air could be thoroughly changed, if a distance of more than thirty feet intervenes between the opposite windows: if, in other words, the ward is more than thirty feet wide. This is the true starting point from which to determine the size of your ward, and the number of beds

> you will have in it. If you make your length too great in proportion to this width, your ward becomes a tunnel--a form fatal to good ventilation. This was the case with the great corridor wards at Scutari.[7]

She goes on to prove that the most effective combination of sickbeds for good ventilation and adequate supervision is thirty-two, or, with two together, sixty-four.

Today, despite the fact that neither the ventilation problem nor the supervision problem which concerned Florence Nightingale exists, we continue to build nursing units of the size she recommended. Ventilation is no longer a problem because patients are not in large wards but in small rooms each of which has more than adequate window space. Supervision is a problem but not the problem which concerned Florence Nightingale. The pavilion hospital promoted by Florence Nightingale was the dominant hospital form until new technology and new methods of medical care made alternate design solutions possible.

Because they were built at a time when communicable diseases were the major health problem, many hospitals, until quite recently, were specialized hospitals. By separating children, pregnant women, the tubercular, the mentally ill, and so on, into separate buildings, the spread of disease was reduced or prevented, and the concentration of common ailments in one place encouraged specialized treatment.

With the decline in infectious diseases and the development of new techniques for isolation and sterilization, the specialized hospital has begun to be eliminated. The most common example is the tuberculosis hospital which has practically gone out of existence, but the idea of segregated mental hospitals is also increasingly under attack.

In the late nineteenth century, the germ theory of disease and the principles of asepsis which followed from it were only the beginning of the development of scientific medicine. While cleanliness helped make the

hospital a place which did no harm, the development of scientific medical techniques began to turn the hospital into a place which did some actual good. The development of medical equipment and trained, specialized personnel began to shift the locus of medical services from the home and doctor's office to the hospital. Only the hospital could cope with large and expensive equipment such as is required for X-rays, laboratory, and surgery. The physician moved his activities to the hospital where the mechanical and human aids he was increasingly dependent upon were located.

Historically, hospitals were planned and organized around the care of the inpatient. The bed dominated the facility. It was on the basis of the bed-count, for instance, that space requirements were projected and that money for construction was allocated. The size of the ancillary services of the hospital, such as X-ray and laboratory, was also determined on that basis. A few hospitals, as either teaching or quasi-social institutions, did maintain outpatient departments, but these were often relegated to the basement and used primarily by the indigent population.

Since World War II, however, there has been an about-face in the attitude of the hospital and its medical staff toward the outpatient, and vice versa. Today over 40 per cent of the activities of X-ray departments, laboratories, and other diagnostic and therapeutic facilities, are centered in the care of ambulant patients, and of these a large number have been referred by their private physicians. This comparatively new outlook of the hospital and the patient is a reflection of 1) medical progress made in prevention, early diagnosis, and treatment of disease, which makes possible the care and cure of patients in ever-increasing numbers before they reach a stage that requires hospitalization; 2) new social and medical attitudes which have widened the spectrum of care for those classified as medical patients to include even psychiatric care; 3) increased demand for medical care on the part of large

sections of the population who are becoming increasingly sophisticated about the potentials of early diagnosis and treatment; 4) the ability of ever larger sections of the population to pay for medical care through various forms of private, federal, and state insurance and prepayment plans.[8]

In addition to the increased use of the ancillary services of the hospital for diagnosis and treatment of ambulant patients, the emergency department of the hospital has become an informal extension of the doctor's office. The number of emergency visits has increased faster than either hospital inpatient admissions or outpatient visits. In the ten-year period since 1953, these visits increased by 175 per cent. Studies also show that from 40 to 50 per cent of the use of emergency departments throughout the country is for non-emergency patients. "When a person is injured on the street or becomes dramatically ill, the cry is no longer, 'Call a doctor,' but rather 'Take him to a hospital.'"[9] The causes for the increased use of the emergency department reflect basic changes in the attitude of the population toward the hospital as an institution.[10] Over the years, the public has become increasingly confident about the hospital as a place to obtain medical care. This is due in part to the hospital's increased array of diagnostic and therapeutic equipment. Other reasons also reinforce and complicate the increased use of the emergency department. These have been well summarized in a recent article[11] as:

--Mobility of the population (the patient does not have a personal physician).

--Large concentration of low-income groups in metropolitan areas.

--The bypassing of physicians' offices and direct use of the hospital emergency service either because the patient has difficulty finding a physician at night or on weekends and holidays, or because the patient does not wish to inconvenience his physician.

--Availability of round-the-clock care.

--The realization by many physicians that hospital facilities for diagnosing and treating certain conditions often are better than those in their own offices.

--Increased use of emergency departments by physicians as an "after-hours office."

--The effect of those health insurance plans that pay for emergency department care.

--The tendency of industry, schools, police and fire departments to refer sick or injured persons to hospital emergency departments.

Due to the use of the diagnostic facilities of the hospital by private doctors, there has been a clustering of private medical offices in hospitals or in special buildings next to them. In addition, in the major urban centers, several hospitals are often located in close proximity to one another, creating a medical complex and offering the physician a choice of hospital privileges. Not only is time saved for the doctor by this arrangement which places him close to his bed patients, but proximity to the hospital enables him to refer his ambulant patients there for X-ray, laboratory, and therapeutic work. A study in 1960 identified some 268 hospitals where clusters of private medical offices were located either in them or close by.[12]

An early example of the trend toward location of doctors' offices near major hospitals is the Bristol Memorial Hospital in Bristol, Tennessee. In this case it was the architect A.L. Aydelott who took the lead. Despite the objections of the doctors that it would be disadvantageous for them to move a mile and a half from downtown, the doctors' wing of the hospital went up. All of Bristol's twenty-six physicians have since moved in, and the combination of physicians' offices and hospital is so well-liked that it has already attracted five outstanding young specialists. Each doctor has two examination and treatment rooms, a consultation room, waiting and reception area, and a

private toilet. The physicians' wing is joined to the nursing wing by the facilities both use in common. Because the ancillary services get continuous use, the 120-bed hospital could employ a full-time radiologist and pathologist.[13]

As the hospital has shifted to a center for elaborate equipment and technical services, there also has been a shift in the relationship between the doctor and the hospital. Modern medicine requires equipment, organization, and services that the doctor cannot provide in a private office but which can be provided in a hospital. Thus, whereas formerly the hospital was an adjunct of the doctor, who was the "prime contractor" for medical services, now the doctor is increasingly an adjunct of the hospital which, as a total organization, has become the prime contractor.

This is due in part to the fact that the doctor is no longer able to function independently but is part of a medical team. The logistics of seeing that people, equipment, and supplies arrive at the right place and time is an organizational problem. The surgeon cannot operate alone. His effectiveness is dependent on the effectiveness of a host of other resources and personnel.

This complexity of the hospital and the requirements necessary to provide health care is reflected not only in the need for the diagnostic and therapeutic tools of the hospital, but also in the fact that today there are some ten supporting health workers for every physician in active practice.[14] Like any large-scale organization, the hospital is dependent for the attainment and maintenance of good coordination on "such things as standardized work flows and procedures, advance planning, and precise regulation of activities in the system. In short, they depend upon an elaborate system of programmed coordination."[15]

In response to the growing size and complexity of the hospital organization, the hospital administrator has taken on the truly professional role

required to organize and coordinate the total hospital effort. Today the authority in a hospital is shared by the board of trustees, the doctors, the administrator, and, to some extent, by the director of nursing. These sources are often in conflict--the administrator fighting to keep costs down, the doctor perhaps wanting more space, equipment, and technicians. The power situation varies from hospital to hospital. In some the ultimate authority rests with a doctor or doctors, in others the administrator, the trustees, the city, or whoever controls the purse strings.

What Is Wrong With Our Hospitals

In urban areas all over the world, the history of our hospitals is still with us. Unfortunately it is not the ghosts of the past that are haunting us but rather the reality itself. The hospitals built around the turn of the century still function in New York, London, Paris, and San Francisco. The large psychiatric hospitals and mental institutions still stand as "fortresses" behind city walls or on the outskirts of towns.

The most superficial glance at the current state of medical facilities reveals an uncoordinated network, a kaleidoscope of components, which includes hospitals of all ages and types--city, county, veterans', army, navy, community, proprietary, specialized, convalescent. They vary in size from 10 beds to those having over 1,000 beds.

This ad hoc medical system has resulted in strained facilities as well as inadequate care. We are confronted with a multitude of problems, both medical and social, which are not being solved by either present methods of organization or architectural design. Let us look at what is wrong with our hospitals in terms of their role in the total health picture and in terms of their own inner functioning.

The Gap Between Advances in Medical Science and their Optimal Application in the Community

Perhaps the greatest problem in American medicine is how to "close the gap between the advances in medical science and their optimal application in the community."[16] A study by Barker S. Sanders of the United States Public Health Service indicates that only one in five ailments in the human body is correctly diagnosed, and three in five are missed altogether.[17] Currently, 25 infants of each 1,000 live births in the United States die within the first year of their lives. Our nonwhite minorities suffer from an infant mortality rate double that of the white population--44 against 23.2. The difference is largely a reflection of the low socio-economic status of the nonwhites. While they comprise only 11 per cent of the population, they number 25 per cent of those living in poverty.[18] Many obstacles stand in the way of bringing medical services to this group: the costs of medical care, long waiting periods, fragmented services, lack of transportation, ignorance about health services that are available, and, not least important, a totally different attitude toward illness. The poor, by their very condition, have their own way of regarding their health. They utilize medical facilities only in time of crisis and not for prevention, diagnosis, or minor treatment. They minimize what appear to be slight physical difficulties in the interest of attending to more pressing problems. Once in a hospital, the length of stay of poor persons is longer than that of the financially better off, mostly because their homes cannot accommodate convalescent care. Until recently, no money was available to pay for this stage of illness. Now Medicare will pay for convalescent care for at least the elderly, but only after the patient has been three days in a hospital with an acute illness.

Shortage of Medical Personnel

There is a tremendous shortage, especially in certain states and non-

metropolitan areas, of physicians, nurses, and other medical personnel. Concern over the need for more physicians prompted the Bane Report in 1959 which promoted federal support for the expansion of existing medical schools and also led to the development of twelve new schools.[19] With minor fluctuations, the ratio of physicians to population in the United States has remained unchanged since 1920. In 1963 the number of physicians per 100,000 population was 181 in greater metropolitan counties but only 80 in counties adjacent to metropolitan centers and only 50 in isolated rural counties. The physician-population ratio ranged from a low of 69 in Alaska to a high of 207 in New York, with the national average about 132.[20] Similarly, the professional nurse-population ratio ranged from 120 in Arkansas to 491 in New Hampshire, with the national average about 300.[21] Increasing the supply of manpower is a task largely outside the province of architecture, but the architect, through improved programming and design, can help to ameliorate the shortage of health personnel by contributing to their productivity.

Poor Social Relationships with the Urban Poor

An estimated one-third of our urban population receives medical care from transient medical staffs in dispensaries of metropolitan hospitals. The urban county hospital, particularly the teaching hospital, has been especially remiss in its consideration for both inpatients and outpatients, who are primarily an indigent population that cannot afford private medical care. The teaching hospital offers free medical care, and, in exchange, the patients are often used as demonstration and teaching material. Outpatient departments are often considered to be a kind of reservoir to keep beds in the teaching hospital filled.

Thus, while high-quality medical care may be given, the social relationships between the patients and hospital staff are so poor that large sections

of the urban population have no faith in medical schools. At a recent hearing in San Francisco before the Board of Supervisors, one irate citizen rose to give a lurid description of how the University of California Medical School used county hospital patients as guinea pigs. The charge was not true, but the social amenities at San Francisco County General Hospital have been so poor that anything was believable and believed. It will take a long time to undo the damage which has been done because of the past dehumanization of patients, especially poor patients. There is a growing "backlash" against teaching hospitals and a growing insistence by the urban poor that "We don't want to be teaching material."

Lack of Continuity of Care

Such institutions, although they may provide highly scientific care for disease once the patient is in the hospital, provide an archaic pattern of medical relief in that little continuous or preventive medicine is practiced.[22] Richard E. Weinerman, Director of the Ambulant Facilities at Grace Memorial Hospital, Yale University, has stated that what is needed instead of the present pattern of discontinuous service geared to acute illness, is a new system of health maintenance over time.[23] With somewhat different emphasis, many medical people have echoed Dr. Weinerman's call for continuity of care, pointing out the need for personalization of the doctor-patient relationship, development of an organization in which the family doctor is the stable link between the chain of specialists, or simply for the invigoration of general practice as a means of providing more families with one long-term physician.

These concerns and aims are admirable. Continuity of care is what is given in the best of private medical practice. The doctor sees the patient in his office, attends him in the hospital, and confers with the specialist if one is called in. But even in the best of group practices--certainly in the experience of many who participate in group prepayment plans such as the Permanente Medical

Group in California--it is only a small percentage of the subscribers who have the force necessary to cut through the organizational system and maintain contact with one doctor. In the university and teaching hospitals, because the interns and residents change frequently, it is impossible to maintain a prolonged patient-doctor relationship. We are also dealing with an increasingly mobile population which moves within cities and the surrounding areas, and between cities as well as between states. Under these circumstances, continuity of doctor-patient relationships is obviously impossible.

Misuse of Hospital Beds

In many hospitals, the X-ray, laboratory, rehabilitation, and other diagnostic and therapeutic facilities are used more than half of the time for ambulant patients. Still greater use would be made by ambulant patients of the ancillary services if these were covered by some form of insurance. Under present-day coverage a doctor will often hospitalize a patient who needs extensive and costly X-ray and laboratory services because a portion of the cost will be covered by insurance if he occupies a hospital bed, and not because the same diagnostic procedures cannot be adequately performed while the patient is still ambulant. The provisions for outpatient services under the new Medicare and Medicaid laws are a major step in this direction.

High Cost of Medical Care

The problem of economics pervades all attempts to improve medical services. The continuing clamor about the cost of medical care can be explained and documented in many ways. For example, the total expense per patient day in non-federal, short-term general hospitals rose from an average of $15.62 in 1950 to $44.48 in 1965.[24] As another example, physicians' fees rose over 60 per cent in the period between 1945 and 1965.[25]

Because of their financial problems, hospitals are demanding architectural

designs that make a positive contribution to hospital efficiency and utilization. The obstetric and pediatric departments of many urban hospitals, for instance, often have an occupancy rate of less than 50 per cent. These departments are maintained largely for the purpose of serving the child-bearing population which has not moved to the suburbs (the urban poor) and for teaching purposes. Current state and federal regulations require that obstetrical beds be isolated from other units, with the result that empty obstetrical beds cannot be used for other types of patients. Current prototype designs and standards do not provide means by which the size of the obstetric department can be expanded or contracted in response to demand. Other hospital areas are also underutilized and, because of rising hospital costs, there have been numerous complaints about the unnecessary duplication of services and the lack of coordination of metropolitan medical services.

Hospitals Endanger Patients

It is not just the indigent patient, however, that suffers at the hands of our hospitals; there is potential danger for all patients. Hospitals are dangerous because of the possibility of infection, of human error, of radiation, or of organ atrophy from disuse. The wrong drugs are given and the wrong treatments are performed much more often than is publicly admitted.[26]

Writing on the use of patients as experimental subjects, a medical doctor at Harvard Medical School stated that hundreds of the patients had "not known that they were the subject of an experiment although grave consequences have been suffered as a direct result of experiments described here." He emphasized that one of the areas in which experimentation is taking place is "on a patient not for his benefit but for that, at least in theory, of patients in general." Because "ethical errors are increasing not only in numbers but in variety" as a consequence of the enormous and continuing increase in available funds for

research (in large part on man), he urged that the problem be given serious and immediate attention.[27]

In addition, since hospitals serve as workshops for doctors and as the hub for services for the ambulant patient, it is difficult to control entrances and exits of patients and visitors. With the trend toward an open-door policy, the urban hospital is becoming a center for petty theft and crime. Cases are reported all over the country of pocketbook snatchers who come into the patients' rooms. Inner-house theft is also a problem. Food leaves the kitchen for unknown destinations. Laundry vanishes, as do also medicines, instruments, and machinery. The design of buildings and equipment can do much to help reduce some of these problems by arranging facilities and space in ways that encourage proper use and discourage improper use.

Hospitals Have Inherent Contradictions in Their Organizational Structure

Much has been written about the authoritarian character of the hospital:

> The authoritarian character of the hospital is partly the result of historical forces having their origins at a time when . . . nursing, medicine, and the hospital were all closely associated with the work of religious orders and military institutions . . . [The] emphasis of religious and military institutions on social arrangements in which the occupant of every position in the organization presumably knew 'his place,' and kept to his place by strictly adhering to specified rights, duties, and obligations, had much to do with the hospital's adopting a strict hierarchical and authoritarian system of work arrangements. But, the advent of professionalization and specialization, the gradual independence of hospitals from religious and military institutions, and the impact of an increasingly secular culture have greatly reduced the authoritarian character of the hospital.[28]

Although the authoritarian character has been reduced, the hierarchical and bureaucratic nature of the hospital will probably remain. Georgopoulos and Mann point out that when human life is at stake there is little tolerance for error or negligence. And if error and negligence can be prevented by adherence to strict formal rules and quasi-authoritarian discipline, such rules are important to have and obedience cannot very well be questioned. The need to

deal with crises and emergencies also requires considerable regimentation in the hospital. Lines of authority and responsibility have to be clearly drawn, basic acceptance of authority has to be assured, and discipline has to be maintained.[29]

But there are inherent contradictions in the hospital organizational structure. On the one hand, lines of authority must be maintained, but on the other hand, the nature of the system constantly requires independent thought and action. The nurse, particularly, is caught in the dilemma. She is unable to operate either in an autocratic atmosphere or in a purely laissez-faire one. Her role and status today are in a state of flux.

The hospital historically has had two functions: nursing care and medical treatment. As the hospital shifted from a place that gave only nursing care to one that increasingly gave medical treatment, the role of the nurse shifted. Whereas formerly she eased the patient's hurts and gave tenderness and love, the nurse has now become a professional partner in the administering of scientific cures. Many of them are no longer responsible for direct patient care. Rather, they have become administrators in charge of units caring for from thirty to sixty patients, and as administrators they have become even further removed from the patients' needs. All patients still need the TCL (Tender Loving Care) treatments, yet, with the change in the role of nurses, this care is increasingly absent. Patients complain that no one shows concern for them personally, that no one explains all the seemingly dreadful things going on around them and being done to them, and that they are not treated as humans but as objects.

Many of the nursing schools are training their students to have a broad social scope, an awareness of the patient as a total human being; yet, when the nurse comes into the hospital milieu, the bureaucracy does not allow her the time nor give her the back-up to develop along the lines which, during her training, she was told were important.

The Debilitating Effect of Institutions

Much more study must be given to the nature of institutions in order to overcome their many debilitating qualities.

> We are still engaged, for example, in the procedure named so appropriately by Irving Goffman as 'the stripping process.' This custom derives from the monastic orders where people were removed from their worldly goods and clothing and put into a new habit. This was proper in monastic institutions, but the same thing is done in all total institutions: in the military, prisons, jails, and hospitals.[30]

People come to the hospital frightened, insecure, and apprehensive. Yet, in this condition, they are forced to behave in a manner drastically contrary to their usual behavior pattern. The patient feels that body exposure is indecent, but in the hospital he often is forced unnecessarily to expose his body. He has been taught to perform bathroom rituals in private, but in the hospital he must use the relatively public bedpan.

Medical students have conflicts similar to those of the patients.

> The first examination of a patient introduces the problem of body exposure, which quite obviously conflicts with much that is commonly taught about modesty and privacy. It is necessary to examine only a few hospital charts before discovering that the vaginal and rectal examinations are frequently 'deferred' and realizing that this problem extends well beyond the early medical school years. A more detailed study reveals that the degree of reluctance may also relate to the socioeconomic brackets of both patient and physician. History taking presents a similar problem, for the entire process may strike the neophyte as a distinct invasion of the patient's privacy.[31]

The Patient Feels Isolated and Forgotten

The present organization of nursing units does not provide the opportunity for a patient to feel that he is getting personalized care and supervision. Feeling that they are forgotten, patients become anxious. Particularly within the framework of the larger urban centers, many of the hospitalized patients have no family or visitors. The need for attention is great. Our present method of organizing nursing care does not allow for this personalized atten-

tion, nor does the physical facility make it easy to develop some notion of identity within the context of the larger system.

