

## OCCASIONAL NOTES

### HEALING BY DESIGN

MEDICAL care cannot be separated from the buildings in which it is delivered. The quality of space in such buildings affects the outcome of medical care, and architectural design is thus an important part of the healing process. This article explores the relation between spatial design and healing by focusing on recent developments in the design of hospitals in the United States.

The number of U.S. hospitals grew steadily from 6125 in 1945 to 7174 in 1974, an increase of 17 percent.<sup>1</sup> Since 1975, however, there has been a continuous decline in numbers, to 6467 in 1993, while the average size of a hospital remained constant at about 180 beds. Nonetheless, construction of new hospitals continues at a brisk pace, both to replace outdated facilities and to serve areas where the population is expanding. The Department of Commerce recently estimated that spending for new hospital construction will reach \$3.4 billion annually by 1998.<sup>2</sup>

During the period from 1945 to 1974, hospital architects focused on providing adequate space for new technology and on maximizing functional efficiency for the hospital staff.<sup>3-6</sup> The hospitals built during this period were efficient, but little attention was paid to the spatial qualities that are an essential component of good architecture. More recently, hospital design has begun to focus on patients and their families — the consumers of hospital services. This redirected focus has resulted from the increasing competitiveness of the health care marketplace and the realization that pleasant, user-friendly facilities can help attract patients.<sup>3,4,7-9</sup>

Many of the qualities of space that are pleasing in hospitals are fundamental to good design in all types of buildings. In this regard, a well-designed hospital reflects the art and skill of architects in the practice of their craft. The emergence of these qualities in new hospitals thus represents a maturing of hospital design from its postwar focus on functional efficiency to a balance between function and aesthetics.

Understanding the spatial qualities that make a successful hospital is important to health care providers for two reasons. First, providers should be aware of the effects of spatial considerations on healing in order to manage patient care better. Second, informed providers can be advocates for good design in the planning and construction of health care facilities. A number of well-designed hospitals have been built in the past decade; this article discusses the success of these hospitals in achieving four qualities of space that characterize good architecture: orientation, connection, scale, and symbolic meaning.

### ORIENTATION

Orientation is the property of space that communicates to the user its physical relation to other spaces. It includes access, the ability to find and gain entrance to a building, and internal orientation, the ability to lo-

cate a destination within a building. Difficulties in access and orientation often result from multiple additions to a structure, and today's hospitals, because of the thoughtless juxtaposition of new and old buildings, are notoriously labyrinthine. Indeed, the riot of signs and profusion of colored lines on the walls and floors of many hospitals give testimony to the difficulty patients have in finding their way.

Patients who are hospitalized are under both physical and psychological stress. Most undergo some degree of regression to earlier psychological stages of behavior.<sup>10-12</sup> This has important consequences for their interaction with the hospital environment; persons under the stress of illness are more susceptible to information overload, less able to process information provided by the environment, and more dependent on the assistance of others.<sup>10,13,14</sup> To a lesser degree, the patients' friends and families have similar difficulties. In addition, patients and their families are almost always first-time or infrequent users of the hospital. Such persons are easily frustrated by spatial configurations that do not daunt familiar users.<sup>15,16</sup>

Successful orientation begins with a clearly identifiable, legible entrance. The central location of the main

