Planning, Design, and Construction of Health Care Facilities

Addressing Joint Commission and JCI Standards and Other Considerations—from Planning to Commissioning

Foreword by Charles H. Griffin, AIA, FACHA, EDAC

third edition

The Joint Commission

Joint Commission Resources

Joint Commission International

THE AMERICAN INSTITUTE OF ARCHITECTS
Academy of Architecture for Health

Planning, Design, and Construction of Health Care Facilities, Third Edition

About This Book

A health care facility's new or improved design establishes the basis for safe and effective care within that structure. Designing and executing a construction or renovation project requires resources, education, communication, and collaboration throughout the process. When patient and worker safety are at risk, the stakes for a successful project are even higher.

This third edition of *Planning, Design, and Construction of Health Care Facilities*—developed in conjunction with the American Institute of Architects Academy of Architecture for Health (AIA-AAH)—presents a comprehensive guide for health care organizations around the world looking to build new facilities or update current structures. This revised edition offers the following:

- New and expanded information on the topics of process improvement, risk assessment, health care commissioning, designing for safety and reliability, alternate facility delivery models, and much more
- Case studies that highlight the application of key strategies

Health care organization leaders, their facilities managers, and the architects, designers, and construction firms they work with will all benefit from *Planning, Design, and Construction of Health Care Facilities,* Third Edition. In fact, the AIA-AAH recommends this book as preparation for becoming a certificate holder in the American College of Healthcare Architects (ACHA). A board-certified health care architect with ACHA credentials is the only specialized certification recognized by the AIA.

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The mission of Joint Commission Resources (JCR) is to continuously improve the safety and quality of health care in the United States and in the international community through the provision of education, publications, consultation, and evaluation services.

About American Institute of Architects Academy of Architecture for Health

The mission of the American Institute of Architects Academy of Architecture for Health (AIA-AAH) is to improve both the quality of health care design and the design of healthy communities by developing, documenting, and disseminating knowledge; educating design practitioners and other related constituencies; advancing the practice of architecture; and affiliating and advocating with others that share these priorities.

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Academy of Architecture for Health

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This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. Every attempt has been made to ensure accuracy at the time of publication; however, please note that laws, regulations, and standards are subject to change. Please also note that some of the examples in this publication are specific to the laws and regulations of the locality of the facility. The information and examples in this publication are provided with the understanding that the publisher is not engaged in providing medical, legal, or other professional advice. If any such assistance is desired, the services of a competent professional person should be sought.

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foreword

Human health and well-being are intrinsically linked to the built environment. This linkage is where the principles guiding the American Institute of Architects Academy of Architecture for Health (AIA-AAH) and The Joint Commission come together. Each organization aims to improve the lives and the outcomes of patients and the public:

- The Academy believes in improving the quality of health care through design.
- The Joint Commission strives to improve health care by promoting safe and effective standards of care.

We believe that this book unifies our missions by guiding health care institutions through one of the most critical and costly activities—that of design and construction of a new or renovated facility. Each design decision for health care facilities impacts the care and well-being of users for many years to come.

Building for Health

Building design can help us live better and longer lives rather than contribute to current lifestyles that may not promote a healthy and motivational activity, thereby indirectly lessening our opportunities to be more active and healthy by design. Such an approach takes on even greater significance for health care facilities such as hospitals and clinics. For example, a safely lit central garden space centrally located in a hospital could encourage ambulatory patients, visitors, and hospital staff to take short walks in a calming space rather than navigate through internal corridors or sit in a windowless lounge or break room.

Impact of Health Care Trends

Living longer and healthier through better building design is a laudable approach, but it may not always be an affordable one. In recent years, the health care market in the United States has been wrestling with cost containment due to annual health care costs that, until recently, have far exceeded the consumer price index. This has resulted in health care costs escalating to more than 17% of the gross national product, per the World Bank, double that of any other developed country. At this rate, the cost of health care in the United States is not sustainable. In addition, the market is redefining itself following passage of the Patient Protection and Affordable Care Act (ACA) legislation of March 2010. The ACA, while increasing the number of insured patients, is also reducing the level of reimbursements provided to hospitals and providers; this further exacerbates the pressure to reduce the costs of providing care. These developments have expressed themselves in several trends in health care that have had strong impacts on design and construction, such as those described here.

Lower-Cost Environments

Providing care has shifted its emphasis to the least complex and lowest-cost environment—from the acute care hospital to the ambulatory clinic, and from the clinic to the home. This has resulted in a significant increase in the design and construction of ambulatory and intermediate-care facilities, which has shifted funds away from hospital construction.

Lean Methodologies

Health care institutions are using Lean methods to reduce waste and improve the quality of the patient and staff experience, thereby improving quality and helping to reduce costs (Lean methodology is a set of principles and practices for continuous process improvement by elimination of waste). Institutions such as Seattle Children's Hospital and Virginia Mason Medical Center borrowed from Lean manufacturing strategies to incorporate continuous process improvement and patient-centered care for their newly designed facilities. It is critical for architects to be engaged in process improvement at an early stage of design to avoid rework that could result in incorporating old inefficient processes into the new design.

Collaborative Teams and Spaces

Integrated clinical team delivery allows each activity to be performed at the lowest cost possible while still providing appropriate patient care. This frees each professional to perform at his or her highest skill level. Such collaborations have a direct impact on staff spaces in terms of both their openness and their relation to patient spaces.

Mobile Technologies

The use of mobile devices that serve as health tracking, diagnosis, and medical tools is still in its infancy. However, these devices may significantly shift health care provision to a range of locations beyond the hospital or clinic. Such shifts would change building utilization patterns in ways that are difficult to anticipate. These trends generate uncertainty as to how and where health care will be delivered in the future. The uncertainty leads to greater emphasis on the flexibility and adaptability of new and renovated facilities.

Impact of Design and Construction Trends

At the same time, there are similar trends evolving in the design and construction fields. These are described here and will be elaborated upon in the book.

Evidence-Based Design (EBD)

Evidence-based design (EBD) is a decision-making approach that provides research-backed information for decisions made during the design process. This may lead to shorter hospital stays due to improvements such as daylight in patient rooms. It may result in a reduction of medication errors as well, thanks to features such as appropriately sized and better lit medication rooms located away from distractions. (See DESIGN FOCUS: Designing for Safety and Reliability.)

Building Information Modeling (BIM)

Building information modeling (BIM) has replaced traditional drafting of plans and details. Using computer technology, BIM entails building a true-to-life three-dimensional model of the planned building, allowing more coordination of all disciplines prior to the construction phase. More elements may be accurately fabricated in a shop and brought to the field for quick assembly. Both design and construction teams use this method, resulting in a more collaborative effort, a safer construction environment, and the prospect of less costly changes during construction. (See Chapter 2.)

Integrated Project Deliver (IPD)

Integrated project delivery (IPD) and similar procurement methods are new means of collaboration between the design and construction teams. IPD is a joint contract between the owner, the architect, and the contractor that has them all share in the risks and the rewards (in different proportions) of the profits or savings. Similarly, there has been an increase in the use of traditional design-built and public-private partnership contracts. Either of these methods can serve to shorten the design and construction period and provide potential cost savings.

There is greater integration in the design/construction process than we have seen in recent decades. Such integration calls for radical changes in the way design and construction are procured and in the composition of their teams and contracting methods. (See PLANNING FOCUS: Alternative Facility Delivery Models.)

Education

We at the AIA are committed to educating our peers and collaborators on the impact these changes will bring to our practices. An example of a health care architect's advanced professional development is obtaining certification from the American College of Healthcare Architects (ACHA). This book is part of recommended reading in obtaining that certification. Joint Commission Resources (JCR) is making a similar educational effort with this book. We applaud them for their efforts. We are excited to participate in this endeavor, and we look forward to working together on projects that may result from it.

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A special thanks goes to the AAH editorial committee for its help and leadership in working with JCR in preparing this book, including the following individuals:

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- Orlando T. Maione, FAIA, FACHA, NCARB, Board Member (2011–2014)

Charles H. Griffin, AIA, FACHA, EDAC, Board President (2014), American Institute of Architects, Academy of Architecture for Health

introduction

The health care landscape has changed significantly since the last edition of *Planning, Design, and Construction of Health Care Facilities* in 2009, and the reported construction boom under way is just one aspect of the industry reflecting that. According to figures reported by major health care architecture firms in 2014, the number of signed contracts and their total dollar value are both higher than in 2012.[1]

One trend spurring this increase in health care development both in the United States and internationally is based on an evolution of consumer health care needs. The US Census Bureau has projected massive growth in the population of those aged 85 and over, while the World Health Organization (WHO) has reported that the average life expectancy globally continues to increase. A larger population living longer means that health care organizations must prepare for an influx of patients.

This is just one example of the increasing need for more and more efficient health care facilities worldwide, and those facilities are obliged to offer safe care in a safe physical environment.

Readers of This Book

This book is aimed at readers who may have differing backgrounds, but who must come together and work collaboratively on a health care facility construction or renovation project. These readers may be from health care organizations (clinical and executive leaders, construction supervisors, accreditation professionals, facilities directors, safety officers), architecture and design firms, and construction firms. Having a common understanding of the phases and issues involved in health care facility projects, as outlined in this book, will help to ensure a smoother process and a better outcome.

Purpose of This Book

This newly updated third edition of *Planning, Design, and Construction of Health Care Facilities* serves as an overview of the planning, design, and construction phases of a new or renovated health care facility, as well as the commissioning (move-in) phase—historically given less than proper attention. The primary intent is not only to define and explore each of these phases, but to also examine them, where possible, through the lens of The Joint Commission and Joint Commission International (JCI) standards, which make safety a top priority. By working with the American Institute of Architects Academy of Architecture for Health (AIA-AAH), we can ensure that this new edition meets the needs of the architects and designers in the field who are working with accredited health care organizations to upgrade or build new facilities.

Most of the concepts discussed in this publication are applicable to health care facilities throughout the world, despite the many variations within countries and among regions. That helps make this one-of-a-kind book valuable on both a domestic and an international level for architects, designers, and planners, as well as for health care leaders (including clinical leaders), administrators, and facility directors. It is a comprehensive guide for health care organizations looking to build new facilities or update their current ones.

Specifically, readers can use this book to gain a better understanding of the following:

- ***Up-front issues for planning:*** Issues to consider before building or renovating health care facilities, including information that allows readers to make an effective, efficient plan at the outset. This saves time and money by moving the construction process from concept to completion more quickly and economically.
- ***Joint Commission and JCI standards:*** The 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 meets accreditation requirements and supports maximum quality and patient safety.*

- *Community needs via data analysis:* The importance of comprehensive data collection and analysis to align the strategic plan, master plan, and architectural plan. The key benefit to this approach is a project plan that addresses the needs of the community and establishes the goals of the organization to meet those needs.
- *Continuous process improvement:* The critical early role of process improvement and its use as an iterative activity throughout the project—first for design, then for process alignment with the design.
- *Collaborative design:* How to take building design from concept to reality, which requires the ability to make adjustments within the parameters of the overall plan and budget. This also requires all parties involved—leadership, staff, architects, construction workers, and others—to have a clear understanding of the plan and implementation to avoid unnecessary distractions, delays, and regulatory barriers.
- *Specialty-area design:* Special considerations for the design of laboratories, pharmacies, and hybrid operating rooms. This ensures that patient and staff safety are paramount when planning functional areas where very small mistakes can make the difference between providing safe care and negatively impacting patient, visitor, and staff safety.
- *The critical role of commissioning:* The importance of commissioning both the systems of the building and clinical processes. Properly test driving the equipment and simulating processes through realistic scenarios (starting in the design phase) while modifications may still be made has short-term and long-term benefits for the organization.

Content and Organization of This Book

This edition provides readers with information and strategies to help them succeed in their efforts to plan, design, construct, and safely occupy new or renovated health care facilities. The scope of this book does not allow for detailed examination of every aspect of that lengthy and complex process and how to meet all local and national standards worldwide. However, it does provide guidelines and strategic linkages that organizations can use to plan and implement safe health care design in accordance with Joint Commission and JCI standards.

Chapters

The chapters in this book are organized to follow the typical process of a health care facilities construction project: planning, designing, constructing, and commissioning and the stages within those phases.

Chapter 1: The Planning Phase

This first chapter covers the specific aspects of the planning phase, the first phase of a health care facility construction project, including the importance of strategic planning on master facility planning and predesign (programming), and other important considerations within the planning phase, such as team selection, data collection, and budgeting.

Chapter 2: The Design Phase

This chapter focuses on key stages of the design phase that constitute the framework for the building process. For most projects, the stages of predesign, schematic design, design development, and construction document preparation are all fundamental to a well-designed and functional facility.

Chapter 3: The Construction Phase

This chapter discusses the stages of the construction phase that flow from the design phase and how to manage the subsequent increase in risk during construction through various types of risk assessments, interim life safety measures, and other actions.

Chapter 4: The Commissioning Phase

The final chapter addresses the commissioning/occupancy phase, including preparation for and activities needed to operate safely in the new space. An overview of both system/facility and clinical operations commissioning is provided, along with a discussion of transition and move-in activities.

* Standards referenced in this book are current as of this book's publication and are subject to change. For current Joint Commission or JCI standards, please consult the most recently published accreditation manual appropriate for your health care setting.

FOCUS Features

Before and after the chapters are special FOCUS features, some chapter length, that cover issues related to the various phases of the construction project process.

FOUNDATIONS: Standards and Regulations

This feature focuses on the role and importance of Joint Commission and JCI standards in the development of health care facilities, including how those apply to the construction project process. It also explains the Facility Guidelines Institute (FGI) *Guidelines* and other applicable regulations to the process.

PLANNING FOCUS: RPI and Change Management

Robust Process Improvement® (RPI), a process improvement method used by The Joint Commission, is introduced. The change management process that forms a part of this method is outlined with suggestions for applying it during a construction project. Note that the acronym RPI is also used extensively in Lean process improvement as Rapid Process Improvement, short studies of a limited-scope process.

PLANNING FOCUS: Alternative Facility Delivery Models

Four different alternative facility deliver models are summarized in this feature.