Hospital Routine Minimizes Personalized Attention

There are segments of the population that require special attention. The aged patient, for instance, has special requirements. The elderly are easily confused by the hospital environment and need more direction and guidance. They sometimes cannot manipulate the nurse's call button used to communicate between the patient and the nurse. They have a harder time getting out of bed, going to the bathroom, walking, and changing clothes. They are insecure and need contact with other people. They need to feel wanted and cared for. The difference between recovery and invalidism for an elderly person may depend on whether his spirits are maintained. They especially have need for the personalized attention which hospital routine denies to patients.

The Institution is not Therapeutic

In the development of hospital programs nearly all doctors have said "make it homelike," and they are voicing a genuine sentiment which is valid and important: the "institution" is not therapeutic. Their solution frequently is skin deep, however, limited to the concept of chintz or colored burlap at the windows, colored spreads on the beds, and Picasso prints on the walls. It will take more than cosmetics to create a therapeutic environment. An environment is a totality. It is the spatial experience, the attitude of the people around one, the ritual, the concern, the attention to comfort, the food, the state of one's health, the noise, the odors, and so on.

Florence Nightingale recognized the value of a therapeutic environment to the recovery of patients when, for example, she wrote, concerning the anxieties of patients:

> . . . you little know how intensified they become to those who can have no change; how the very walls of their sick rooms seem hung with their cares; how the ghosts of their troubles haunt their beds; how impossible it is for them to escape from a pursuing thought without some help from variety.[32]

The key word is variety, because variety is contrary to the sameness of the institution--it is the enemny of all-pervading ritualism or routine. This means, for example, that such routines as the 5 o'clock temperature-taking and the proverbial waking up of a patient to give him a sleeping pill should be eliminated. Architecturally, variety means a variety of spatial experiences. The predominant spatial experience of an institution, whether hospital, prison, or mental institution, is of the long corridor. This must be destroyed. Likewise, in the individual room it means there must be variety; in addition to pleasant colors and objects to look at, there must be a place to sit and space in which to walk about as soon as convalescence permits.

Lack of a Coordinated System

In 1946 the Hill-Burton Act was passed for the purpose of providing money (one-third from the federal government, one-third from the state, and one-third from the local community) to encourage the building of hospitals, particularly in the rural areas. Financed in part from funds allocated under this legislation, most hospital construction since 1946 has been in the form of small hospitals built in suburban and rural areas. The act uses bed per-population ratios in estimating the need of a state for different types of hospital beds. General hospitals are allowed 4.5 beds per 1,000; 5 per 1,000 mental hospital beds are allowed; 5 per 1,000 chronic and nursing-home beds are allowed; and 1.5 tuberculosis beds per each new case are allowed. While these ratios are supposed to reflect the need of the population for these services, in practice, the Hill-Burton ratios do not make allowances for differences among states in the nature of their populations and their corresponding health needs, nor for

differences in patterns of medical services. The legislation occurred at a time when there was a particular shortage of beds in rural areas. Some twenty years later the situation is no longer the same. Many of these small rural hospitals operate with less than 50 per cent occupancy and cannot provide a large range of medical services.[33]

The Hill-Burton legislation operated on the theory that a base hospital should be located in the large city, an intermediate hospital in a suburban area, and smaller rural hospitals scattered in the surrounding areas. Whereas, theoretically, they were to be linked into a system of larger medical centers, this has only happened in a few instances. Instead of a coordinated and linked hospital system we have these small, underutilized rural hospitals.

Obsolete Standards

It is important to have standards and important to have government rules that regulate hospitals, but our present rules system does not serve the needs of hospitals. Government rules too often reflect obsolete standards. In the Hill-Burton Act the federal government specifies certain equipment and service standards for hospitals of various sizes, that is, for 50, 100, 200, 400, 500 beds, and so on. But when these standards are compared to the actual requirements for hospitals in such departments as radiology and pathology, we often find that the government standards are gross underestimations. Used as regulatory devices, they present a key problem because they are usually minimum and therefore discourage investigation of the feasibility of lower standards and the possible advantages of more generous ones. For example, one common standard is that bedrooms shall have a minimum width of 11 feet. Yet several architects have demonstrated that the functions of a bedroom can be performed in narrower rooms.[34] What is needed is not the elimination of government regulation but, rather, the development of performance standards to replace existing solution standards.

Hospitals Are Obsolete Even as They Open Their Doors

A hospital takes approximately two to three years to plan and several years to build. During this period of time so many changes take place in scientific and technological knowledge and social and medical concepts that new hospitals are obsolete before they are built. In addition, hospitals tailor-made to suit the desires of one group of department heads often are replaced by changed personnel who neither respect nor share the ideas of their predecessors.

The Overcrowding of the Hospitals' Facilities by the Ambulant Patient

The emergency clinic has become the doctor's office for the urban poor, and on weekends and off-hours doctors often tell even paying patients to "meet me in the emergency room." In a study by Sidney Lee and others, it was shown that only 6 per cent of the emergency room patients required immediate attention while only 44 per cent required very early attention. The Lee study also indicated that at the Beth Israel Hospital in Boston emergency room patients came from every socio-economic group.[35] It has been indicated in various articles appearing in professional journals that many private physicians are worried about the competition provided by so-called emergency services. Many hospital administrators also feel it is unfair for doctors to use the emergency room for minor surgery on weekends or to save time, to have the benefit of the hospital's resources, to accommodate the patient's convenience, to allow for possible emergency factors, without any compensation paid to the hospital.

The sheer increase in numbers of persons who are using and will use ambulant facilities raises questions about the best way physically to accommodate their needs. Does the outpatient belong in the same building as the acutely ill bed patient?

It would seem fair to state that outpatients are often uncomfortable around very sick inpatients. If economically feasible, this would indicate a need for

separate diagnostic facilities, entrances, and so on. By the same reasoning, some solution must be found for the undue use of the emergency department for nonemergency medical care.

In summary, we have a heritage of fragmented programs and isolated facilities. Existing mental health services are separated from physical health services, specialized clinics are separated from general hospitals, and rehabilitation services are separated from homes for the aged. Special funds are available for the study and treatment of heart disease, strokes, cancer, birth control, and mental illness, but no money is available for the coordination of these efforts and no money or organization exists for focusing on the health needs of the individual. There is increased need for the treatment of the ambulant patient in terms of preventive medicine and early diagnosis, but no plan has been worked out to handle the problem. There are two major issues facing the hospital system: 1) how to increase the scope of the system to include medical care for all stages of health and illness; 2) how to solve the internal problems of the hospital organization which, despite the tremendous medical achievements, leaves much to be desired with respect to both patient care and economics of service.

CHAPTER II: FOOTNOTES

1. George Rosen, "The Hospital: Historical Sociology of a Community Institution," The Hospital in Modern Society, ed. by Eliot Friedson (New York: The Free Press of Glencoe, 1963), p. 3.

2. Florence Nightingale, Notes on Hospitals (3rd ed.; London: Longman Green, 1863), p. 23.

3. Ibid., p. 13.

4. Samuel W. Bloom, The Doctor and His Patient (New York: The Free Press, 1965), p. 150.

5. Henry C. Burdett, Hospitals and Asylums of the World (London: J. & A. Churchill, 1893), IV, p. 33.

6. Florence Nightingale, op. cit., p. iii.

7. Ibid., p. 36.

8. M. H. Silver, R. F. Manegold, and J. E. Gartland, "The Emergency Department Problem: An Overview," Journal of the American Medical Association, 198 (October 24, 1966), p. 146.

9. R. M. Magraw, Ferment in Medicine (Philadelphia: W. B. Saunders Company, 1966).

10. U.S. Department of Health, Education and Welfare, Hospital Emergency Service: Criteria for Organization, Public Health Service Publication No. 930-C-3 (Washington, D.C.: U.S. Government Printing Office, 1963).

11. M. H. Silver, op. cit.

12. C. R. Rorem, Physicians Private Offices at Hospitals, Monograph 4 (Chicago: American Hospital Association, 1959).

13. For detailed plans and description of this hospital, see "Bristol Builds a Living Memorial," Modern Hospital, 77 (July 1951), pp. 55-58.

14. Richard M. Macgraw, op. cit., pp. 165-67.

15. Basil S. Georgopolos and Floyd C. Mann, The Community General Hospital (New York: The Macmillan Co., 1962), p. 604.

16. E. J. Lieberman and L. J. Duhl, "Physical and Mental Health in the City," The Annals of the American Academy of Political and Social Science, 352 (March 1964), p. 14.

17. Martin L. Gross, The Doctors (New York: Random House, 1966), pp. 33-37.

18. E. J. Lieberman, op. cit., p. 17.

19. U.S. Department of Health, Education and Welfare, Physicians for a Growing America, A Report of the Surgeon General's Consultant Group on Medical Education (The Bane Report), Public Health Service Publication Number 709 (1959).

20. U.S. Department of Health, Education and Welfare, Health Manpower Source Book: Manpower in the 1960's, Public Health Service Publication Number 263, Section 18 (1964).

21. Ibid.

22. E. R. Weinerman and P. S. Snokle, "Comprehensive Care Programs in University Medical Centers," Journal of Medical Education, 40 (July 1965). p. 646.

23. E. R. Weinerman, "Changing Patterns in Medical Care: Their Implications for Ambulatory Services," HOSPITALS: Journal of the American Hospital Association, 39 (December 16, 1965), p. 67.

24. HOSPITALS: Journal of the American Hospital Association, 39 (August 1965), p. 441; Ibid., 40 (August 1966), p. 432.

25. U.S. Department of Health, Education and Welfare, Health, Education, and Welfare Trends, Annual Supplement, Part I (1965), p. S-22.

26. Martin L. Gross, op. cit., Chapter V.

27. Henry K. Beecher, "Ethics and Clinical Research," The New England Journal of Medicine, 274 (June 16, 1966), pp. 1354-1360.

28. Basil S. Georgopoulos, op. cit., pp. 7-8.

29. Ibid., p. 8.

30. Leon Lewis, Hospital Hazards, Report Number 10 of the Illinois Hospital Association (Chicago: February 23, 1961), p. 26.

31. G. E. Miller, et al, Teaching and Learning in Medical School (Harvard University Press, 1962), p. 26.

32. Florence Nightingale, Notes on Nursing (Boston: William Carter, 1860), p. 46.

33. George Bugbee, "The Future in Health Services: Changing Values in the Search for Perfection," HOSPITALS: Journal of the American Health Association, 39 (December 16, 1965), pp. 46-49.

34. State of California, Hospital Licensing Act and Requirements (Berkeley: Department of Public Health, 1962), p. 487.

CHAPTER III: GOALS, CONSTRAINTS AND SIZE DEFINE THE BOUNDARIES OF THE HOSPITAL

Before it is possible to plan any medical facility, it is necessary to understand the goals of the medical institution, to know who the patients will be, what procedures will be used for medical care, how many patients are anticipated, what resources are available to take care of these patients, and what alternate methods can be employed to make the most effective use of these resources. Answers to such questions must be sought by all planners concerned with the physical,economic, organization, or medical aspects of the problem. Since the components of a medical system act together like the pieces of a giant kaleidoscope, a shift in the value of one component changes the entire pattern; it is therefore, imperative that all components be planned together. It is the decisions reached prior to the time the architect sets pencil to paper that most often affect the resulting form.

New Hospital Goals

In the previous chapter we mentioned some of the problems facing hospitals. Among these were the rising costs, the shortage of personnel, the indiscriminate mixing of the ambulant and the ill patient, the vacancy in some specialties and the overload in others, the misuse of beds used for diagnostic and rehabilitative purposes because of lack of other facilities, the poor facilities to accommodate the health needs of the urban poor, the old buildings, and the difficulty of adjusting the plant to the rapidly changing medical demands.

Because of these horrendous problems many persons within the administrative, medical, public health, planning, architectural, and nursing professions are projecting a new role for the hospital. Until now the generally accepted role of the hospital has been to cure diseases, repair injuries, and facilitate births, with a minimum amount of death and damage. Chronic hospitals have had the additional goal of providing custodial care for long-term or incurable

patients. Now there is a new awareness among hospital planners of the necessity for extending the function of the hospital to include comprehensive health services available to meet the totality of a person's health needs, and to do this regardless of a person's economic circumstances.

With the rising costs of hospital care, the crass reality of the situation in economic terms (let alone in terms of human values) is that it is more economical to treat an illness early while the patient is still ambulant, where this is possible, than it is to wait until he becomes acutely ill. This has been aptly stated by Dr. David E. Price, Deputy Surgeon General of the United States Public Health Service:

> One of the ways to economize on medical time and effort is to emphasize health maintenance. A disease detected in its early stages can usually be checked with a minimum investment of service. Its serious and disabling effects can be prevented and minimized, thus eliminating a long-term patient from the roll call.[1]

In the past the urban hospital has salved its conscience and borne its responsibility to the urban poor by treating them for free or at nominal rates at clinics. Many hospitals established clinics to which doctors devoted their time free of charge for several hours a day or week. The Puritan ethic helped to generate the attitude of "don't give them too much without payment." Now Medicare is turning a large section of the urban poor into paying patients, and the increased use of health insurance of all kinds is adding to the number of patients that are able to pay. In the opinion of many medical care experts, it is only a matter of time before the indigent patient, as such, is eliminated altogether. Another developing objective, therefore, is to remove any trace of the look of a "charity hospital" from any hospital no matter where subsidized.

On the importance of studying the hospital as a total health system, Dr. Edwin L. Crosby has stated:

> The concept of the hospital as a collection of physical facilities and the personnel necessary to provide medical care within its building or group of buildings is no longer

> viable. Whether we are dealing with an individual facility or a group of facilities, we cannot treat one aspect of the health system in isolation from its other aspects. Today the hospital must be seen not only as a physical facility but as an organizer of all the medical resources necessary for maintaining the health of the individual. This means that the hospital must reach beyond its own legal responsibilities and cooperate with other agencies and services for the benefit of the patient.[2]

Hopefully, this will lead to a program for prevention of illness as opposed to the idea of a hospital accommodating only the acutely ill.

This need for a change in emphasis from provider of care to promoter of health was verbalized by Dr. J. M. Stubblebine, Director of Mental Health, City and County of San Francisco, in the following manner:

> . . . community mental health services must be centripetal rather than centrifugal. The professionals, and in some cases the nonprofessionals who are actually rendering the service, must go out into the communities and neighborhoods to meet patients and clients rather than remaining in the center and waiting until the consumer comes to the service.[3]

Emphasis on the promotion of health rather than the provision of care requires quite a different orientation for the hospital. The President of the International Hospital Federation discussed this shift in goals in the following manner:

> . . . we have been largely and sometimes exclusively . . . preoccupied with the development of the best hospital care for the ill inside of hospital walls . . . and now we come to the second revolution . . . this hub, the general hospital cannot function independently of the other elements within the circle of organized health care activities . . . In other words we have looked inward too long now we have to look outward.[4]

How will this outward look affect the physical hospital? Will the image shift from fortress to market place? If the work of Hermann Field at Tufts New England Medical Center at Boston is any prognosis of the future, the hospital is going to entice and invite. Discussing new design concepts for urban hospitals, he projects that the hospital

> will open up neighborhood interchange rather than perpetuate a normal versus sick side of the street, that will bring downtown commercial life into the hospital setting with shopping arcades, that will separate the work of the car from that of the pedestrian, that will seek out recreational nursery school and nighttime community functions as shared facilities.[5]

The more the hospital is seen as the generator and focus for comprehensive medical care, the more difficult it will be to differentiate between the role and goals of the hospital and those of the total health system. It is becoming increasingly difficult to say with any specificity that x is the job of the hospital, y is the job of the public health department, and z is the job of the doctor.

The purpose here is not to speculate on whether the hospital will be the organizational or administrative director of medical care within a given region, city, or suburban area, but rather to determine to what extent the increased complexity and cost of providing medical care requires planning on a community-wide or regional basis in order to eliminate the waste and duplication of overlapping services regardless of who directs them. It is obvious that unless there is conservation of manpower and facilities by coordinated planning, it will be impossible to provide the needed medical care. The 1960 census indicates that 70 per cent of this nation's population lives in urban and suburban areas, with increasing numbers of nonwhite, aged, and indigent occupying the former, while the white, young, and affluent are moving to the latter. The health needs of both the urban and suburban population must be satisfied in terms of all their health needs, preventive and curative.

We have shown historically that the practice of modern medicine has required the resources of the hospital for many aspects of medical care. But as more diagnosis and treatment are given to the patient while he is still ambulant, perhaps other forms of medical organization will substitute for the hospital. It was one thing for the hospital to share its facilities between

in- and out-patients when the outpatients were a relatively minor component of the total patient load, but it is quite another thing to plan for the joint use of diagnostic and treatment facilities when the majority of patients are ambulant. Our approach to the problems of designing hospitals is based on the recognition that the hospital is only one part of a total health system which also includes doctors' offices, public health clinics, mobile health trucks, nursing homes, medical schools, research laboratories, and the like.

In establishing the boundary conditions of a particular design, it is necessary to determine the relationship and the responsibility of the hospital to the various preventive and ambulatory health requirements and then develop the design program for the individual hospital.

The issues involved and the design implications of these changing hospital objectives will be discussed in greater depth in the chapters on user requirements and uncoupling the hospital system.

Despite the changing role of the hospital and the extension of its definition of responsibility, there are still many traditional objectives of hospital design and operation as well as many traditional constraints which will continue to set design objectives and influence design decisions.

Different Types of Hospitals Have Different Objectives

It has been commonly recognized that there are different types of hospitals which play quite different roles in the health system. The requirements of a teaching hospital, for instance, are quite different from those of a community general hospital. A teaching hospital needs to play for patients who will provide the whole gamut of diseases, since the students have to learn about all of them. A community hospital may not care to treat all diseases because this would involve having expensive equipment for diseases only minimally represented in the community population. A teaching hospital would thus admit a patient with a rare disease where a community hospital might send the patient

to a hospital specializing in that disease. Teaching hospitals have to have student facilities, meeting rooms, lecture halls, libraries, and rooms for examination of patients--none of which are usually needed by a community hospital. A teaching hospital may prefer to group patients by disease, while a community hospital may prefer a random grouping. The differences are best expressed statistically. A teaching hospital requires on the average an area of about 1,200 square feet for each bed, while an acute general hospital generally requires only 800 square feet. Just as the teaching hospital has distinctive goals, so do other special types of hospitals, and these distinctive goals have to be identified in the development of an architectural program.

Efficiency as an Objective

The stated objectives of a hospital generally come to the architect as a mixed-up bundle of ends, means, and constraints which state that the hospital should be homelike, efficient, flexible, and planned for maximum utilization.

The question of efficiency of the hospital as an objective is raised so frequently and is considered so important to the over-all functioning of the hospital that I should like to dwell on this aspect at some length. In the first place, measures of efficiency are not at all clear. In the design of hospitals, efficiency has most often meant a design that requires a minimum amount of walking for doctors and nursing staff. The saving of a doctor's time, for example, is considered an efficiency measure which gives him an opportunity to treat more patients and thus affect a greater number of cures. The Yale Index measures efficiency by determining the cumulative distance walked by the nursing staff on one shift.[6] Implicit here is the idea that time spent walking could be used more effectively in giving better patient care and that, moreover, too great walking distances can create bad staff morale. It is concluded that if two hospital plans are in all respects equal except that one involves less staff walking, then, obviously, one is more efficient than the other. But this

is a gross oversimplification. As a matter of fact, there are no cases where all the variables of two different hospitals are the same, and using walking distance as the sole criteria of efficiency ignores all the other factors which affect working time and the morale of nurses.

Walking distance as an efficiency criteria for determining nursing staff productivity may not even be the best measure. Nursing staff turnover, i.e., how long nurses stay at a hospital before changing employment, is probably a more sensitive over-all indicator of staff happiness and productivity (the longer the stay, the less the amount of time spent on costly and unproductive training, accounting, and so on). Since nursing staff productivity is only one of the factors contributing to better patient care, it is conceivable that a plan with small walking distances might have great inefficiencies in other key areas. To the limited extent that they are concrete and quantifiable, indicators of the achievement of primary goals of the hospital are mortality rates, readmission rates, length of stay, number of unnecessary operations, and so on.