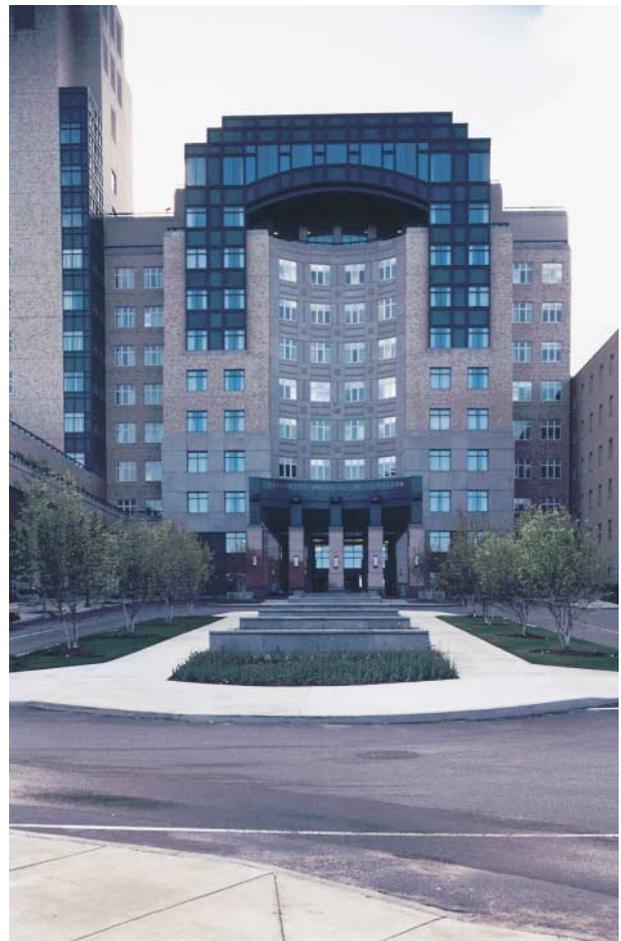


Figure 1. Lerner Tower, University Hospitals of Cleveland (1993), Designed by Payette Associates.  
(Photograph by the author.)

entrance, its portico, and the absence of other doors make arriving at the proper entrance of the University Hospitals of Cleveland straightforward (Fig. 1). Once inside a hospital, patients and visitors are confronted with a choice of numerous paths. Several design features can reduce the visual confusion associated with such choices. Proper signs are of course essential, but direct visual cues transmit information better than signs.<sup>10</sup> Such direct visual access to a destination is well demonstrated in the main hallway of the Dartmouth–Hitchcock Medical Center in Lebanon, New Hampshire (Fig. 2A). This broad, straight thoroughfare forms the main path of circulation in the hospital. From the main entrance, one passes first the outpatient clinic, then the departments of admissions, financial services, and radiology, before arriving at the inpatient area. The ability of patients and visitors to see where they are heading increases the sense of orientation.

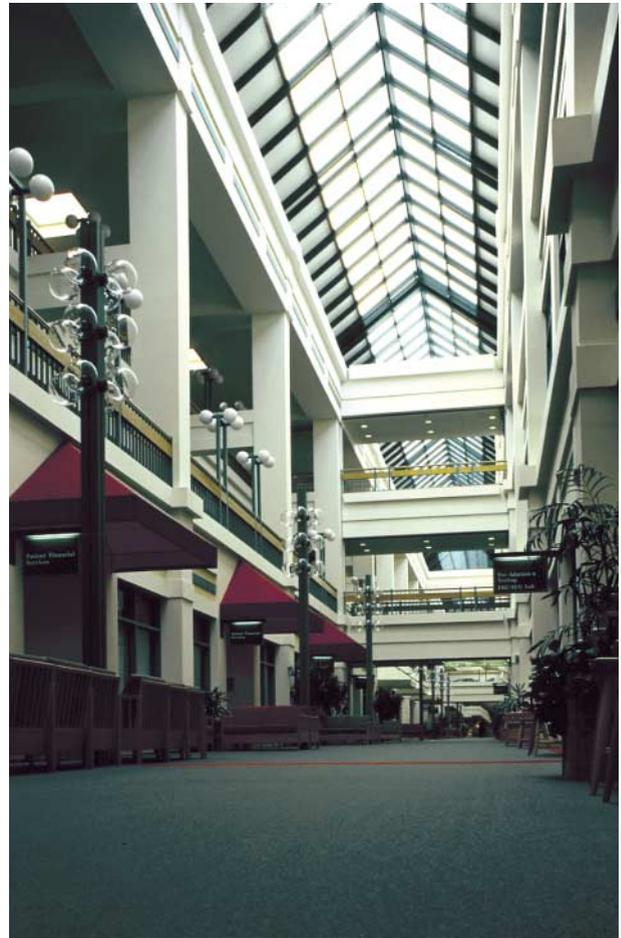
Another important device in orientation is the use of landmarks — easily identified and remembered objects that can be used as points of reference along paths.<sup>17</sup> Sculptures, fountains, and gazebos often serve this purpose. In the University of Michigan Hospital in Ann Arbor, life-size bronze figures of children identify the pediatric waiting area, and at the Mackenzie Health Sciences Centre in Edmonton, Alberta, trees in the atrium provide a convenient point of reference for finding one's way (Fig. 3A). Other strategies for minimizing spatial confusion include the use of orthogonal and symmetric circulation plans and the differentiation of architecturally similar but functionally different areas by color or ceiling height.<sup>16</sup>