PLANNING FOCUS: Design Outcome Plan™

The Design Outcome Plan, created by the Safe Health Design Service℠ of JCR for use on construction and renovation projects, is explained. A sample plan is provided as well.

PLANNING FOCUS: Value Engineering

This feature describes how this approach can be used for management of costs during a health care facility construction or renovation project.

DESIGN FOCUS: Forward-Thinking Design

This feature touches on the significance of patient-focused and environmentally sustainable design, as well as design for expanding technology and design for adaptive environments.

DESIGN FOCUS: Designing for Safety and Reliability

This feature describes issues involved in designing for life safety, infection prevention and control, security, worker safety, and more. It also addresses evidence-based design and designing for facilities in developing countries.

DESIGN FOCUS: Specialty Design

Approaches to design for technically complex areas, including laboratories and pharmacies, comprise this feature. Special considerations are detailed.

CONSTRUCTION FOCUS: Construction Risks and Measures

Various types of risks present during construction of health care facilities are listed and explained. Measures to address these risks are provided as well.

COMMISSIONING FOCUS: Moving Day

This feature provides an overview of issues involved in moving into a facility, along with suggestions for making that transition easier and safer.

Key Terms

The health care, architecture, and construction fields are awash with terms and jargon. Understanding these and "talking the same language" are crucial for effective communication and collaboration. A list of key terms appears at the beginning of each chapter and feature. Key terms are in red and defined at point of use in the text.

Other Items

Throughout the chapters of this book, the following items will appear as appropriate:

- ***Overarching Issue:*** Insights into issues that occur throughout health care facility construction and renovation projects
- ***Standards Sidelight:*** Information highlighting how Joint Commission and JCI standards relate to the topic under discussion
- ***Project Gallery:*** Case studies focusing on organizations' struggles and successes during construction and renovation projects

Joint Commission and JCI Standards

The Joint Commission and JCI are not involved in the design or construction process of health care facilities. There are, for example, no standards that drive the building codes. However, there are standards associated with construction and renovation projects. These are included in both the domestic accreditation manuals and the international manuals (see FOUNDATIONS: Standards and Regulations). While project planning, design, construction, and commissioning issues remain fundamental to a safe design, most manual chapters address facility design in a broader sense because facility design can help an organization meet accreditation standards, offer safer care, and provide a safer and more efficient building.

Manuals to Consult

Early in the planning process, the most current edition of any relevant manual should be obtained for use and reference during the project.

Domestic Program Settings

Joint Commission standards for built environments in the United States appear in manuals for the following health care settings:

- *Ambulatory health care:* Surgery centers, community health centers, group practices, imaging centers, telehealth providers, sleep labs, rehabilitation centers, student health centers, urgent care clinics, and other ambulatory providers
- *Behavioral health care:* Organizations that provide mental health services, substance-use treatment services, foster care services, programs or services for children and youth, child welfare, services for individuals with eating disorders, services for individuals with intellectual/developmental disabilities of various ages and in various organized service or program settings, case management services, corrections-based services, and opioid treatment programs
- *Critical access hospitals:* Hospitals in the United States that offer limited services and are located more than 35 miles from a hospital or another critical access hospital, or are certified by the state as being a necessary provider of health care services to residents in the area. A critical access hospital maintains no more than 25 beds that could be used for inpatient care. It provides acute inpatient care for a period that does not exceed, on an annual average basis, 96 hours per patient. A critical access hospital can also have a distinct part psychiatric and/or rehabilitation unit; each unit can have up to 10 beds.
- *Hospitals (including academic medical centers):* General, acute psychiatric, pediatric, medical/surgical specialty, long term acute care, and rehabilitation hospitals
- *Laboratories:* Clinical laboratories, point-of-care testing facilities, assisted reproductive technology labs, and reference labs
- *Nursing care centers:* Organizations that provide specialized services to patients or residents, which may include rehabilitative care, dementia-specific memory care, and long-term nursing care
- *Office-based surgery practices:* Surgeon-owned or -operated organizations (for example, a professional services corporation, private physician office, or small group practice) that provide invasive procedures and administer local anesthesia, minimal sedation, conscious sedation, or general anesthesia that renders three or fewer patients incapable of self-preservation (able to leave the facility independently) at any time, and are classified as a business occupancy

International Program Settings

The international standards are available for the following JCI accreditation programs:

- *Ambulatory care:* The standards are applicable to a variety of service models, but primarily organizations where the patient population is outpatients seeking services—general or specialty, urgent or planned. Examples of specialty services include outpatient surgical services, diagnostic testing, dental services, or palliative care. Patients stay in the facility for short periods; however, if patients need to stay overnight due to a prolonged recovery, they are expected to be released or transferred to an appropriate facility within 24 hours.
- *Clinical laboratories:* Facilities that perform laboratory testing on specimens obtained from humans in order to provide information for health assessment and/or for the diagnosis, prevention, or treatment of disease
- *Hospital (including academic medical centers):* General, acute psychiatric, pediatric, medical/surgical specialty, and rehabilitation hospitals
- *Long term care:* Organizations that provide specialized services to patients or residents, which may include rehabilitative care, dementia-specific memory care, and long term nursing care
- *Primary care centers:* Organizations that focus on community integration, health promotion and disease prevention, first-contact medical services, and linkages to other parts of the health care delivery system

Common Themes

Common themes among all of the manuals and expectations that may be pertinent to a facility construction project include those listed below. These will be woven throughout the book, with several called out in the Standards Sidelight features.

Leadership

- Leaders base project planning on the needs of community and/or the population base.
- Project plans reflect current best practices.
- Project plans are made with input from those in the field with knowledge of the various clinical and environmental needs—for example, pharmacy, nursing, infection prevention, imaging, and so on.

Patient-Centered Care

- Facilities provide the support services necessary for specific patient populations, such as radiology, food service, and laboratory services.
- Design is centered on the well-being of the patients, both physical and psychological.
- Privacy is provided for patients in care settings.
- Built environments reflect the needs of the disabled, age-related services, cultural needs, and others as may be appropriate.
- Families are integral to patient care.
- Belongings are secure at all times.

Staff

- Staff is provided appropriate and safe work space.
- Staff training is essential and space is identified for this purpose.

The Physical Environment

- Facilities are designed and built to provide a secure and healthy environment to patients, visitors, and staff.
- Systems are in place to manage hazardous materials and waste.
- A secure environment is maintained for users, equipment, and supplies.
- A safe physical facility is maintained for users, equipment, and supplies.
- Facilities plan for and manage probable emergency situations.
- Adequate utility systems and controls are in place.
- Fire safety protocols meet prescribed local or national requirements.
- Supplies of potable water and electricity are available 24 hours a day.
- Interim life safety measures can be met.

Infection Control

- Current scientific practices, as well as local and national laws, are followed to reduce the risk of infection.
- Appropriate airflow technology is installed to mitigate contamination potential.
- Hand hygiene accommodations are made.
- Proper equipment and processes are in place for disposal of waste.
- Sterilization and/or disinfection of equipment reflect current standards.
- Infection control risk assessments are conducted and solutions applied.

Information Management

- Patient records are protected and maintained so that they are secure.
- Confidentiality is maintained.

Medication Management

- Medications are safely received, processed, stored, distributed, administered, and disposed of.

Surgical and Anesthesia Care

- The physical environment supports the customary requirements of patient monitoring and medical technologies for life support.
- Air management is appropriate for temperature, humidity, and required exchanges.

Tissues

- Appropriate and adequate technologies are adopted to protect and maintain tissues for testing, research, transplant, or other purposes.

Exit Note

Some readers of this book will be new to many of the concepts contained within, while others will find familiar topics discussed. Regardless of experience, all readers should understand that entering into a construction and renovation project in a health care facility is a huge responsibility that will affect the lives and health of millions over the years that the facility is in operation. Knowing as much as possible about such projects is part of that responsibility.

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Reference

1. Healthcare Design. 2014 HCD Corporate Rankings: Healthcare A/E/C Firms Correcting Course. Silvis, J. Jul 1, 2014. Accessed Jul 3, 2015. http://www.healthcaredesignmagazine.com/article/2014-hcd-corporate-rankings-healthcare-aec-firms-correcting-course.

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foundations

standards and regulations

FOCUS Outline

Joint Commission and Joint Commission International Standards

- Standards and the Physical Environment
  - Emergency Management
  - Facility Systems
  - Human Resources
  - Infection Control
  - Leadership
  - Medication Management
  - Patient Care
  - Patient Education and Rights
  - Patient Safety Goals
  - Sentinel Events

The Facility Guidelines Institute

- The FGI *Guidelines*

Other Relevant Standards and Regulations

- US/Domestic Standards and Regulations
- International Standards and Regulations
- Codes per the AHJ

TERMS

elements of performance (EPs)
measurable elements (MEs)
sentinel event
standards

Meeting standards and regulations, particularly in health care facilities, plays a primary role in maintaining safety in physical structures and with the systems that support them. This FOCUS feature provides a brief introduction to the types of standards and regulations that will be part of most health care facility building projects.

Joint Commission and Joint Commission International Standards

The Joint Commission accredits more than 20,000 health care organizations in the United States. Joint Commission International (JCI) provides accreditation and health care consulting services in more than 90 countries. The standards health care organizations are required to meet for accreditation are principles of patient safety and quality of care. Each standard defines performance expectations, structures, or processes that enhance quality of care in an organization. Within each Joint Commission standard are one or more elements of performance (EPs), and within each JCI standard are measurable elements (MEs). Each EP and ME is a specific action an organization must implement to achieve the goal of a standard. Overall compliance with a standard is determined by an organization's compliance with the EPs or MEs for that standard.

Standards and the Physical Environment

The Joint Commission and JCI are often asked to identify or define how their standards apply to planning, design, construction, and commissioning. In actuality, neither organization has developed its own set of such standards for health care. However, organizations accredited by The Joint Commission and JCI are expected to show processes and outcomes that rely on the built environment for effective support. This requires consideration of more standards than those traditionally addressed for the physical environment. In the United States, for example, The Joint Commission traditionally surveys health care organizations to ensure that they are meeting facility safety and health care occupancy requirements through its Environment of Care (EC), Infection Prevention and Control (IC), and Life Safety (LS) standards. JCI standards traditionally surveyed for facility systems are Facility Management and Safety (FMS); Governance, Leadership, and Direction (GLD); and Prevention and Control of Infections (PCI). Given the diversity of the areas served, however, JCI standards for construction and other health care areas must allow for local laws and regulations, which may relate to health care construction guidelines established in many developed countries.

Throughout the various chapters of the manuals issued by The Joint Commission and JCI, there are myriad standards that should influence the design of the physical environment so that safe and reliable processes can be conducted for all users of the facility. Yet, too often the standards chapters just named are the only ones reviewed during project design. It is critical that the design project team examine each of the manual chapters, as each chapter cites concepts—framed as processes and outcomes—that should be taken into account when designing or renovating health care facilities. For more information on those concepts, discussed below (listed alphabetically, not by order of importance), see DESIGN FOCUS: Designing for Safety and Reliability.

Emergency Management

When designing to deal with emergencies, the Emergency Management (EM) standards, applicable to US facilities only, encourage organizations to complete an assessment called a hazard vulnerability analysis (HVA). This activity assists organizations in understanding the potential impact of natural, technological, human, and hazardous material events. It is crucial to conduct this analysis in cooperation with community emergency responders, business owners, and other local health care organizations so that the external hazards are understood and can inform design decisions. JCI–accredited facilities are required by FMS as well as GLD standards to assess risk both internally and externally.

Facility Systems

As mentioned earlier, in the United States, the EC and LS standards chapters encompass a good portion of the requirements that impact facility systems, while internationally, those are addressed by FMS standards. However, at the core, both The Joint Commission and JCI advocate planning for security, safety, medical equipment, utility systems, fire safety, and management of emergencies, as well as safe handling of hazardous waste.

Human Resources

Every facility accredited by The Joint Commission or JCI is required to have competent, well-trained staff. This requires adequate and appropriate spaces in which staff can be trained and receive orientation to work safely within the facility. Staff qualifications and education are covered in the standards for human resources as well as standards in other chapters that outline competencies and qualifications related to the topics of the chapters.

Infection Control

In the United States and abroad, the standards for infection control should be considered during the entire building process. In the Joint Commission manuals, these are IC standards; in the JCI manuals, these are the PCI standards. The infection control chapters present outcome directives for providing an environment that controls and prevents infection. Many design elements can serve to reduce the risk of exposure to infections for patients, visitors, and staff. These design elements are supported by evidence-based research studies from such organizations as the World Health Organization (WHO), Association for Professionals in Infection Control and Epidemiology (APIC), and the US Centers for Disease Control and Prevention (CDC). For example, one key to reducing and/or preventing infections is effective management of air and water quality. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) provides guidance on air and water quality for health care facilities (see page 6).

Leadership

The requirements found in the leadership-related chapters of the Joint Commission and JCI manuals provide broad statements about responsibility and accountability. Leadership is responsible for analyzing and developing programs that meet community needs and is accountable to the community for the results of those programs. This drives the whole strategic planning process for operations, and shapes the planning, design, construction, and commissioning of facilities.

Both Joint Commission and JCI standards require leadership to understand and use resources to buy appropriate equipment, supplies, and medications as recommended by authoritative sources such as professional organizations. The standards also require that input on space, equipment, and staffing be solicited from the appropriate director or specialist, as well as soliciting input into project decisions.

Medication Management

The safe storage, ordering, dispensing, distribution, and administration of medications in health care facilities are important processes to understand in creating an adequate design. Frequently, technology is used both in the pharmacy area and in the storage and administration locations in the patient care areas. Early in the design phase, the owner/operator of the facility needs to determine the processes for each of these important phases of medication management.

Patient Care

Patient care involves access to care, continuity of care, assessment, and care provision. Patient flow is a primary consideration related to patient care that must be addressed during design of building projects. Efficient patient flow through a health care facility reduces potentially harmful delays in patient care. Patient flow applies from the moment an individual wants access to the facility, all the way through his or her entire experience there, until transport back home. External and internal wayfinding, direct visualization, areas for assessment, and care spaces that meet the population's needs are just a few of the design elements that support good care processes and timely patient flow.

