SEPTEMBER 2008

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Healthcare Leadership

Evidence-Based Design Resources
for Healthcare Executives

WHITE PAPER SERIES 3 of 5

Implementing Healthcare Excellence: The Vital Role of the CEO in Evidence-Based Design

Funding provided by a grant from the Robert Wood Johnson

Georgia Tech College of Architecture

THE CENTER FOR HEALTH DESIGN®

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EXECUTIVE SUMMARY

There is growing evidence that chief executive officers (CEOs) can use research-validated evidence-based design (EBD) features as a tool to transform healthcare safety and quality. This paper explores how successful CEOs were able to navigate the multiyear process of project development. The utilization of EBD to create a building that supports cultural transformation and care redesign can reduce patient and staff harm and stress and still improve the bottom line. The CEOs of successful projects were the pivotal leaders who inspired their organizations to measure and confront unacceptable patient and staff outcomes, established strategies to meet improvement goals, and required disciplined reengineering of clinical and business processes—resulting in the achievement of the organizations' desired end state.

This paper also identifies 10 strategies that reflect the systems thinking and leadership approaches shared by CEOs who bridged the gap between aspiration and reality. They used daily decision-making and team-shaping opportunities over the lifecycle of the building to create a genuinely healing environment.

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Implementing Healthcare Excellence: The Vital Role of the CEO in Evidence-Based Design

This paper is adapted from a full-length article, "Implementing Healthcare Excellence: The Vital Role of the CEO in Evidence-Based Design" by Craig M. Zimring, Godfried L. Augenbroe, Eileen B. Malone, and Blair L. Sadler, originally published in the spring 2008 issue of HERD (Health Environments Research and Design Journal)*, Vol. 1, No. 3. For more information about* HERD*, visit the Web site at www.herdjournal.com.*

As the United States enters one of the largest waves of healthcare facility building in our nation's history—with construction projected to exceed $67 billion a year by 2012 (FMI, 2008)—some leading healthcare organizations are using their construction programs as a catalyst to bring about significant, measurable improvements in key patient, staff, and organizational outcomes, such as increasing patient safety, improving patient and family satisfaction, increasing market share, increasing the effectiveness of its work force, improving retention and reducing turnover, and increasing revenue and reducing cost.

For example, OhioHealth's new facility, Dublin Methodist Hospital, has been open for 8 months and has yet to experience a single hospital-acquired infection; Press-Ganey patient satisfaction scores remain above the 98th percentile, and staff turnover is below 6% (C. Herbert, personal communication, 2008). It appears that its innovative built environment has played a significant role in these results along with significant investments in clinical and process improvements and culture development.

While every organization would like to achieve the kinds of transformational outcomes that are emerging at Dublin Methodist Hospital, many projects fall short of their potential. We have spent the past year exploring how some organizations have been able to navigate the multiyear process of project development and remain true to their vision of facilities that work with cultural transformation and care-process redesign to help transform healthcare quality and safety. We found that successful organizations often represent a fundamental shift in the way healthcare organizations think about, deliver, and manage buildings. Rather than simply being regarded as cost centers, facilities are seen as an integral part of a healing environment where the facilities are fundamental components of a system that includes capital investment, culture and care, clinical, and business process. Successful organizations put in place structured evidence-based processes that established broad agreement on principles underlying the design; articulated goals that must be satisfied to achieve those principles; and set measurable, expected outcomes. They infused these principles, goals, and expected outcomes throughout all steps of planning, designing, and operating buildings, establishing specific measurement, reporting, and accountability at each step. The successful projects reflected an organization's ability to recognize its problems, an openness to change, a willingness to measure, and the ability to take action based on the results of measurement.

Further, we found that, while project planning and development are often outsourced to construction management firms or architects or are handled by facility staff, even a highly competent team cannot replace the key role of the chief executive officer

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(CEO) and other senior executives. The CEO is in a unique position to cut across departments and specialties—break down silos—and create an agile and open organization that can deliver much safer, higher quality, and more efficient healthcare. Many complex decisions will be made during an evidence-based design (EBD) journey; the effective CEO shapes a culture and process that ensures that the best decisions are made for the organization.