### CONNECTION

Connection is a term that describes the quality of the interaction between people and their environment. Prisoners in solitary confinement have too little connection with their environment, whereas a person boarding a crowded subway train (or lost in a forest) may have too much. Two types of connection are important: connection with people and connection with nature.

Connection with people is a continuum from community to privacy; good design allows a gradual transition between these extremes. In the hospital, this transition begins in the lobby. A successful lobby is an open, welcoming area, quieter and less busy than the street outside. Such a space is well provided by the atrium lobbies of the Dartmouth–Hitchcock Medical Center and Mackenzie Health Sciences Centre and is a major reason for the success of atrium hospitals. In such a hospital, patients who are convalescing can look out on the atrium or walk to areas that overlook it, allowing them to be connected with the interior “street scene” below (Fig. 3B).<sup>3</sup>

From these lobbies, more private hallways lead to patient areas. Within hallways, alcoves can provide private spaces for confidential discussions.<sup>18</sup> Windows in hallways help establish a visual connection with outside landmarks, providing additional focal points for orientation.<sup>15</sup> Removing service traffic (such as the delivery



A



B

Figure 2. Dartmouth–Hitchcock Medical Center (1992), Designed by Shepley, Bulfinch, Richardson, and Abbott. Panel A shows the main atrium, and Panel B the inpatient wing. (Photographs by the author.)

of meals and supplies) from patient hallways enhances their ability to provide a transition from public to private spaces.

Within the best patient areas there are social spaces; sadly, most of the airy and relaxing sunrooms and



A



B

Figure 3. Mackenzie Health Sciences Centre (1986), Designed by Wood and Gardener, Groves Hodgson Palenstein, and Zeidler Roberts.

Panel A shows an atrium alcove, and Panel B the main atrium. (Photographs by the author.)

porches of our older hospitals have been converted to offices or storage areas. Fortunately, there is now a trend toward community spaces in patient areas, as seen in the inpatient units designed according to the Planetree concept.<sup>19-21</sup> These units provide community rooms, which allow bedrooms to be private, and individual kitchens, which encourage patient autonomy. Planetree units have been established at Pacific Presbyterian Medical Center in San Francisco, San Jose Medical Center in San Jose, California, and Beth Israel Medical Center in New York.

Connection with nature is also highly valued; we prefer views of nature to those of the built environment.<sup>22</sup> In a hospital study, views of nature were associated with reduced stress and fewer health-related complaints among employees.<sup>23</sup> Students under the stress of examinations felt better after viewing nature scenes,<sup>24</sup> and prisoners with a view of nature from their cells were less likely to attend sick call than those whose cells did not have such a view.<sup>25</sup> In a retrospective study of patients who had undergone cholecystectomy, those assigned to rooms with a view of a natural

setting had shorter postoperative stays and took fewer analgesic drugs than those whose rooms looked onto a brick wall.<sup>26</sup> Taken together, these results suggest that views of nature provide therapeutic benefit.