Patient Education and Rights

To appropriately care for an individual, staff must acquire a complete description of the patient's complaint and assess his or her condition accordingly. To successfully accomplish this objective, organizations need to provide a confidential space with auditory privacy where a patient can discuss his or her condition with the health care provider. This design need must be considered in relation to the patient's entire experience at the facility, from entry through discharge.

Joint Commission and JCI standards also promote family involvement in care and education as to the patient's condition, which calls for appropriate space where family can be included in the care.

Patient Safety Goals

Both domestic and international accreditation manuals highlight specific patient safety goals. In the United States, these are the National Patient Safety Goals (NPSGs); internationally they are the International Patient Safety Goals (IPSGs). These goals may change over time based on current health care issues (for example, a patient safety goal may become a standard once significant progress has been made on compliance with the goal). Many of these goals translate to design considerations. For example, a crucial patient safety goal for facility design is hand hygiene. This goal seeks to increase hand washing and use of hand gel disinfectant for hygiene purposes. That translates to design considerations that must include quantity and placement of hand-washing stations and gel dispensers. A second crucial goal is preventing patient falls. This topic is a much-researched one in the design field to determine safer design elements to include to reduce or eliminate falls.

Sentinel Events

Both US and international accreditation programs focus on prevention of sentinel events. A sentinel event is a patient safety event (not primarily related to the natural course of the patient's illness or underlying condition) that reaches a patient and results in death, permanent harm, or severe temporary harm. Joint Commission leadership standards require the design of new or modified services or processes to incorporate information about sentinel events; JCI standards require organizations to use information from their own sentinel events to revise their processes. The following are sentinel events that can be specifically impacted by safe design:

- Abductions
- Suicide attempts
- Criminal events
- Falls with harm
- Infections
- Delays in treatment
- Elopements
- Fire
- Medical equipment–related injuries
- Medication errors
- Operative and/or postoperative complications
- Restraint-related injuries
- Other events such as drowning or "found unresponsive" (failure to rescue)

The Facility Guidelines Institute

The Facility Guidelines Institute (FGI, http://www.fgiguidelines.org) is an independent not-for-profit corporation that provides multidisciplinary consensus review and revision of health care building requirements. It is the result of a long history of health care construction requirements first developed in 1947 by the federal government to apply to the Hill Burton hospital development program. In 1984 the US Department of Health and Human Services asked the American Institute of Architects Committee on Architecture for Health (AIA/CAH) to assume responsibility for overseeing the standards. The first set of standards under AIA/CAH guidance was published in 1987. In 1998 FGI emerged because of a widespread desire to have the guidelines reflect consensus among many disciplines involved in the functioning of health care facilities. FGI's early members and funding organizations were AIA/CAH, the American Society for Healthcare Engineering (ASHE), and the National Institutes of Health (NIH). A 2010 revision to the guidelines incorporated standards from ASHRAE. The name also changed from AIA standards to FGI standards.

The FGI *Guidelines*

FGI publishes its standards under the title *Guidelines for Design and Construction of Hospitals and Outpatient Facilities* (commonly known as FGI *Guidelines*). The FGI *Guidelines* contains minimum standards for hospitals, rehabilitation facilities, and ambulatory health care facilities. It addresses program, space, risk assessment, infection prevention, architectural detail, and surface and finishing needs. It also details minimum criteria for plumbing, electrical, and HVAC (heating, ventilating, and air-conditioning) systems. The Joint Commission—along with many federal agencies and authorities in most US states—uses the *Guidelines* as a code or reference standard. The *Guidelines* are updated frequently to keep up with the evolving needs of the health care industry.

The Joint Commission EC standards in particular require that facilities use design criteria based either on state-mandated rules and regulations, or on the 2010 edition of the FGI *Guidelines*.* An exception is provided for situations when those criteria do not meet specific design needs, in which case an equivalent set of design criteria may be selected.

Other Relevant Standards and Regulations

During a building project, it is also vital to keep in mind the many and varied local, state, regional, and national standards and regulations. Following is a brief overview of such standards and regulations to note.

US/Domestic Standards and Regulations

- ***Local, state, and regional building codes:*** Many states, regions, and municipalities offer building codes and make them available on their websites. Project teams should be familiar with these codes and have ready access to them. Other entities also determine allowable dimensions, sizes, and cost allocations.
- ***International Code Council (ICC):*** The ICC is dedicated to developing model codes and standards used in the design, build, and compliance process to construct safe, sustainable, affordable, and resilient structures. Most US communities and many global markets choose the ICC codes. See http://www.iccsafe.org.
- ***Americans with Disabilities Act (ADA):*** The US–only ADA prohibits discrimination and ensures equal opportunity for persons with disabilities in employment, state and local government services, public accommodations, commercial facilities, and transportation. It also mandates the establishment of Telecommunication Devices for the Deaf/telephone relay services. Some areas the ADA specifies regarding building design and content include the width of doorways, ramps into and out of a facility, number of accessible parking spaces, and removal of barriers. The regulations were most recently revised in 2010, with mandatory compliance as of March 15, 2012. See http://www.ada.gov.
- ***Occupational Safety and Health Administration (OSHA):*** This US government agency provides standards related to the safety and health of workers. Requirements relate to several topics, including air quality, ergonomics, and safety. See http://www.osha.gov.
- ***National Fire Protection Association (NFPA):*** This nonprofit US organization provides scientifically based consensus codes and standards related to life safety. The NFPA's *Life Safety Code*† specifically addresses construction features necessary to minimize danger to life from fire, including smoke, fumes, or panic. See http://www.nfpa.org.
- ***US Environmental Protection Agency (EPA):*** This US government agency regulates and monitors the environmental impact of many industries, including the health care industry. It offers guidelines for air and water quality maintenance, hazardous and other medical waste disposal, and other issues. See http://www.epa.gov.
- ***American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):*** This US organization offers standards and guidelines related to heating, refrigerating, and air-conditioning systems. See http://www.ashrae.org.

International Standards and Regulations

Internationally, codes are often country specific; few are adopted globally. For example, in the Netherlands, a permit is required from the Netherlands Board of Health Facilities (NBHF) for the construction of new buildings and major renovations, and the NBHF develops guidelines related to such issues as correct ventilation in the operating room to prevent postoperative infections. In the Middle East, the Health Authority of Abu Dhabi developed building regulations in 2010 that are currently used as a template throughout the region. The United Kingdom publishes its building guidelines under *Health Building Notes* and *Health Technology Memorandums* for the National Health Service. These are available online.

* The 2014 FGI *Guidelines* have been released. As the current standards state, 2014 FGI *Guidelines* may be adopted by an organization as an equivalent set of design criteria. It is up to the individual state, city, or country to develop and schedule adoption of the FGI *Guidelines* for their area. Organizations should therefore check with their design professional or governmental affairs groups for the latest on the formal adoption of FGI *Guidelines* in use in a locale.

† *Life Safety Code*® is a registered trademark of the National Fire Protection Association, Quincy, MA.

Laws, regulations, and inspections by local authorities largely determine how a facility is designed, used, and maintained. JCI requires all accredited organizations to comply with these local requirements, except where standards require a higher level of compliance than local code.

Codes per the AHJ

In general, codes are written to work as a system. It is important that the project design team includes within the project manual or specifications which codes govern the project, per the authority having jurisdiction (AHJ). This provides owners and the project team with the contractual references for codes and standards that are needed to help manage these complex projects.

CHAPTER 1

the planning phase

Chapter Outline

Types of Planning
- Strategic Planning
  - SWOT Factors
- Master Facility Planning
- Project Predesign Planning
- Separate or Combined Processes

Step 1: Analyzing Project Needs
- Needs Analysis Topics

Step 2: Assembling the Project Team
- Organization Representatives
  - Executive Project Team
  - The Project Leader
  - User Group Teams
- Project Partners
  - Integrating the Contractor
  - Criteria for Partner Selection

▪ STANDARDS SIDELIGHT: Leadership
- Team Decision Making
- Team Collaboration and Partnering
  - Common Level of Understanding

▪ OVERARCHING ISSUE: Project Size
  - Mutual Respect
  - Partnering

▪ PROJECT GALLERY: Community Partnerships

Step 3: Gathering Project Data
- Existing Facility and Site Conditions
  - Areas for Evaluation
- Workload Analysis
- Guidelines and Requirements

Step 4: Devising a Project Plan
- Preliminary Facility Plan Elements
  - Other Preliminary Facility Plan Considerations
- Schedule
  - Representing the Time Line
- Detailed Space Plan
- Benchmarking for Estimating

Step 5: Determining a Budget
- Anticipated Critical Costs
  - Construction Costs
  - Equipment Costs
  - Finishes Costs
  - Professional Fees
  - Permit Fees
  - Escalation Fees
- Budget Contingencies
  - Design Contingency
  - Construction Contingency
  - Owner Contingency

Step 6: Finalizing the Master Facility Plan
- Implementation in Phases

Step 7: Ensuring Regulatory Compliance
- Certificate of Need

Step 8: Documenting the Master Facility Plan
- Form and Format
- For Communicating and Training

Build or Renovate?
- Renovation Issues to Consider

▪ PROJECT GALLERY: Major Renovation

Exit Note

TERMS

certificate of need (CON)
detailed space plan
executive project team
master facility plan
master facility planning
needs analysis
predesign
preliminary facility plan
strategic planning
user group teams
workload analysis

The first phase of most construction and renovation projects is the planning phase. Within this phase are various types of planning that involve many activities, from incorporating goals for the future of the facility or organization to steps such as analyzing needs, assembling a team, gathering data, creating a project plan, determining a budget, and phasing in and documenting the master facility plan. All of these activities require complying with applicable standards and regulations as well as collaboration among internal and external groups and individuals.

Types of Planning

For projects in health care organizations, the planning phase typically incorporates several types of planning that often overlap: strategic planning, master facility planning, and project predesign planning.

Strategic Planning

Strategic planning is a systematic process of translating the vision of a desired future into broad goals or objectives and enacting steps to achieve them, including allocation of resources.

In the past, strategic planning was "looking through a ten-year window into the future." With the rapid changes in technology and health care, that window has narrowed to an average of three years. Given that most projects take more than three years from inception to completion, today's facility projects are fraught with uncertainties: How will such projects mesh with the evolving needs of new medical home models, the complexities of the continuum of care, and the looming challenges presented by aging acute care facilities? In addition, other areas of health care are looking through the same window, so building projects often must compete for tight resources for electronic health records, telehealth programs, and diagnostic and treatment equipment.

Because of the swift pace of change and increases in budget cuts, strategic planning now plays a heightened role in health care organizations. A strategic plan not only investigates the internal status of an existing organization, it also identifies the external environmental and competitive forces that may impact the organization in the near future.

SWOT Factors

A wide variety of strategic planning methods are available today, but the common element in each is to identify an organization's SWOT factors: its strengths, weaknesses, opportunities, and threats. In response, the organization develops a plan to improve and optimize its performance.

Planning a new facility—or renovations to existing facilities—can be a response to any of the SWOT factors. The project can capitalize on a perceived strength within the community. It can reduce a weakness caused by outdated structures or poor location of a facility. It can aid in an expansion of services or withstand a threat by a competitor. When and if a strategic imperative for construction or renovation results from the strategic planning, the construction planning phase can begin. The construction planning phase for a project consists of two types of planning: master facility planning and project predesign planning.

Master Facility Planning

Master facility planning is the planning that determines the building and/or campus needs to align with an organization's strategic plan. For health care systems, a master facility plan may be created that encompasses all of the campuses, buildings, and/or land. The goal of master facility planning is to assist an organization's leadership in making decisions that will optimize the building and/or land use for the future while still assisting the organization in making wise choices to meet current needs.

The result of master facility planning is the creation of a comprehensive master facility plan (referred to as a strategic facility plan by the International Facility Management

Association)[1] Regardless of what the plan is called, it is essentially an extensive analysis of the facility needs to support the strategic plan. Much of the data collection to support this analysis is similar to what is required for a project plan (see page 21). To determine the time line horizon for a master facility plan, it is important to consider the complexity of the plan. For example, a campus plan that incorporates multiple building projects over time and includes appropriate infrastructure, adjacencies, and circulation will take many years. Whether the completion time frame is short or long, it is always important to review and update the master facility plan regularly for continued relevance in meeting the strategic goals of the organization.

Because the master facility plan guides *all* projects for a facility or campus, it may have several phases that embrace one or more distinct or related projects, but all build toward the master facility plan. A well-developed master facility plan reveals how each project ties in to an organization's strategic plan as well as its current physical, organizational, social, political, and economic context. The master facility plan is considered by many organizations as a living document that is reviewed, revised, and updated regularly. This will be discussed in more detail later in this chapter (see page 24).

Project Predesign Planning

Project predesign planning (predesign) is the discovery type of planning that occurs prior to actual design drawings and construction, but usually after some funding is obtained. It involves planning for a *specific project:* outlining project objectives and challenges as well as conducting studies to determine space requirements, opportunities and limitations of the site, and expected cost versus the budget. Project predesign planning overlaps with design and may be referred to as programming. Note that terminology and definitions vary: Some view programming as a separate and distinctive function and predesign as more conceptual planning of a building and less defined. Project predesign planning will also be discussed later in this chapter (see page 21) and in more depth in Chapter 2.

Separate or Combined Processes

Depending on the size of the maximum build-out of the site and the scope of the project, organizations may engage in master facility and project predesign planning separately or combine them into one planning phase. For example, complex organizations may create a master facility plan to map out several projects, each of which will have its own predesign stage, so that more specificity is provided for that project. Simpler organizations with small or single-campus projects may combine many of the steps for the master facility plan with the project predesign planning. This chapter focuses on the steps to take to complete predesign for a specific project. It is important to determine early in this process if much of the needed data and analysis have been completed in a master facility plan prior to moving forward with predesign for a specific project.

Planning should be an interactive and iterative process with workshops, meetings, research, and "homework" periods for all participants. Each step in the process should eliminate certain options and, ideally, bring those involved closer to agreement on the best alternatives. The following sections describe steps in the planning phase. The scope and nature of the project will determine whether organizations engage in all of these activities or just some of them.

