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Printed in the U.S.A. 5 4 3 2 1

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Oakbrook Terrace, Illinois 60181
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Library of Congress Control Number: 2009923623

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The United States is currently in the midst of an unprecedented health care building boom, with a projected $180 billion investment in new hospital construction expected in the next five years. A similar trend is being observed internationally.

The key drivers for this boom in the United States include aging facilities (built in the 1950s and 1960s) that no longer support efficient and safe care delivery; advances in treating childhood diseases; rapidly emerging technologies that fundamentally change care delivery processes; and the growing importance of patient- and family-centered care. Most importantly, the heightened focus on improving patient, environmental, and workforce safety and quality has increased the need to create optimal physical environments.

A growing body of research shows that there is a strong link between the design of health care settings and outcomes experienced by patients, staff, and families. There is mounting recognition that risks and hazards of health care–associated injury and harm are a result of problems with the design of systems of care rather than poor performance by providers. Furthermore, there is substantial evidence that the design of hospital physical environments contributes to medical errors, increased rates of infection and injuries from falls, staff injury, slow patient recovery, and high nurse turnover. The wider costs of lost working time, disability, and economic consequences are greater still.

Well-designed, supportive health care environments can not only prevent harm and injury but also provide psychological support and aid the healing process. It has now become imperative to rethink facility design as a critical element in bringing about change in the way health care is provided and experienced in health care settings.

This approach reflects a significant change in the way design practitioners, health care planners, and health care administrators undertake health care facility design. By linking health care building design strategies with key desired outcomes such as reduced health care–associated infections, reduced falls, increased energy savings, increased patient satisfaction, and increased market share, the discussion at the design table is no longer about the first costs of health care facility design or about meeting immediate facility space needs but about the role of the physical environment in supporting the mission of the organization in providing high-quality care. This is a positive trend that will affect the quality of health care facilities being built in the years to come.

The National Quality Forum has identified 27 “never events” that are largely preventable and should simply never occur in hospitals. The Centers for Medicare & Medicaid Services has identified specific harms, including hospital-acquired infections and falls, that should not be reimbursed. While the details are just emerging, it is likely that within three to five years, virtually no payers will reimburse hospitals and physicians for serious harm that they caused.

In today’s reimbursement climate, where hospitals will increasingly be compensated for performance, it has become evident that the business-case discussion must be about the potential long-term savings from cost avoidance due to a reduction in avoidable adverse events that represent huge costs to both the health care organization and the patients and families who receive care.

By linking the design of the physical environment with an organization’s patient safety and quality improvement agenda, processes such as evidence-based design are providing a common language of communication for architects, clinicians, and facility administrators.
Evidence-based design is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes. Health care design teams are increasingly looking to health environments research to help inform design decision making.

In some cases—such as the impact of noise on patients and staff—sufficient research exists to make informed decisions, while in other cases—such as the impact of same-handed rooms on medical errors—there is currently little supportive evidence.

We have made great strides in understanding and articulating the relationship between the built environment and outcomes in health care, but there is still a lot of work that needs to be done. Architects, researchers, facility administrators, and others must join forces to evaluate the effects of health care design innovation and share that information widely so that future projects are based on a strong knowledge base and experience. This will reduce risks and help to spur design innovation.

Our goal should be to critically analyze the premises on which we base our designs and move increasingly toward decision making based on good evidence. The Center for Health Design’s Evidence-Based Design Accreditation and Certification Program will help industry professionals with the tools they require to undertake such a process. The excellent ongoing work by the Facilities Guidelines Institute and The Joint Commission to examine the assumptions on which health care building codes and standards are currently based as well as the efforts to adopt new standards that are based on evidence are more steps in the right direction.