When infectious diseases were the primary complaint, it was proved empirically that there was a correlation between certain physical relationships of buildings and the reduction of hospital infection. These relationships became, then, the criteria for planning. No one has ever demonstrated that reduction of walking distance for the staff has any measurable influence on these indicators, despite the general assumption that it does. Even if time were saved by short walking distances, there is no assurance that it would be used for additional nursing work. Many occupations and unions, formally and informally limit the amount of work an employee can produce in a day. The limit may be enforced by a contract or by social pressure. The limit holds regardless of the efficiency of the work environment.

I have belabored the matter of walking distance as a measure of efficiency because I do not subscribe to the view that it is the basic criteria for evalu-

ating the effectiveness of one plan over another. Of course, walking distances have to be within reasonable limits for doctors and nurses, but within these limits there are many additional factors that should go into planning decisions for efficiency. Distance is an easily measurable quantity and consequently latched on to as a measure, yet some of the other factors that also affect efficiency and morale, such as "pleasantness," are not measurable in the same way. The distance-efficiency criterion has been so overemphasized that it is standing in the way of searching for other design criteria and alternatives.

Increased Utilization as an Objective

Another demand often referred to as an objective is the increase in the hospital utilization rate. The demand for greater hospital utilization usually refers to the desire not to have unused hospital beds, that is, a desire to eliminate excess capacity. Other areas of the hospital, however, also have utilization problems. Objections by many hospitals to the acquisition of expensive facilities and machines, such as cobalt bombs, computers, and X-ray machines, are based on the fact that most hospitals do not have a sufficiently large work load to make full use of this equipment. The desire to have physicians perform duties which only they can do, instead of performing services which nurses also could do, is likewise a utilization question. Given the money and manpower shortages confronting our health system, high utilization rates are generally desirable. However, as with efficiency, improving utilization is not a simple problem.

A high rate of hospital bed utilization can indicate many things. It can be an indication of accurate planning, reflecting an accurate estimate of the demand for inpatient services. It also can be an indication, however, that beds are being filled with patients who do not really need hospitalization. Or it can indicate an unsuccessful community health program, since a successful program generally should result in a reduction in the number of people needing

hospitalization. Finally, a high bed utilization rate can indicate that there is an insufficient reserve capacity of beds for emergencies and major catastrophes. Hospital facilities are comparable to fire fighting facilities to the extent that both characteristically have a large, normally unused capacity reserved for exceptional emergencies. A fire department that could not handle an unusually large fire would not be considered satisfactory and neither would a hospital that could not handle an unusually large epidemic or disaster.

Utilization per se cannot be considered a legitimate hospital goal. The hospital has to be concerned with utilization for specific health purposes, and low utilization may be the best way of achieving the goal. Finally, the "trade-offs" from utilization have to be considered. High utilization bought at the expense of unnecessary patient hospitalization is bad, and low utilization which produces higher quality manpower may be good.

Objectives of Constraints

A first necessity for the architectural programmer is to differentiate between goals which can be accomplished and goals which because of money, law, technology, site and image or other reasons, are beyond the realization of a specific project. Site, local building codes, available technology, cost, existing facilities, and, particularly, existing ideas of what a hospital should be like, act as constraints on a project. Thus, very small building sites dictate the use of vertical buildings; it is impossible to plan for a hospital with a great amount of horizontal floor area if the site is too small to permit it. One cannot get federal or state money if the regulations of these bodies are not adhered to, unless changes in the laws or variances can be obtained. Available market products also limit the design organization. It is necessary to evaluate constraints so that those which can be overcome will be fought and eliminated. Laws can be changed, zoning altered, products developed on the basis of performance specifications, images transfixed, and

sites added to or changed. Before a physical plan can be developed, which objectives are possible of accomplishment, which have priority, which means are related to real rather than irrelevant objectives, which means have substitutes, and which constraints can be breached, must be determined.

The influence of the architect on design is quite minimal in comparison to the influence of economics, technology, culture, geography, habit, and law. The New York sky line is the product of zoning regulations and the economics of land rather than considerations of spatial design. The form of the sky line can be influenced by obtaining zoning variances and mortgage money much more quickly than by spending hours at the drawing board. Every homeseeker knows that it is the cost of money rather than the cost of construction that makes possible the ownership of the "dream house." The spurt in hospital construction from the end of World War II until today is the result of financing under the Hill-Burton Act rather than design innovation.

Differentiating between realizable objectives and true constraints is a problem common to many fields. In the field of water pollution, Allen Kneese has outlined some rough means for distinguishing between goals and constraints:

> The distinction between objectives and constraints can be somewhat troublesome when politically determined constraints are involved. 'Technological' constraints, which set the physical framework within which maximization (or minimization) is carried out, are usually fairly clear-cut. In a pollution problem such a constraint might be that water cannot flow uphill. Public policy constraints, however, can be viewed as requirements set on certain results which constrain the effort devoted to the attainment of others (objectives) . . .

As a generalization, the following distinction has been proposed.

> A practicable distinction between constraints and objectives might go as follows: A requirement is a constraint if (a) it must not be violated at any cost however high or with any probability however low, and (b) if there is no gain or advantage in overfulfilling it. On the other hand, a requirement is one of the objectives of the firm if it can be violated, though at a cost or penalty, or if there is an advantage in overfulfilling it. Obviously, politically determined constraints often do not fully meet the rigorous conditions

> described . . . Hence the great importance of not considering constraints immutable and of testing the sensitivity of costs to them.[7]

Another example comes from my own experience in the conceptual development of the new San Francisco General Hospital. The original bond issue posed as a constraint that the hospital remain in operation during the total construction period. This constraint was construed by the authorities to mean that no beds were to be moved, and the construction site allocated for the hospital building was selected on this premise. The site was totally inadequate for the purpose and its acceptance would have meant shoehorning a thirty-three million dollar hospital into an almost unbuildable space. By refusing to accept this constraint and by examining the site alternatives, we were able to propose a solution that, while it required the moving of some beds, would obviously produce a better building site. On this basis we were able to persuade "the powers that be" to re-examine their original interpretation of "remaining in operation," with the result that we were permitted to plan the hospital for occupation on the superior building site.

Frequently, constraints themselves are objectives. The budget that is a financial constraint also becomes an objective--the objective of spending only so much money. No matter how exciting the program projected for a new hospital, the scope can be only as large as the budget. Money, in the form of a capital budget or an annual operating budget, may also measure hospital size. The architect's instructions may not be "build a 500-bed hospital," but, rather, "build a $5,000,000 hospital." Within the limits of a budget, plant size and service volume can vary considerably, because size alone does not determine cost. It is simple arithmetic, for instance, to figure out that two buildings of the same size may cost quite different amounts; type of construction, quality of finish, cabinet work, type of mechanical equipment, degree of flexibility, and so on, can double the cost of a building. Cost per square

foot is therefore a meaningless statistic unless it is related to a specific building project. Building within a budget can at best be described as merely a negative goal, however, and an architect who calls for a reappraisal of the almost universal practice of setting budget limits prior to planning argues that

> to begin with, we must break the shackles of the preconceived notions of capital costs. Before establishing a budget we must first design the kind of facility we decide we need, and afterwards, from such design, estimate its probable cost. Is not this the method which is correctly used in space exploration? We first design the spaceship to meet specifications and afterwards determine its cost. Once we have removed the shackles of the predetermined false budget, we can let our minds explore the possibilities consistent with our ingenuity and technology. This has not happened because nobody that I know of really dared challenge the budgeteers and legislators.[8]

Scope of Service and Corresponding Size Define Hospital Boundaries

It is impossible to design a hospital until there is a clear definition of who is to be served and what service will be offered. To establish this meaningfully requires that the medical needs of a region be determined by a careful analysis of the age, sex, and ethnic composition and economic status of the people in the area, coupled with the health patterns particular to that region. Simultaneously, a careful inventory must be made of available resources in terms of manpower and facilities and the type and quality of medical care that is currently provided. Based on the relationship of a given population to a given set of medical services, it is possible to evaluate the present gaps and inadequacies and thereby determine the scope of service for a new facility. With so many factors to consider and with some factors very difficult to estimate or project, the job of estimating future hospital requirements and size is not one which can easily be performed by an architect or even by the staff of a single hospital. Sophisticated statistical projections must increasingly be the responsibility of the National Center for Health Statistics and regional hospital planning bodies. Since we are a long way from a comprehensive, integrated health service system, however, the hospital as an entity

still has to determine its specific objectives so that the architect may plan for them.

The nature of the services, both new and expanded, that a community requires is not so much related to the numerical statistic of the population as it is to the make-up of the population. Notably, a young population will require large obstetric facilities and pediatric services, and an older population will require a higher percentage of facilities to care for chronic ailments. Ethnic or cultural attitudes toward illness also are important. The Dutch, for example, prefer to deliver babies at home, while the Swedes prefer hospitals for this purpose. Climate and industrialization can affect demand. Obviously, mobidity and accident rates are among the primary factors determining demand. On the supply side are (1) the availability of alternative facilities, such as nursing homes, half-way houses, and home care; (2) the extent to which outpatient facilities are available; (3) the development of new treatments which promote hospitalization and, conversely, the development of new treatments which shorten or discourage hospitalization; and (4) the extent of public health and preventive health services.

Hospital Size

Decisions cannot be made concerning organization, method of operation, or spatial configuration, unless there first is an understanding of the size of the enterprise to be dealt with. Unfortunately, decisions about institutional size frequently are made without a clear conception of the manifold implications of size on every aspect of the architectural program and the architecture itself. A 50-bed hospital, a 200-bed hospital, a 900-bed hospital, and so on, vary enormously in the scope of services they offer.

The size of a hospital has customarily been defined by the number of its beds, since they have been used as the physical measure of the hospital's volume of service; the tremendous advance in the treatment of patients while they are

ambulant has altered the picture, however. The size of diagnostic and therapeutic facilities is no longer correlated with the number of beds in a hospital, but, rather, with the number of outpatients served. In other words, the measure of hospital size has shifted from a physical unit to a service unit.

Geography, thus, can be a determining factor of hospital size either in terms of the area the hospital services or in terms of the distances between the physical units of the hospital. For the "hospital" providing home care and mobile services to schools and work situations, the size of its physical plant may be less significant than the area it services.

The implications of size for the shape and function of animals and plants were made clear by D'arcy Wentworth Thompson in his monumental work On Growth and Form, first published in 1915:

> To terms of magnitude, and of direction, must we refer all our conceptions of Form. For the form of an object is defined when we know its magnitude, actual or relative, in various directions . . . The effect of scale depends not on a thing in itself, but in relation to its whole environment or milieu; it is in conformity with the thing's 'place in Nature,' its field of action and reaction in the Universe. Everywhere Nature works true to scale, and everything has its proper size accordingly . . . nor can Nature grow a tree or construct an animal beyond a certain size, while retaining the proportions and employing the materials which suffice in the case of a smaller structure. The thing will fall to pieces of its own weight unless we either change its relative proportions, . . . or else we must find new material, harder and stronger than was used before . . .[9]

The circular hospital is a case in point. It first came into vogue in an effort to provide an efficient nursing station. The nurse sitting in the center of the circle could easily see into all the surrounding rooms and could reach any patient with a minimum number of steps. But the shape and efficiency of the circular hospital are closely related to the size of the circle. As the circle of bedrooms is increased, the size of the interior core increases. In a relatively large circle the core becomes so large it is necessary to use it not just as an open corridor and nursing station but also to house other

hospital facilities. These facilities, in turn, block the view of the nurse and increase her walking distance. Thus, when the size of the circle has become too large, the efficiency of the shape has been lost, as well as its validity as a defining form.[10]

J.B.S. Haldane has drawn an analogy from animals, applying it to human institutions:

> Just as there is a best size for every animal, so the same is true for every human institution. In the Greek type of democracy all the citizens could listen to a series of orators and vote directly on questions of legislation. Hence their philosophers held that a small city was the largest possible democratic state. The English invention of representative government made a democratic nation possible and the possibility was first realized in the United States and later elsewhere. With the development of broadcasting it has once again become possible for every citizen to listen to the political views of representative orators and the future may see the return of the national state to the Greek form of democracy. Even the referendum has been made possible only by the institution of daily newspapers.[11]

Many false conclusions have been made from the works of Thompson and Haldane. Their point is not that bigness or smallness by themselves are good or bad; rather, the point is that function, form, organization, and size are interrelated both in nature and in human institutions.

Is There an Ideal Hospital Size?

Hospital planning authorities have reached no agreement on an optimum size for hospitals. The psychiatric field is currently filled with various proposals for eliminating, or at least reducing in size, the large rural asylums, and for redistributing patients among a larger number of smaller urban general hospitals and mental health centers. Hermann Field, Planning Director of Tufts New England Medical Center, feels that a pediatric hospital should not be larger than 300 beds.[12] The California State Plan for Hospitals says that for service areas with 100,000 or more people, the <u>minimum</u> hospital size should be 150 beds. This plan sets no upper limit for hospitals and sanctions smaller

hospitals in less populated areas.[13] Walter McNerney, President of the Blue Cross Association, said "the ideal size for a hospital is somewhere between 200 and 2,000 beds."[14] Martin Cherkasky, Director of Montefiore Hospital in New York City, has proposed that New York City hospitals be organized into 8 groups, with each group having 3,600 to 5,200 beds. Each group would contain 1 medical school, 2 core hospitals of 1,000 beds each, and 8 neighborhood hospitals with a size ranging from 200 to 400 beds.[15] Even in densely populated areas, then, under this plan, there may be valid arguments for a few small hospitals, because specialized services would be available in the large core hospitals. In other words, administrative size can substitute for physical size.

The proponents of a maximum limit on the size of hospitals usually argue that if hospitals grow too large (no clear definitions of excessive growth are provided) they are less efficient to administer, more costly to operate, unpleasant in appearance, and too impersonal.

Studies have been made by the Nuffield Trust in England that militate against the first three arguments:

> . . . an attempt was made to discover whether there was any discoverable relation between size and running cost for hospitals. This was based on British and United States data on running costs. The results were entirely negative--no correlation of any kind was found between size and running cost . . .
>
> Prima facie, . . . we must expect that the increase in mechanisation and automation will in hospitals, as in other fields, tend to favor the large unit, which can best take advantage of technical progress . . .
>
> It can be demonstrated that the capital cost of new hospitals will be reduced by planning large units, which can share certain centralized services, and that the cost of providing heating, lighting and engineering maintenance will be lower for a large unit than for two or more separate units giving a similar total service . . .
>
> . . . appearance is a consequence not of absolute volume but of the way the bulk is distributed.[16]

The argument concerning impersonality might, at first blush, seem to have validity, both for the outpatient and the inpatient. For example, Anselm Strauss in his report, "Medical Organization, Medical Care and Lower Income Groups," said that he found low-income families are uncomfortable when in unaccustomed contact with large institutional complexes:

> A great portion of low income patients (especially in urban areas) are serviced at municipal and county hospitals. These facilities typically share certain characteristics--frequently the hospital is very large and may even be spread among separate buildings. As a consequence, these hospitals and their accompanying outpatient clinics are easily imagined by patients to be terribly massive and complex, crowded, and busy; while the personnel seems often impersonal, brusque or even insulting.[17]

This impersonality no doubt is related to the scale of the operation, but the problem does not necessarily stem from sheer size alone. Rather, the problem is one of how the size is handled. When the lines at the San Francisco International Airport are too long, special "stewardesses" are assigned to see that people who do not have to be in line are properly informed. Large hospitals can develop their own techniques for providing social warmth if they want to. In this connection, Richard Llewelyn-Davies, referring to the findings of the Birmingham Study, reported that

> The broad conclusion reached is that statements as to the disadvantage of exceeding certain sizes are all related to administrative or architectural structures and have no absolute meaning. While it is certainly true that within the limits of any one administrative system or architectural design there may be a maximum size, it does not follow that the problems of large hospitals cannot be met by starting again and designing the administration, and the architecture, to fit the new scale. It was, therefore, concluded that there was no need to draw back from the idea of very large hospitals if these seem to be an advantage from a broad medico/social point of view.[18]

Other arguments in favor of large hospitals are that they allow for diversity, specialization, and better facilities. Expensive equipment can be justified only by a large hospital which uses it extensively and efficiently. Without a large patient population, staff specialization is not possible. And

without a large staff it is impossible for a hospital to have a variety of types of doctors. The relationship of size to the quality of medical care is a ticklish question. Small institutions cannot provide the services that are found in larger institutions. Intensive care units, for instance, are found in only 13 per cent of hospitals with 50 to 100 beds, but are offered in 90 per cent of the large hospitals. Home care is sponsored by 1 per cent of small hospitals, while 50 per cent of the larger hospitals offer this additional feature. Social service is found in 4 per cent of the smaller but 85 per cent of the larger hospitals.[19] These statistics surely suggest that care is better and fatality rates lower as hospitals become larger and specialization increases. On this basis, it would seem that comprehensive planning on a scale that takes advantage of the rapidly expanding amount of information on techniques and procedures related to health is both feasible and needed if the problems presented by the increase in population, rising medical costs, and difficulties of meeting health manpower shortages are to be resolved in a manner that will provide an adequate supply and distribution of health services.

The Number of Beds

For care of the inpatient, the meaning of hospital size involves both a unit size, i.e., the number of beds in a ward, and the number of units, i.e., the number of wards in the hospital. Both the size of the units, be they wards, laboratories, or doctors' offices, and the number of units, can vary. Confusion between unit size and the number of units has been one of the reasons for doubts concerning the feasibility of large hospitals. We fear that patients will be disturbed by the coldness and overwhelmed by the size of internal social and spatial relations in a large institution. But

> the inpatient lives in a world composed of quite small numbers of others. The limits of this social field are provided by the four or five patients who are immediately adjacent, the doctor, nurses, and one or two others. Out-

> side this field it is not specially significant whether there are two hundred or two thousand other patients in the hospital.[20]

Flexibility and the Provision for Growth and Change as an Objective

A fundamental concept which has affected the design of hospitals is the grouping of facilities to allow for increase in size of the hospital and varying growth rates within hospital departments.

The provisions for growth and expansion, as well as for flexibility to accommodate change, are high priority objectives. In general, growth refers to the addition of required areas and spaces; change refers to the rearrangement or reorganization of given spaces. However, it is not always possible to keep them separate. Growth is a particular type of change, and it is frequently accommodated by rearrangements and reorganizations of existing spaces. The accelerated tempo of change in methods and techniques of medicine makes hospital decision-makers reluctant to commit themselves to one particular organization of services and one particular set of facilities because of fear of the radical changes in machinery, techniques, and procedures that are constantly occurring. There are different ways in which the need for changes in the layout of hospitals and parts of hospitals has been accommodated. For example, the development of heart surgery required changes in equipment, area, size, and procedures. These needs were met in many hospitals by altering the existing surgeries. In the case of special procedures needed in radiology, adaptations at first were made within the confines of the traditional radiological suite. By shifting walls, moving plumbing, and so on, it is usually possible to handle the early stages of new procedures and techniques within the existing departmental configuration. As a new medical procedure or development gathers momentum, however, minor changes prove to be inadequate. Instead, an entire department may need to be totally reorganized and redesigned. This type of change is frequently accompanied by expansion. X-ray therapy in most hospitals, for

instance, was traditionally a part of diagnostic radiology, but today the new X-ray procedures have changed the nature of radiology so drastically that in some hospitals they have required the development of an entire new department. Another type of change occurs when the new functions are of such a nature as to make impossible the reorganization of the existing structure to accommodate them. It then becomes easier to start from scratch and rebuild the section or, in some cases, the entire building.

The internal parts of a hospital vary in their rates of obsolescence. The bedroom has remained relatively unchanged over the years, while equipment, organization, and size of the diagnostic and service units have been constantly in flux.

Because architects have known that the diagnostic and therapeutic facilities are growing the most rapidly, they have located these facilities on the ground floor. The relatively slow-growing inpatient areas were located in a tower that could be expanded, if at all, only by the addition of whole floors. Locating the ancillary departments on the ground floor gave both inpatients and outpatients relatively easy access to these facilities. Frequently, so-called soft ware, such as lockers or movable facilities, were located next to the ground floor hardware of the radiology and surgery departments. The latter could then be easily expanded by the elimination or movement of the former. Also, the hospital frequently was located in the center of the site so the ground floor facilities could be expanded horizontally. While this arrangement has served well in the past, the continued growth of outpatient departments and diagnostic and therapeutic facilities has opened up the possible need for new solutions.