Step 1: Analyzing Project Needs

Analyzing project needs is a logical first step in the planning phase. Information about needs drives decisions during the planning phase and helps estimate the capital requirements of the project. One way to get this information is to perform a needs analysis. A thorough needs analysis should involve a detailed assessment of each department or service, coupled with projections for the future state of the service for volumes, relevant offerings, space requirements, and so on. For example, as part of a needs assessment for a maternity unit, an organization should examine population projections of women ages 15 to 44, including historical and projected fertility rates by geographic area. Similarly, in assessing the needs of a surgical service, an organization should examine the impact of payer-driven changes, such as from inpatient to outpatient provision of services, and estimate what the population-based surgical rate will be in the future for cases such as heart or orthopedic procedures.

Needs Analysis Topics

As part of a needs analysis, an organization collects information from either the strategic plan or an independent market study aimed at providing a detailed analysis of the project scope and direction. This type of research can help the organization obtain information on a variety of topics, including the following:

- Service area demographics and projections
- Payer mix of constituents
- Specialty service line expertise
- Community perceptions of the facility and any of its potential projects
- Appropriate location of a new facility or facilities
- Potential lost revenue due to a project or relocation of a facility
- Presence and impact of competition

Results from this research should be considered when determining whether to do a project at all, as well as when determining the location, nature, timing, and financial impact of the project if and when it goes forward.

Step 2: Assembling the Project Team

A critical step in the planning phase is selecting the project team—the group of people who influence and are involved in the planning, design, and construction phases of the project. Every project team consists of two distinct groups: representatives of the organization and the consultants, or project partners, who work on the project. To achieve a successful planning phase, organizations should be aware of the needs, goals, and perspectives of both groups. The consultants and project partners are selected at different times based on the contracting choice and bidding process.

Organization Representatives

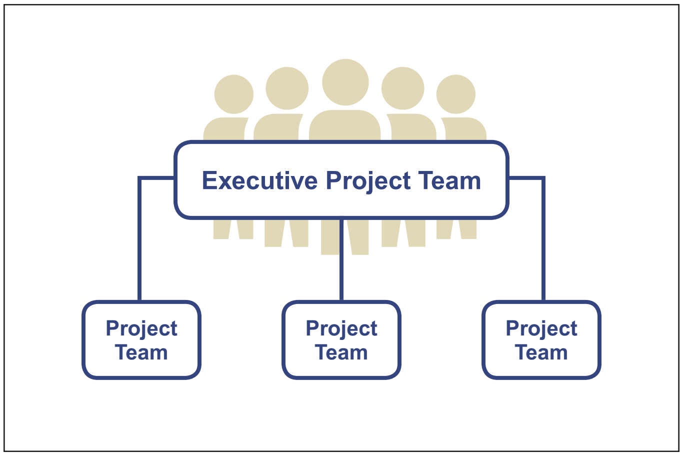
On any project team, an interdisciplinary group from various departments should represent the organization. This group should provide information to project partners (see page 12) and react to a variety of proposals made by the partners. Conversely, the project partners should work with organization representatives to tailor design and layout ideas to fit the organization's unique needs and culture.

Steps in Planning a Project

Executive Project Team

With large projects, there is usually a hierarchy of organizational involvement in teams. The leadership team with the authority for final decision making is normally called the executive project team. Following are those persons in an organization who may be included on this team:

- Representative of the executive administration, such as the CEO
- Physicians and other practitioners
- Nursing leaders, such as director of nursing
- Infection prevention and control specialist
- Facilities planning and/or engineering director
- Representative(s) of the established planning or building committee(s)
- Information technology supervisor
- Representative from the finance department
- Safety officer (the person who manages environmental risks)
- Representative(s) of the user groups



The Project Leader

Empowering a leader on the executive project team is critical to ensure that the planning phase moves forward on time and on budget. The project leader must be established as the primary contact on the team and the conduit for decisions and exchange of information. This person must therefore be a good manager of people, schedules, changes, surprises, and problems. To know when and how to bring about timely decisions, this person must have an understanding of the institution's leaders and their interests or concerns, as well as those of the project team members. A project leader must also have the respect of management and the board, and the authority and responsibility to make the planning phase work. As project leader, this person develops the organizational structure for the project, which includes subgroups such as other project teams, including user groups.

User Group Teams

As the project moves through the design development phases, it is important to involve multiple internal stakeholders (see Chapter 2). This is often accomplished through user group teams (individuals representing those who will be using parts of the building). These stakeholders should see not only their own space but also its interdependence on other spaces and processes throughout the facility. The following are areas of the organization that should have user group teams involved in the planning, both intradepartmental and interdepartmental:

- Facilities management
- Pharmacy
- Laboratory
- Radiology
- Surgery
- Clinical engineering
- Treatment areas such as the emergency department, renal dialysis, and outpatient care areas
- Specialized clinical areas, such as oncology, magnetic resonance imaging (MRI), and computed tomography (CT)
- Support services staff, such as food service, housekeeping, and materials management
- Representative(s) of the board of directors (these may be part of the executive project team)
- Emergency management groups

The following external groups could be considered for advisory members on appropriate user group teams:

- Previous patients (particularly from focused specialties) and visitors to the campus
- Representatives from community organizations, such as senior care organizations and child and family services
- Vendors in key areas, such as information technology, imaging, and surgical specialties
- Representatives from local regulatory or governmental organizations
- Donors

Project Partners

The project partners, professional consultants who design and execute the planning, design, and construction phases, are essential to the executive project team and its subgroups.

The exact makeup of these consultants will vary according to the scope of the project, size of the organization, and nature of services needed to develop and implement a sound plan. The following list identifies a range of consultants that organizations should consider:

- Architects, including the principal, project manager, lead medical planner, and lead designer
- Engineers, including mechanical, civil, structural, electrical, and plumbing engineers
- Contractors, including the project manager, estimators, and schedulers
- Health care management consultants
- Developers or development consultants
- Financial consultants
- Cost estimators
- Equipment and technology planners
- Specialized consultants, including those specializing in kitchens, furniture, information technology, and security
- Landscape architects
- Interior designers
- Wayfinding experts (see DESIGN FOCUS: Designing for Safety and Reliability)
- Process flow experts
- Green (environmentally sustainable) construction experts (see DESIGN FOCUS: Forward-Thinking Design)
- Experts in patient handling (for example, ceiling-installed lift systems)

Integrating the Contractor

Benefits of bringing the contractor or construction manager on board during the planning phase include receiving their advice on project scheduling and their opinions on construction costs. Contractors can also provide advice on the selection of building systems and constructability issues. When a government facility or other organization requires a competitive bid process at the completion of design, an organization should consider hiring a contractor for preconstruction services to assist with these activities during the design process. Ideally, the same contractor in preconstruction will be with the project through construction, but this is not a requirement.

Criteria for Partner Selection

After determining which outside professional services are needed, criteria should be developed for selecting the best firms and individuals for each specialty. One way to do this is to send a request for qualifications (RFQ) to a number of qualified firms. The responses to the RFQ should be reviewed, and the 5 to 10 most qualified firms should be invited to submit a request for proposal (RFP). A short list of the firms submitting RFPs (3 to 4 at most) should be invited to participate in an interview process with a selection committee. Make sure deadlines for submission allow adequate time for firms to respond and prepare for RFQs, RFPs, and interviews. Also, the team does not need to issue a separate RFP for each professional consultant required for the project. The RFP should identify whether the RFP should include the architect's team only or the full design team including consultants. If the former is chosen, then the consultants may be selected by the architect with the owner's consent. Otherwise, the full design team submits and interviews jointly, under the architect's leadership.

The following criteria are useful when selecting which firms to send an RFQ, reviewing the RFQs to determine which firms to send an RFP, as well as during the interview process:

- ***Commitment:*** The firm and its principals should be able to demonstrate commitment, interest, and an understanding of the client's professional service needs.
- ***Location and availability:*** The location of the firm with respect to the site and/or client, and its availability when needed, will be important factors in selecting a firm, particularly if the firm will be involved through the construction of a project. This will make it easier to conduct master facility planning or other predesign services on a more predictable schedule. After construction begins, it is critical that the project leader from the firm be available on short notice. In some cases, local firms may not have the expertise necessary for the project. In these cases, a more geographically distant firm with appropriate expertise can team up with a local firm to manage on-site issues. Cost and availability to travel to the site are also important considerations.
- ***Skill and experience:*** It is essential that people assigned to the project have the relevant skills, experience, and professional training. The firm must distinguish between its capabilities and those of the specific staff that will be assigned. In addition, organizations choosing to pursue certain types of design—such as sustainable, evidence-based, or safety-related design—should choose consultants who are well versed in these areas. References from prior projects should be checked closely to ensure that stated skills

STANDARDS SIDELIGHT

Leadership

Master facility planning and predesign cannot proceed without input and participation from an organization's leaders. Some leaders may not directly participate in all steps of the planning phase, but the personnel they hire, the decisions they make, and the initiatives they implement do affect the ultimate completion of a project. Generally speaking, leadership must not only shape the planning for these steps and provide input into design decisions, but it must drive and actively support the entire strategic planning phase for operations.

LD and GLD

The role of leadership in project planning is addressed in the requirements of both The Joint Commission and Joint Commission International (JCI). The Joint Commission's Leadership (LD) standards and JCI's Governance, Leadership, and Direction (GLD) standards require leaders to plan carefully for the services that will be offered in facilities under development, as well as to support those services with appropriate equipment and resources. (Also see FOUNDATIONS: Standards and Regulations)

and expertise have been demonstrated in the past and are specific to hospital or other health care construction.

- *Track record:* Prospective firms should be able to demonstrate professionalism, dependability, and a proven record of delivering on time and within budget for comparable clients and types of service. Occasionally, informal research can uncover negative experiences. In such cases, consider that problems in a relationship can result from either client-created or consultant-created situations.
- *Creativity, ingenuity, and imagination:* The proposed consultant team needs to have demonstrated these attributes in solving complex problems of a similar nature and must be able to apply them within given financial constraints.
- *Firm size:* The size of the firm should match the size and scope of the work. When the scope is too large, smaller firms can be overwhelmed; large firms, on the other hand, carry higher overhead costs that are difficult for a project to absorb when the scope of services is small.
- *Culture:* There should be a positive relationship between organizational cultures and the key personnel involved in the effort. Architects and engineers should have a positive working relationship with each other and, if possible, have some history of working together. A fit between the team and organization is paramount. The team members must respect each other, understand the others' needs, and interact positively.
- *Fee:* The fee structure and rates of compensation are a significant factor in selecting consultants. However, it is not always the lowest bid that provides the best fit for the project. All the factors identified here are important to weigh and evaluate against proposed fees. Also note that fees are often negotiable, so a proposed fee need not always be seen as an absolute cost. To help with this, an organization should make sure a consistent breakdown of fees is included in all proposals for each task and consider a specialized cost consultant to see if there is an anomaly in the pricing that may be causing a significant discrepancy in the fees. In many cases the fee negotiation is set separately from the selection

process. The fee is negotiated with the top firm selected. In the few occasions when there is failure to reach an agreement, the negotiation shifts to the second selected firm.

Frequently, the best firms for consideration are those that have worked with administrative colleagues of comparable organizations. Projects need to engage professional consultants that have significant health care facility planning and architectural expertise to conduct and coordinate the planning phase. The planning and design phases of the health care facility construction process require a broad perspective and knowledge base, including an understanding of health care delivery systems and services, the effect of planning and design on these services, and the facility construction process. Professional consultants must take into account the values of the broad range of constituents involved in the process and communicate effectively with each.

Team Decision Making

In addition to a common understanding of health care facility needs, there must be a common understanding of decision making on the project team. To operate effectively, a clear chain of command should be established early on. Lack of a structured decision-making process is a major cause of delays. Such delays are likely to make consultants, such as architects and engineers, exceed both schedule and fee projections. Organizations may want to include a facilitator on the project team to assist with communication and ensure streamlined decision making.

Team Collaboration and Partnering

Small or large, the best projects involve team relationships, shared successes, shared failures, and tolerance for human error and project complexities. Adversarial or autocratic relationships often lead to failure. Success is much more likely when an organization and project partners engage in collaboration—working closely as a team, generating ideas, exploring solutions, discarding bad ideas, and mutually reaching conclusions.

Planning should always be collaborative. Such collaboration has many advantages, including the following:

- Market, infrastructure, and operation issues are defined early.
- Various kinds of expertise inform and identify issues and solutions.
- Approval processes are streamlined on every level.
- A fact-based case can be made for capital investment.

In large projects, however, collaboration can be challenging: With many constituencies and finite resources, conflicting needs inevitably will surface at different points during the planning phase. Causes of conflict include the relative importance of specific project elements, current needs versus anticipated patient demands, and organizational concepts of the project. The factors forcing these issues are the initial determination of a project budget, the sequencing of construction, and the proposed physical location of services. The needs of the surgery service, for example, should be balanced against the needs of other services, including those necessary to support surgery. If these issues are not addressed during the planning phase, they will reemerge during design, jeopardizing the project scope and timetable along with the entire team's morale.

Common Level of Understanding

For the planning phase to work, all participating team members must have a common level of understanding. This includes some common base of knowledge, mutually understood goals, and shared experiences. Relevant literature, research, and field trips to innovative facilities can establish this common ground. Following are some areas in which there should be a common understanding from planning onward:

- ***Health care facilities projects:*** A shared language and understanding of health care facility projects facilitates communication and decision making. This can be achieved through thorough documentation of the guiding principles, design elements, and other features of the master facility plan (see page 9). It is important that anyone asked to sign off on plans has the information, background, and time needed to make a thoughtful decision.[2]
- ***The health care organization:*** To facilitate collaboration, before beginning the planning phase, all project team members should acquaint themselves with the organization's mission, strategic plan, planning assumptions, and objectives, so there are clear-cut agreements and a mutual understanding of the goals and objectives of construction planning efforts. This is a good place to begin identifying the organization's existing operational and facility infrastructure.
- ***The project goals:*** As teams begin the planning phase, they should specify all goals. Unstated objectives can throw a process off track and result in miscommunication and misunderstandings. This can lead to "project creep"—

Overarching Issue

Project Size

Team selection, as well as several other components of the planning phase, are affected by the size of a project. Many of the success factors for large projects apply to small projects as well but are more limited in scope and involvement. Small projects typically entail renovations or conversion of existing space to new use space.

