

*Symposium on Design and Function of the
Operating Suite and Special Areas*

Introduction—Architectural Planning and Hospital Ecology

IN A CONVERSATION with the author, Dr. Carl W. Walter once compared a hospital to a shellfish. Its exoskeleton is the architecture; the softer inner tissue is the medical organization. It must be able to shed old parts and grow new parts at will. At the same time, it must maintain a constant growth rate inside of a hard shell that must continually renew itself. During all of this change, it must remain a fully integrated and operative organism. The architect is primarily concerned with the skeleton, and the health professional is primarily concerned with the soft tissue; but excellence in design requires a full understanding of each part within the context of the other and of both parts within the context of their developmental history, past, present and probable future.

Too often, the concepts of the architect are not adequately transmitted across professional boundaries; often they remain colloquial. Too often they contain a measure of erroneous mysticism about the physician's real goals. Of course the reverse is equally true. It ought to be useful, therefore, to set forth some of the concerns of the architect as he proceeds to design a medical facility such as an intensive care unit.

To the architect, it appears that the era of scientific medicine since the Flexner Report of 1910 has produced knowledge at such a phenomenal rate that the theoretical capabilities of health care systems far outstrip their actual accomplishments. The effectiveness of health care systems must be measured not by what might be achieved conjecturally in an individual instance, but by what is actually achieved in most instances. The notion that a gap exists between the potential and actual could be supported by statistical data such as comparative infant mortality rates, but what more graphic evidence could one find than the heroic efforts to reorganize medical care to close that gap.

The recent development of intensive care units is just one of many such efforts. Like the shellfish, a health care system such as envisaged in a hospital or a medical center must adapt to rapid change and growth. More than that, it must continually readjust the system in such a way that change and growth are fully integrated. For example, if the intensive care unit is to be fully effective, it cannot just be grafted on to one end of the existing system. The entire system must respond with total relative readjustment.

Historically, the intensive care unit appears to be an outgrowth and special adaptation of an earlier concept of progressive patient care. Progressive patient care in its simplest form in hospitals placed the most seriously ill patients nearest the nurses' station and the least ill furthest away. Under this system, patient care was still episodic in nature, suspended between hospital admissions and usually divided among medical specialists. Later, more sophisticated forms of ambulatory care were added to one end of the patient care system and the intensive care unit added to the other. The result was that a whole spectrum of patient care began to emerge roughly as follows: Intensive Care, Intermediate or Continuing Care, Self Care, In-Hospital Ambulatory Care, Satellite Clinic Care and Home Care. Concurrently, the concept of comprehensive and continuing care began to take form after being lost for years because of the organization of medical care around hierarchies of specialties and subspecialties.

Unfortunately, it seems to be an immutable law that for every beneficial development in the organization of medical care there is a concomitant price to pay. In this case, the intensive care unit has proved so successful that, in larger medical centers, pressures to increase its size are irresistible. The more successful the ambulatory programs become and the more the population growth outpaces available hospital beds, the more the hospital becomes occupied with patients with truly life-threatening illnesses. It is not inconceivable that a majority of the beds in large medical centers in the future will be occupied by intensive care patients and that community hospitals will be providing most of the intermediate care. In more and more hospitals increasing numbers of surgical cases are being sent directly to the intensive care unit, either on the theory that everyone who has undergone operation and anesthesia is enough of a risk to warrant this kind of care, or because of the impetus to shut down the recovery room in the later afternoon.

All of the new medical centers now in design on our drafting boards have between 10 and 20 per cent of their beds committed to intensive care. In an 800-bed hospital this means planning for intensive care units of a

size equivalent to two or three full intermediate care nursing units, or more. Immediately, architects and medical staffs are faced with the problem of where to put the intensive care unit within the medical center, and how to subdivide it so that it will be manageable without losing effectiveness. Then there is the nagging worry about the almost certain need to expand it in increments in the near future. Before attempting to suggest answers to these problems, it might be well to examine three distinct philosophic approaches to the organization of patient services. The formulation of these approaches was suggested to me by Dr. Edmund Pellegrino and the staff of the State University of New York at Stony Brook.

The first approach, the organization of patient services by medical specialty, is oriented toward technical excellence. Thus, the intensive care unit would be located as close as possible to all supporting services, such as the surgical suite, the recovery room, the emergency ward, all diagnostic and x-ray services, laboratory services and anesthesiology. In its most extreme form, surgical beds would also be close by. In any case, all other beds would be distributed by specialty throughout the bed towers.

The second approach, the organization of patient services into self-contained "mini-hospitals," is oriented toward comprehensive patient care. This pattern seeks to de-emphasize the distinctions among the conventional clinical specialties. A "mini-hospital" would include 60-80 beds under the supervision of a chief medical officer (CMO). The CMO would be a generalist, skilled in mobilizing, organizing and coordinating the various specialties. The gastroenterologist, endocrinologist, plastic surgeon, urologist, and even the general surgeon, would function as consultants to the generalist, who would be the coordinator and supervisor of all medical care provided the 60 or 80 patients under his supervision. This "mini-hospital" would include intensive care patients, other acute short-stay patients, chronically ill patients requiring somewhat longer stays, and psychiatric patients. There would be no distinction between medical and surgical patients so far as nursing arrangements are concerned.