Historically, mechanical obsolescence has occurred at a faster rate than structural obsolescence. The same houses in Williamsburg, Virginia were adapted from candlelight to gaslight to electricity and now have become air-

conditioned without change in their basic structure. Palaces in Europe are constantly being renovated and improved with new mechanical and power systems. In Siena, an ex-palace is now a modern hospital where kidney transplants are performed. What the palaces in Europe, the Williamsburg houses, and the flexible American factory have in common and what makes them so adaptable over time are large unobstructed spaces which can accommodate the introduction of new mechanical equipment and the rearrangement of internal parts. Hospital personnel often request movable partitions to accommodate new spatial arrangements of activities. Such partitions are easy to provide.

The mechanical and electrical systems are more difficult to design in a manner which allows for change. These systems account today for more than 50 per cent of the total cost of hospitals, doctors' offices, and laboratories. The spatial flexibility achieved with movable partitions is of limited value as long as it is not integrated with mechanical and electrical facilities: if a sink cannot be moved, little is gained from moving the wall behind it. Two successful examples of spatial and mechanical flexibility are to be found in the school designs developed by the Educational Systems Development Corporation, and in the design of the Salk Institute in San Diego, California. In the school design the air-conditioning and electrical services are designed so as to easily accommodate changes in the partition system. In the latter, flexibility was achieved by devoting an entire floor to the mechanical and electrical systems inbetween the floors used by personnel.[21] Generally, there are no technical problems interfering with the achievement of spatial, mechanical, or electrical flexibility. It is just a question of cost, and whether a higher initial cost is warranted to achieve the desired flexibility.

In any system which tries to accommodate growth and change, it must be recognized that there are limits to the amount of growth and the degree of change which can be planned for. Increases in size cannot go on indefinitely

without revisions in the basic method of organization. Size, shape, and function all are interrelated.

Cowan and Nicholson, in a study of British hospitals, found that "areas of hospital buildings had increased by about 120 per cent in 40 years or so."[22] From their study, Lord Richard Llewelyn-Davies concluded that:

> Usually, a new hospital remains without much growth for 10 years or more. During this period one may suppose the additional work load is taken up within the existing building which may have been rather generously sized to begin with. After 10 to 20 years a vigorous building expansion seems to go on, but sooner or later the curve flattens out. This flattening appears to coincide with a decision to move to another site or rebuild the hospital entirely. The very broad conclusion from these studies is that, at least under the circumstances studied, a growth of the order of 100 per cent might well take place between the building of a new hospital and the time when it becomes necessary to move or reconstruct it completely.[23]

We have been successful in designing for and projecting growth patterns for smaller hospitals. Thus, a 50-bed hospital can be programmed so it can eventually grow into a 150-bed hospital; a 150-bed hospital can be planned to grow into a 400-bed hospital, by 50 bed increments, if desired. We have had no success in trying to plan for a 400-bed hospital with the growth potential of 800 to 1,000 beds. At a certain point in size, the organizational requirements become so varied as to prevent the proper function of the organization.

In Summary

Before it is possible to develop an architectural program for a hospital, it is necessary to define the boundaries of the problem. These must include specifications as to the type of hospital, its role within the health picture, and the extent to which it will participate in the prevention of illness and ambulant care. The specific conditions of site and codes must be established. Both the scope of service and the initial size as well as a guesstimate as to the size to be realized over time must be approximated.

Once these parameters are established, alternate developments for the solution can be formulated. The larger the hospital is and the greater the range of services to be provided, the more alternatives there are. This will be further discussed in the chapter on uncoupling the system.

FOOTNOTES: CHAPTER III

1. David E. Price, "The Struggle for Excellence," Journal of Medical Education, 40 (October 1965), Part II, pp. 8-13.

2. E. L. Crosby, "Presidential Address to the International Hospital Federation," Hospitals, 1 (October 1965), p. 429.

3. J. M. Stubblebine, A Survey of Some Urban Mental Health Programs, A Mimeographed Report Prepared by the San Francisco Department of Public Health (1966), p. 2.

4. E. L. Crosby, op. cit.

5. Herman Field, City-Institutional Collaboration in Urban Hospital Planning, A Mimeographed Report of the Planning Office (Tufts-New England Medical Center, 1966), p. 10.

6. Robert J. Pelletier and John D. Thompson, "Yale Index Measures Design Efficiency," The Modern Hospital, 95 (November 1960), pp. 73-77.

7. Allen V. Kneese, Water Pollution: Economic Aspects and Research Needs, A Monograph from Resources for the Future (Washington: 1962), pp. 32-34.

8. Joseph Blumenkranz, "Planning Medical Care Facilities: Present Trends and Future Possibilities," American Journal of Public Health, 56 (October 1966), 1960.

9. D'arcy Wentworth Thompson, "On Magnitude," The World of Mathematics, ed. by James R. Newman (New York: Simon and Schuster, 1956), II, p. 1001.

10. The circular towers of the Kaiser Foundation Hospital, Panorama City, California, are 90 feet in diameter. Consequently, the interior cores of the circles could be left open as central nursing stations. In contrast, the tower of the Saint Francis Xavier Cabrini Hospital in Montreal is 125 feet in diameter with the result that the core is so large that it has to be used for a myriad of internal services. In this case, the value of using the circular form is totally defeated. For plans of these hospitals and a discussion of the problem see Hugh and John Gainsborough, Principles of Hospital Design (London: Architectural Press, 1964), pp. 153-158.

11. J. B. S. Haldane, On Being the Right Size," The World of Mathematics ed. by James R. Newman (New York: Simon and Schuster, 1956), I, p. 956.

12. Hermann H. Field, et al., Problems of Pediatric Hospital Design, A Mimeographed Report Discussing, in Part, the Boston Floating Hospital for Infants and Children (1965), pp. 92-94; 151-152.

13. California State Department of Public Health, California State Plan for Hospitals, A Plan Prepared by the Bureau of Hospitals (Berkeley: California State Department of Public Health, 1962), p. 21.

14. The Modern Hospital, 108 (January 1967), p. 27.

15. Martin Cherkasky, Determining Priorities for New York City: Health Services, A Mimeographed Advance Paper for The Future by Design, a Symposium Sponsored by the New York City Planning Commission (October 1964).

16. Thomas McKeown, et al., A Balanced Teaching Hospital, Published for the Nuffield Provincial Hospitals Trust (London: Oxford University Press, 1965), pp. 72-73.

17. Anselm L. Strauss, Medical Organization, Medical Care and Lower Income Groups, A Mimeographed Report of the University of California San Francisco Medical Center (1966), p. 34.

18. Richard Llewelyn-Davies, "Similarities and Differences in Hospital Design: International Trends," American Journal of Public Health, 56 (October 1966), p. 1677.

19. The Modern Hospital, op. cit.

20. Thomas McKeown, op. cit., p. 73.

21. Architectural Forum, May 1965, pp. 36-45.

22. Peter Cowan and Jill Nicholson, "Growth and Change in Hospitals," Transactions of the Bartlett Society, III, pp. 3-26.

23. Richard Llewelyn-Davies, op. cit., pp. 1680-81.

CHAPTER IV: PATIENT USER REQUIREMENTS

It is our intent in this chapter to examine the needs of the patient users of the hospital system as a basis for arriving at the spatial answers to satisfy these needs. Our concentration on the requirements of the patient as the key hospital user, does not minimize the importance of the role of doctor, nurse, medical student, technician, engineer, administrator, and hospital director, to mention a few. Any institution with a large number of diverse users has a set of complex interacting requirements. The hospital, as an institution, presents a particular challenge as the users--the patients, the medical, and the paramedical staffs--come from all socio-economic groups and their medical and social needs, as well as their evaluation of the hospital environment, is as varied as the cultures and subcultures from which they come. In today's complex environment it is most difficult to isolate the physical component from the multitude of other variables which affect a person's well-being. One can recognize the objectives of the institution, however, and then plan the physical design so that the objectives will meet with minimum interference. This does not assure that objectives will be reached, but it at least can provide opportunities. As an example, the psychiatrist in a general hospital talks of his need for cooperation with the internist, and neurologist in the care of many patients. This interaction between medical disciplines is very slow to come about. If physical barriers such as long distances are put between the main working places of the respective disciplines, it is almost certain they will remain isolated from each other. If there is proximity of working locations, however, as well as opportunities to meet informally for exchange of experiences, there may be a chance they will get together. The design, of itself, will not ensure the interaction of disciplines, but, if the goal is understood, the physical design can at least make easy communication possible.

It is often very difficult for the hospital architectural programmer to determine the information about the user's needs which has most relevance for design decision. It is even more difficult to evaluate this information in terms of a system of priorities.

For certain types of activities there is very little confusion about what the architect needs to know or how he should find it out. To design a parking garage, for example, the architect must know the maximum size of vehicle to be accommodated and the turning radius; he must also know whether the car is to be parked by an attendant or by self-parking, how payment is to be made, how the car is to be retrieved, etc. The architect will need to determine how long people are willing to wait when leaving or picking up their cars and how large a volume of cars will be needed to make money. This is information of a general nature about car parking. The architect will also have to know how many cars the specific garage will hold, the specific patterns of ingress and egress which the streets surrounding the site allow, and the destinations of the garage patrons.

Whether the garage turns out to be a handsome structure or not, there can be no doubt about the relevance of the physical design to the system of operation to be performed in the garage. Regardless of its beauty, a garage would not be considered a success unless a maximum number of cars could be parked and retrieve by a minimum number of personnel in a minimum space and a minimum amount of time. This is the raison d'être of garages.

Each type of building has its own raison d'être, and just as an architect designing a garage must understand its functional and operational requirements, so should he understand the user needs for any other type of building or part of a building he is to design. Let us look more closely at the requirements of the users of the hospital system.

The Patient

The patient cannot be grouped as one unit. Distinctions must be made between the horizontal patient and the vertical patient, the very old and the very young patient, the adolescent patient, the intensely ill patient and the emergency patient, the drunk, the drug addict, the LSD case, the chronically ill patient and the homeless patient. Each of these persons and many others are users of the hospital system. Many of them are users who are one time ambulant, at another time intensely ill, and at another time in need of rehabilitation. These patients in turn could be male or female, old or young, rich or poor, and suffering from a variety of types of medical, surgical, or other conditions.

It is apparent that the patient who requires a bedpan is different from the patient who can walk to the bathroom. The patient who enters the hospital for diagnostic purposes calls for a different set of nursing activities from one brought to the emergency department from an automobile accident. The nursing activity patterns surrounding the different types of patients for the entire hospital stay must be analyzed to determine spatial and organizational needs.

Historically, the usual patient-grouping decision was according to type of illness (e.g., tubercular, maternity, acute, chronic, psychiatric, communicable). In addition, patients have since been and still are grouped according to age, sex, income, social class, race, religion, geography, health insurance, and membership in special groups, such as veterans.

Both physically and administratively, hospitals have been organized on a disease ward basis. Hospital department heads have promoted the physical and organizational separation of their units. This separation is no longer valid. In the first place, disease patterns have changed and in all probability will continue to change. Nursing units built for a given pattern of disease have

resulted in the underutilization of some units and the need for more space in others. A disease orientation for the hospital works against a medical approach which stresses the interrelatedness of diseases and encourages cooperation among medical specialties. With the decline in infectious diseases and the development of the techniques which allow a single room to function as an isolation ward, the traditional justifications for disease-wards have been eliminated.

I would like to concentrate the discussion on the needs of three main categories of patients: the acute patient, the psychiatric patient, and the ambulant patient. I am not minimizing the importance of the convalescent patient, the chronic patient or the patient in an intensive care unit, or other special groups. Each warrants their own study, but I have had more opportunities to study and to worry about the three mentioned patient groupings, and they comprise the majority of patients.

The Acute Patient

The acute patient is that class of patient who is generally in our acute hospitals and is neither in self-care units or in intensive care units. The acute patient's world is circumscribed by the room he is in; the people he is with; and the nursing unit of which the room is a part. He may also be aware of trips to surgery, X-ray, admitting, discharge, but primarily his world focuses on the range of activities within the boundaries of the nursing unit. Design decisions must be made as to the number of patients to be housed in a room, the number of rooms to a nursing unit, and the configuration of both the room and the nursing unit.

The Number of Patients to a Room

Should there be one, two, three, four, six, or more patients in one room? In intensive care units, where ease of supervision and mobility are most

important and privacy least important, the number of patients can be large, often as many as twenty. In other areas of the hospital, however, the trend has been to put only one or two patients in a room having a private bath. Small rooms are considered desirable because they afford privacy. To the extent that it boosts patient morale, privacy does contribute to recovery. However, too often privacy is desired mainly for itself, because it is a status value of the American middle class. Lack of privacy in hospitals is associated with wards for the poor and with low social status. Single rooms do allow for greater flexibility. Any patient can be placed next to any other patient, regardless of sex, disease, or personality. If the single room has a staff anteroom for changing gowns and washing rooms, it even can be used as an isolation room. Single rooms also allow the most flexibility for visiting at all hours without disturbing other occupants.

Unfortunately, this attempt to promote privacy can conflict with hospital economy, with proper supervision of patients, and with other aspects of good medical care. Goldwater and Bluestone, writing in 1922 on the subject of the single room, asked: "Are the chances of care invariably improved, is the period of treatment unquestionably shortened, is the patient's comfort necessarily enhanced, is the safety of the patient always promoted, by placing him in a single room rather than in a larger ward?"[1] They cite examples of patients alone in private rooms who are feverish, confused, timid, ignorant, ". . . normal intelligence often clouded," and of the accidents that happen due to their being unsupervised. They go on to say:

> A hospital which places a sick person alone in a room without immediate and constant supervision, assumes a serious responsibility; the patient who is thus left alone runs a serious risk.
>
> It is the duty of every hospital to provide single rooms for a certain proportion of its ward patients, whatever the cost may be, but let us remember that with every extension of this type of service, additions to the nursing force must be provided as a measure of safety.[2]

Single rooms also have structural disadvantages. They increase the perimeter of the hospital. Each single room requires a window which could provide light and air sufficient for a deeper room with two or three beds. Finally, single rooms may not be good for patient morale despite the importance placed on privacy. Depending on their personalities or ethnic backgrounds, patients may feel insecure and frightened in the hospital, and company, even unpleasant company, may be better for them than none (when a Navajo is taken to a private room it means to him that "he is supposed to die"). Patients without visitors may find the single room lonely. Still other patients may consciously prefer companionship or may be more entertained by watching other people than by reading magazines or watching television.

Most hospital planners have settled on the semiprivate room as being the most desirable way to group patients. My observations indicate that there is less privacy in a semiprivate room than in a room having three or four persons. It is very difficult to remain detached if there is one other patient in a room, whereas, if there are three or more, the amount of sociability required is less demanding.

The Nursing Unit

The typical design of the nursing units of our hospitals consists of two corridors with rooms lined up on both sides and the nursing station and other services in the center. As we have previously stated, the criteria influencing the development of nursing unit planning has been the minimization of distance the nurse has to walk. The nursing unit having the least distance from the nursing station to the most remote bedroom door was considered to be the most efficient. More recent studies reveal that a nurse's travel pattern could more truly be measured by the cumulative distance of all the trips she made. The previously mentioned Yale index was a method for this type of efficiency evaluation. Is distance the really significant measure for nursing

unit effectiveness? There are undoubtedly limits for walking distance, but so much attention has been given to the reduction of a few feet of steps that the really important aspects of nursing unit design have been forgotten. The activities of a nurse cannot be studied unless related to the medical goal of patient recovery. Let us look again at some of the problems which the nursing unit should attempt to resolve.

The lack of direct nurse-patient contact is one of the most prevalent hospital complaints. One of the main reasons for increasing the efficiency of the nursing unit has been to increase the amount of time a nurse can spend with a patient. The patient in a hospital is anxious. The larger number of contacts he has are impersonal. His bed is changed by one nursing aide; his temperature taken by another; and his food is brought by a member of the dietary department. Occasionally he will see the nurse, but the variety of contacts he has creates uncertainty as to who is really responsible for his care. Tender, loving care has been a recognized requirement for patient recovery. Old people particularly require the knowledge that another person is concerned about their welfare. Doctors specializing in the field of geriatrics have said that personal attention can often mean the difference between whether a patient has the will to live or not. The problem is to develop an organizational and spatial form for the nursing unit which will enable the nurse to have greater patient contact and will provide the patient with a sense of identity rather than a sense of being a cog in a large, impersonal wheel. The need for more direct nurse-patient contact is also felt by the nurse. Under current conditions a nurse does not get the gratification resulting from being close to and important for a patient. Instead of actually taking care of the sick, the nurse has become an executive. We know that the function of a nurse changes with the size of her work situation and with the degree of illness of her patients. A nurse with eight patients functions as a companion, a listener,

a personal servant; a nurse with thirty patients functions as an administrator. Larger nursing units are thought to be more efficient, because the nurse-administrator can extend herself by directing less trained personnel. But at Montefiore Hospital in New York City the nurse-companion has been shown to be very efficient, because her style of treatment, which deals with the important psychosomatic aspects of illness, results in an 80 per cent reduction in readmissions.[3]

Because of the need to re-establish contact between the patient and the nurse, we would like to project the following nursing unit reorganization. The nursing unit consisting of up to sixty-four beds should be organized into a series of subunits of eight beds each. Every two units should be designed to be able to function as one unit of sixteen. These subunits should operate as independent entities during the day but should have the possibility of being combined into two or more units at night. The closest approximation to this idea is the nursing unit developed for the Kaiser Permanente Hospitals. They have located the nurse directly in contact with eight patients. However, the physical facility leaves much to be desired with respect to other patient needs. Doctors continually talk of the therapeutic value of early ambulation for many types of illnesses, yet there are no incentives for early ambulation in either the room or nursing unit design. There is often the provision of a solarium for a nursing unit, but it is generally located at the end of a long corridor with a shiny waxed floor service. It is terrifying, at best, for a patient to relearn walking, and a long excursion on a shiny surface to an unknown destination down the hall is enough to guarantee a reluctance to ambulate, if not a firm resistance. A patient should have the opportunity to ambulate close to his bedroom under the supervision and security afforded by the nurse. He should also be able to eat out of bed, yet close to his room. The independence he requires can only be achieved gradually and under

supervision. The patient, therefore, requires a place close to his bedroom where he can, in effect, regain his strength and ability to function as an independent person. The sense of place is not achieved by the Kaiser units, although many other attributes are. There are other dividends to be gained by structuring the nursing unit into separate, recognizable, and supervisable smaller segments. There is the possibility of increasing the occupancy of specialty units such as maternity and pediatrics. These units are often underutilized. If these units were designed as a series of independent components of eight beds each, it would be possible to use subunits for other medical specialties without destroying the integrity of the particular type of medical facility. The need for supervision on a very intimate scale in our modern nursing units should not be minimized. The more open our hospitals get the higher the rate of theft in the individual hospital rooms. There is case after case reported of the unauthorized person entering a patient's room, taking the patient's pocket book, and leaving him distraught and panicked. A nursing station closely related to every eight patients would be able to supervise comings and goings in a subunit.

Implicit in the design, is the organization of food and services so that they are available to the nurse without having to travel beyond her own eight patient domain. The organization and design of the nursing unit is critical for the design and organization of the rest of the hospital, because it establishes the structure for the relationship of the other hospital departments. The hospital is faced with the problem confronting so many of our modern institutions--how to give the individual a place in the anonymity of large scale organizations.[4]

The Psychiatric Patient

Ferment in the field of psychiatry has led to a number of important questions about the location, organization, and grouping of psychiatric facilities

and services. There is general agreement in the field that the treatment of mental patients should not take place in isolated rural hospitals but rather in the urban communities where the patient lives. It will be many years before the large rural hospitals are completely eliminated, but in the meantime we must make plans for care units where those patients who do not need to be totally confined can be cared for in acute hospitals, day hospitals, night hospitals, or in half-way houses, depending on the stage of their need.