Small Projects

Differences for small projects usually are reflected in the number of external consultants used for the project. For work on small projects, organizations often select architects and contractors who have worked with the organization before: An established record of good communication and sound decision making is critical when quick decisions are required with minimal owner input. Some organizations use smaller projects to assess or evaluate a firm prior to deciding if that firm is appropriate for a larger project. It is a good way to evaluate communication and other functions that contribute to future successes.

Organizations may also have the in-house capability to complete some parts of the planning and construction process. Project management of all components is critical for both large and small projects, but for small projects, careful coordination of tasks must be established to minimize potential conflicts between in-house and contracted projects or providers.

In addition, small projects are subject to wider variations in cost than are large projects as measured by percentage variance. Larger projects can absorb cost variances within a smaller contingency allotment. A large contingency fund (20% or more of the total budget) should be maintained throughout a small project.

Many small projects are completed within an operational health care facility. It is critical to bring all key stakeholders together to determine project impact on patients, visitors, staff, equipment, and circulation.

Also, just because a project is small does not mean there are no significant risks to be assessed. In fact, small projects often have the most complications because organizations may overlook the risks involved. For example, a simple cabling project may require drilling through fire walls, interrupting utilities, and/or generating significant noise and vibration. An organization should begin to address risks in the planning stages and follow through with preconstruction risk assessments (see Chapter 3), just as it would identify risks for larger-scale projects.

Large Projects

Large projects are complex and require strong project management skills from a number of the key involved constituents. The organization must identify an experienced administrator to oversee the process on its behalf. At the same time, key partners need to demonstrate excellent project management skills as well. These include the lead architect, construction contractor, and various suppliers of infrastructure and major equipment. All must work together for the project to be successful.

Documentation of all decisions and changes is critical due to the long-term nature of large projects. Research has shown that frequent leadership changes occur over the life of a project, making documentation a means to communicate the project efficiently to new team members.

Unlike small projects, contingency amounts are often reduced throughout the life of the project as key milestones are met and risk of variation is reduced. This often frees reserved funds for use on a list of add-ins or desired elements for the project.

For large (and small) projects with an existing organization, communication of the project's goals and status needs to be frequent with key constituencies such as staff, community, and regulatory bodies.

add-ons and other unscheduled delays—that can derail a project. For example, an organization may have an unstated goal of constructing a building that does not look overly expensive, so patients will not raise questions regarding the cost of health care. At the same time, the architect(s) may aspire to win a design award and consequently may focus on design visibility. These unspoken goals need to be candidly shared before a line is put to paper. Architect and client can achieve a shared understanding of building image by viewing notable works of architecture together or by carefully studying slide images to determine client and community desires. A quality design will result in firm balance between architectural features and infrastructure. (See PLANNING FOCUS: Design Outcome Plan™.)

Mutual Respect

Trust and chemistry between the organization and the project partners are as important as the partners' skills. For a facility construction project to be successful, the team must be able to work closely together, not only with mutual understanding but also with mutual respect, to share successes and to work through failures. Team leaders must recognize and rely on the strengths of participants, ensure open communication, and make timely decisions with respect to project scope and budget. This approach will best position the project for success.

Partnering

Many organizations approach larger projects with the concept of partnering in mind to proactively coalesce complex teams of in-house staff and consultants. The key characteristics of partnering in the project process include the following:

- Identifying individual goals and resolving conflicting goals
- Building lines of communication and mutual trust among project team members
- Setting common goals and project milestones relative to project scope, quality, and timing
- Establishing methods for later conflict resolution

Partnering can also occur between a hospital and the community itself. See Project Gallery: Community Partnerships below to learn how one children's hospital partnered with local cultural and arts organizations.

Project Gallery

Community Partnerships

Ann & Robert H. Lurie Children's Hospital

The Ann & Robert H. Lurie Children's Hospital of Chicago opened in June 2012. Based on evidence that art in health care facilities can improve patient outcomes, the hospital partnered with more than 20 local museums, cultural organizations, and civic institutions to create a unique creative arts program. The resulting Lurie Children's Creative Arts Community Partnership Program (https://www.luriechildrens.org/en-us/our-home/Pages/community-partner-spaces.aspx) was supported by more than $1 million from donors inspired by the initiative.

Before construction of the new hospital began, the partnership program was launched with 125 of Chicago's cultural and civic icons brainstorming concepts for patient, family, and public spaces in the facility. A hospital advisory board and the hospital's Kids Advisory Board reviewed these concept proposals and provided feedback. Working closely with the hospital and design teams, the group then contributed time and talent to create exhibits that would invite exploration, reflect the character of each organization, and appeal to children of all ages, backgrounds, and abilities.

As a result, families can enjoy interactive displays, wall-size images and murals, and care stations that feature three-dimensional diorama boxes at the eye level of young children. All displays are configured to accommodate the specific needs of a clinical environment—accessibility, safety, infection control, and space constraints—and are integrated with the wayfinding, interior design, and architectural elements of the building. Each of the hospital's 21 floors feature contributions from various donors and participants, including the John G. Shedd Aquarium, the Adler Planetarium, the Chicago Botanic Garden, and the Lincoln Park Zoo; a number of Chicago museums and theater companies; and several children and teen art programs.

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The Ann & Robert H. Lurie Children's Hospital of Chicago partnered with numerous local organizations to create its unique creative arts program.

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Chicago's Lincoln Park Zoo provided the mural and egg play set on Level 19 of the hospital.

The Red Moon Theatre contributed an interactive display in the waiting area of Level 21.

The Chicago Cultural Alliance contributed a video installation featured in the Level 12 lobby.

Step 3: Gathering Project Data

The data collection process familiarizes the project team with the organization, its services, and its facilities. The process should identify a wide range of goals, facts, and issues that will affect or be affected by the planning, design, construction, and commissioning process. Data collection activities usually involve detailed graphic and written documentation of the following:

- Type and volume of existing services
- Current and anticipated operational structures
- Anticipated health care market trends
- Property boundaries and features
- Current facility issues
- Desired facility elements

Organizations should also consider existing research on health care facility design to use as evidence during the design phase. Research could focus on the specific needs of the particular building type and patient population. For example, an organization planning construction or renovation of a neonatal intensive care unit (NICU) might search for literature on NICU design and the impact on patient outcomes and staff efficiency.

Existing Facility and Site Conditions

Documenting the layout, size, and function of existing facilities is necessary to understand current use and condition, as well as the future needs of the facility. As part of this effort, the project team may want to develop narrative and graphic histories of each facility, including changes in the physical plant. The team should look at existing drawings and verify their accuracy. In some cases, an on-site survey, with measurements of each department, floor, building, and site, may be necessary.

Areas for Evaluation

Organizations should evaluate the current physical condition of all existing facilities and review their potential for continued use, whether in existing form or as renovated space. Three specific areas should be evaluated:

1. ***Systems and infrastructure:*** Evaluating the condition of a building involves identifying, or verifying, the types of materials and functional systems used in the original construction and subsequent renovations of the building, as well as its general condition. Special features or qualities and notable deficiencies should be documented. At this point, it may be appropriate to have engineering consultants evaluate the condition, life expectancy, and future capacity of existing buildings, sites, and, perhaps, off-site systems.
2. ***Compliance with standards and codes:*** A code analysis should be conducted to verify each building's code classification, its allowable occupancy load, its allowable height and area limitations, and its conformance to codes and standards related to seismic design, flood issues, evacuation processes, life safety, accessibility, and so on. The results of this assessment often play a significant role in determining the future use of facilities and their need for renovation or replacement. See FOUNDATIONS: Standards and Regulations for more information on codes.
3. ***Functional and operational space needs:*** There should be a functional assessment to determine how existing facilities accommodate the functional space needs of each department or service. The process usually involves evaluating surveys conducted during meetings with departmental staff or their representatives on the project team. Information should be gathered about each department's services and functional relationship with other departments. The functional analysis should consider the location and accessibility of all departments, and determine how location affects the functionality of each. The bottom line is that the functional assessment should analyze whether current departmental space can accommodate existing and future needs.

Workload Analysis

As part of the data collection process, a project team should conduct a workload analysis. This analysis can help determine the space needed for specific components of the project, such as the size of operating rooms (ORs), patient beds, or examination rooms. If the project scope and size allow, team members may wish to create a five-year profile that details historical workload, staffing, and other measures for each service, along with an analysis of operational policies, functional requirements, patient care objectives, and growth assumptions. This picture will help in understanding overall trends, seasons of peak demand, and the link to operational goals. These must be tempered with an understanding of changing health care patterns.

It is important to exercise caution when using past data and workload factors to size and design future spaces. Many facilities that undertake new construction are functioning in outdated, inefficient built environments. Designing to fix those problems may not be the goal of the organization. Process improvement or revision activities are strongly recommended at this stage (see PLANNING FOCUS: RPI and Change Management and Chapter 2).

Guidelines and Requirements

As part of the data collection effort, organizations should research the local, state, and national regulations that will affect the design, content, and layout of the facility. These regulations will vary depending on where an organization is located and the type of facility being built. The scope of this chapter does not allow for in-depth discussion of all the possible regulations and guidelines organizations around the world must consider. See FOUNDATIONS: Standards and Regulations for information that organizations can and should consult.

Step 4: Devising a Project Plan

Every specific project must have a plan that fits within the master facility plan. At this point in the planning phase, this plan is known as the preliminary facility plan (or preliminary facility program). The activities involved in creating the plan are often referred to as *programming*, which is another term for predesign, the part of planning that deals with specific projects (see page 10). A preliminary facility plan is used to determine a project's scope and anticipated facility care needs, phasing and scheduling, and estimated project budgets for early phases. Preliminary facility plans usually do not include a detailed space-by-space list of needs; instead they identify general departmental or functional area needs. Development of a much more detailed facility plan will result from the master facility plan after a project is initiated (see page 9).

Preliminary Facility Plan Elements

In addition to a statement describing the overall intent of the project, the preliminary facility plan typically includes the following elements:

- Phasing and scheduling
- Space needs (existing space measurements and the project's general goal for spatial/physical organization)
- Cost-benefit analysis (both long- and short-term) of the specific project and related projects
- Future growth projections

A wide range of computer modeling tools and other guidelines is available to help create a preliminary facility plan.

Other Preliminary Facility Plan Considerations

Although examining different physical and functional relationships is important, other areas of a facility or campus should be considered while creating the preliminary facility plan. The areas of safety, equipment, and utilities are summarized here:

- ***Safety:*** Standards and regulations related to safety in health care facilities require performing risk assessments to identify safety issues that can result in harm to patients, staff, and visitors. Many also relate to built-environment remedies to address those risks. During the planning phase, it is helpful to perform the required safety risk assessments if there is an existing facility for baseline information. Safety risk assessments can be an iterative process for design review as well. This will be covered in greater detail in Chapters 2 and 3. Also see FOUNDATIONS: Standards and Regulations.
- ***Major equipment:*** Large equipment planning is an essential and time-critical element of health care facility planning and development. Existing and new equipment, such as an x-ray machine, often affects the size and layout of a planned space in a project. As part of the predesign process, a preliminary equipment list should be developed to determine the equipment space and design needs for the preliminary facility plan. The list will not only identify appropriate space considerations, but it can also be used as a preliminary pricing guide for the budget. More about equipment considerations follows in Chapter 2.
- ***Utilities:*** The project team should ensure that the project's utilities, including its mechanical, electrical, and air-handling systems, are determined early in the process and coordinated with existing systems. This is true regardless of whether the project is a new building, an addition, or a renovation. If the organization has not considered the cost, location, and functionality of utility systems early in the planning phase, unpleasant surprises can emerge as cost estimates are developed. All too often, organizations order equipment without considering the utilities required to run the equipment or keep it temperature controlled. This can result in utility costs that surpass the cost of the equipment. Consulting engineers can determine a project's utility requirements.

Schedule

As noted above, part of the preliminary facility plan should include estimates of the length of time necessary to complete each phase in the process: planning, design, construction, and commissioning. Schedules should reflect a realistic time frame for completion of the entire project.

To create a project time line, the team must identify and schedule the major milestones and the stages of the project within each phase. Typical early milestones include points of organization input and key go/no-go decision points for the organization's board of directors or governing entity. Each stage within the phases of planning, design, construction, and commissioning consists of a specific set of tasks or activities that should be defined and organized. This requires identifying each activity and estimating its duration and interdependencies to establish an accurate overall timetable. It is wise to allow for some float time in the schedule as a contingency for unforeseen events, such as delays in obtaining geological surveys, weather delays, negotiating contracts, securing financing, and obtaining necessary agency approvals.

Representing the Time Line

After time estimates and interrelationships for each activity have been defined, the schedule needs to be formalized in a format for reference. Several effective tools are available to represent the overall time line. The simplest employs a bar chart with a scale representing logical units of time. This is typically represented in weeks for planning, but it may take months for large projects. The anticipated start date and duration of an activity are represented by the location and length of a bar extending across the graph. The bar chart has found wide acceptance, primarily due to its simplicity and ability to illustrate an entire process in compact form. The major weakness of a bar chart is that it fails to identify the activities whose completion or delay will have an immediate effect on the duration of the project.

Detailed Space Plan

Again, part of the preliminary facility plan addresses existing and projected space needs. Organizations should therefore create a detailed accounting of the space needed to meet the project's goals and objectives. Such an outline can use forecasted workloads and likely scenarios to estimate key patient care spaces (patient beds, exam rooms, and ORs) and develop estimates of the other space elements necessary to support these areas. This outline is often referred to as a detailed space plan (or detailed architectural program). It can be generated through working sessions with departmental representatives, tours of similar facilities, and examples from previous projects. It typically includes the following:

- ***Summary list:*** A list that identifies department, building, and project area subtotals and totals. The list should also include a room-by-room space list that is organized by department, functional area, or physical component of the building or project. At a minimum, this list should identify the name, number, and size of every room, space, area, and department that will be included in the project.
- ***Narrative description:*** A narrative description for all key spaces identifying how the size and character of each is determined. This detailed information should also be recorded on separate forms called room data sheets, which are developed for each room. For more information on the detailed space plan and room data sheets, see Chapter 2.