We urge everyone involved in health care design to contribute to this knowledge base. We can do this not only by using the best available information to inform design decision making but also by committing to design innovation, evaluating its effects, and sharing this information with the health care community so that the body of knowledge and our evidence base grow. This will help with the transformation of design and construction strategies that is truly needed to reach our goal of providing compassionate, safe care for our patients while respecting and supporting the needs of the health care workforce.

—Debra J. Levin, M.A., president and CEO, The Center for Health Design

—Anjali Joseph, Ph.D., director of research, The Center for Health Design

Debra J. Levin has worked for The Center for Health Design in various roles since 1989 and is currently president and CEO. Under her direction The Center has grown exponentially, expanding its impact both in the United States and internationally through research, education, and advocacy efforts. Levin has a master’s degree in management and organizational leadership from the John F. Kennedy School of Management and a bachelor’s degree from Arizona State University’s College of Architecture. She serves on advisory boards for Healing HealthCare Systems, Touch Briefings, and the American Academy of Healthcare Interior Designers. A fellow of the Jim Whittaker Discovery Camp for Innovation and Leadership, Levin received an Outstanding Alumni Award from Arizona State University in 1998 and was named one of Twenty People Making Healthcare Better in 2007 by HealthLeaders magazine.

Anjali Joseph is the director of Research at The Center for Health Design. Trained as an architect, she has a Ph.D. in architecture from the Georgia Institute of Technology, Atlanta. She leads and coordinates the research activities at The Center. Dr. Joseph has been actively involved in several different research projects aimed at understanding the relationship between architecture and health. Peer-reviewed articles authored by Dr. Joseph have been published in several refereed journals. She is a regular speaker at many national conferences, such as HEALTHCARE DESIGN, the Institute for Healthcare Improvement Forum, the American College of Healthcare Executives conference, the Environmental Design Research Association (EDRA), and others.

The Center for Health Design has been engaged in exploring and disseminating information about the hospital built environment and patient outcomes and patient and staff satisfaction for more than 20 years. Its mission, through research, education, and advocacy, is to transform all health care settings into healing environments that contribute to positive health outcomes through the creative use of evidence-based design. For more information about The Center’s work, visit The Center for Health Design Web site, at www.healthdesign.org.
Global health care construction shows no sign of waning, just as when the first edition of this book was published in 2005. This growth is evident in cities around the world, with increasing demand for new services and technologies as well as new ideas about how to make care better through safer construction and renovation projects. For example, one U.S. city gained four heart surgery centers, two general hospitals, and an orthopedic hospital in a two-year period and reported another $1 billion in ongoing hospital construction. Although the pace of building may appear frenzied to those looking from the outside in, construction of any health care facility requires forethought. The planning, resources, education, and communication necessary to successfully design and construct a new health care site require the “building” of a team. In addition to architects and contractors, health care organizations need the input of staff, patients, and the community. A more abstract but crucial part of the team should be the use of best practices, standards, and expert literature to guide the design of a facility that will meet quality and safety expectations.

The purpose of this publication is to help health care organization leaders, environment of care professionals, and other health care organization staff members successfully navigate the complex aspects of planning, design, and construction. This concept of health design, or evidence-based design, is emphasized throughout this publication in all issues related to planning, design, and construction. This newly updated second edition is now also a resource for health care organizations around the world interested in building new facilities or updating their current structures in line with the standards of The Joint Commission and Joint Commission International (JCI), as well as other recognized design criteria standards. Although the scope of this publication does not allow for detailed examination of every aspect of the process, which can vary greatly from country to country, it provides guidelines organizations can use in planning and implementing a holistic approach to the design and function of health care facilities that support safe, high-quality care.