One of the new developments of medical care is the treatment of the acute psychiatric patient in the acute hospital setting. Fifty per cent of all hospital admissions are for psychiatric disturbance. There is a growing awareness that the concept of progressive patient care has validity for the mentally ill patient, as well as for the physically ill, and different proposals have been made for the handling of psychiatric patients, using this principle. One involves grouping mental patients with the physically ill at urban general hospitals; another involves locating mental patients in a separate facility called a "community mental health center"; others involve integrated systems where they form a part of a community complex. Day hospitals, night hospitals, and half-way houses are all attempts to develop intermediate care units for the patients.

The Psychiatric Patient in the General Hospital

The principle reason given for locating mental patients at the general hospital is that at the crisis stage they require many services which require the facilities of the acute hospital. Mental patients usually enter a general hospital clinic when they are quite disturbed. While they sometimes come by themselves, often they are forced to come by the police, family, or friends. Initial treatment may involve drugs. The psychological problems of the patient may manifest themselves in physical symptoms such as ulcers, asthma, skin disease, insomnia, and so on, which require medical as well as psychiatric

treatment. Some mental patients suffer from physical brain damage which must be diagnosed and treated by medical techniques, including surgery. Drug addicts and alcoholics are often brought to general hospital mental health clinics and often require detoxification under medical supervision.

For the first few days the psychiatric patient may well stay quite close to his room. A patient gradually becomes more aware of his surroundings and will slowly begin to participate in group therapy sessions and other activities of the psychiatric unit. The therapy offered by the acute hospital setting goes beyond any specific treatment; the security and contacts offered by the total twenty-four hour environment constitute the major therapy.

Wherever mental patients are located, there are a number of internal grouping questions which have to be resolved. Psychiatrists now often recommend that inpatients and outpatients, men and women, be grouped together. According to the staff at San Francisco General Hospital, outpatients have a therapeutic effect on inpatients who, in turn, do not have a detrimental effect on the psychiatric outpatients. They observed that both men and women dress better and behave better in the presence of the opposite sex and, therefore, that a sexually mixed environment also helps create an environment closer to a normal one.

Psychiatric Unit Size

A great deal of thinking has gone into the determination of the most effective size for the psychiatric nursing unit to provide the most possibilities for patient interaction. It is generally considered that a total of twenty-five persons, comprised of both inpatients and outpatients, provides the most satisfactory size for all the groups concerned. If there are more people in one locale at a time it tends to become confusing, and, if there are less, it is inefficient from a staffing point of view. Within a group of twenty-five patients, a third might stay the entire time, a third might be

day or night patients, and a third might be outpatients. A day patient is a patient who comes to the hospital for the day but returns home during the night. A night patient reverses the procedure and may have a job during the day but comes to the hospital to eat and sleep. The concept of the day and night patient is relatively new in this country, although day hospitals are prevalent in other parts of the world.

Design

The organizational and spatial intent which governs the design of psychiatric units is to encourage the patient to function in small and large social groups. Food is a recognized stimulator for social intercourse, and facilities for cooking and eating to be used by the patient are recommended as essential components of the psychiatric facilities.

The patients are, by and large, ambulant, and places must be provided for eating, playing music, talking, meeting in group therapy sessions, visiting with families, playing cards, etc. The atmosphere should allow for a variety of types of spaces to accommodate the variety of moods and desires all of us have. There should be enclosed spaces and open space, light spaces and dark spaces. Access to the out-of-doors is considered very important. There are different philosophies for sleeping accommodations which range from everyone in his own room to groups of four in a room. The main criteria is to provide each patient with a place of his own, his own corner, bed, desk, bureau, storage for clothes, bulletin boards for personal pictures. There is no need to self-consciously develop a "homelike" atmosphere, as an institution is an institution. But if the long hall is eliminated and there are a variety of types of places to go to the greater evils of the institutional building are reduced.

The Treatment Team Concept

The mental health program projected by psychiatrists is impressive, because the goals are directed toward the prevention of hospitalization. The treatment of the psychiatric patient is conceived of as being conducted by a team comprised of psychiatrist, psychologist, social worker, public health nurse, orderly, and nursing aide. The structure of the team should be such that a patient in any given geographical area will have the opportunity to meet at least one member of the team whether he is an outpatient, an acute patient, or a patient needing momentary help in his home or neighborhood. This concept has been legislated into the Mental Health Center Act. In order for a community to get funding for a mental health center, they must provide facilities on a geographic basis to care for patients in all degrees of psychiatric health. Thus, facilities must be provided for: emergency care, outpatient, and day and night care. These centers should serve a maximum of 200,000 people. The emphasis should be on providing care closer and closer to the places in which people live. The theoretical model works more effectively than the actual one. The urban population is very transient and the desire to have the same person care for a patient in one geographic area may be wishful thinking. With the amount of movement of the urban population, there is little time to establish the desired types of contact.

The staffing logistics also work against the success of the staffing pattern proposed. Many persons need help at odd hours, and even if there is a twenty-four hour emergency psychiatric and suicide prevention service, it is not likely that the individual person needing help will find the staff member he is familiar with at the emergency station at the times he needs him.

Although the trend is to definitely couple psychiatric services into the general hospital, I have many reservations as to the validity of the concept.

The acute general hospital is a high-powered institution generally pro-

viding intensive care; the psychiatric patient, in contrast, requires a low-keyed treatment although he often needs supportive medical services. The average stay of most general hospital patients is measured in days; the average stay of a short term, psychiatric patient is three months. The staff of a general hospital must demand cleanliness, neatness, and precision, whereas the staff for psychiatric patients must be capable of very relaxed work habits. The open wards, considered desirable for mental patients, permit the homeless of the street to wander into the hospital. Despite much education and propaganda, many physically ill patients and much of the general hospital staff still have a great fear of the psychiatric patient.

Lastly, it is uneconomic to house ambulant patients, even if psychiatric patients, in a high-powered, extremely costly medical facility. I suggest at least a separate wing on a hospital site, if not a separate building. This will be discussed at greater length in the section on regrouping the hospital system.

The Ambulant Patient

The "outward" hospital movement and the shift in emphasis from cure to prevention are reflected, in part, in the increasing numbers of ambulant patients who use the hospital for medical service. Many hospitals appear to have accepted the expansion of ambulant facilities as a goal, but the key questions of what form of facility and what method of operation have not been answered. Suggestions range from joint use of diagnostic and therapeutic facilities for ambulant and nonambulant patients to the provision of separate diagnostic facilities for ambulant patients, except for those procedures less frequently done and requiring more complicated equipment.

The ambulant patients fall into as many groups as the bed patients. There are the old and the young, the patient with a chronic illness, the minor emergency case. Included in the ambulant category are the pregnant mothers,

the psychiatric patient, and the patient in need of rehabilitation. The combination of the increased ability to treat patients while they are ambulant and the increase in demand for medical care has strained the existing ambulant care facilities.

The most superficial glance at the current state of ambulant medicine reveals a multiplicity of arrangements reflecting heterogeneous types of health establishments and ad hoc medical services. The ambulant patient is cared for in the private doctor's office, the group practice medical clinic, the outpatient department of the hospital, the hospital emergency department, the public health well-baby and prenatal clinic, and other types of clinics, and at home through the services of the visiting nurse, by the pharmacist, and by the still prevalent herb doctor and magic cure advocates. The basis on which persons utilize one or more of these facilities has been largely economic, although there is considerable overlap in the use of all of them by the different economic groups. Broadly speaking, the higher income groups obtain medical care from a private physician in his private office, who, in turn, routes them through a medley of medical specialists when needed.

Some trade union groups and sections of the middle class, particularly university and professional groups, belong to medical prepayment plans. Many of these groups build their own facilities for ambulant patients which combine, under one roof, offices for a variety of medical specialists along with diagnostic and therapeutic equipment, often in excess of that provided for many 100-bed hospitals. This relatively new building type, known as the group practice medical building, varies considerably throughout the country in both size and composition. The Health Insurance Plan facilities in New York are perhaps the best known examples.

The urban poor generally use the outpatient and emergency departments of county and teaching hospitals or clinics in private and community hospitals,

when available. Characteristic of the outpatient departments of many urban hospitals are the large waiting rooms, the long rows of uncomfortable chairs, the walls of green hospital hue, and the combined outpatient and emergency entrance. These places can be both dismal and fearful. The poor are thus thrice penalized. Once for being sick, once for being poor, and once by the time lost waiting and waiting and waiting.

In deciding on alternate courses of action in the provision of ambulant services, stress should be placed on the needs of the one-third of the urban population at the bottom of the social ladder occupationally, financially, and educationally. Research studies have shown that this population group, by and large, has distinct ways of looking at the world, to say nothing of their health. There is a tendency for them to minimize slight physical difficulties in the interest of attending to more pressing needs. A person from the middle income group will go to a doctor for pain symptoms and a multitude of other reasons. He can, and will, travel far to see a doctor. Persons in the lowest income group have the tendency to live with illness and do not spend energy and resources on doing something about it unless it becomes acute.[5]

Group Practice Medical Buildings

Several hospitals have projected the idea of developing ambulant facilities on the same site as the hospital but in a separate building modeled after the group practice medical building. This building type is relatively new. It has doctors' offices, yet it is more than a professional building. This building type, the group practice medical center, has importance because it is a conscious attempt to provide, under one roof, all the facilities required for the diagnosis and treatment of ambulant patients. This building houses the examination, treatment, and consultation space of a variety of medical specialists; the number and type vary with the scope of medical services and the needs of the community. Under this form of medical practice, rather than

being hampered by the fear of losing one's patients to another doctor, consultation among the various medical specialists is encouraged. The method of payment to doctors is based on some prearranged agreement independent of the fee charged to individual patients. The ambulatory patient who patronizes the group practice medical center is not a charity patient. He is not an outpatient in the old sense of the word. He is either a paying patient or a prepaid patient and wants all the amenities of private practice, plus the convenience and medical service offered by the availability of both specialist and equipment in one location.

Horizontally Contiguous Ambulant Facilities

Another solution is to locate the outpatient facilities horizontally contiguous to the inpatient facilities, but with their own transportation system. The solution to San Francisco General Hospital is of this nature. Both solutions are based on the concept that the needs of the ambulant patient and the needs of the bed patient are essentially different and that it is not good social or medical practice for ambulant patients to be exposed to the extremely ill patient.

Ambulant Centers in Different Sections of the City

The appropriate ambulant pattern of a low income, densely populated area will be different from the ambulant pattern for a suburban group used to travel by car for medical care. Many people in poorer neighborhoods need medical attention but do not realize it, or are unaware of available means for obtaining care or information on how to maintain health. An important health goal must certainly be to devise methods to stimulate the use of health services by this segment of the population. The spatial implications of this goal are either to aid in physically bringing the people to the medical resources or to take the medical resources to the people. From my own experience at San Fran-

cisco General Hospital, I know the importance of the transportation system to overall utilization of the hospital.

The goal of keeping people healthy by preventing illnesses, or of arresting or curing illnesses before they reach a stage requiring hospitalization, involves tremendous changes in the scope, perspective, and activity of the hospital. It involves developing new diagnostic techniques to detect diseases and predict potential degenerative diseases in presently healthy people. The multiphasic examination is a step in this direction. It is far more extensive and quite differently oriented from the type of examination usually given in a private doctor's office. At the Kaiser Foundation Health Plan center in Oakland, California, for instance, patients are not only given a complete battery of tests, involving laboratory and highly automated equipment, but are also checked for such qualities as pain tolerance, air volume of the lungs, and personality traits. All findings are registered on IBM cards and run through a computer programmed to come forth with a diagnosis of the test results. An appointment is then made for the patient to return to the hospital in several weeks for examination by his personal doctor, at which time arrangements for treatment are made, if required. Keeping people healthy also involves going into the community with educational programs to help them learn to be responsible for maintaining their own good health, insofar as this is possible, by teaching them proper methods of accident prevention, sanitation, care of the body, prenatal and infant care, care of children in general, and so on.[6]

An attempt to encompass a wider range of activities can be illustrated by the Columbia Point Health Center and Health Association. This neighborhood health center is located in a housing development consisting of 1,500 low income apartments. The facility for the medical center itself is in 12 remodeled apartments. The Columbia Point Housing Development is situated on a peninsula

(formerly the city dump) jutting into Boston Harbor.

The remodeled apartments include areas for sick children, well children, adults; specialty clinics; emergency rooms; a laboratory; an X-ray unit; a modified day care center for children whose relatives are visiting the center for care; a pharmacy; a record room; a central supply; a conference room; and offices for physicians, nurses, social workers, administration, etc.; a community health action center; and the Columbia Point Health Association. Four family health care groups were constituted, each responsible for 350 families and consisting of an internist, pediatrician, social worker and nurse. Care is continuous and family centered. Patterns of hospitalization and referrals for consultation have been developed with different institutions which are best able to meet the needs of our patients. The visits to the health center often exceed 100 per day. In ten months 80 per cent of the residents had visited the Health Center for individual medical care. This particular project has significance beyond the health care it provides to the specific community. Because the community is an isolated and totally defined population, many kinds of health care needs are being measured as well as the cost of providing them.[7]

The Peckham Pioneer Health Center in Peckham, Southeast London, is still probably one of the few models which attempted to broaden the meaning of health. The Center's line of reasoning was that the process of health was itself a subject worthy of study--one distinct and different from that of sickness. The outstanding fact learned by the scientific staff in the early stages of the experiment "was that although sickness could be detected early, often indeed long before the individual had any idea of its presence, . . . it was in many cases useless to eradicate the disorder only to return the individual to the environmental conditions which had induced it.'[8]

The ambulant patient requires a variety of types of services. The fact that the emergency clinics of the urban hospitals are so crowded with mothers

and children at night reflects the difficulty they have in getting to the hospital. They have to wait until their husbands come home to have them baby-sit for the other children or provide transportation. It is terrible to go to the emergency department and see a child with a sore throat coming in the same door as a man with a gun shot wound.

From the point of view of women and children, particularly of the lower income group, medical facilities for ambulant care should be located near where they live and shop and where their children go to school. The types of ambulant facilities needed include

1. Private doctors' offices or small health clinics within walking distance from homes.
2. Health clinics centered around the school which provide not only preventive shots but also diagnostic tests and medical and dental care.
3. Strategically located clinics at downtown areas and places of work.
4. Larger ambulant diagnostic and treatment centers situated throughout the city--some on the same sites as hospitals, others built on separate sites but linked to the hospital.

FOOTNOTES: CHAPTER IV

1. S. S. Goldwater, On Hospitals (New York: The MacMillan Co., 1947), p. 288.

2. Ibid., p. 290.

3. "Montefiore Cuts Readmissions 80%," New York Times, April 1, 1966.

4. For existing nursing unit design see--E. T. Wheeler, Hospital Design and Function (New York: McGraw Hill Book Co., 1964); John and Hugh Gainsborough, Principles of Hospital Design (London: The Architectural Press, 1964); Isadore Rosenfield, Hospitals Integrated Design (New York: Reinhold Publishing Co., 1951).

5. Anselm Strauss, Medical Organization, Medical Care and Lower Income Groups, A mimeographed report from the University of California's San Francisco Medical Center (1966), pp. 44-45.

6. Morris Collen, "Periodic Health Examinations Using an Automated Multitest Laboratory," Journal of the American Medical Association, 195 (March 7, 1966), pp. 142-145.

7. Count D. Gibson, The Columbia Point Health Center and Health Association, A mimeographed report from the Tufts University School of Medicine, Department of Preventitive Medicine (1966).

8. H. Innes Pearse and Lucy H. Crocker, The Peckham Experiment (London: George Allen and Unwin, Ltd., 1944), p. 12.

CHAPTER V: UNCOUPLING AND REGROUPING THE HOSPITAL SYSTEM

As difficult as it is for an architect to free himself from past approaches to hospital problems in order to use a fresh analytic perspective, it is even harder for the client who has been working in an existing spatial pattern to see that there are alternative ways of spatially organizing his activities. The first habit we have to break is thinking of the hospital structure as necessarily being in one physical location. We have to uncouple the hospital system to see what physical facilities must have physical proximity and which can be functionally linked but spatially separated. Once we uncouple the system, it is possible to see alternate grouping arrangements and new solutions to the health systems' many problems.

What do we mean by uncoupling the system? Let us take an example from a recent study we just completed on diagnostic radiology.[1]

Uncoupling the System of Diagnostic Radiology

Over a period of years designers and radiologists have developed principles of spatial organization which have strongly influenced the architectural design of radiology departments.

Because it is used by both inpatients and outpatients, the ideal location was considered to be the first floor where outpatients could use this department without having to tax the vertical transportation system of the rest of the hospital. The outpatient in many hospital situations accounts for as much as 60 per cent of the utilization of the diagnostic radiology facilities. The emergency department was also customarily located at ground level, and, therefore, this location for radiology afforded the additional advantage of being close to emergency. For these reasons, the radiology departments, whenever possible, were located on the ground floor adjacent to emergency and surgery and accessible to both inpatients and outpatients.

Radiology is one of the most rapidly increasing hospital departments. To accommodate this growth, designers of radiology departments located them so that one end would be "open" or free for horizontal expansion. In addition, many architects located so-called software, such as lockers and storage, next to the radiology department to allow for expansion into these easily removable and replaceable areas. An excellent example of how these patterns were put into operation is illustrated by the El Camino Hospital Radiology Department in Mountain View, California, designed by architects Stone, Marraccini, and Patterson. The plan of this department shows the location of X-ray next to surgery and emergency. It is open-ended on the west side so it can expand. It also embodies another pattern which has governed radiology planning for many years, which is to locate the radiographic rooms around a central processing unit, consisting of a light room and a dark room, which in turn leads into a viewing room and file room. A plan of the Diagnostic Radiology Department at Moffitt Hospital, University of California Medical Center, San Francisco, represented an extremely forward looking concept when it was built. The diagnostic rooms surround a central processing unit which in turn leads directly into a file room and viewing rooms. A separate work corridor for technicians is differentiated from the public corridor for patients. In-patients and outpatients have separate waiting facilities as well as separate corridors. The fluoroscopy rooms can be used by both inpatients and outpatients.

Despite the fact that their plans were originally effective, many radiology departments are suffering from growing pains, inadequate space, increased demands, and overburdened organizational methods. The radiology department at Moffitt Hospital was designed to handle a certain capacity, and this capacity has been exceeded by both the patients and personnel required for processing, storage, filing, reading, teaching, etc. The size explosion has negated the original validity of the plan.

The problem posed was how to come to grips with solving increases in demand, limitations of space, and rising numbers of ambulant patients who require the use of the facilities, as well as increases in the use of new techniques for diagnosis which require complex apparatus and teams of medical personnel. Our approach was to examine the radiology department from a systems point of view and examine the system in such a way as to determine which components of the system needed to be spatially adjacent in order to function and which components of the system could be functionally linked but physically separated. We analyzed the system of diagnostic radiology and defined its function in the following manner.

The prime function of diagnostic radiology is to enable a trained radiologist to see parts of the human body hidden from the naked eye in order to help diagnose a person's illness. The process involves bringing together patients and machines, medical and technical personnel, and past and present information, so that the radiologist can utilize the total available information simultaneously. Essential to the success of the system, is the transmission of the diagnosis to the responsible physician for action within a specified amount of time. We then isolated the subsets of the system which required spatial proximity as a necessary condition to function from those subsets which did not need this spatial contiguity. We found the following:

1. The patient, the machine, and someone both to help the patient and run the machine (the technician), must come together. There is no way yet of taking a picture with the patient in one location and the machine in another--there has to be direct contact. The machines can be operated remotely, but someone still must help the patient on and off the machine.
2. The film and the film-processing must come into contact. There are numerous alternate ways of developing film (Polaroid, manual,

automatic), but contact must still be made between the film and the developing agent.

3. The radiologist, in order to make a diagnosis, needs the X-ray image of the patient, as well as previous images and other pertinent information. He can get the image in a number of ways, but whichever way, the image is essential.

These then become the sets which require spatial proximity. Each of these sets has a series of secondary needs which demand spatial solutions. Thus, when a patient, a machine, and a technician are brought together, the patient needs toilet facilities, a place to dress and undress (if the patient is an outpatient), and so on. The machine requires a room with a lead lining (or the scatter of X-rays will become damaging), control booths to protect the technician, and space for the machine requirements (transformers, generators, tube stands). The film and the film-processing unit require their own sets of spaces depending on the method of processing, and the radiologist, in turn, will have his own space requirements for viewing the image. If these are the only needs which have to be satisfied by spatial proximity, then, by implication, the other subsystems necessary to functionally satisfy the requirements of radiology do not demand spatial proximity to one another.