Benchmarking for Estimating

Teams should be wary of using simple rule-of-thumb guidelines to estimate schedules, space needs, budgets, and other aspects of the preliminary facility plan. For example, space estimates based on inpatient beds or other simple statistics can easily overlook unique characteristics of an institution and the enormous changes occurring in health care. Benchmarking is a good tool to identify potential inefficiencies in use of space. The design team can use the benchmarking information to find outliers and determine whether the variance can be justified. Benchmarking may also be useful to test an early budget estimate. Comparing it against industry benchmarks can show substantial variation based on facility type and geographic location. For example, in the United States, health care projects usually include a total project cost-to-construction cost multiplier of 1.25 to 1.4, depending on the engineering requirements. A specialty facility or smaller project may require a significantly higher multiplier.[3]

Step 5: Determining a Budget

Underestimating, or failing to identify and predict, total project-related costs is one of the biggest obstacles to successfully completing a project. Careful financial and data analysis is therefore an integral part of the planning phase. Determining a budget is a core step, and it is important to note that a project budget is more than just a construction budget. It includes all other costs associated with planning, design, construction, and commissioning. A good budget includes critical costs related to land, construction, professional fees, interest, start-up, moving, equipment, furnishings and other finishes, and contingencies.

Anticipated Critical Costs

Following are some critical costs that make up the project budget. These must be considered during planning and readjusted as necessary throughout the project process.

Construction Costs

The largest element of the budget, construction costs, may account for 60% to 80% of total project costs. Construction estimates are typically based on an approximated cost per square foot. Factors applied to this estimate reflect the geographic location, building occupancy classification (per life safety regulations), relative complexity of construction for each component of the project, and type of construction (for example, new or remodeled; wood, concrete, steel, or composite). It is also important to remember that major construction or renovation requires several years between budget development and ground breaking, and costs may rise due to demand or inflation.

Equipment Costs

Equipment is often the second most expensive item in the budget, but the cost of major medical equipment can be among the most difficult to estimate in the early phases of a project. The specific services included in the project and the potential reuse of existing equipment can cause the estimate to range between 15% and 40% of the total cost. An inventory of existing equipment, including an estimate of its remaining life expectancy, should be completed early in project development. Special consultants for equipment planning are often available for large projects, and there are several software programs that can be helpful in developing equipment budget requirements.

Finishes Costs

Finishes in construction account for a large portion (32%) of the initial construction cost of a health care facility.[4] The cost of finishes may be part of the construction budget or it may be a separate budget item. This is often determined by who is providing the finishes budget. Because cost for finishing details (such as wall and flooring surfaces, furnishings, and window treatments) varies greatly depending on design decisions, many firms separate out costs of finishes. This allows project managers better control and oversight of the various cost drivers.

Professional Fees

This category covers professional services for all planning/predesign, design, construction, and commissioning services, including consultants not traditionally listed in the basic architectural or engineering categories. For example, the fees for construction management or a materials management consultant are not defined as basic architectural or engineering services.

Permit Fees

The local building department, the regional utilities, and the state's department of health each levy their own fees to review and approve the project plans and construction. These permit fees are typically based on the construction cost and should be accounted for in the project budget.

Escalation Fees

These fees come into play when there are unreasonable or unpredictable delays in the project, or when the general time frame is long. To account for escalation, projects are often estimated to the midpoint of completion, which means the schedule must be known in detail prior to budgeting. When setting an escalation factor, the risk is shared by the organization and the construction team. On a large project extending across a number of years, even a modest escalation factor of 3% per year can result in a significantly higher cost estimate for the project.

Budget Contingencies

Because of the complex nature of projects, as well as the impossibility of predicting exactly what conditions will be encountered during a project, organizations must allow for contingencies related to the budget. If an organization has an absolute limit on the amount of money it can spend on a project, the initial allowance for all contingencies should be larger. If cost overruns are of little consequence, more money can be budgeted for the project itself and less for contingencies. Following are contingencies that should be considered during the budgeting step of the planning phase.

Design Contingency

Generally, a design contingency is established early in the predesign stage of planning or in the design phase to cover unforeseen conditions. This contingency should be largest during the predesign stage, but it can be reduced as design and documentation progress. Design contingencies for renovation projects vary considerably, depending on knowledge of such conditions as the presence of asbestos, concealed mechanical and electrical systems, and building code changes.

Construction Contingency

A construction contingency should be budgeted to cover field coordination and unanticipated conditions during construction. For new construction, a rule of thumb is to initially budget construction contingencies at 2% to 4% of construction cost; for remodeling, 4% to 10% is typical.

Owner Contingency

In addition to construction and design contingencies, the organization as "owner" should carry a contingency. Owner contingencies are often used for changes in project scope that occur after consultant bids are received. These can vary from 5% for new construction to 10% for smaller remodeling projects. As the design moves forward, firm pricing on construction and equipment serves to reduce risk, and the contingency should be reduced accordingly.

Step 6: Finalizing the Master Facility Plan

The goal of master facility planning, as explained at the beginning of this chapter, is to develop a definitive master facility plan. The project team develops a final conceptual plan that addresses all the planning goals and issues for all projects. This plan, if developed properly, will be flexible enough to meet the evolving needs of the organization for several years. A well-crafted master facility plan provides guidance and information needed by the project team members as they work with organization leadership to continue making critical facility-related decisions, many of which will have lasting consequences.

Because an organization's master facility plan may embrace several projects, a particular project may be the first one in that master facility plan or a later one. Regardless, any preliminary facility plan and the more detailed project plans based on them (see Chapter 2) must work within the master facility plan, which is created first; the projects are part of the phasing in of the overall master facility plan.

Implementation in Phases

As the planning phase draws to a close, an organization needs to consider how the master facility plan will be implemented. Implementation of most master facility plans must be accomplished in several phases, due to limits on available resources as well as operational and physical constraints. Phasing is a major planning factor and can have an immense impact on timing, schedule, and cost. It can also have a major impact on the care and comfort of patients and staff. Note that phasing of a master facility plan is of broader scope than the schedule phasing of a particular project, as explained on page 10.

The first step in the master facility plan phasing process should be communication with staff and the public that something major is about to happen. Subsequent steps will bring forward new or revitalized services and spaces, as recommended in the master facility plan or in the predesign part of the planning for a specific project.

Step 7: Ensuring Regulatory Compliance

Regulatory process requirements vary from state to state and country to country. It is critical to any project that the various regulatory requirements for approving and constructing a health care facility be identified and all relevant stipulations met.

Most jurisdictions within the United States and internationally have several review steps that span the project process. Often this includes preliminary approval of the project, intermediate approval of plans and costs, final approval of plans, and occupancy permitting. This chapter does not attempt to discuss each of these requirements; instead it recommends that any partner chosen for the project be knowledgeable about the associated regulatory requirements. Regulatory review processes can add months or even years to the project schedule. See FOUNDATIONS: Standards and Regulations.

Certificate of Need

One activity to complete before proceeding to the next step is securing a certificate of need (CON). This involves justifying to the state why a project is necessary. It allows states to provide a balance of services across health care organizations and ensures that each one is adequately serving its community. Some states require this; others don't. If a state requires one, organizations should have a preliminary review with CON hearing staff early in the planning process and allow extra time in the schedule for the CON hearing process. Presenting a master facility plan as part of the review will show the scope of the organization's plans and may facilitate CON hearings for all projects in the master facility plan.

Step 8: Documenting the Master Facility Plan

All project plans must be documented in a manner that is not only easy to understand but also easy to use, share, and store. This documentation serves multiple purposes, such as providing the historical perspective of selection decisions and rationales, and orienting new partners and organizational team members.

Form and Format

A master facility plan may be documented into a book (physical or digital) that includes a text narrative, tables, and drawings. This book should contain an executive summary that highlights key goals, facts, issues, assumptions, facility needs, concepts, and master facility planning proposals for specific projects. An executive summary should enable key decision makers to digest the most important information and make informed decisions without reading the entire document. The body of the document should be organized to reflect the key steps in the planning phase and the findings that resulted from each step. The body provides the substantiating evidence for the master facility plan proposals. Documentation of the steps in the planning phase may be located in an appendix and include such information as the work plan and schedule, meeting minutes, and background information.

For Communicating and Training

Other ways to document the planning phase include slides or other multimedia presentations, large presentation drawings of the plan proposals, and models (including three-dimensional presentations), that reflect the physical implications of the plan. These are useful for communicating the master facility plan to a broad range of constituencies in a variety of venues. Planning presentations are often used to present to community groups, staff, board members, and the media. The ability to communicate the master facility plan with these groups is critical to successful implementation.

Documenting the process is especially important when there is staff turnover affecting the makeup of the team. Whenever a person leaves the team, his or her replacement must become familiar with the project's history, goals, description, elements, phases, status, and so on. Without thorough documentation, valuable time and knowledge can be lost, which opens the door for poor, uneducated decisions and potentially increased costs for time overruns and error remedies.

Build or Renovate?

As planning progresses through to finalization of a master facility plan, organizations evaluate whether to build new facilities or renovate existing ones. In some cases, organizations can renovate and convert existing space for less money than they can build new space. Often, however, renovation costs may exceed construction costs, due to unforeseen conditions, phasing, scheduling, or logistical complexities.

A wide variety of physical conditions will determine the viability of renovation, including the following:

- Amount and type of space available for renovation
- Mechanical and electrical system limitations
- Ability to work within the existing building's boundaries
- Location of structural columns and walls
- Location of vertical penetrations (such as mechanical shafts, elevators, and fire stairs)
- Location of staging area (either close in proximity or some distance away from the site)
- Temporary parking for staff and contractors
- Abatement of hazards (such as asbestos in older buildings)

Renovation Issues to Consider

Other issues to consider when deciding whether renovation is the best option are listed below. The Project Gallery: Major Renovation on pages 26-27 describes how one hospital dealt with some of these complex issues during a major renovation project.

- *Functionality*
    - How will the space function to support the mission of the organization and its role in the community?
    - How large is the discrepancy between the current space and the desired functionality?
- *Adaptability*
    - How can the space be adapted for the desired use?
    - How much will it cost to adapt?
    - What systems or services will be compromised by the renovation?

- *State of the facility*
  - Can the infrastructure support the new technology?
  - Will the utility systems need upgrading or expanding to meet the demands of the new space?
  - What hidden costs might arise, such as removal of hazardous materials?
- *Ability to meet current requirements*
  - Will all systems meet current fire and safety code requirements for the new space, or will they need updating?
  - Will the renovation affect the organization's ability to meet accreditation standards?
- *Physical age*
  - How much useful life is left in the major construction elements of the facility (for example, heating, ventilation, and air-conditioning [HVAC], boilers, windows, roof)? Will they need replacement?
  - Is it cost-effective to replace aging utility systems with new, more efficient versions?
- *Future-proofing ability*
  - How long will it be before the renovation needs updating? How long for new construction?
- *Cost of downtime*
  - Will the project deter patients from using the facility?
  - Will temporary facilities be needed to avoid a break in services?
- *Possibility of hybrid approach*
  - Can the organization renovate some of the existing elements and replace others?

Project Gallery

Major Renovation

Hamad Bin Khalifa Medical City

To respond to the needs of the growing population, Hamad Medical Corporation (HMC) in Doha, Qatar, was concluding the renovation of a health care facility as 2014 came to a close. Known as Hamad Bin Khalifa Medical City, the facility consists of three hospitals, a Translational Research Facility, and a Bio-Bank. This project, which began with a shelled building, was designed as a children's hospital, women's hospital, rehabilitation hospital, and skilled nursing facility. However, four years after the start of the project, three of these buildings changed use and had to be redesigned.

From the beginning, this project was a challenge from both a clinical services and a facility perspective. In the harsh environment of Qatar, many of the components in the existing building had to be replaced or upgraded due to inactivity over a long period of time. New room layouts did not always fit the existing space. To incorporate new technologies, existing elements like columns had to be relocated. Also, the weight of new equipment necessitated adjustments to the concrete slab and load-bearing columns.

As clinical models and patient flows were analyzed, the connectivity between the buildings had to be amended. While the original design gave connectivity at ground level and basements only, new connections were incorporated at the higher levels to improve staff efficiency and provide flexibility between the spaces. This change also helped to support the new initiatives for education and research.

Different Standards

Still another challenge the project faced was the use of different standards in the design. Using mixed sets of standards is common in the Gulf States. In this case, the facilities were designed to Facility Guidelines Institute (FGI) American standards (see FOUNDATIONS: Standards and Regulations), but the services were designed to British codes. For example, the head units for the beds purchased for the ward bedrooms were designed under the FGI *Guidelines*, while the pipe work for the medical gases was designed under the British code. The result was two sets of pipe work in different sizes. This triggered some difficulty in defining ultimate responsibility in commissioning the system (see Chapter 4). Going forward, HMC adopted one set of consistent standards to avoid this problem in future facilities.

Design for Flow and Access

This project was executed under a design-and-build contract. The original designer finished at the schematic design stage (see Chapter 2), and the contractor engaged a different design team. This discontinuity led to delays. To solve the problem, HMC engaged a consultant team to provide coordinated room data sheets (see Chapter 2).

When designing the women's hospital, the consultant team analyzed patient flow to find ways of simplifying and reducing patient journeys through the facility (see DESIGN FOCUS: Designing for Safety and Reliability). One example is the design of the LDR (labor/delivery/recovery) rooms. These are birthing rooms designed for comfort and support, where labor and delivery can occur without moving to another room or bed. Rooms are relatively large, and each has a dedicated equipment room and bathroom. Each room is decorated in soft colors and warm tones to help create a relaxed and homelike environment. Three operating suites for cesarean delivery are in close proximity to the LDR area, as is the neonatal intensive care unit. This hospital has a dedicated entrance for obstetrics and gynecological urgent care, which is separated from the outpatient entrance.

The facility's Ambulatory Care Centre is designed to provide HMC with a high-quality, safe, and cost-effective approach to day surgical health care. Providing day surgery, combined with new methods of imaging and point-of-care testing (POCT), alleviates the immediate need for inpatient beds, thus taking the pressure off the existing tertiary hospitals. The POCT can also facilitate reduced waiting times in the outpatient clinics. The patient care process is designed to produce the best possible clinical outcome, maximize patient convenience, and offer as many treatments and procedures as possible on an ambulatory basis. This facility is linked to the Women's Wellness Centre at four levels, which gives ease of access to shared services and opportunity to use theaters and bedrooms should a sudden need for surgical or other services arise during the births.