Obtaining views of nature requires both the appropriate placement of windows and the availability of natural views. The tendency to eliminate windows from hallways, intensive care units, and other hospital areas must be resisted. Poorly fenestrated rooms have deleterious effects on both patients and staff members, but patients are more severely affected.<sup>27</sup> The windowsills should be lower in patient rooms so that the landscape outside can be seen by a patient lying in bed. In addition to providing views, windows admit natural light, which is more changeable, interesting, and informative than artificial illumination. The introduction of natural light into the center of the hospital contributes to the popularity of atrium hospitals.

At the Victoria General Hospital in Victoria, British Columbia, and at Dartmouth-Hitchcock Medical Center, patient wings have been placed at ground level adjacent to the hospital's service core and connected to it by

walkways (Fig. 2B). This arrangement gives patients a connection with trees and ground that was lacking in the hospital towers of the 1960s and 1970s. Views of water are particularly favored<sup>22</sup>; this fact was used to provide a connection with nature at the Lakeland Medical Center in Athens, Texas, where a lake was created that appears to flow into the building (Fig. 4). In urban areas, or where weather is severe (as in Edmonton), an interior garden provides a connection with nature (Fig. 3A).

### SCALE

Architectural scale refers to the relation of sizes to one another, and particularly to the relation between the size of architectural forms and spaces and that of the human figure. As the architectural historian Talbot F. Hamlin observed in 1940, "The hospital is not a house, nor is it a factory; its character must have a subtle balance of human scale and community scale . . . the quality of the surroundings of the sick person may be as important in the cure as the specific therapeutic measures themselves."<sup>28</sup> A hospital of about 180 beds permits the integration of hospital functions without sacrificing human scale, and this may be one reason this size remains the U.S. hospital average.

Larger hospitals clearly have difficulty in preserving a balance between human scale and community scale. At the 868-bed Mackenzie Health Sciences Centre, the insertion of 2.4-m (8-ft) service floors between the patient floors results in an atrium that apparently has five stories but that is more than nine floors high; this incongruity of scale makes the observer feel small and unimportant.

In contrast, the patient care buildings at Victoria General Hospital and the Dartmouth–Hitchcock Medical Center provide a successful solution to the need to maintain appropriate scale while allowing for future expansion. These five-story buildings are nearly free-standing, connected to the main hospital structure only by walkways. Patients are reassured by the small, intimate environment, not far from the ground; their connection to surrounding nature is maximized, and orientation is straightforward.

Hospital hallways and lobbies are busy pedestrian environments, and their scale should be appropriate to pedestrians. Such scale has been defined by another indoor pedestrian environment, the shopping mall, where distances must not be so great that shoppers are discouraged from visiting stores. A similar need for pedestrian scale has led to the "mall hospital" (Fig. 2A and 3B).<sup>3</sup>

Scale within a hospital should be modulated to provide variety, to accent changes in function and ambience, and to help define the progression from public to private space. As one enters the Dartmouth–Hitchcock Medical Center or Mackenzie Health Sciences Centre, one moves from the outdoors into a high-ceilinged lobby. The path continues into corridors with lower ceilings, ideally more than a single story high. Patient rooms and work spaces are defined by further reduc-



Figure 4. Lakeland Medical Center (1986), Designed by Ellerbe Associates.

(Reproduced with the permission of the photographers, Shin and Erich Koyama.)

tions to a standard ceiling height. Abrupt entry into cramped, low-ceilinged corridors that feel private rather than public is one of the most pervasive and intimidating shortcomings of modern hospital design.

### SYMBOLIC MEANING

In addition to their functional and aesthetic roles, buildings convey symbolic meaning by visual reference to cultural icons. Since patients and their families need to concentrate their energies on healing, architects often design hospitals to provide an atmosphere of security, cleanliness, and physical comfort. In this way patients are encouraged not to worry about safety, sanitation, or physical discomfort.