Links and Linkages

The various forms of links and linkages used to connect different activities are closely related to technological developments. It is now common practice to have verbal messages transmitted over intercom and telephone or written messages transmitted by teletype or pneumatic tube. Dumbwaiters, conveyors, and elevators are commonly used to transport material objects of varying sizes. All of these ways of communicating messages and materials have modified the requirements for physical proximity between activities.

An examination of the technical requirements necessary to link together

the activities of radiology shows that the processing of film does not require a location next to the diagnostic rooms. What is required is a method of transporting the exposed film to the processing room. In some cases, locating it directly adjacent to the diagnostic rooms will be the best solution. But it is also possible, under certain circumstances, for the processing to be on one floor and the diagnostic machines on another, and the connection between the two may be by means of dumbwaiter or other vertical conveyance. The filing system certainly does not have to have physical proximity to the diagnostic rooms or the radiologist. All that is important is that a method be developed whereby the image of the old films is delivered at the required place at the proper time.

It is not an essential part of the system to locate the radiologist in close proximity to either the diagnostic rooms or the processing unit. The image of the developed film or the fluoroscopic image could be transmitted over closed-circuit television to a radiologist located in another part of the building or even in another building. Already image intensifiers and television are integral parts of fluoroscopy rooms. The video taping of fluoroscopic images is a real technical possibility. Since there is no film to develop, instant playback is possible. The potential for transmitting picture images through space gives increasing freedom for radiological spatial organization. Telognosis and television of radiographs allow the radiologist to be far removed from the patient and the picture-taking machine. In a remote area, a technician, nurse, or general practitioner can take the picture, transmit it to a distant radiologist, and receive back a diagnosis very quickly. [2-5]

Not all of the technical aspects of the radiology system change simultaneously. The major technological advance which affected the practice of diagnostic radiology occurred a decade ago when automatic processing was intro-

duced. In this period, the X-ray machine itself remained relatively unchanged. Today the reduction in cost of automatic processing units allows for several of them to be located in one hospital. Some hospitals have automatic processing units in emergency and surgery as well as in radiology. The Kaiser hospital in Santa Clara County has one processing unit for each two diagnostic rooms. The uncoupling of the various subsystems allows for the introduction of new developments as they occur without constant revision of the total physical arrangement of the department. Thus, the introduction of videotape as a method of storing information may eliminate the need for a developing machine altogether as well as change the central-storage and retrieval-of-information subsystem. These changes brought about by videotape will not, however, change the spatial requirements of the patient-machine-technician subset.

Much of the new technology is used in very time-consuming special procedures and thus exacerbates the manpower shortage. Further uncoupling could occur when computer analysis of X-rays will permit less trained people to make accurate diagnoses.[6,7]

The concept of uncoupling the system of radiology in no way implies that a centralized radiology department is necessarily wrong or a decentralized radiology department necessarily right. It would depend on the department's size and relationship to other aspects of the hospital and community. A system for a 100-bed hospital will be quite a different one from that necessary for a 500-bed hospital, which in turn will be different from the requirements for a 1,000-bed hospital. The uncoupling of the system will allow for many types of alternate possibilities, including decentralized arrangements, which might better satisfy the needs of a large organization. For example, the greater the volume of patients, the more the department can be specialized and the easier it is to divide the department and to locate different parts of it in different parts of the hospital. A hospital with a large enough volume of

patients can have separate radiology departments for inpatients and outpatients. A hospital with a high volume of surgery can locate specialized radiology rooms in the surgery department. For example, a solution to the Moffitt Hospital radiology growth problem could be to subdivide into outpatient, inpatient, and special procedures departments with only one of these in the present location.

Special radiology procedures which require expensive equipment can be effectively utilized only in a hospital large enough to make efficient use of the equipment. In a small radiology department each room and machine must serve a multiplicity of functions. The larger the department, the greater the possibility of providing specialized rooms and machines, as the increase of volume tends to justify their single purpose accommodation.

Uncoupling the system provides alternatives for expansion of facilities as well as the possibility of centrally locating a portion of the radiology department. There is always a struggle to place key facilities in centralized and strategically located ground floor areas. Those very departments which should logically be in the central locations are also those which require the most opportunity for expansion. By uncoupling the spatial system considerable freedom is gained for alternate spatial configurations. It is also possible to develop a mobile system as part of a hospital X-ray department. Mobile X-ray trucks can use the hospital as a base station and circulate to different nursing homes, schools, or areas of the city where population groups would most benefit by having this equipment directly available. These mobile units could be designed to literally couple into each of the facilities they will serve and then transmit the images to the radiologist in a central location. Such a form is comparable to the Dulles Airport where mobile lounges "couple" into the airplane and then "uncouple" transport patients to the airport proper.

Mobility in bringing the X-ray to the patient can also be achieved within the hospital as the technological potential of the portable X-ray increases.[8]

It is not beyond the realm of feasibility to conceive of an X-ray in the elevator to reduce problems of vertical patient transportation.

Conclusion

Studies of diagnostic radiology generally conclude their analysis with a plan illustrating ideal space arrangements.[9-13] Before it is possible to design an "ideal" plan there has to be agreement about criteria by both architect and client. Based on this agreement, it is then possible to evaluate alternate solutions for a particular building with its specific organization and specific constraints. The criteria for planning is sometimes referred to as a building program; it is at best a starting hypothesis to use as a basis for design development. As the design solution progresses, the conditions of a particular project often make ideal solutions "impossible," and there is need to then modify the initial program.

As a result of this study of diagnostic radiology, the following premises might currently be useful to architects and radiologists as a starting point for their design development.

1. More and more ambulant patients will be using diagnostic radiology both within and without the hospital setting.
2. Inpatient procedures will become increasingly more complex and involve new types of equipment and teams of trained personnel. More procedures will be performed on each patient.
3. The shortage of radiologists will continue, and there will be greater need to make the most efficient use of their time and capabilities.
4. The radiologist will see patients in fluoroscopy and in special procedures but will not actually come in contact with the patient in most routine diagnoses.
5. Technology for the transmission of the X-ray image by closed circuit T.V., telephone, and computer will be perfected so that the X-ray image

can be transported over remote distances.

6. The storage and retrieval of X-ray images will undergo a complete transformation from the present, relatively archaic, hand filing and retrieval systems to a modern system of data processing and retrieval. It is conceivable to project the idea of a central system for a geographic area in a city which serves clinics, doctors, and hospitals.
7. X-ray machinery will continue to develop and change, hence, constant revision of existing facilities will be required.
8. Accidents and emergencies will be on the increase and X-ray equipment must be available for this service both in the emergency room and in the ambulance.
9. Processing of X-ray film will become less expensive and consequently each diagnostic room will probably be able to afford its own automatic processing unit, thus making the location of the X-ray room independent of the processing department.
10. Diagnostic mobile units containing X-ray equipment will be developed to literally "couple" into predesigned receptacles located in nursing homes, schools, rural health centers, and areas of the city which would be more effectively served by bringing the equipment to the user rather than the user to the equipment. The organizational and spatial implications of these ten premises point to a diagnostic radiology department made up of a series of subdepartments. These subdepartments fall under the following categories: (a) inpatient, (b) outpatient, (c) emergency, (d) special procedures, (e) surgery, (f) mobile units.

Many factors reinforce the validity of the concept of subdepartments within the department of radiology. Among them are:

1. The variation in the times required for different examinations;
2. The differences in personnel and equipment required for the different

categories of diagnostic work;

3. The different needs of inpatients and outpatients in terms of attention, furniture, and facilities;
4. The fear that outpatients have when they see the very ill or the genuine emergency case;
5. The different requirements for proximity of location: inpatient facilities should be close to bed areas; outpatient facilities should be close to clinics and offices; special procedures should be close to the facilities of the anesthetist and certain surgical personnel.

We now have the technological possibility of satisfying the functional relationships required between the various parts of the radiology system without having them necessarily physically contiguous. Uncoupling has demonstrated this. Now, therefore, we can satisfy other user requirements for patient comfort, growth, and specialization without the constraint of a unitary spatial configuration.

Hospital Systems

The hospital is customarily looked on as a series of departments. These departments include nursing, radiology, surgery, therapy, dietary, laundry, housekeeping, administration, laboratory, outpatient, and emergency. The nursing department is often subdivided into subdepartments such as pediatrics, obstetrics, surgery, urology, etc. The hospital can also be looked on as a series of systems.

I have found the following divisions useful: (1) the patient system, (2) the personnel system, (3) the service system, (4) the diagnostic and treatment system, (5) the information system, (6) the transportation system, and (7) the administrative system.

In broad outlines, the patient system includes the needs of all categories of patients--from the moment the patient enters the hospital to the time he

leaves. This includes the needs of the patient for treatment, living, sleeping, and recovery. The personnel system involves the activities of doctors, nurses, aides, orderlies, administrators, and so on. The service system involves all the services of the hospital--food, laundry, central supply, goods of all kinds. The diagnostic and treatment system involves the processes of all the individual departments--surgery, radiology, emergency, laboratory--separately, as well as the interlocking of these processes in terms of the requirements of patients and staff, and of the patient-staff relationship. The information system involves the flow of reports, requisitions, records, mail, and communications by audio-visual and mechanical means. The transportation system is the total system of getting people, materials, and information to the proper place at the proper time. The administrative system includes the admission and discharge of patients, billing, accounting, and so on.

Uncoupling the Hospital System

It is necessary to uncouple the other spatial systems of the hospital to determine which of the activities require physical proximity in order to function and which activities, though functionally linked, could be spatially separated. The need to uncouple the hospital system is compounded with the size and complexity of the hospital. In a small hospital it is possible to develop an efficient system based on the prevalent image of the nursing unit--tower on top of the diagnostic, therapeutic, and service base and linked to the services by a central elevator and delivery system. As the institution increases in size, it becomes impossible to locate all of the required services close to the delivery system. In addition, as each of the departments increases in size, it becomes geometrically impossible to relate them in close proximity to each other. The high cost of the hospital environment requires that we re-examine it to see if it is possible to take out some of the functions requirin less precise and controlled environments and locate them in different types of

physical structures.

Let us examine some of the possibilities for spatially uncoupling the hospital system.

Uncoupling the Service System

The grouping of the service system of the hospital is undergoing rapid change in the direction of moving the service system outside of the physical structure of the hospital proper. There are more and more examples of food, laundry, central supply, and even baby formula, being prepared and processed in separate facilities and brought to the hospital in a "ready-to-use" state. Groups of hospitals are investigating the possibilities of having a centralized supply depot, laundry facility, kitchen, etc. The advantages to be gained are in (1) lower production costs of larger service establishments; (2) the lower building costs for the facilities required for service as against the cost of a building for patient care accommodations; and (3) the freedom the hospital achieves from getting out of the so-called hotel business. All of these virtues have to be cost accounted against the cost of delivery, the lack of personal control, etc.

Kaiser-Permanente in California has adapted a system of food service which may be a forerunner for other hospitals. The food is prepared in a central kitchen away from the site. It is brought to the hospital daily in the manner similar to the system used by the airlines. The food is assembled on trays in a small kitchen assembly area and brought to the patients' floor where a daily supply is stored in especially designed, refrigerated compartments. When a patient desires his meals, the nurse places his tray in a microwave oven which heats it to serving temperature in thirty to ninety seconds. This flexible food system permits the patient to eat when he pleases, assures that meals intended to be hot are hot, and eliminates the tyranny of "hospital meal time," when everything else slows down. In the Santa Clara Kaiser Hospital the

kitchen staff finished work by 2:00 p.m. in the afternoon having supplied the patients with the requirements for twenty-four hours of food.

In the projected new Cologne hospital in Germany, all the service facilities are located in one building separated from the hospital proper.[14] This type of decentralized service implies new methods for the distribution and storage of food and supplies. For over two decades we have been so caught up with the notion that centralization equals efficiency that it is only recently that architects and hospital planners have explored other distribution methods. The delivery of food, materials, and drugs to each person's room, on the milkman principle, is working successfully in a number of hospitals and allows for much greater freedom for planning.

Uncoupling the Information System

Accurate medical diagnosis is predicated on reliable information about a patient's condition. This information includes current reports of lab, X-ray, etc., as well as past medical history. Doctors continually discuss the medical need for continuity of medical care. Continuity of medical care, as they discuss it, implies a continuity of a doctor-patient relationship. Realistically, in our urban centers, where we have the combination of extremely mobile population groups and shortage of medical personnel, the desirable close patient-doctor relationship is not a realizable goal. What is possible, and what in time will become an absolute necessity, is for the continuity of a medical record to be maintained by the development of an information system within the city and between cities. The technical feasibility of a unified information system is here.

Today, technological possibilities allow us to decentralize our facilities and at the same time maintain our informational and functional links. It is technologically feasible to have a data center located in the city, away from the hospital, equipped with all information pertaining to the health of an

individual or a family. Such information could be available at a moment's notice for use at all levels of a health complex: hospital, doctor's office, rehabilitation center, and nursing home could be linked in a medical information chain. There is no reason to take up valuable ground floor, priority patient space for medical records as has been the pattern for the past decades.

A centralized medical record system implies a coordinated health system at a higher level than just a single hospital system. But, given a centralized information source containing a coordinated system of medical records, it becomes even more possible to uncouple various aspects of medical care from the main hospital center and distribute them in the surrounding area without giving up the medical prerequisite for continuity of information.

Many people object to the notion of a centralized medical information system. Their objections are based on the public nature of a centralized system and the lack of privacy of a person's medical record. Some also object on the basis that persons lose their mobility to maneuver between agencies to obtain needed welfare from several sources. These are indeed problems, but if the funds given for medical care are sufficient and an information system is developed which respects the right for private information, I believe the objections can be overcome.

Diagnostic and Treatment Services

We have already discussed, at length, the possibilities for uncoupling the radiology system of the hospital. The laboratory is easier to uncouple. The patient generally does not need to go to the laboratory. What is required is that a specimen be taken to the laboratory for processing and that the results of these tests be sent to the proper medical person within a required time. A laboratory could well be in a separate building from the hospital as long as the system for getting the sample to the laboratory could be developed to work with sufficient rapidity. Collection stations for samples could be located in

any part of the city and be brought to a centralized lab facility. In a similar manner EKG's could be taken in any part of a hospital or urban area and the results transmitted to a central location for accurate reading.

Again, I would like to emphasize that the degree of uncoupling that is desirable will vary with the nature of the institution, its projected scope of service, and the geographic area within which it operates. It is obvious that the possibility for decentralization only occurs at a point in magnitude that allows for both specialized services and decentralized facilities.

Uncoupling the Patient System

The concept of progressive patient care has already, in effect, uncoupled the patient system. Progressive patient care is the name given to grouping patients according to their degree of illness.

Patients are grouped into three categories: patients who are acutely ill and need the most intensive in-hospital care; patients who do not need intensive care but who need to be in the hospital under varying degrees of medical supervision; and patients who are ambulant and able to care for themselves. The ambulant facilities may or may not be part of the hospital. Included in the system is the notion of home care, so that a patient may receive necessary care from a visiting nurse.

The psychiatric patient, a special category cutting across all degrees of illness but generally considered as an ambulant patient, is, for the first time, being included in the general hospital system. In this instance, study is required to see how to couple the needs of the psychiatric patient into the hospital framework.

The significant aspect of progressive patient care is not patient categorization, but, rather, use of hospital resources of space, equipment, and manpower where they are most needed. If a patient needing minimal nursing care is confined to bed in a hospital, the resources of the hospital are being mis-

used. If a patient is fed in bed when he could walk to the cafeteria, an expensive food distribution system is being used where a cheaper one would suffice. If nurses supervise patients who do not need supervision, a scarce manpower resource is being wasted. The implications of progressive patient care have not yet been fully translated into design concepts.[15]

Patient needs are different at different stages of patient care. The priority for a patient entering emergency in an acute condition is provision of the required medical care with maximum efficiency in minimum time. The arrangement of the services, the location of one to another, the distance--all could mean the difference between life and death.

As the health of a patient improves there is another system of priorities. The sheer increase in numbers of persons who are using and will use ambulant facilities raises questions about the best way physically to accommodate their needs. Does the outpatient belong in the same building as the acutely ill bed patient? Historically, the hospital is oriented toward the diseased patient. Can it be effectively remodeled to include a healthy patient outlook?

Regrouping the Hospital System

We have examined the history of the hospital and the reasons for present shapes and spatial configurations. We have looked at the problems facing hospitals today, including high costs for medical care, obsolete facilities, and shortage of medical personnel. We have recognized the shift in emphasis of the role of the hospital from a provider of care, to a promoter of health as well. We have discussed the needs of the various hospital users and explored the tendencies for and the technological possibilities of spatially uncoupling the hospital system. We would like to conclude with a design prognosis for the hospital system. This prognosis is based on the following assumptions:

1. More and more people are demanding medical care;

2. The increase in insurance coverage for medical care is making more persons able to pay for this care and eliminating the category of the indigent patient;

3. It is possible to catch diseases early and treat many patients while they are ambulant;

4. Many segments of the urban poor do not utilize medical resources for prevention, early diagnosis, or ambulant care. They go to hospitals in crisis periods;

5. There is a growing shortage of trained medical personnel;

6. There is every indication that the cost of medical care is increasing;

7. There is great variation in the type and sophistication of environment required for different types of medical services and different stages of sickness and health;

8. Modern technology makes it feasible to project the notion of certain centralized medical facilities such as information storage banks and laboratories which could service hospitals, doctors' offices, clinics, rest homes, and other facilities;

9. As more and more persons are treated as ambulant patients, there seem to be both social and economic benefits to be gained by the separation of ambulant and non-ambulant facilities;

10. It is impossible to develop a rational approach to medical care unless all of the components of the medical care system are related and seen as integral parts of a whole.

The organization and spatial implications of these premises point to a zoned hospital system. The zones can be characterized as intensive, acute, semiambulant, and ambulant. Each of these zones requires an environment which is suited to the needs of the respective users. I believe that this zoning will occur whether all the facilities are located on a single site or dispersed throughout a city. Of necessity, the zones are linked together by an information system, by a medical personnel system, and by a transportation system. Each zone requires that it have its own circulation system, service system, and physical design. In the chapter on user requirements we discussed the needs of different categories of patients. Let us relate these requirements to an overall plan.

Zone 1--Intensive Care

The very ill, those patients requiring constant supervision and care, are grouped in intensive care units. These units contain all ages and both sexes. Some of these units are quite specialized and treat only burns (which require reverse isolation), strokes, or coronary diseases. These units require a concentration of high-powered electronic equipment, monitoring equipment, special ventilation, and temperature control arrangements. The equipment in such medical units is most subject to change due to constant scientific and technical innovations.

Patients in intensive care units require that a doctor be available immediately, that the supervision be constant, and that the equipment be the most up to date. But even the acutely ill patients cannot be lumped together. For example, the coronary case, although acutely ill, is often totally aware of his surroundings and needs personal attention as well as medical observation. The physical environment of intensive care units must include the latest environmental controls, germ free atmosphere, controlled humidity and temperatures, etc. This environment will be constantly changing as new medical, mechanical, and electronic technology is developed. These will become the most costly units. Great flexibility will be required and these units will contain the highest rate of obsolescence.

Zone 2--Acute

This zone must be linked to the first zone. It is the transition nursing unit as a patient becomes less critically ill. The Acute or Intermediate care units are comparable to the more typical hospital nursing units. Many hospitals have simply removed from their main nursing units those patients who require more or less than intermediate care.

This zone should have its own circulation system but also allow communication, for patients and personnel, with the intensive care zone. The nursing

units should be designed as discussed under patient-user requirements.

Zone 3--The Semiambulant or Convalescent Zone

This zone is designed for persons who can partially care for themselves but need varying degrees of supervision and help. The components which make up this zone include the convalescent hospital, home care programs, and hotels for those without people at home to care for them. The number of types of facilities will be as large as the categories of patients and their needs.

Zone 4--The Ambulant Zone

Under this category are the clinic, doctors' offices, the group practice medical building, psychiatric patient centers, public health clinics, mobile X-ray trucks, and the preventicades--clinics attached to schools and shopping centers. The objective of the ambulant zone is to provide preventive care and early diagnosis, as well as ambulant treatment, to the entire population. The specific means used will depend on the particular group being served.