Growth Challenges

HMC has evolved over the last decade into a major provider of acute and continuing care, and it continues to grow at a very fast pace. As is true for many successful international hospital providers, that growth has produced a number of challenges for the organization. The challenges can be grouped into two areas:

- Managing a series of service and facility changes successfully to open three new hospitals and a research facility while making the best use of the total available resources in the short and long term
- Developing the clinical services across HMC into a corporate model that will support an Academic Health System, encourage internationally recognized best practices, and build a hub of highly specialized, high-impact services

Transfer of Services

As the project neared completion, managing a staged transfer of services was expected to be a challenge, with 3,400 new staff members slated to be integrated into the system (see Chapter 4). HMC developed a Clinical Services Reconfiguration Programme to manage this complex change process. This program was created to simultaneously develop clinical leadership capacity and reform practice within and across recognized clinical specialties. To help achieve this goal, the organization developed and adhered to the following set of guiding principles:

- Provide facilities that will give HMC international recognition as a health system that integrates excellent treatment, care, education, and research.
- Ensure safety in treatment and care, and the best experience for each individual patient.
- Ensure that services and facilities will be used to optimize competitive pricing of activity in readiness for an insurance-based funding model.
- Develop a system of lower-impact acute and specialized services as fully integrated satellites from the central hub.
- Provide a transition of services from current to new locations with minimal loss of availability.

Although renovating an existing building has its challenges, HMC overcame them without compromising patient care delivery, with the end result of improving the patient experience.

Exit Note

This chapter has outlined the types of planning and myriad steps in the master facility planning and predesign process for health care facility projects, as well as vital considerations related to that process, such as collaboration. Whether a project is small or large, a new build or a renovation, the first or the final proposal in the master facility plan, the planning steps are essentially the same. These steps require the same degree of mutual understanding and respect from internal organization and external partner team members to fulfill the health care organization's mission and goals in the project, which are focused on the community it serves.

References

1. International Facility Management Association (IFMA). S*trategic Facility Plan: A White Paper*. Houston: IFMA, 2009. Accessed Jul 6, 2015. http://www.ifma.org/docs/knowledge-base/sfp_whitepaper.pdf.
2. Reno K, et al. Lessons learned: Clinicians' post-occupancy perspective of facility design involvement. *HERD*. 2014;7(2):127–139.
3. Healthy Environment Research Group, Georgia Institute of Technology. A Project Planning Guide for Healthcare Facility Owners. Walrath B, Augenbroe G. May 2007. Accessed Jul 6, 2015. http://herg.gatech.edu/Files/lsu_report.pdf.
4. Lavy S, Dixit MK. Wall finish selection in hospital design: A survey of facility managers. *HERD*. 2012;5(2):80–98.

planning focus

RPI and change management

FOCUS Outline

Robust Process Improvement® (RPI)

RPI's Four Elements of Change Management

- Plan Your Project
- Inspire People
- Launch the Initiative
- Support the Change

TERMS

change management
process improvement

Any project, whether a minor renovation or completely new building, is a change. Although not a requirement, change management—the processes, tools, and techniques for managing people during change—should therefore be a consideration before any planning or design happens, and it should continue through all phases of the project. It becomes particularly important during efforts at process improvement (or business process improvement), a series of strategic actions to identify, analyze, and improve existing processes or create new ones within an organization to meet new goals and objectives.

It is recommended that several iterations of process improvement be undertaken during a facility construction project. The first is in the early planning phase to inform the predesign (see Chapters 1 and 2). During design development (see Chapter 2), processes can be tested through stakeholder involvement and the use of mock-ups to test assumptions. Once the design has been finalized, alignment between the chosen elements and desired processes must occur. These process redesign exercises offer rich opportunities to initiate change management activities for the involved staff. Research has shown that without adequate attention to change management, staff may resist new processes and designs that support those processes. This can lead to failure of the new processes to achieve goals as well as costly physical change requests to re-create the "comfortable" old environment. A structured, planned approach to change management therefore needs to be considered early in the project. Many organizations have committed to a process improvement model.

Robust Process Improvement® (RPI)

Adopting a plan to manage change is essential to maximize the ease, efficiency, sustainability, and overall success of a project. The Joint Commission uses the Robust Process Improvement (RPI) model, which shares elements of Lean and Six Sigma process improvement approaches.

RPI is a set of strategies, tools, methods, and training programs for improving its business processes. Application of RPI increases the efficiency of business processes and the quality of its products and services. A process is robust when it consistently achieves high quality in the following ways:

- Recognizing and seeking the voice of the customer
- Defining factors critical to quality
- Using data and data analysis to design improvement
- Enlisting stakeholders and process owners in creating and sustaining solutions
- Eliminating defects and waste
- Drastically decreasing failure rates
- Simplifying and increasing the speed of processes
- Partnering with staff and leaders to seek, commit to, and accept change

The RPI change management method focuses not only on process improvement but also on behavioral changes required to support process improvement.

RPI's Four Elements of Change Management

RPI relies on four key elements of change management, all of which should be considered when working through a project. These are illustrated below and followed by a brief description of each.

Facilitating Change Model™

The Robust Process Improvement® (RPI) business model adopted by The Joint Commission focuses on these four key elements of change management, which can be applied to any construction or renovation project.

Plan Your Project

Starting off right is critical to successful change initiatives. Taking into consideration some key elements in planning a project—such as assessing the culture for change, defining the change, building a strategy, engaging the right people, and painting a vision of the future—will build a strong foundation for change.

Inspire People

Change is not something that just happens. Instead, it takes place as the result of a series of individual actions that together create something bigger. By soliciting support and active involvement in a change initiative, an organization can begin to obtain buy-in and build accountability for the outcomes. Leading change is critical to a successful process. However, this is also the time to seek out and identify resistance to the change initiative and, if necessary, to develop an action plan or strategy to work through any resistance.

Launch the Initiative

The foundation of all change initiatives is operations. If that foundation is not strong, the change will last only a short time before the cracks start to show. Aligning operations before launching the initiative ensures that the organization has not only the ability but also the capacity to change. Ensuring that operational aspects are aligned with the change initiative empowers staff to function freely in the new state without hitting operational roadblocks.

Support the Change

An organization must have the capacity to support the change. If there is no support, the project will experience failures along the way. Keeping people informed at all stages of the project helps avoid those failures. Monitoring the gains to be sure that the change is both successful and sustainable, and to be sure that the organization shares results with the team at all levels, is vital. Supporting the team and those working through the change initiative by recognizing their work and efforts is integral to sustaining change.

planning focus

alternative facility delivery models

FOCUS Outline

Integrated Project Delivery Model
Construction-Manager-at-Risk Model
Design-Build Model
Design-Assist Model
P3 Model

TERMS

construction-manager-at-risk model
design-assist model
design-build model
integrated project delivery (IPD) model
P3 model

Traditional facility delivery models follow the design-bid-build model described through the pages in this book. Many organizations, architects, and construction companies, however, are using alternative models of facility delivery. These models have their origin in several objectives. One is speed of process. The time from planning to occupancy often spans several years, and if regulations change during the process, project completion can take even longer. Few designs can successfully weather these long time spans, which greatly increase the cost of renovation before occupancy. Another objective for the new models is to create stronger “team ownership” by forming a coalition to build a facility. Access to capital is still another objective addressed by the new models. This is becoming much more of an issue for health care organizations in the United States due to recent downgrading of those organizations by bond markets.

Some of these alternative models are described here.

Integrated Project Delivery Model

Perhaps the most complex new model is that of the integrated project delivery (IPD) model. This model calls for creating a new contractual business structure that includes several of the significant partners of the project, such as a health care entity, the architectural firm, and the construction management firm, all coming together to create a limited partnership (see Chapter 1). The American Institute of Architects describes this model as one that “integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction."[1(p. ii)]

The benefit of this model is that it transforms the traditional unilateral approach (design, then handoff to contractors), which is often fragmented and ineffectively linear, into one that provides early inclusive team efforts, is collectively managed, and encourages multilateral collaboration. The drawbacks to this model are that developing the necessary legal entity is complicated, financial risks and rewards are difficult to determine, and sustaining relationships can be a challenge.

Construction-Manager-at-Risk Model

In the construction-manager-at-risk model, a qualified construction manager is contracted prior to the completion of design and construction drawings (see Chapter 2), which provides the opportunity for collaborative teamwork among the owner, designer, and construction contractor. This model can provide several benefits, such as a closer alignment of the team on cost, quality, and project outcomes; shortened time frames for completion; increased owner confidence in the construction process; and often a guaranteed maximum price (GMP). A GMP reduces risk to the owner, but it requires that there be no major decision changes in the facility design.

Design-Build Model

The design-build model is used mainly when one entity is contracted to design and build a facility. The owner provides the project goals and specifications, then works with the design-build firm to complete the project. A slight variation to this is called "bridging," in which a designer may be hired to begin the design, with the build partner being brought into the project early to begin the design-build process. This variation on the design-build model is not unlike the construction-manager-at-risk model. This type of model is employed often when a project is very time sensitive and somewhat standardized, such as a medical office building. It should be pointed out that in a design-build model, the design team generally works for the contractor or builder. This can place design decisions into a compromised environment, in that the designer's contract is held by the builder, and not the health care facility. Very careful attention, as in all team arrangements, must be paid the business and service attitudes in the relationship makeup of this type of design and construction approach.

Design-Assist Model

The design-assist model is used when a design has a specialty need or in an effort to save design and construction time and secure time-sensitive materials for delivery for the project. Specialty subcontractors may be brought on board the team to advise and assist with the design of particular systems or details (glazing, MEP [mechanical, electrical, and plumbing] systems). This can help control cost as well as save time during shop drawing and the fabrication phase. The design-assist contractor helps in developing specifications and cost estimates, and scheduling for the specialty portion of the project. The design-assist model is always used in conjunction with one of the other models, most often with design-build or construction-manager-at-risk models.

P3 Model

The P3 model involves a public-private partnership that creates a relationship between public governmental units and a private contractor to finance, design, construct, and operate a project without up-front capital from taxpayers. In the United States, this model has gained momentum from cash-depleted governmental agencies as a financing source. The objective of a P3 model is to gain its return on investment from the operations during the concession period, the time contracted for operating the facility. Critical issues for the private entity include the viability of the project for projected revenues, increased liabilities for the project, and long-term warranty issues for the concession period. Internationally, these partnerships are seen as less of a capital procurement issue and more as an opportunity for rapid deployment of services to regions needing health care services. This is particularly useful when the expertise for developing health care systems may be limited within the country.

Reference

1. American Institute of Architects (AIA). *Integrated Project Delivery: A Guide*. Washington, DC: AIA, 2007.

design outcome plan™

FOCUS Outline

- Project Vision
- Guiding Principles
- Design Elements
- Processes
- Metrics
- Baseline
- Targets
- Outcome

TERM

Design Outcome Plan™ (DOP)

Postoccupancy research conducted both in the United States and internationally cites project leadership turnover as one of the biggest issues for a timely project completion.[1] These changes in the organizational participants often cause a loss of project focus and direction. In addition, nearly all projects start out with an idealistic set of goals, but budget realities sometimes limit the ability to realize all the desired elements chosen for the design. Increasingly, facilities will also serve as models for innovative design features that need to be evaluated postoccupancy to determine their impact on care- or operations-related outcomes.

With this in mind, Joint Commission Resources' Safe Health Design Service℠ developed the Design Outcome Plan™ (DOP), which is a process that documents the project vision and target goals, enlivens those goals through design element choices, identifies process changes driven by the design elements, and evaluates the results of those choices. The DOP provides a sense of continuity throughout a project. DOP documentation should begin during the planning phase (see Chapter 1) with identification of the project vision and guiding principles. Selected design elements are added during the design phase, and any process redesign (see Chapter 2) is determined from final element selection. The evaluation metrics for current measures and target measures are determined prior to facility occupancy, either from internal sources or external benchmarking. Once the facility is occupied and operating, outcomes can be measured against the target. This information is useful for process redesign as well as for subsequent element selection for new projects. The figure on page 35 shows a completed DOP. A description of the individual sections of the DOP follows the figure.

Sample Design Outcome Plan℠

Project Vision:

Outpatient Facility—One-Stop Health Care in Every Community

Inpatient Acute Facility—Building to ensure the best in health care outcomes for our patients and community.

Guiding Principles	Design Element	Process	Metric	Baseline	Target	Outcome
Outpatient Facility Expand ambulatory services in continuum of care provision.	• One-stop diagnostic center for lab and routine radiology tests	• Modify schedule processes to accommodate one visit.	• Increased market share • Visit time for dual testing	50% in secondary 2 hours	70% in secondary 45 min	TBD
	• Outpatient CT and MRI capability	• Reorganize acute care setting schedule for reduced loads due to outpatient option.	• Ratio of inpatient to outpatient exams on campus	1:2	1:0.5	TBD
	• Primary care and referral specialty physician in office space of facility	• Negotiate with physicians to create the "center" approach for leasing the space.	• Percentage of leased space in new facility	0%	100%	TBD
Acute Care Facility Focus on reducing harm from hospitalization.	• 90% single-bed patient rooms	• Modify nurse assignments.	• Paid hrs/PT day (PH/PD)	6 PH/PT. day	5.3 PH/PT. day	TBD
		• Eliminate consultation rooms. • Move consultations, registration, and exams to take place in rooms instead of other spaces.	• Reduction of on-unit patient support space	10% of current space	< 2% of space	TBD
	• Staff hand sinks in every room and treatment space	• Move staff hand washing to rooms instead of corridors.	• % compliance	75%	100%	TBD
			• Reduction of hospital-acquired infections (*C. diff*, MRSA)	40/1,000 days	0/1,000 days	TBD
	• Entry to patient toilet rooms visible from patient bed	• Keep toilet doors open with low light on 24 hours a day.	• Reduction of in-room patient falls	30/1,000 days	0/1,000 days	

This chart shows the components of a completed Design Outcome Plan™ (DOP) for two kinds of facilities (TBD [to be determined] for the outcome is considered appropriate for the plan). The components demonstrate the process of documenting goals and enlivening them through design element choices, and then identifying process changes (process redesign) and evaluating the results.