These conclusions are based on significant original research. We interviewed CEOs who have led current and completed construction projects, examined published and unpublished case materials about transformational projects, and drew on our experience as researchers, consultants, and CEOs. We conducted 28 interviews with CEOs or senior staff from Ascension Health, DeKalb Medical, Emory HealthCare, Kaiser Permanente, Massachusetts General Hospital, MCGHealth, MD Anderson Cancer Center, Memorial Sloan-Kettering Cancer Center, LSU Health Sciences Center, OhioHealth, Palomar Pomerado Health, and others. We examined case material from The Center for Health Design's Pebble Project, *Healthcare Design* magazine, and other sources.

However this paper is a guide to CEOs rather than a research paper; our detailed results are available elsewhere (Zimring, Augenbroe, Malone, & Sadler, 2008). Rather, this paper addresses several questions:

- How have these organizations actually been able to implement transformational change, moving beyond rhetoric to action?
- What is the role of the CEO and other senior executives in creating transformational change that significantly improves outcomes for patients, staff, and organization?
- What are the key considerations for the busy CEO?

THE GROWING ROLE OF EVIDENCE-BASED DESIGN AS A STRATEGIC PROCESS

Dublin Methodist and many other organizations are using an *evidence-based design* (EBD) process to help guide their capital facility investments, including:

- More than 50 healthcare organizations from the U.S., Canada, and United Kingdom have joined The Center for Health Design's Pebble Project and are committed to EBD in their construction projects.
- The Military Health System, serving 9.2 million beneficiaries around the world, has mandated EBD as part of its $6 billion new construction portfolio over the next 5 years.
- Kaiser Permanente and 20 other partners representing some 100,000 hospital beds have adopted EBD as part of their Global Health and Safety Initiative (GHSI), dedicated to advancing environmental, worker, and patient safety (Kaiser Permanente, 2007).

Further, the emerging field of EBD is gaining mainstream recognition and credibility:

- A literature review shows that there are numerous peer-reviewed articles relating to various aspects of EBD (Ulrich et al., 2008).
- Another literature review that focused on pediatric facilities shows that there are a significant number of articles relating to EBD in pediatric settings, many in neonatal intensive care units (Joseph, Keller, & Kronick, 2008).
- Designers and others will soon have the opportunity for certification in The Center for Health Design's EDAC (Evidence-based Design Accreditation and Certification) program (Center for Health Design, 2008).
- Five thousand DVDs produced by the U.S. Agency for Healthcare Research and Quality (AHRQ) were sent to hospital CEOs advocating EBD.

Evidence-based design is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes (Center for Health Design, 2008b). It is fueled by the growing body of rigorous research showing that the appropriate design of the built environment contributes to significant, measurable improvements of key patient, staff, and organizational outcomes, such as increasing patient safety, improving patient and family satisfaction, increasing market share, increasing the effectiveness of its work force, improving retention and reducing turnover, and increasing revenue, and reducing cost. *(For an in-depth review of the available research, see "A Review of the Research Literature on Evidence-Based Healthcare Design" by Roger S. Ulrich, Craig M. Zimring, Xuemei Zhu, Jennifer DuBose, Hyun-Bo Seo, Young-Seon Choi, Xiaobo Quan, and Anjali Joseph.)*

USING EVIDENCE-BASED DESIGN TO NAVIGATE THE ORGANIZATION'S COMPLEX DECISION-MAKING ENVIRONMENT

Evidence-based design begins with identifying key overall principles and goals and understanding how a facility can enable these goals, often in concert with technology integration, cultural transformation, and re-engineered care processes and business processes. Evidence-based design is a performance-based approach to building in which a set of increasingly specific performance targets are established over the course of planning, design, construction, and occupancy. Evidence-based design is often value-driven in the sense that the organization wants to significantly improve healthcare quality, safety, and patient- and family-centeredness and is willing to consider innovative approaches to achieve these improvements.