The Six Phases of the Building Process

Any time an organization embarks on a large project, it can be helpful to reduce that project to small, easy-to-manage parts. With that in mind, most building projects can be organized into six distinct phases:

1. **Planning.** This includes “blue sky” (“wish list”) considerations, master planning, and predesign efforts.
2. **Schematic design.** This involves drawing a rough outline of the project, including preliminary room layout, structure, and scope.
3. **Design and development.** This includes adding details to the design, including fixtures, furniture location, and decor.
4. **Construction documents.** This requires converting all aspects of the design into a template from which contractors can estimate costs, identify issues, and plan construction activities. At this point, organizations will discuss contract conditions—the rights and duties of all participants, including the owner, the contractor, and the architect.
5. **Construction.** This is the phase in which the building or facility is actually built.
6. **Commissioning.** Before taking ownership of a building, project, or renovation, an organization must make sure that all specifications are met and that all systems, components, equipment, and so forth are fully operational. Commissioning encompasses these activities.

Although some of these phases can overlap, they are usually implemented sequentially. The phases provide a framework for the building process; however, some degree of variation is common on almost every building project.
Content of This Book

The chapters within this book are organized to follow the six phases of the building process. Chapters 1 and 2 discuss issues and actions related to planning. Chapter 1 looks at the variety of considerations organizations should keep in mind when conceptualizing a building and the building process. Chapter 2 discusses more concrete steps, such as team selection, programming, scheduling, communication, and budgeting.

Chapter 3 takes a focused look at Joint Commission and JCI requirements regarding planning, design, and construction. Areas such as safety and security, emergency management, infection prevention and control, and fire safety are discussed. This chapter also provides information on accreditation requirements related to the proactive risk assessment process and interim life safety measures. Please note: Standards and standards numbers listed and referenced here and anywhere else in this book are current as of this book’s publication. For current Joint Commission or JCI standards, please consult the current comprehensive accreditation manual. Also, although Joint Commission and JCI standards are similar, they are not identical. JCI-accredited organizations or those interested in JCI accreditation should read this chapter (and the entire book) for its concepts but should consult the accreditation manual that applies to their specific program for official requirements.

Chapter 4 moves past the planning phase and examines the schematic design, design development, construction documents, and construction phases. It provides general information on what organizations can expect during these phases and offers suggestions to ensure effective communication and implementation of risk reduction strategies throughout the different phases.

The final chapter, Chapter 5, briefly discusses the commissioning process. While not difficult conceptually, this process can be challenging for organizations if they do not prepare for it early. The chapter offers some tips and strategies to successfully commission a new or renovated building.

The two appendixes take a closer look at areas that require special design considerations: laboratories and pharmacies. Meeting regulations, ensuring proper ventilation, and enhancing patient and staff safety are paramount in these areas.

In addition, some online extras have been included as further resources for readers. In many cases, these extras provide visual support for case studies and other downloadable forms and tools to assist in making the concepts discussed here more understandable and practical. Look for the Online Extras icons throughout the book, or go to http://www.jcrinc.com/PDC09/Extras/ for the full list of online extras.

Although every construction project will be different, all organizations should keep certain concepts in mind throughout the building process. Organizations that plan, communicate, respond to input, and address the needs and concerns of patients and staff can successfully navigate this effort. After completing the project, organizations will be proud of their accomplishments and know that their hard work, diligence, and enthusiasm resulted in creating a dynamic, focused, and safe environment.

How to Use This Book

Planning, Design, and Construction of Health Care Facilities, Second Edition, provides readers in the United States and elsewhere around the world the strategies and tools—including real-world experiences of organizations through a wealth of case studies—to succeed in their efforts to plan, design, and construct new health care facilities. For readers in the United States, the book includes revisions to the organization and numbering of Joint Commission requirements that are the result of the Standards Improvement Initiative. For organizations outside the United States, this publication references JCI’s Facility Management and Safety (FMS) standards. Please note that although U.S. and international standards are similar, they are not identical (see the description of Chapter 3’s contents, above, for more details).