CT, computed tomography; **MRI**, magnetic resonance imaging; **c. diff.**, *Clostridium difficile*; **MRSA**, methicillin-resistant *Staphylococcus aureus*.

Project Vision

The first step an organization should take is to put into words what the project is meant to accomplish. Another way to think about the project vision is as a mission statement. This is a "big picture" statement that is contextual, inspirational, educational, and marketable. It should be written to reflect the specific project under consideration at a particular organization, as opposed to merely reflecting the organization's vision. Examples are shown in the figure on page 35.

Guiding Principles

These are the aspirational goals or objectives of the project. They create the framework that is fleshed out by specific design element selections (see below). The stakeholders (described in Chapter 2) should provide ideas on what the guiding principles should be. These principles identify for the project executive team (see Chapter 1) the outcomes that design decisions need to uphold. In addition to the examples in the figure on page 35, following are some other examples:

- Serve the community through distributed sites.
- Provide age-appropriate care in all settings.
- Provide support for the patient's family/significant others.
- Incorporate evidence-based design principles.
- Select best practices for process and design decisions.
- Provide patient- and family-centered care in all services.
- Contribute to a healthy sustainable environment.

Design Elements

This is the part of the DOP creation that adds the muscle to the plan. These are the design elements chosen to support the goals embedded within the guiding principles. Because the design elements require specialized knowledge and research, the stakeholders who provide input should be selected based on their expertise on the matter under consideration. This is a place where negotiations can happen regarding needs as opposed to wants. Following is just a small sampling of such design elements, in addition to those shown in the figure on page 35:

- 100% single-patient rooms
- Combined labor-delivery-recovery (LDR) concept for obstetrics
- Pneumatic tube system and robotics for supply transportation
- Central sterile supply and distribution (CSSD) support for all reprocessing needs for equipment
- Hybrid operating room (OR) with MRI and/or CT
- Seismic infrastructure to meet codes

The guiding principles and design elements provide a valuable format for discussion during any value engineering activities (see PLANNING FOCUS: Value Engineering (VE)). Any major changes or modifications to the design elements should be evaluated against the chosen vision, guiding principles, and design elements to determine whether changes will have an acceptable impact on the overall project goals. These discussions should be conducted by the project executive team.

Processes

The chosen elements for the design will most often demand that new processes be created or current ones redesigned to meet the operational needs of the design elements. There may be multiple process changes for each element, depending on the element chosen. Often these are phrased as directives or actions. Following are some examples of process changes based on chosen design elements in addition to those in the figure on page 35:

- Redesign supply and medication flows in response to a design element selection to incorporate the use of a pneumatic tube distribution system.
- Institute safe operation of MRI processes in an OR environment in response to a design element selection of an MRI-hybrid OR.
- Revise transportation of contaminated instruments and equipment to and from the sterile processing department in response to a design element selection of a centralized reprocessing system.

Metrics

Any new facility can have hundreds if not thousands of metrics to track outcomes. It is important to identify the key metrics expected to improve in response to design and process decisions made during development of the design (see Chapter 2). This may require identifying many potential metrics and then conducting a priority-setting exercise to determine those most important for informing leadership on investments in the element—either for potential process redesign or for future project element selection. This is particularly important to systems that may be contemplating multiple facility expansions. Kaiser Permanente has developed a unique competition for creating its "small hospital template" for just this reason.[2]

Baseline

After the metrics are chosen, it is important to identify the baseline performance, using either internal or external benchmarking. Replacement facilities or renovation projects can collect internal baseline data that will inform the postoccupancy review process (see Chapter 4). New facilities will not have internal data to draw on, and may need to go to external sources such as the US Centers for Disease Control and Prevention and other agencies for government-reported statistics. For international organizations, the World Health Organization offers data from global sources. The chosen metric will be the baseline from which to evaluate the organization's change once the facility is in operation.

Targets

When the metrics and internal/external benchmarks have been selected, organizational performance targets should be defined. The data benchmarks (baseline) and project goals (guiding principles) should inform decisions about what performance numbers would be appropriate targets. For example, if the average organization has an 80% rate of patient satisfaction with noise levels, an organization trying to create a healing environment might aim for a 90% rate. Methods of data collection should be determined early in the metric-selection process. The target setting should be done together with the visioning. It is part and parcel of setting the goals for the project. There are many ways to collect the necessary data, including patient and/or staff surveys, observation by performance improvement teams, and analysis of records.

Outcome

Postoccupancy evaluation of the performance outcomes on the chosen metrics is generally conducted after a minimum of six months of operations. This time frame gives the facility a chance to pass through the postoccupancy phase and have processes stabilize. Some measures will be one-time events; others will need to be cyclical and completed on a predetermined time frame (for example, annual utility costs). The outcome data can be used to inform process redesign, future projects in the master facility plan, and even revision of some design features if results are negatively affecting desired outcomes.

References

1. Reno K, et al. Lessons learned: Clinicians' post-occupancy perspective of facility design involvement. *HERD*. 2014;7(2):127–139.
2. Kaiser Permanente. Small hospital: Big idea competition. Accessed Jul 6, 2015. http://design.kpnfs.com/.

planning focus

value engineering (VE)

FOCUS Outline

Planning
Design
Methodology and Approach
- **Five Key Steps**
- **VE Benefits**

Construction
Conclusion

TERM

Value engineering (VE)

Value engineering (VE) is a conscious and explicit set of disciplined procedures designed to seek out optimum value for both initial and long-term investment. First used in the manufacturing industry during World War II, it has been widely used in the construction industry for many years.

VE is not a design/peer review or a cost-cutting exercise. VE is a creative, organized effort that analyzes the requirements of a project for the purpose of achieving the essential functions at the lowest total costs (capital, staffing, energy, maintenance) over the life of the project. Through a group investigation, using experienced, interdisciplinary teams, value and economy are improved through the study of alternate design concepts, materials, and methods without compromising the functional and value objectives of the client.

The Society of American Value Engineers (SAVE) was formed in 1959 as a professional society dedicated to the advancement of VE through a better understanding of the principles, methods, and concepts involved. Now known as SAVE International, SAVE has grown to more than 1,500 members and currently has more than 350 active Certified Value Specialists (CVSs) in the United States. Requirements for registration as a CVS were developed by SAVE at the request of the US General Services Administration in the early 1970s.

VE can be applied at any point in a project, even in construction. However, typically the earlier it is applied the higher the return on the time and effort invested. The three main stages (or phases) of a project and VE's application are described below.

Planning

At the planning stage of development, there are additional benefits to be derived from a VE workshop. An independent team can do the following:

- Review the program.
- Perform a functional analysis of the facility.
- Obtain the owner/user's definition of value.
- Define the key criteria and objectives for the project.
- Verify/validate the proposed program.
- Review master facility plan utility options (central utility plant versus individual systems).
- Offer alternative solutions (square footage needs per function, adjacency solutions).
- Verify that the budget is adequate for the developed program.

There are a number of benefits of applying VE at this initial stage of development. These include the following:

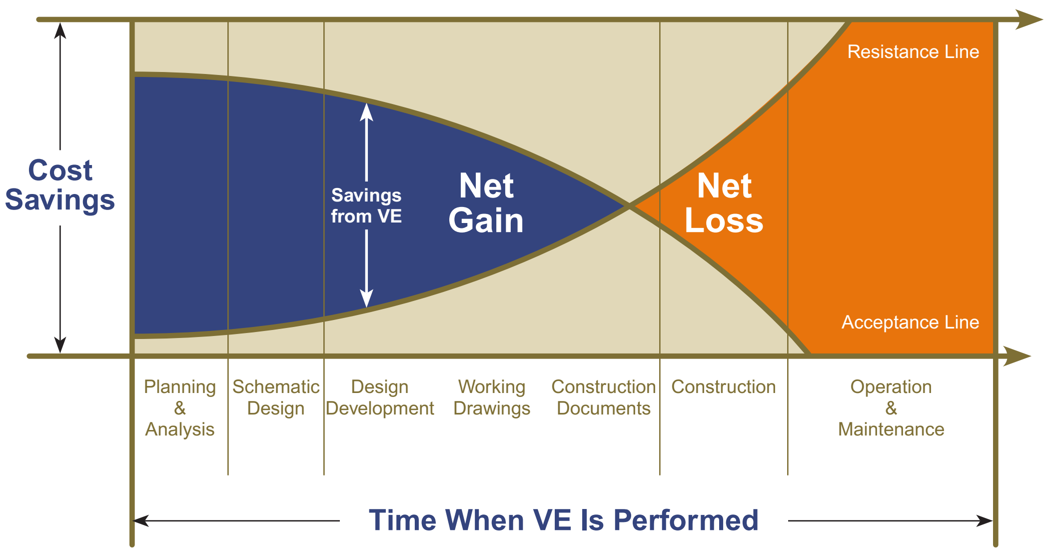
- Any changes to the program at this phase have very little if any impact on schedule and architecture/engineering (A/E) time and redesign costs.
- The project will be developed with fewer changes and redesigns and a greater understanding by all parties of what the final function and space allocations will be.
- An independent team can bring a fresh outside view of alternate solutions from other similar projects.

Design

This is the stage in which most VE participants are used to becoming involved, when the design has at least made it to the schematic stage (see Chapter 2). Most government agencies require at least one VE session at the design phase on projects over a certain monetary amount. The primary tool available to the VE team is the workshop—typically a 40-hour session (or less for smaller or less-complex projects).

The workshop is an opportunity to bring the design team and client together to review the proposed design solutions, the cost estimate, and proposed implementation schedule and approach, with a view to implementing the best value for the money. The definition of what is good value on any particular project will change from client to client and project to project.

Potential Savings from Value Engineering (VE) Applications



This graph shows one major benefit of applying value engineering—the potential for reduced costs as the project moves through essential functions.

Methodology and Approach

During the actual workshop portion of the VE study, the five-step job plan is followed, as prescribed by SAVE International:

Five Key Steps

The VE job plan follows these five key steps:

1. Information Phase
2. Speculation (Creative) Phase
3. Evaluation (Analysis) Phase
4. Development Phase (Value Management Proposals)
5. Presentation Phase (Report/Oral Presentation)

These five key steps are described as follows:

1. ***Information Phase***

   At the beginning of the VE study, it is important to do the following:
   - Understand the background and decisions that have influenced the development of the design through a formal design presentation by the design A/E.
   - Analyze the key functional issues governing the project. The functions of any facility or system are the controlling elements in the overall VE approach. This procedure forces the participants to think in terms of function, and the cost and impacts associated with that function.
   - Define owner's objectives and key criteria governing the project.
   - Determine owner's definition of value.

2. ***Speculation (Creative) Phase***

   This step in the VE study involves the listing of creative ideas, as follows:
   - The VE team thinks of as many ways as possible to provide the necessary function within the project areas at a lesser initial or life-cycle cost (LCC), which represent improved value to the client.
   - Judgment of the ideas is prohibited.
   - The VE team is looking for quantity and association of ideas, which will be screened in the next phase of the study.
   - Many of the ideas brought forth in the creative phase are a result of work done in the function analysis. This list may include ideas that can be further evaluated and used in the design.

3. ***Evaluation (Analysis) Phase***

   In this phase of the project, the VE team, together with the client and/or users, does the following:
   - Defines the criteria to be used for evaluation
   - Analyzes and judges the ideas resulting from the creative session

   Ideas found to be impractical or not worthy of additional study are discarded. Those ideas that represent the greatest potential for cost savings and value improvement are developed further. A weighted evaluation is applied in some cases to account for impacts other than costs (such as schedule impacts, aesthetics, and so on).

4. ***Development Phase***

   During the development phase of the VE study, many of the ideas are expanded into workable solutions. The development consists of the following:
   - Description of the recommended design change
   - Descriptive evaluation of the advantages and disadvantages of the proposed recommendation
   - Cost comparison and LCC calculations
   - Presentation of each recommendation with a brief narrative to compare the original design method to the proposed change
   - Sketches and design calculations, where appropriate

5. ***Presentation Phase***

   The last phase of the VE study is the presentation of the recommendations in the form of a written report. A briefing/oral presentation of results is made to the client and users, as well as the design team representatives. The recommendations, the rationale that went into the development of each proposal, and a summary of key cost impacts are presented at that time so that a decision can be made as to which value management proposals will be accepted for implementation and incorporation into the design documents.

VE Benefits

In addition to the monetary benefits, a VE workshop provides a valuable opportunity for key project participants to come together, then step aside and view the project from a different perspective. The VE process therefore produces the following benefits:

- Allows an opportunity to explore all possible alternatives
- Forces project participants to address "value" and "function"
- Helps clarify project objectives
- Identifies and prioritizes client's value objectives
- Implements accepted proposals into design
- Provides feedback on results of the study

Construction

During the construction phase, VE is still possible through the use of Value Engineering Change Proposals (VECPs). Contractors can be provided monetary incentives to propose solutions that offer enhanced value to the owner, and share in the financial benefits realized. Clearly the owner must consider contractor-generated proposals very carefully, from a life-cycle perspective and a liability perspective. The A/E team must be brought into the decision-making process to agree to the proposed change as not having any negative impact on the overall design and building function. The evaluation of a VECP is treated similarly to any change order during construction, with issues such as schedule and productivity impacts being considered along with the perceived cost savings generated.

Conclusion

In the final analysis, VE is not only beneficial, but essential because of the following:

- The functionality of the project is often improved as well as producing tremendous savings, in both initial and life-cycle costs.
- A "second look" at the design produced by the architect and engineers gives the assurance that all reasonable alternatives have been explored.
- Cost estimates and scope statements are checked thoroughly, ensuring that nothing has been omitted or underestimated.
- It helps to ensure that the best value will be obtained over the life of the building.

Source: Cullen S. Value Engineering. *Whole Building Design Guide*. Washington, DC: National Institute of Building Sciences, 2010. Accessed Jul 6, 2015. http://www.wbdg.org/resources/value_engineering.php. Used with permission.