The past 50 years have been an era of biologic and technological advances in medicine; symbolically, many of our hospitals reflect this technological preoccupation in their clean, streamlined facades and exposed structural and mechanical elements. Such symbolism effectively asserts the technological skills to be found within, and this is reassuring to some patients. However, the resulting resemblance of some hospitals to office buildings, airports, high-technology factories, and laboratories carries a different message. Large office buildings emphasize the subordination of their individual inhabitants, airports treat people as units of baggage to be transported, factories deal with new arrivals as material to be processed, and laboratories regard their subjects as experimental specimens; in a hospital, such symbolism does not convey the message that the institution is concerned about each patient as an individual but instead reinforces the dehumanization of the patient as a "case."

Making the hospital more homelike and less impersonal is an important way to indicate that the focus of the hospital is on the individual patient. Norman Cousins reminded us that familiar surroundings are an important adjunct to the healing process<sup>29</sup>; similarly, such surroundings can ease the acceptance of serious illness

and death.<sup>30</sup> The importance of using design to create a homelike feeling in the hospital has recently been recognized in the Planetree model and in the creation of birthing suites that resemble bedrooms in a home rather than hospital rooms.<sup>21</sup>

Frank Lloyd Wright urged architects to use design to promote a positive attitude about healing: "Hospital patients should never be imbued with the idea that they are sick. . . . Health should be constantly before their eyes."<sup>31</sup> This theme was reiterated by Cousins, who prescribed humor as a way to focus on the positive. Hamlin, writing after he recovered from a serious illness, observed that "the true hospital should be a place where any of us would love to go as to a vacation."<sup>28</sup> Architecture has a well-developed lexicon of fantasy, as can be seen at resort hotels and theme parks. Children's Hospital and Health Center in San Diego uses historical references to the early California missions not only to evoke a romantic era of the past, but also to draw on the image of the mission as a place of succor and renewal (Fig. 5). Other hospitals have emulated the grand urban hotels as places where one would want to vacation (Fig. 1).

### CONCLUSIONS

Hospitals are spaces for healing. Their functional and spatial requirements differ from those of other public buildings, such as hotels, airports, and shopping malls. Yet, because of the technical complexity of hospitals and their immense cost, optimal orientation, connection, scale, and symbolic meaning are often not achieved. Recently, however, hospitals such as those described here have successfully integrated efficient core support facilities with positive spatial qualities. These hospitals demonstrate that it is possible to provide both successful function and good architecture.

One way these hospitals improved was by listening to their patients; suggestions from patients can be difficult to obtain, but they are critical to designing spaces that enable patients to heal.<sup>15</sup> This patient-centered approach is part of a larger movement toward involving patients in the healing process.<sup>21,32,33</sup>

Hospitals also improve by learning from their experience; the University of Michigan Hospital was designed with an unprecedented amount of assistance from patients and careful attention to spatial qualities. Nonetheless, the hospital has grown in an unforeseen way: a high proportion of patients and visitors now enter the hospital from the parking garage rather than through the main entrance. Therefore, the hospital is exploring ways to improve the entrance from the garage (as in many hospitals, this passage now traverses dingy stairwells and arrives at the hospital by an unremarkable side door). Such ongoing evaluation and revision are vital to the continued optimal function of buildings, particularly hospitals, whose functions grow and change quickly.

Although this review has concentrated on hospitals, the principles outlined apply equally to other spaces in



Figure 5. Children's Hospital and Health Center, San Diego (1993), Designed by NBBJ. (Reproduced with the permission of the photographers, David Hewitt and Anne Garrison.)

which health care is provided: medical office buildings, clinics, hospices, and nursing homes. Good architecture can be created in expansion or renovation projects, as well as in new facilities. The challenge to us is to support architects in their efforts to provide the best spaces for our patients.

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## BOOK REVIEWS

### CARDIOVASCULAR MEDICINE

Edited by James T. Willerson and Jay N. Cohn. 1976 pp., illustrated. New York, Churchill Livingstone, 1995. \$115. ISBN 0-443-08781-4.