The Health Bus

If the hospital is to be developed as the location for the diagnostic and preventive services for ambulant patients, part of the design must include the delivery system for patients. Mobility has a price far beyond the cost of bus fare. Utilization of health facilities and the success of a health system are related to the availability of information, transportation, and baby sitters, as much as to X-rays and laboratories. It is not so farfetched to project a health bus to be to the hospital what the yellow school bus is to the educational system.

Ambulant Facilities at Schools and Shopping Centers

Many schools have public health nurses and programs for eye testing and immunization. These sources could also act as a potential nucleus around which

to develop clinics for more comprehensive educational and medical screening services but, to date, have not been fully utilized. The idea is akin to the storefront psychiatric clinics being set up in New York. These ambulant facilities could be well equipped and linked functionally to either hospitals or larger ambulant cores by closed circuit television, the computer, or other forms of communication technology.

The Mobile Unit

Another idea is to develop mobile "preventicade" units modeled after the old tuberculosis trucks, only equipped with considerably more sophisticated facilities for multiphasic testing, X-rays, and so on. These units could literally go into the poverty pockets of our urban areas on a block to block basis and "promote" preventive and early diagnostic care. These mobile units could be designed to actually "couple" into local health centers, schools, nursing homes, or the hospital hub itself, which, in turn, would be designed to receive them.

In Summary

In summary, we are projecting a zoned hospital system, comprised of intense, acute, semiambulant, and ambulant zones. In each zone there will be a variety of types of facilities, depending on the size of the institution and the other resources for medical care. Zones may be located on one site or distributed throughout a city, and other systems using both zoning methods may be developed. The important criteria for their effective functioning is that the zones be linked together by an information system, by a personnel system, and by a transportation system. The information system makes available a patient's past and current medical history at any zone--the personnel system must be structured so that a familiar person can see a patient in any of the zones. This person need not be medically trained but should act as a

human fulcrum for the patient maneuvering between specialists and medical care zones. The transportation system should make it possible to bring patients from one zone to another as well as bring some of the diagnostic facilities to the different types of institutions unable to afford their own facilities and equipment.

In the next chapter we will demonstrate how the theory of a zoned hospital was projected for an urban medical teaching complex.

FOOTNOTES: CHAPTER V

1. Roslyn Lindheim, Uncoupling the Radiology System, A Monograph of the Center for Planning and Development Research (University of California; August 1967).

2. M. S. Blumberg, "Electronics Can Expand X-Ray Capability," Modern Hospital (November 1965), p. 14.

3. Wendell G. Scott, et al., Planning Guide for Radiologic Installations (2nd ed., Baltimore: Williams and Wilkins Co., 1966), Chs. 10, 21, and 23.

4. J. Gershon-Cohen, "Contrast Enhancement with Television Technics: Gallbladder Lesions," Radiology, 70 (March 1958), pp. 390-391.

5. Majic S. Potsaid, et al., "Computer Analysis of Radiographs," Medical Science (March 1966), pp. 35-42.

6. J. Gershon-Cohen, op. cit.

7. Ibid.

8. Mary Jo Unkelbach, "The Challenge of Portable Radiography," Hospital Progress, pp. 40, 44, 48, 50.

9. Nuffield Provincial Hospitals Trust, Towards a Clearer View: The Organization of Diagnostic X-Ray Departments (Oxford University Press, 1962), p. 126.

10. Picker X-Ray Corporation, Handbook for Hospital X-Ray Department Planning (White Plains, New York).

11. W. R. Taylor, "Diagnostic X-Ray Suites for the General Hospital," Architectural Record (October 1959), pp. 217-224.

12. Curt E. Westman, "Planning New Diagnostic Departments," British Journal of Radiology, Vol. 35 (April 1962), pp. 265-268.

13. United States Public Health Service, Division of Hospital Facilities, Elements of the General Hospital (Washington: 1950).

14. "Drive-In Hospital is Planned for Cologne," The Modern Hospital, 107 (December 1966), pp. 68-75.

15. Ruth A. Preston, Kerr L. White, et al., "Patient Care Classification as a Basis for Estimating Graded Inpatient Hospital Facilities," Journal of Chronic Diseases, Vol. 17 (1964).

CHAPTER VI: THE TRANSLATION OF MEDICAL NEEDS INTO A CONCEPTUAL ARCHITECTURAL PROGRAM

The following example is taken from the Conceptual Architectural Program developed for the new general hospital for the City and County of San Francisco. I was hired by the architects, Stone, Marraccini, and Patterson, as a consultant to develop a conceptual program for the new hospital. In the previous chapters we presented the determination of goals, constraints, scope of service, size, user requirements, and uncoupling and regrouping of the system as necessary decisions required in the programming process. Each of these decisions defined the boundaries within which the next decisions were embedded. Under the pressures and constraints of an actual programming problem, decisions are often made by the programmer as well as by the client using habit and prejudice rather than a structured and careful methodology for studying the facts. This is not necessarily the fault of the individual decision-maker; it can also be the result of the system in which the decision process is imbedded.

In the case of the San Francisco General Hospital, the architects were hired three years after the project had been started. Two sets of consultants had already developed reports which determined the site, the budget, and the facilities to be included. A bond issue had been voted on and accepted by the voters of San Francisco, and, in the course of promoting the bond issue, commitments had been made by city officials which they felt duty bound to carry out. New federal and state legislation, passed after the bond issue became law, created a new set of conditions affecting hospital planning decisions. The passage of Medicare and the Casey Bill changed the status of a section of the population who were indigent to that of paying consumers of medical care. The Community Mental Health Centers Construction Act authorized federal matching funds of $150,000,000 for use by the states in construction

of comprehensive community mental health centers, and projected a new type of mental health facility in possible conflict with the concept projected by the bond issue.

The events that occurred in the three year time lapse between the start of the feasibility study for the project and the hiring of the architect, obviously required a re-evaluation of the previous assumptions made. But already constraints were imposed on the project which limited its scope, location, and budget.

San Francisco General Hospital in its Historical and Contemporary Context

The San Francisco General Hospital was planned in 1908 and essentially completed in 1915. Physically, it consists of a series of red brick buildings organized into pavilions, each pavilion leading off of the longest main hall in captivity. The site is surrounded by a brick wall. Several independent buildings are connected to the main hospital by winding, dangerous, underground tunnels. It was facetiously stated at one of the meetings with the hospital staff that "if you want to hide, do it in San Francisco General Hospital, you will have food and linen and no one will ever find you." The hospital corridors and grounds are the scene of many petty crimes, and the staff is worried about getting to their parked cars at night. The look of the hospital is "institutional." People come to this hospital from the entire city of San Francisco but primarily from the low income sections. The indigent population that uses it the most is theoretically a ten minute ride from the hospital, but in actual fact an hour to an hour and a half often is required to reach the hospital from several key user areas such as Hunters Point, a Negro ghetto, if travel time is calculated to include waiting for a bus and transferring from one bus to another. Most patients come into the hospital through the emergency entrance. At night the halls are a medley of drunks, persons with gunshot wounds, mothers bringing in sick children.

San Francisco General Hospital has many unique features. It is operated by the department of health as part of a city-wide health system which includes neighborhood health centers, emergency departments, a home for the aged, and a T.B. sanatorium. It is staffed by members of the University of California Medical School and is used as a teaching hospital for their students, interns, and residents. It operates a twenty-four hour emergency service open to all patients in the city including the drunk, the drugged, the victims of riots, fires, and suicide attempts. It also unofficially provides an overnight bed for the homeless and indigent newcomer to the city. Many devoted doctors on the staff and many city officials have fought hard to obtain funds to achieve such small amenities as bedside curtains for privacy. The nurses on the staff have an incredibly hard time, as the ordinary difficulties of nursing are compounded by the lack of facilities to lighten the load.

The Client

The client for the San Francisco General Hospital was multi-headed, multi-opinioned, and multi-powered. Official committees that were set up to meet with the architects consisted of various members of the hospital staff as well as advisors from other institutions in the city. The working committees were grouped under three headings: an acute and emergency committee, an outpatient committee, and a psychiatric committee. These committees in turn formed sub-committees on special subjects. In addition meetings were held with the chief administrative officer for the city; the chief city architect; the chief of public works; the chief health officer; the two assistant health officers; the administrator of the hospital; the dean of the medical school; the assistant dean, who was located at the hospital; the mayor's personal advisor; the board of supervisors; the city planning commission; and the city's hospital consultant.

When we first started meeting with the committees, the medical school

was in a "lame duck" situation in that there was no permanent dean or chancellor at the university medical school and it was impossible to even project any long range plans. The doctors, although members of the university faculty, had no power to make decisions affecting the teaching, research or patient care policies. Close to the end of the period allotted for conceptual program formulation, a chancellor and dean were appointed.

No meetings were ever set up with any of the user or consumer groups of the city. The city officials, the doctors, the advisors, the architects, and the consultants were all very middle class in their outlook. Their idea of a "better hospital" was a reflection of their own desires which might or might not coincide with the desires of the low income users. There were months of meetings and discussions with these committees and with individuals, and in the course of these meetings, certain major issues came into focus which needed resolution. These issues were the result of the problems of an institution in flux which was groping for a new image, a new organizational form, and a new physical expression.

Goals and Constraints

Despite the diversity of interests represented by the multi-headed client, there were general goals for the future of San Francisco General Hospital which were shared by all concerned. These can be summarized:

1. To transform the negative image of the county hospital into a positive image of an institution which provides the highest quality of medical care;
2. To completely eliminate any physical indications that the county hospita is a hospital for indigent patients;
3. To make the facilities of a standard comparable to the best offered in private medical care;
4. To enhance the medical reputation of the hospital by developing it

into a center for a number of medical specialties which would service the entire population of San Francisco and the surrounding region regardless of income--such service to include a hemodialysis center, a stroke center, a coronary care center, a hyperbaric chamber;

5. To provide comprehensive medical care, preventive medicine, diagnosis and treatment, acute care, and follow-up care including home care for a section of the population, using this hospital as the focal point for this medical activity;
6. To provide programs of student teaching and research, even though the primary goal of the hospital had been patient care.

These goals had to be realized within the framework of the constraints already imposed on the project.

The previously mentioned goals were agreed upon when stated in the above generalized terms. There was less agreement when the goals were translated into specific commitments which involved space and money. While there was agreement on the general goal of the hospital to provide programs of student teaching and research, there were disagreements between the city and the university as to the amount of teaching space to provide. As an example, no provision had been made for an auditorium in the original bond issue. Several of the medical staff said that building a "teaching hospital without an auditorium was like building a house without a kitchen." A compromise was reached by the provision of plans for the shell of the auditorium which could be finished at a later date, perhaps with university funds.

There were also conflicts in goals between segments of the community and the university. A member of the Board of Supervisors of the City of San Francisco introduced a resolution which requested a review of the city's contract with the University of California to permit local qualified physicians, regardless of whether they were members of the University of California medical

staff, to practice at San Francisco General Hospital. The doctors had offices in the geographic area surrounding the hospital. Several heated hearings were held at the Board of Supervisors in which citizens got up and stated examples of the inferior medical care they were getting at San Francisco General Hospital under the present system. Two examples were the injustice of not having the privilege of choosing one's own doctor and the indignity of being used as teaching material. The members of the University of California medical staff contended that if the hospital were open to the community doctors, the quality of care would deteriorate. I asked several of the doctors confidentially if they would send their families to San Francisco General Hospital and they said "no." The conflict of interest between town and gown is not new. When Stanford University and the City of Palo Alto decided to build a joint hospital, the only acceptable solution was, in effect, to build two hospitals under one roof. The Palo Alto doctors have one wing and the Stanford Medical School the other. Two Radiology departments coexist. In the Palo Alto Stanford Hospital, the conflict between town and gown was spatially expressed. The issues involved at the San Francisco General Hospital were further complicate by the fact that the neighborhood doctors wanting to use the hospital were primarily Negro. It was finally resolved that "qualified" community doctors would be allowed to practice at the hospital and no separate facilities would be required.

The normal goals of designing an efficient, economical, flexible, and effectively utilized hospital were also reaffirmed. Accompanying these goals were images of how they should be accomplished. The most prevalent image was that of a tower hospital in which high speed elevators whisked doctors from patient to patient and floor to floor in a matter of seconds. This image of the tower hospital as the most efficient hospital was the result of a prevalent notion that efficiency is somehow achieved by verticality. But in addition,

the existing inefficiency of the present San Francisco General Hospital and the excessive distances between patients and facilities made most persons on the staff draw the conclusion that horizontality was bad without recognizing that there were all degrees of horizontality and that like all other things horizontality by itself was neither good nor bad but dependent on the method of operation, the organization, and the purposes it was to serve. The vertical image for the new hospital was also a result of previous hospital programming. In the process of developing size and cost estimates for the bond issue proposal, the city's hospital consultant had developed plans for a seventeen story building These plans were not officially presented or accepted, yet the image of the seventeen story building was etched into the minds of some of the decision-makers who helped formulate answers to many of the initial program questions.

Constraints

The bond issue passed on November 3, 1965, and imposed many constraints on the project:

1. The building shall be located on the existing site;
2. The hospital shall remain in operation during the total construction period;
3. The project shall cost $33,670,000, and any monies obtained from government agencies for hospital funding should be used to reduce the bond issue rather than add to the scope of the project, unless they are specifically approved as additive;
4. The proposed medical care facility shall provide a minimum of 554 beds for acute care and 226 for psychiatric care, for a minimum of 780 beds;
5. The new hospital shall provide for outpatient visits up to 250,000 per year, for the various medical specialties, as well as a minimum of 4,500 visits per year for psychiatric outpatients;
6. Patient care shall be centered in the new hospital building, whereas

some of the old existing building shall be used for teaching laboratories, research, housing personnel, and other related services.

The constraint that the building must be built on the existing site, already crowded with obsolete hospital buildings, seemed difficult. The additional constraint that the hospital remain in operation during the entire construction period made the problem seem insurmountable (figure 2 shows the existing buildings on the site). The constraints of the site were further complicated by the vagueness of some of the hospital goals. Whereas it was generally accepted that provisions would be made for expansion and change without the disruption of on-going operations, the precise nature of this change was never specified. It was necessary to make a series of assumptions, namely, that eventually all of the existing buildings on the site will of necessity be replaced; the demand for teaching facilities will probably expand; additional research space will be required; long term care or convalescent care may well become part of the continuum of comprehensive medical services in that location; and, lastly, the hospital itself will require expanded service and bed areas.

The site had its own internal logic which affected program decisions. The site bordered on the freeway and it was decided that the sound of cars would act as an irritant to sick patients and therefore must be minimized. Consideration also had to be taken of the effect of the new hospital on (1) the views of the surrounding residential neighborhood, (2) the traffic pattern of the surrounding streets, (3) new private medical and paramedical development, (4) neighborhood change and growth.

Implicit in the directive that the existing hospital remain in full operation while the new hospital is being built, is the need to maintain the following buildings during the construction process: kitchen and radiology, emergency and surgery, the nursing units, the laboratories. Figure 3 indicates

the area available or potentially available for the first phase of construction and the status of existing buildings relative to their projected use or expendability. Based on these constraints, a careful site analysis was prepared and submitted to the city by the architects on November 10, 1966. This analysis dealt with the fact that only two potential building sites are possible; one on the northern end of the site; and one on the central or southern portion of the site.

The architects strongly recommended the selection of the central or southern portion of the site based on (1) the logic of potential medical and paramedical growth to the south, (2) the more central location of this site to the remaining buildings as well as to projected future development, (3) the environmental advantages afforded by the depression of the freeway adjacent to the site which minimize noise and glare in contrast to the elevated freeway at the northern site. After consideration, representatives of the hospital and the city concurred in this selection, but placed the additional constraint that, until the new hospital is completed, Buildings 50 and 70 housing T.B. and psychiatric patients must remain in operation.

Defining the Size and Scope of Service

Despite the fact that studies made prior to the passage of the bond issue had already defined the scope of the project in terms of number of beds, number of outpatient visits, and amount of budget, a great deal of time was spent, particularly by the acute and emergency committee, on the re-evaluation of bed need and the redistribution of bed service. The number of beds projected for the hospital by the bond issue totaled 780 of which 226 were designated as psychiatric beds. The 554 nonpsychiatric beds had been tentatively assigned as follows:

136 T.B. beds;
24 communicable disease beds;
39 admission beds;
13 intensive care beds;
36 surgery, ear, eye, nose, and throat beds;
76 urology and gynecology beds;
76 orthopedic beds;
76 beds for internal medicine;
40 beds for maternity;
48 beds for pediatrics;

Total 554 beds.

Each medical department, when confronted with these figures, went into action and re-examined its medical needs. Thus, members of the department of medicine stated that an absolute minimum of 150 beds, exclusive of a medical intensive care unit, would be required. The surgeons said the 36 beds allocated to surgery was totally unrealistic. The 39 bed admission unit was thought too high. The neurosurgeons stated that the present neurosurgery ward had 15 beds already, and that if neurology and neurosurgery were combined, each could easily fill 25 beds, making a total of 50. The orthopedics department was reasonably happy and said 76 beds would be a realistic figure if the service was not overburdened with chronic cases. Meanwhile, the psychiatric planning committee remained firm in their conviction that they needed 226 beds. The present hospital census and the bed distribution was analyzed. By the time each of the departments finished estimating their requirements, the total number of beds requested added up to 1,151 beds. After considerably more debate, the committee anticipated they might possibly pare this request down to 951 beds. No member of the medical or administrative staff suggested a method for financing these additional 171 beds.

Clarifying the Problem

Each of the committees raised an enormous number of questions pertaining to the organization, the staffing, the projected growth, the user, the type of facility, and the most effective grouping pattern required for the inpatient, the outpatient, and the psychiatric patient. Although it was accepted that

there were to be 226 psychiatric beds at San Francisco General Hospital, how one defined a psychiatric patient was not resolved. Was a geriatric patient a psychiatric patient, an alcoholic, or a drug addict? At the time we started meeting with the psychiatric committee, although it was accepted that the 226 psychiatric beds were to be located at the hospital, it was not clear who the 226 beds were actually for, or what treatment was to be given, or how these beds were to relate to the other acute beds or the ambulant facilities.

Many of the psychiatrists on the committee were firmly committed to the philosophy expressed by the Community Mental Health Centers Construction Act, which projected the idea of a new type of mental health center based on the concept of dividing a city into distinct geographical units or catchment areas consisting of from 75,000 to 200,000 persons each. Each geographical area was to contain the provisions for the entire spectrum of psychiatric care which includes day care, night care, emergency care, twenty-four hour care, and out-patient care. Important to the philosophy of the program was the notion of team units. The concentration of so many psychiatric beds in one geographical location seemed in contradiction to the notion of decentralized services. Some members of the committee argued that San Francisco as a city is so compact that the concept may not be applicable in this case. Finally the committee adopted the following policy concerning the care of the psychiatric patient:

"SAN FRANCISCO GENERAL HOSPITAL MEDICAL CENTER PSYCHIATRIC DEPARTMENT"
(Summary of recommendations of the Psychiatric Services Subcommittee for the organization of the city's mental health services)

CITYWIDE PLAN FOR ORGANIZATION OF PSYCHIATRIC SERVICES

The city will be subdivided into five catchment areas, Westside, Sunset, Downtown, Eureka/Noe, and Bayview.

CARE OF THE ADULT PSYCHIATRIC PATIENT

The basic module for patient care is the "team unit." A team unit will care for about 24 patients divided approximately between eight day care patients, eight night care patients and eight 24-hour care patients.

Approximately 16 beds must be available for the use of each team.

San Francisco General Hospital Medical Center's psychiatric department will be planned to initially accommodate the adult team units for three catchment areas--the Downtown, Eureka/Noe and Bayview Districts. In the future, it is possible that some or all of these facilities may be moved from the hospital to future health centers and hospitals located geographically within the catchment areas. In this event, other psychiatric or medical activities may move into the spaces vacated.

The assumption is that the psychiatric needs of the Westside and Sunset Districts will be accommodated by health centers and hospitals within these areas.