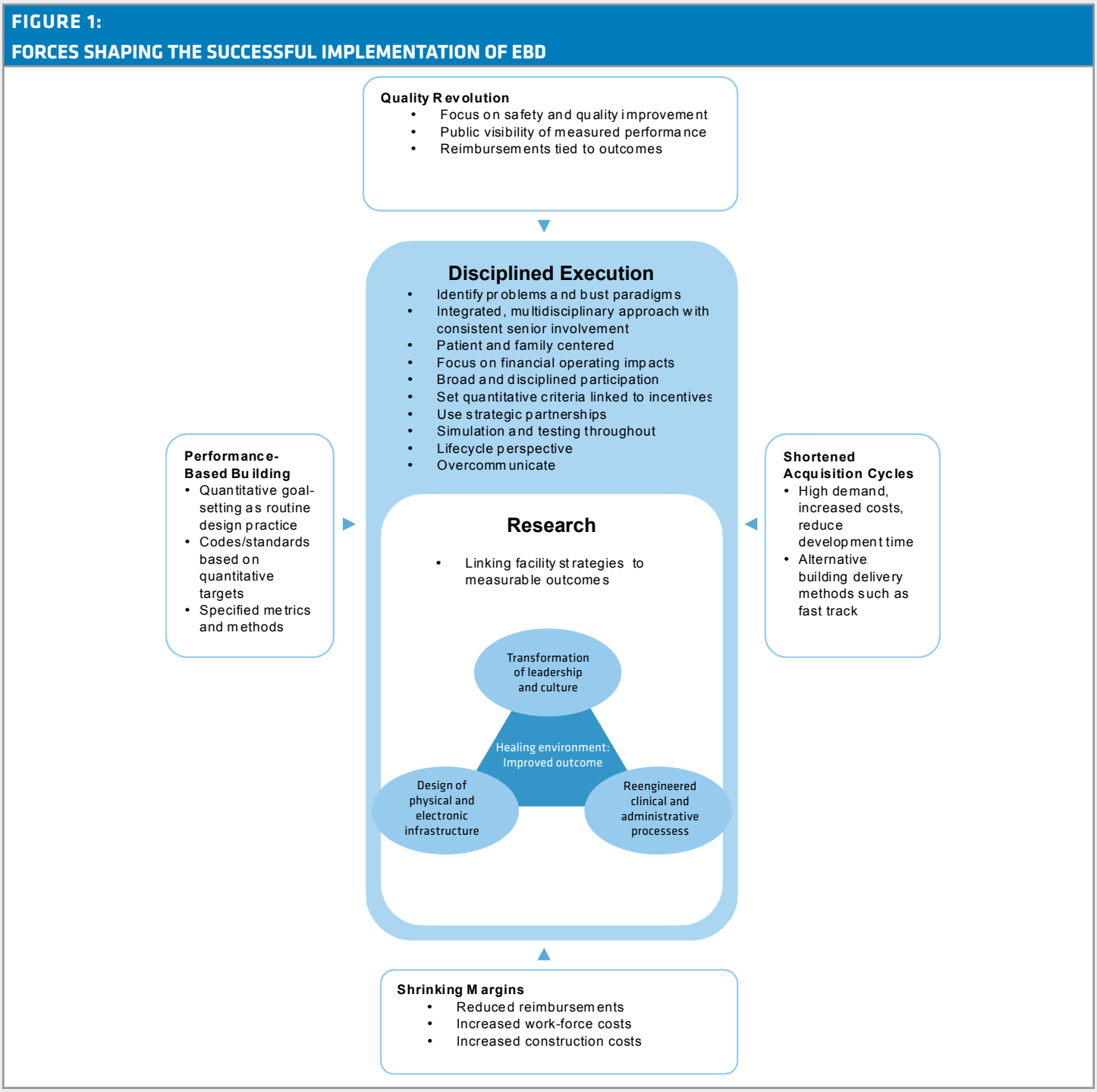
The EBD investment decision is explicitly tied to an organization's most significant patient, staff, and resource goals and challenges and is analyzed in the context of a facility's lifecycle, as shaped by myriad external forces. In addition, each EBD investment usually requires the reengineering of clinical processes and the transformation of an organization's culture with disciplined execution to ensure the maximum return on investment. *(For more on cultural change and facility design, see "Culture Change and Facility Design: A Model for Joint Optimization" by D. Kirk Hamilton, Robin Diane Orr, and W. Ellen Raboin.)*