Many of the concepts discussed, however, are applicable to health care facilities throughout the world. Specifically, readers can use this book to better understand the following:

- Issues to consider before building or renovating health care facilities, including information that allows readers to make an effective, efficient plan at the outset to save time and money by moving the construction process from concept to completion more quickly and economically.
- The importance of master planning and predesign. The key benefit to this approach is “smarter” planning that eliminates waste and errors.
- The most current Joint Commission and JCI standards related to the planning, design, and construction of health care facilities. Knowing the standards and the concepts that guide the standards gives organizations a basis for sound decision
making that both meets accreditation requirements and supports maximum quality and patient safety.

- How to take building design from concept and the page to reality, which requires the ability to make adjustments within the parameters of the overall plan and budget. This also requires all parties involved—staff, patients, architects, construction workers, and others—to have a clear understanding of the plan and implementation in order to avoid unnecessary distractions, delays, and regulatory barriers.

- The importance of commissioning, including testing the success of the facility's function before opening for patient care. Properly “test driving” the facility at a time when modifications can still be made benefits the organization in both the short term and long term.

- Special considerations for the design of laboratories and pharmacies. This ensures that patient and staff safety are paramount when planning new construction or improvements in functional areas where very small mistakes can make the difference between providing safe care and making medical errors.

### Key Terms and Definitions

Similar health care settings sometimes use different language to refer to the same concept. No discussion of planning, design, and construction of health care facilities can occur without referring to the **environment of care**. (Note to JCI readers: Environment of care is a term used in the United States for the physical environment in which health care is provided, but the term’s spirit is global.) The environment of care is made up of three basic components: buildings, equipment, and people. Effective design and management of the physical environment achieves the following goals:

- Reduces and controls environmental hazards and risks
- Prevents accidents and injuries
- Maintains safe conditions for patients, staff, and others coming to the facility
- Maintains an environment that is sensitive to patient needs for comfort, social interaction, and positive distraction
- Minimizes unnecessary environmental stresses for patients, staff, and others coming to the organization’s facilities

To be sure that other terms in this publication are understood, the following terms are defined:

- **Care** also refers to treatment and services.
- **Cleanroom** is defined by the International Organization for Standardization (ISO) as a room in which the concentration of airborne particles is controlled. A cleanroom is constructed and used in such a manner as to minimize the introduction, generation, and retention of particles inside the room and in which other relative parameters, such as temperature, humidity, and pressure, are controlled as necessary.

- **Critical access hospitals** are rural U.S. hospitals that receive cost-based reimbursement from the U.S. government’s Medicare program.

- **Evidence-based** is defined by The Joint Commission as being based on empirical evidence or, in the absence of empirical evidence, expert consensus (such as consensus statements promoted by professional societies).

- **Evidence-based design** incorporates specific design principles that have been shown through comprehensive research studies to improve clinical and satisfaction outcomes for patients and staff. The Center for Health Design defines evidence-based design as the process of basing decisions about the built environment on credible research to achieve the best possible outcomes. Evidence-based health care architecture creates safe and therapeutic environments for patient care and encourages family involvement. It promotes efficient staff performance and is restorative for workers under stress. These designs ultimately should improve the organization’s clinical, economic, productivity, satisfaction, and cultural measures.

- **Facility** refers to any building used for the care of patients.

- **Organization(s)** refers to all types of health care organizations.

- **Wayfinding** refers to the concept of patients, staff, and visitors being able to easily navigate a facility, or find their way.

Finally, throughout the publication, the word **patient** is used universally to represent any individual served within a health care organization.

### Acknowledgments

Thank you to all reviewers, including Diane Bell, David Boan, John Fishbeck, Jerry Gervais, Sherry Kaufield, John Maurer, Kristine Miller, George Mills, and Skip Wilson. Special thanks to Debra Levin and Anjali Joseph for their Foreword, and to Dr. Joseph for her time and expertise in developing the rest of this book. Janet McIntyre, as always, delivered an excellent manuscript on schedule.

Finally, many thanks to the following health care leaders, providers, and staff who provided or helped develop the many case studies and other supportive elements in this book:
Reference