CHILDREN

Eight beds are to be provided in San Francisco General Hospital Medical Center for children--four beds for adolescents and four for the younger group. In addition, provision will be made for 32 day patients, approximately 16 adolescents and 16 younger children, making a total of 40. The in-patients will be primarily short term, diagnostic evaluation cases. This will be a crisis-oriented service. The number of day patients is chosen to give a workable unit (20 patients) for both the adolescent and pre-adolescent age groups. This service will be primarily for the Bayview, Eureka/Noe and Downtown areas. Hospitals in other districts (e.g., St. Mary's) will continue to treat longer-stay cases.

PSYCHIATRIC TREATMENT FOR DRUG AND ALCOHOLIC PATIENTS

40 - 50 beds will be used by this service--nominally three units of 14 beds, but if required some of the geriatric beds may also be used at times.

The physical requirements for such a unit are primarily medical with additional facilities for office space and recreation. This unit is initially expected to serve the whole city. Long term rehabilitation of drug and alcoholic patients may be accommodated in some of the older buildings on the site. The drug and alcoholic services must be closely related to the medical service.

GERIATRICS - PSYCHIATRIC

A 16-bed unit is to be provided, although some of these beds may at times be used by the drug/alcoholic service. These will be mainly short term patients (1 - 2 weeks) who are sent in from psychiatric or general emergency, or screening and admitting area, for observation and evaluation, to decide their disposition. These patients have a combination of physical and mental disabilities and require both medical and psychiatric staffing. The criteria for admission to the special geriatric unit will be the patient's condition and needs, not age. Old people who are paranoid or depressed will be treated on the general adult team units. This unit is initially expected to serve the whole city.

EMERGENCY

The psychiatric emergency facilities will be situated adjacent to the general emergency department. There may be some sharing of offices, exa-

mining rooms, etc., but care must be taken that psychiatric cases do not come in contact with seriously sick and injured patients. This department is initially expected to serve the whole city.

SUMMARY OF BED ALLOCATION

Adult team units	Downtown	64 beds
	Eureka/Noe	48 beds
	Bayview	8 beds
Children's unit		8 beds
Drug/Alcoholic unit)	Combined total	58 beds
)	(exact apportionment	
Geriatric unit)	between these may vary)	
	TOTAL:	226 beds

The outpatient committee had not decided on the type of service they were planning to give; who were to be the recipients of this service; how it was to be staffed; and what type of facility they felt would be most effective in breaking down the institutional and grim clinic-atmosphere. They had a notion they wanted it modeled after a group practice clinic but had no clear idea of what the type, size, or composition of the group should be. It was necessary to project the various types of patients who might come to the hospital for service; what type of service they would need; and diagram the process by which they would be assigned the proper medical care. It became clear that three types of ambulant services were needed: one for the sick ambulant patient who needed to see a doctor for his current ailment; another for the well ambulant patient who needed a physical check up or preventive shots; a third for the chronic ambulant patient who needed continual, specialized medical service. It was decided to provide a screening center for the purpose of identifying the type of care a patient needed. A patient, once he knew where to go, would go directly either to an assigned family doctor or to his assigned specialist--chest, pediatrics, obstetrics, etc. A person entering for the first time needing only minor care would be treated in a minor treatment center

thus freeing the load on emergency for the nonemergency ambulant case.

The acute and emergency committee, as previously mentioned, spent a great deal of time determining what their needs were. When it became apparent that no amount of conjuring would summon up the required bed count, a policy was adopted which divided the beds into two categories: specialized beds, i.e. those beds which required specialized type of equipment and environment, such as burn cases, coronary care, intensive care, communicable disease, shock; and the rest of the beds. These in turn could be grouped to allow for the concentration of types of medical cases in one area but be flexible enough to permit fluctuation in the number of patients in any given nursing unit. The nurses felt strongly that a subnursing unit of sixteen beds, with the option to add or subtract beds, would provide the most flexible and effective grouping size.

The Conceptual Program--Grouping the Hospital Facilities

The following conceptual framework and program directives were used by the design team as the first hypothesis for design development. For the purposes of early program planning we concentrated on the conceptual development which crystallized the relationship of ambulant services to the bed portion of the hospital as well as to the diagnostic and therapeutic facilities; we also concentrated on the nature and character of the ambulant services, the groupings for bed patients, and the requirements for psychiatric patients. At this stage we purposefully ignored the conceptual criteria for surgeries, maternity, laboratory, etc.--we barely touched on the communication, transportation, or service aspects of the hospital except to note that the solution for these would be secondary to the prime purpose of ambulant and bed patient care.

PROGRAM DIRECTIVES

Zoning for Patient Needs: The hospital will be developed into identifiable zones which can be characterized as intensive, acute, ambulant, and psychiatric. Each of these zones requires an environment suited to the needs of the respective users. These zones must be made up of basically independent elements providing service of the nature described by its general title.

Intensive Medical Zone: The intensive care facilities, both the medical and the surgical units; surgery emergency; coronary care; shock; burn units; diagnostic radiology for inpatients; and lab should be in close proximity to each other (close proximity can be achieved by placing of units on the same level; by speeding up vertical transporation; and by using of stairways, if sufficiently close).

Reasons:

1. There is need for quick communication between these services in case of health emergencies where literally a few seconds makes the difference between life and death.
2. Specially trained personnel are required to handle intensive care.
3. These services are rapidly changing in terms of techniques, equipment, and facilities. The highest degree of flexibility for change should be incorporated in the design of these units. Their proximity, horizontally or vertically, would make for a more economical method of providing for the flexibility they require.

Acute Medical Zone: The nursing unit should be a series of subunits of approximately sixteen patients each. These subunits should be operated as single entities during the day but should be so designed that two, three, or four subunits could be combined for night care.

Reasons:

1. These subunits would contribute to the patient's sense of identity in

the large, institutional environment of the hospital.

2. Sixteen patients, plus or minus, is essentially the size that a nursing team can manage for normal acute care. It is also the existing unit size for a nursing team;
3. The smaller unit of sixteen makes possible a personal identification between the nurse and the patient;
4. The requirements for day care are different from night care's.

If the nursing units are made flexible enough, they can expand and contract according to patient demand. Those units which contain a specialized occupancy such as pediatrics and obstetrics and have a low utilization rate throughout San Francisco have the greatest need for flexibility. Thus, as an example, an obstetric unit of 32 beds should be designed so that it can accommodate 8, 16, or 24 patients, or fractions thereof, without nullifying the integrity of the unit itself.

Reason:

It is impossible to project the exact size of a unit. Flexibility in size is essential for maximum utilization.

Places near patients' bedrooms should be provided for ambulant use.

Reasons:

1. Much medical treatment requires early ambulation and incentives should be developed for this.
2. The standard hospital generally provides a long corridor at the end of which is a dayroom which is too forbidding and too far away to encourage early ambulation.
3. To feel secure in their first ambulant attempts, patients need places nearer their bedrooms where they feel the nurse is watching them.

The Institutional Quality of the Nursing Unit Should be Destroyed: By changing the spatial experience of the long corridor so characteristic of every institution, whether hospital, prison, or dormitory; by eliminating the

"routine-ism" of mealtime and medicine rounds; by providing flexible systems for food delivery to accommodate patient desires; and by the development of the sense of place and of being watched over.

Reason:

Patients feel the need for personal care and a sense of identity. These are often important components in the healing process.

Supervision of persons who enter the nursing unit should be provided. This supervision can be provided by a ward clerk, the nurses' station, closed circuit TV, or other devices.

Reason:

The hospital has become an extremely open institution. This is both positive and negative. On the negative side, the ease of entry has allowed for trespassing and stealing from defenseless bed patients, as well as intrusion on their privacy.

Outpatient Facilities: Separate the ambulant patient from exposure to the inpatient who is ill, or undergoing diagnosis and treatment.

Reasons:

1. It is disturbing for am ambulant patient to see horizontal and sick patients.
2. If the purpose and goal of the hospital is to bring patients there before they are critically ill, the hospital will have to be made a pleasanter experience.

Outpatient Diagnostic Services: Develop the diagnostic services, such as X-ray and specimen-taking for laboratory work, as a separate facility for outpatients.

Reasons:

Same as above and, in addition, the large volume of outpatients projected in the next medical era justifies the provision of separate facilities for them.

Outpatient Service: A twenty-four hour emergency service, a twenty-four hour minor treatment center, specialty clinics, a diagnostic center, and a comprehensive, family oriented medical care for a selected section of the population should be provided.

The outpatients will enter a central area containing a screening center staffed by the appropriate medical personnel. From this area they will be directed, as the nature of their need indicates, to a minor treatment center, a specialty medical clinic, the emergency service, or a general medical diagnostic and treatment center. The minor treatment center will take patients needing care for an injury or ailment that can be handled in a quick routine manner, such as poison oak or minor cuts. Some patients will be sent to the specialty clinics such as the pediatric, obstetric, and chest clinics. Once the patient has been to one of these clinics, he can go to them directly. A general medical, diagnostic, and treatment center should be available for the proper diagnosis and family care of patients. This should be located so that patients can easily get to an X-ray as well as a lab specimen area for taking of blood and urine samples. This will, in a sense, be the equivalent of the family doctor.

Grouping between Outpatients and Inpatients: Certain outpatient facilities (obstetrics, pediatrics, psychiatry, T.B.) should be located so that they will be on the same floor as the inpatient facilities.

Reasons:

1. For ease of staff communication.
2. To facilitate teaching by illustrating the various degrees of sickness and health.
3. To minimize waste of medical staff time.

Psychiatric Facilities: Conceptually the psychiatric unit should consist of three parts: (1) the acute facility where the patient first comes and is cared for as a sick patient; (2) a group facility where the patient meets with

other patients in small and large rooms. The patients in this facility can come both from the acute unit and from the outside. Both types of patients will use this as a therapeutic meeting ground; (3) an outpatient facility where the patient gets help in terms of (a) talking things over with a doctor, (b) maintaining a drug program, (c) participating in group therapy sessions, and (d) participating in other group activities such as occupational therapy, etc

Relationship to the Rest of the Hospital: A description of the relation of the psychiatric department to the rest of the hospital should be developed. Four major criteria, stressing communication, are as follows:

1. There should be the opportunity for an easy and a direct relationship between the psychiatric facilities and the rest of the hospital;
2. Patients for other medical and surgical services should be able to participate in group therapy sessions etc., which take place in the psychiatric area;
3. Medical consultation should be easily available to psychiatric patients;
4. Opportunities should be provided for unstructured meetings between the psychiatric and medical staffs in lounges, coffee break facilities, and outdoor areas.

Environmental Criteria for Psychiatric Patients: The following environmental criteria should be maintained:

1. The patient needs to have the opportunity to have privacy or to socialize in large groups or small groups;
2. It is a hospital, not a club, not a recreation center, and not a home. It should be pleasant but not try to disguise its main function;
3. A variety of types of spaces help satisfy individual needs. Choice and options minimize the institutional quality of a place. There should be dark spaces and light spaces, big and small spaces, indoor and outdoor spaces;

4. Cooking and food play an important role in developing social contacts. Cooking facilities and eating facilities should be provided and easily accessible;
5. The nurses' station should be open, with no barriers such as glass between the nurse and the patients. Drug therapy and shock treatment should be given to the patients in their usual unit and, if possible, in their own rooms rather than in a strange environment;
6. The nurse does not necessarily have to see everything that is going on. The patient should know that he can have privacy.
7. Locate psychiatric beds as near the ground floor as possible, as psychiatric patients are less able to tolerate the discomfort of heights;
8. The place should say, "come in," rather than "stay out";
9. A psychiatric patient should be able to move easily in and out of doors;
10. Provision should be made to accommodate the patients' own belongings, such as clothes, books, pictures;
11. The design should help increase the patients' interactions with other human beings.

Summary of Space Requirements: Space requirements for each team unit are as follows:

1. Bedroom area: develop alternate schemes showing combinations of four-, two-, and one-bedrooms, each with private baths. Some of the single bedrooms shall be so located as to be used for disturbed and noisy patients;
2. Shower and baths: provide for two shower rooms and one bathroom for each team of sixteen beds;
3. Multi-purpose day room: each team will have a large day room sufficient for thirty-five persons, to be also used for dining and a variety of social functions;

4. Pantry and kitchen: each team shall have its own pantry and kitchen to cook snacks and use as it so desires;
5. Quiet rooms: two quiet rooms holding approximately 8 people will be provided each team;
6. Treatment rooms: a treatment room shall be provided for physicals, medicine, EST, etc.;
7. Utility room: a utility room shall be provided adjacent to the treatment room;
8. Nurses' station: an open nurses' station shall be a communications center for the unit. Behind the nurses' station, space should be provided in a series of smaller rooms for charting, medication, dictation and conference;
9. Group therapy rooms: there should be two group therapy rooms provided, taking groups up to fourteen people. One of these may be provided as a part of the day room;
10. Offices: as a temporary directive, we will try to provide approximately 11 offices in all, each to be able to hold approximately from 6 to 8 people if so desired;
11. Laundry room: this small laundry room shall provide a home washer and drier and ironing board for patient care of personal belongings;
12. Locker and toilet facilities for outpatients;
13. Locker and toilet facilities for staff.

Beauty parlor and barbershop facilities should be shared by the three or four teams in a catchment area. Facilities shared between all psychiatric teams are as follows:

1. Library;
2. Occupational therapy workroom and storage;
3. Home maintenance training room;

4. Provisions for instruction in electrical woodworking, plumbing, soldering, maintenance;
5. Kitchen for classes in cooking, menu planning, and housekeeping;
6. Outdoor maintenance for car and cycle repair; care of house and garden should be provided somewhere on the hospital site;
7. Testing room;
8. Observation room, a group therapy room with both closed circuit TV and one way glass;
9. For teaching facilities, a conference room to accommodate fifty people;
10. Staff lounge and coffee room.

An auditorium to be shared with the total hospital was planned. Originally a gymnasium and a swimming pool were also specified, but since these cannot be included in the present budget, arrangements may have to be made in the nearby community for use of a gym and swimming pool. A judge's chambers and court room to include court for legal proceedings, a judge's chamber with private toilet, an office for head clerk and an additional office to be located near the entrance to the building are planned, and outdoor spaces for sitting, playing and recreation should be provided for all the psychiatric patients.

Teaching: The teaching activity should be an integral part of the hospital function. A variety of facilities are required for teaching:

1. Bedside teaching, involving student rounds with the medical professor, requires a larger area than the normal bed allocation;
2. Conference areas to which a patient is brought (when a patient is brought into a conference room or auditorium, every effort should be made to respect the sensibilities of the patient);
3. Resident and intern facilities on the nursing unit (an integral part of every nursing unit should be an area which can be used by interns and residents for charting, writing, analyses, etc.);
4. Larger conference rooms are needed on every floor (again depending

on the nursing configuration) to accommodate up to sixty people;

5. Small conference areas must be available for small groups of up to fifteen people to meet among themselves or with a professor. Key to this space is its accessibility. Depending on the numbers of beds per nursing floor, several of these should be spotted in strategic locations;
6. There is a request for an auditorium to house some 450 to 600 people, and to be used for teaching purposes as well as community functions. Although this is not provided for in the budget, explorations should be made to plan to provide for it in future construction. This will be used by persons both within the hospital and the community at large.

Admission Services: The entrance into the hospital should be made as simple as possible by dividing the basic entrances into two categories--ambulant and ambulance. The ambulant patients to include visitors, outpatients, walk-in patients requiring minor treatment, prearranged admission patients, psychiatric patients. The ambulance patients will be brought by car or ambulance and taken into the hospital through an emergency entrance.

Reasons:

There is too much confusion about where to go in the hospital. A central entrance, like an airline station, where you can easily find which transportation route to take once you are in, will help eliminate ambiguity and confusion.

Information and Communication: The heart of a modern hospital is its information and communication system. The emphasis should be placed on developing a continuous record for a patient in all degrees of sickness and health. Therefore, before eventual use of a computer system for recording and retrieving information was projected and planned for, a system was to be developed which at least allowed for the centralized record for inpatients, outpatients, and emergency patients, or whatever methods of storage and

retrieval were most appropriate for the interim period.

Industrial Areas: These areas include boiler plant, shops, storage and basic distribution, laundry, housekeeping, dietary, central supply. In a facility of this size and complexity, there are substantial reasons to separate industrial areas from those primarily concerned with patient care.

Reason:

1. Inclusion within the hospital proper inhibits possibility of change of both the industrial and hospital facilities.
2. Industrial areas can be of lesser basic cost if separated from costly medical construction. The constraints which apply to separation are:
   (a) efficiency of operation in control and movement of goods which just be accommodated by using truly modern distribution and control systems;
   (b) assuring that separation as such is consistent with quality of selected services--dietary and central supply being cases in point.

Distribution System: A major distribution system for material, and for mechanical and electrical services, is inherent in any proper design concept for this site, by virtue of its size, and because of the continuation of operation of the hospital during construction, changes, and expansion.

Above all, it has to be a major design premise that supporting services not dictate the concept of hospital design, nor limit the use of the site for the foreseeable future. A solution which properly integrates industrial services, which provides proper, efficient distribution methods, and which frees both the site and its component hospital elements of a maximum of constraints is essential.

Dietary: Plans should be made to explore the possibilities of having a catering service comparable to that used by the air lines and by Kaiser Hospitals in the Santa Clara and San Fernando Valleys in which the food comes to

the hospital prepared, cooked, and ready to be stored, assembled, and heated.

Laundry: The possibilities of developing a laundry separate from the physical premises of the hospital (even though it could remain on the site), and which might also service other institutions operated by the city, should be explored. Cost benefit analysis may prove that the centralized laundry for more than one service will enable the city to achieve economy in operation.

Transportation: The transportation of people and supplies should be planned around the most effective patient grouping.

Reason:

New methods of horizontal transportation are now available which combine with vertical systems to make the whole solution to the problem much more flexible. Efficiency of operation, of moving of goods and materials, can be achieved in a variety of ways. The care of patients should be the first priority rather than the efficiency of the service system. In the long run this might prove to be the most economical.

Emergency Service: Emergency service shall be used for genuine emergencies. It shall service the entire city and be open 24 hours a day. It shall be immediately accessible by ambulance or car. It shall have its own X-ray or be directly contiguous to the X-ray Department. It shall either be horizontally near the surgery or shall have its own independent elevator to take patients directly to the surgical suite. The emergency service should be expandable into appropriate adjacent areas to handle disaster situations.

Master Planning the Site

At the time of writing this chapter, the first site plan has been developed. The underlying idea of the plan is to provide for functional zones based on the assumption that at some future date the site will include a medical school, a long term care facility, and expanded outpatient and public health functions.

The circulation pattern of the site reinforces these functional zones.

Ambulance and ambulant do not conflict. Services have their own circulation system. Key to the future development of the site and the provision of future hospital expansion space is the uncoupling of the service and distribution system from the rest of the hospital.

The service and distribution center will initially consist of the power plant, laundry, and shops, but provisions will be made so that at a later date it can also accommodate a dietary department, central supply, storage, or other service requirements. The service center will be linked to the other existing and future buildings on the site by a central "spine" located below grade for utilities and material distribution. Services and utilities can be tapped through this spine to feed into the various zones as new buildings are built and as functions change. The central spine will immediately link to the new hospital as well as to the existing buildings on the site.

In Summary

Whether it will be possible to carry out the planning directives as hypothesized still remains to be seen. The hospital, at least, will be a vast improvement over the existing facilities. At most it will set a new standard for urban medical care.

Epilogue

Professor C. E. Winslow said in his book, The Cost of Sickness and the Price of Health, "It was clear . . . that poverty and disease formed a vicious circle. Men and women were sick because they were poor and became poorer because they were sick and sicker because they were poor." Public health epidemiological studies point to the socioeconomic correlates of illness and have demonstrated to the medical profession that treatment requires more than just medical therapy. A further extension of this new awareness is seen in the increasing concern of mental health professionals with the psychiatric implications of work, education, poverty, and leisure.

In our discussion of programming of hospital facilities we have used the more advanced models of the medical profession for the prevention, diagnosis, and treatment of illness. These models are already obsolete. The health needs of the urban poor must be met by a more FUNDAMENTAL ATTACK on the environment which includes the elimination of poverty, ghettos, rotten housing, air pollution, and urban stress.

A new conceptual framework is needed in which to embed the concept of health as a positive attribute and not simply the absence of disease. The hospital and other existing forms of medical facilities must be looked at as small segments of the larger health picture.