Figure 1 presents a working model to help explain the complex EBD decision-making environment that CEOs face. At the heart of the model is the goal to provide a healing environment, which positively contributes to improved outcomes. Realizing these outcomes depends on three critical investments: (1) designed infrastructure including the built environment and technology, (2) re-engineered clinical and administrative practices to maximize infrastructure investments, and perhaps, most importantly, (3) transformational leadership to ensure the organization's successful cultural transition to maximize the human capital and infrastructure investments just described. All three investments depend on existing research, and ideally the investment results should contribute to the growing body of EBD science.

A Growing Body of Rigorous Evidence

The growth of EBD has been accepted by healthcare organizations in part because evidence-based medicine is already familiar to many healthcare organizations. The expansion of EBD has also resulted from the growing availability of relevant evidence. Recent literature reviews have found hundreds of rigorous studies, many of which link design choices to outcomes of special interest to healthcare organizations, such as patient safety, staff safety, patient satisfaction, and work-force recruitment and retention (Joseph, 2006; Ulrich, Zimring, Quan, & Joseph, 2006; Ulrich, Zimring, Joseph, Quan, & Choudhary, 2004; Zimring, Ulrich, Joseph, & Quan, 2006; Ulrich, et al., 2008). These outcomes closely fit with the mission of many organizations and can have strong impacts on revenue and cost. At the same time, many healthcare planners, architects, and designers are becoming knowledgeable about evidence and EBD and are bringing this knowledge to healthcare projects.

FIGURE 1:
FORCES SHAPING THE SUCCESSFUL IMPLEMENTATION OF EBD



FORCES SHAPING THE IMPLEMENTATION OF EVIDENCE-BASED DESIGN

The rapid growth of EBD is driven by the growing evidence base and changing regulatory and building delivery processes.

In a model this dynamic, disciplined implementation is critical and fuels all efforts. In addition to the internal forces a CEO must lead and manage, CEOs face four major external forces that further complicate EBD investment decision making: (1) the quality revolution, which brings higher expectations for safety, quality, and demonstrated performance; (2) shortened facility acquisition cycles, intended to deliver projects more quickly, but in so doing, decreasing decision-making time; (3) shrinking financial margins, attributable to reduced reimbursements for hospital-acquired conditions and increasing healthcare costs; and (4) performance-based building processes in which designs, codes, and standards increasingly are based on specified outcomes. Each external variable and its relationship to EBD are provided below.

EBD and the Quality Revolution

The ability to project organizational outcomes fits well with the quality revolution, where hospitals are increasingly assessing their performance, where these assessments affect reimbursements, and where performance results are made available to the public. Federal and state Web sites are beginning to provide consumers with detailed information about the comparative performance of individual hospitals, including process measures and even explicit risk-adjusted death rates for major conditions.

For example, the Colorado Hospital Association Web site shows a statistically significant 14-fold difference in risk-adjusted death rates for hip replacement for Denver hospitals. These hospitals are listed by name (Colorado Hospital Association, 2008). The pioneering 100,000 Lives Campaign and the 5 Million Lives Campaign coordinated by the Institute for Healthcare Improvement have involved more than 4,000 hospitals and are significantly changing the quality improvement landscape.

The Centers for Medicare and Medicaid Services (CMS) is rapidly moving toward pay for performance and even more rapidly to no pay for poor performance. Among other initiatives, beginning in October 2008, CMS will not reimburse hospitals for harm that they cause patients due to many hospital-acquired infections, falls, and other preventable conditions (US Government Printing Office, 2007). CMS will also tie part of its reimbursement for hospitals to the requirement that they conduct and publish the results of standard user satisfaction surveys. *(For a review of these trends, see "The Business Case for Building Better Hospitals Through Evidence-Based Design" by Blair L. Sadler, Jennifer R. DuBose, Eileen B. Malone, and Craig M. Zimring.)*