The "mini-hospital" would have radiologic and laboratory facilities within it, so that in the whole hospital comprising many beds, one must visualize several substantially independent "mini-hospitals" with certain limited types of routine x-ray and laboratory facilities decentralized in each of the units. The more complex and expensive diagnostic x-ray and laboratory facilities and such facilities as radiotherapy and operating rooms might remain centralized. Special diagnostic facilities that would be used both for patient care and for research activities would also be located on or close to the nursing units. Such facilities would include a heart station (ECC, phonocardiography, vectocardiography, fluoroscopy), pulmonary function laboratory, EEG, and C-I fluoroscopy.

The third approach organizes patient services by organ systems and is oriented to a position somewhat intermediate between the preceding two. It acknowledges the fundamental place occupied by specialization under the current patterns of medical care, but does not provide for the segregation of patients according to the conventional specialties (medical, surgical, pediatric, etc.). Instead, patients are grouped according to organ systems. Thus, there would be a floor or a nursing unit devoted to cardiovascular disorders, another to renal disorders, another to respiratory diseases, still another to neurologic disorders, and so on. Within each unit, medical and surgical specialists would function as a team and there would be no discrete area identified as "the medical service" or "the surgical service." Under this system the intensive care unit would be organized and divided similarly. It could be centralized and located close to the operating rooms, it could be decentralized with each subdivision adjacent to the appropriate floor, or there could be a combination of both. Any large centralized facility could also be subdivided by organ system.

Certain advantages and disadvantages are built into any of the three approaches and it seems appropriate that during any transitional phase the arrangements should be flexible enough to follow any one of the three patterns. We have previously noted that the hospital must continuously adapt to growth and change. We should not be under any illusion that a

perfectly planned static facility could be produced if only we had the vision to do so. We must deliberately design so that we can change our minds. Our health facilities must be designed to forgive us our planning errors, gracefully.

Although the preceding general discussion may provide clues to the disposition of intensive care units, it is also necessary to consider some of the specific requirements which also affect planning before coming to any decisions. The specific requirements that make a room in an intensive care unit different from a usual patient room fall into three fundamental categories. First is the environment, which protects the patient and staff from ordinary hospital risks and provides for their comfort. Second is the electronic monitoring system, which furnishes continuous and accurate data on the condition of the patient. Third is the medical and nursing support system, which provides highly sophisticated, around-the-clock care of the patient and instantaneously mobilizes emergency therapy at the onset of a crisis. The reason any given single patient bedroom cannot be converted to an intensive care room simply by adding monitoring and the equipment and staff normally associated with intensive care is that the ordinary patient bedroom is a most dangerous environment for the typical intensive care patient. The hazard comes primarily from exposure to electric shock and to environmental sepsis.

The environmental conditions affecting patient comfort are many, but only three will be mentioned here. The first is that 50 per cent relative humidity not only helps protect the patient, but is a very comfortable condition for inactive patients provided that the dry-bulb temperature in each room can be individually controlled. The second is that an exterior view is almost essential. We have had numerous cases reported to us of acute emotional distress in intensive care patients in windowless rooms. The third is that the sights and sounds in an intensive care unit can cause anxiety for many patients and their families, yet provide a measure of comfort to others. Provision must be made so that patients can be separated from each other. Curtains are not enough, only solid partitions can do this. If nursing vision

between rooms is required, then high eye-level panels should be provided, although those that we have seen usually are blanked off with curtains and rarely used in actual practice. It seems likely that the best arrangement would be clusters of six to eight to ten single-bed units grouped about a central nurses' station with good vision control through solid wire glass partitions separating the patient from the nurse.

If we now examine all of the foregoing considerations, it can be seen that some would favor decentralization of the intensive care unit and some would favor centralization. Generally speaking, the specific requirements favor centralization. For example, special air-conditioning and electrical requirements would be less expensive and easier to maintain in a centralized unit. Clustering for visual control would be easier, and life support systems more efficiently used. By the same token, the general considerations seem to favor decentralization. For example, a centralized intensive care unit is usually difficult to expand and is the least responsive to various organizations of medical care.

There are four possible solutions to this problem. The first is complete centralization. The second is decentralized intensive care units stacked one above the other and attached to the intermediate care bed tower, as at the Georgetown Medical Center. The third is total decentralization, in which the intermediate bed tower is designed in such a way that clusters of rooms may be assigned to intensive

care. The fourth involves combinations of the first three.

While organization of medical care is being restudied in various parts of the country, it is probably advisable to have some portion of the intensive care unit in a centralized area somewhere near the surgical suite, also to design a bed tower with the appropriate flexibility to permit conversion to various forms of intensive care. For the protection of intermediate care patients, it is strongly advisable to provide the same kinds of air-conditioning and electrical systems typical of an intensive care unit; if simple raceways can be added, it will be possible to set up the monitoring system for conversion to an intensive care unit at a later date.

And so it goes. The essays that comprise this Symposium are all concerned in one way or another with hospital ecology as we see it today. We have here a sampling of the problems to be solved and some indications of the spectrum of individuals concerned in the planning and solution of them. From the beginning, as the shell begins to form, the organic interior develops its integrative mechanisms involving patients and professionals from many areas of endeavor. Planning is never completed. A realization of this should impart to the reader some measure of the excitement, intellectual stimulation and human relationships that enter into the creation of any edifice.

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