The stated goal of *Cardiovascular Medicine* is to provide an "authoritative and comprehensive review of important, clinically relevant topics pertaining to cardiovascular diseases." The editors have selected over 100 authors from all over the world for their excellence in science, medicine, and writing and have merged the chapters into a superb treatise that is both authoritative and comprehensive. *Cardiovascular Medicine* is a unique textbook that covers the scientific basis of disease as well as the available clinical experience, while also identifying therapeutic enigmas. This approach will allow the reader to adapt easily to new information as it is developed.

*Cardiovascular Medicine* begins with a thoughtful and well-illustrated unit on symptoms and signs of cardiovascular disease. This unit is an excellent introduction for medical students and interns and is a solid review for more advanced residents and fellows. The chapters on anatomy and surgical treatment provide a wealth of information and therapeutic approaches. The chapter on echocardiography is well written, although it would have benefited from more emphasis on transesophageal echocardiography. In adults, especially those who have had cardiac operations, the window allowing the passage of sound waves is small. Therefore, transesophageal echocardiography is an important option to consider when echocardiography is indicated. The unit on basic aspects of myocardial function, growth, and development examines the relation among cardiac hypertrophy, alterations in cardiac-specific gene expression, and systolic and diastolic function. The illustrations were carefully chosen and will be very helpful to readers who are inexperienced in this important field. There are also particularly insightful units on aging, the genetic basis of cardiovascular disease, and coronary artery disease in women, as well as a futuristic chapter on cardiovascular changes associated with space flight. *Cardiovascular Medicine* also provides excellent units on valvar and coronary artery disease, myocardial and pericardial disease, vascular medicine, arrhythmias, pulmonary hypertension, newer imaging methods such as computed tomography and magnetic resonance imaging, cardiovascular anesthesia, exercise testing, and preventive cardiology. These bread-and-butter areas of cardiology are examined carefully and in depth. The reader is provided with clear and well-reasoned recommendations

for patient care, along with an abundance of supportive references. The authors and editors have been careful to cite primary peer-reviewed literature containing original data, rather than refer to earlier chapters and reviews. Virtually all the chapters are accompanied by informative illustrations.

*Cardiovascular Medicine* will be a welcome addition to the personal libraries of medical students, house officers, fellows, and clinicians.

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### LOWERING CHOLESTEROL IN HIGH-RISK INDIVIDUALS AND POPULATIONS

(Fundamental and Clinical Cardiology. Vol. 24.) Edited by Basil M. Rifkind. 372 pp. New York, Marcel Dekker, 1995. \$125. ISBN 0-8247-9412-5.

This multiauthored textbook by well-known authorities is "intended to be of interest to primary care physicians, internal medicine practitioners, cardiologists, pediatricians, epidemiologists, public health physicians, clinical chemists, dietitians, and nurses involved in preventive care." Therein lies one of the major problems. It is difficult to be all things to all people. The approach is more pedagogic than practical. It is entirely too detailed for some of the intended readers and probably not detailed enough for those familiar with the field. Overall, the book is well written, but there is considerable overlap among the chapters, several of which detail information provided in reports of the National Cholesterol Education Program. Several chapters review the well-known evidence of the relation between blood cholesterol and coronary heart disease. Two chapters cover nutrition exclusively, and several others contain nutritional information. As a consequence, the chapters are self-contained but repetitious and lack a thread of continuity.

The first three chapters provide an excellent source of information on available data and strategies for reducing the occurrence of coronary heart disease. Several potential problems include a controversial recommendation to delay lipid screening for those without other risk factors until they enter the medical system for another ailment and the mention of combination therapy with fibrates and reductase inhibitors without qualification. The chapter on low cholesterol is a thorough review of the topic and dispels the idea that cholesterol lowering increases the risk of death from noncardiovascular causes. Chapter 3, "Secondary Prevention of Coronary Heart Disease," gives a thorough overview of previous secondary-