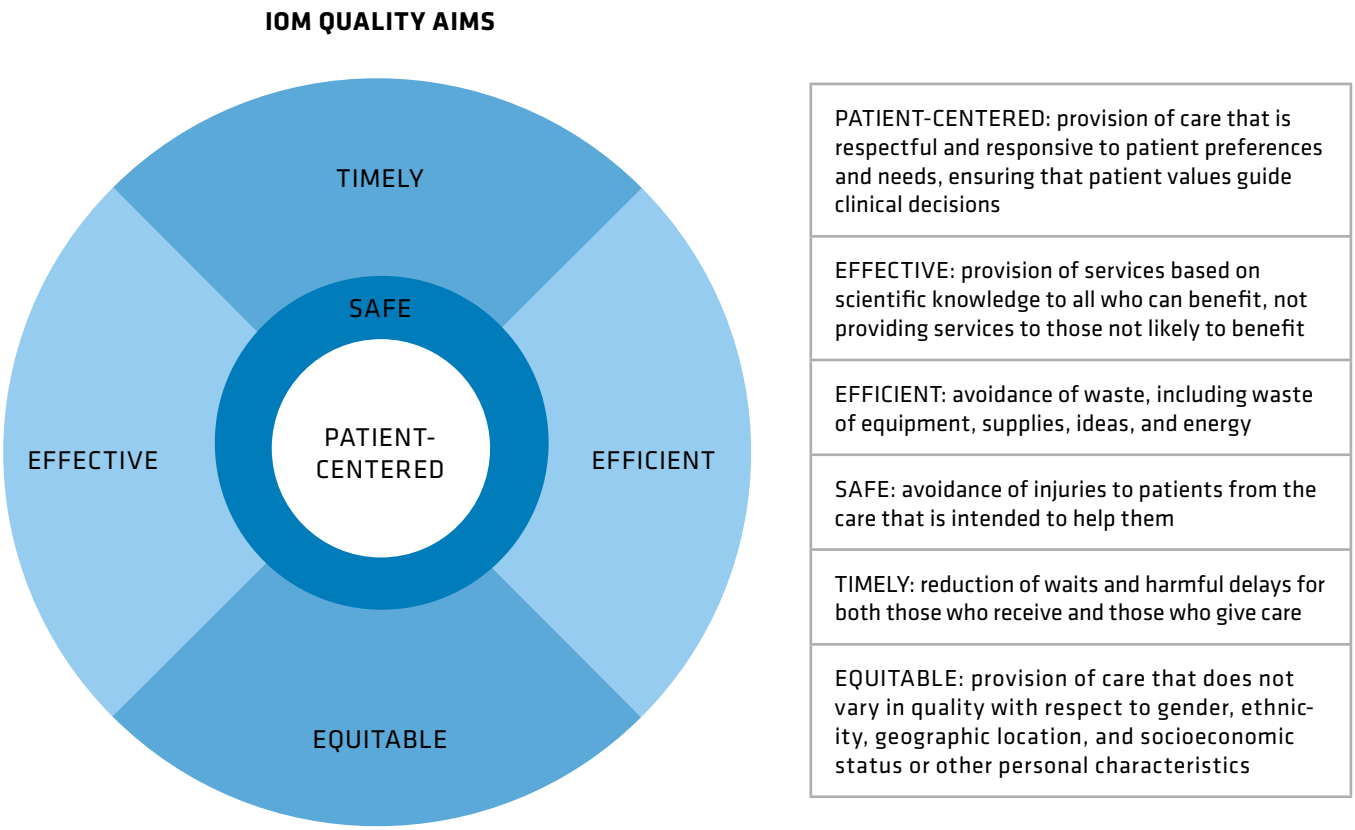
More generally, Henriksen and colleagues have argued that EBD features can help hospitals achieve the goals set out by the Institute of Medicine in its quality chasm reports, which criticize the state of American healthcare (Henriksen, Isaacson, Sadler, & Zimring, 2007). The six healthcare quality goals advocated by the Institute of Medicine are shown in Figure 2.

Shortened Acquisition Cycles

The rapidly escalating cost of healthcare construction—8% or more per year in some areas—has led to pressure to produce healthcare buildings much more quickly (Walrath & Augenbroe, 2007). For example, many projects are employing fast-track construction and other methods in which construction of the building shell actually starts before the interior is designed. The Military Health System is now striving to deliver hospitals in six years, while it formerly took 10 years or more on some occasions. This shortened cycle calls for special clarity about building requirements early in the design process, because the results of major decisions are literally set in stone before many specific design decisions are made.

FIGURE 2:
INSTITUTE OF MEDICINE QUALITY GOALS (HENRIKSEN ET AL., 2007)

Evidence-based design can help address the six key goals outlined by the IOM.



Shrinking Margins

After several good financial years, many healthcare organizations are struggling with increased construction costs, increasing costs of labor, and decreased reimbursements. These factors strain budgets and make access to capital particularly important. This has put additional pressure on design solutions that reduce costs, increase revenue, and improve access to capital. For example, in its report on reducing risk, a major hospital-rating agency recently stated: "Fitch Ratings believes a disciplined operational plan, combined with leading evidence-based capital design, should result in tangible improvements in quality, patient safety, information connectivity, operational efficiency, and retention of labor, all of which will be a differentiating factor in hospital credit quality going forward (Fitch Ratings, 2007, p. 1)."

Architectural Research, Postoccupancy Evaluation, and Performance-Based Building

EBD is a refinement of several strong, continuing research and building delivery practices that have been active since the 1960s. For example, architectural researchers in the United States and Britain have studied the impact of hospital layout on work-force effectiveness since the 1970s (Clipson & Johnson, 1987; Clipson & Wehrer, 1973; Medical Architecture Research Unit, 1971, 1973a, 1973b, 1976, 1977). *(For more on the environment's impact on the work force and patient care, see "Maximizing the Impact of Nursing Care Quality: A Closer Look at the Hospital Work Environment and Nurse's Impact on Patient-Care Quality" by Ann Hendrich and Marilyn Chow.)* Environmental social scientists have studied issues such as wayfinding and patient and visitor experience (Carpman & Grant, 1993). Architectural researchers have explored how postoccupancy evaluation—the evaluation of occupied buildings—can inform design and building delivery (Baird, Gray, Isaacs, Kernohan, & McIndoe, 1996; Zimring, 2002).

From the perspective of the building industry, EBD is closely related to other performance-based building (PBB) practices such as LEED (Leadership in Energy and Environmental Design) certification. Like EBD, PBB uses research evidence to make predictions about the probable performance of design decisions. Performance-based building is an increasingly important way to structure building codes and standards (Augenbroe & Park, 2005; CIB Working Commission W60, 1982; Foliente, Huovila, Ang, Spekkink, & Bakens, 2005).

The 25-year experience with PBB has important lessons for EBD. As a tool for design, PBB attempts to create clear statistical relationships between single design decisions and single functions of the systems. But even technical systems such as heating, ventilation, and air-conditioning systems have many interrelated design choices and performance functions, such as energy use, comfort, use cycles, and so on. As a result, system design cannot be based on simple cause-and-effect predictions about design choices; instead it depends on evidence, consulting expertise, best practice examples, and other methods.

TEN STRATEGIES FOR SUCCESSFULLY IMPLEMENTING EVIDENCE-BASED DESIGN

While the CEOs we interviewed employed many different strategies and tactics, it was clear that none of these projects would have succeeded without the CEOs' central involvement as the integrating force that focused the energy and efforts of the team. These CEOs were systems thinkers in that they tended to see the design of the building as being a fundamental part of the system they use to deliver care. They were willing to challenge traditional disciplinary boundaries to solve problems in new ways and take on the entrenched interests of clinicians, technologists, and business staff. We identified 10 strategies for consistent and ongoing implementation, to move beyond the senior management "idea du jour" to an approach that permeated everyday decision making over the lifecycle of the building (Figure 3).

1. **Start with problems: Identify the problems the project is trying to solve and for which the facility design plays an important role.**
   Some traditional examples include: adding or upgrading technology, expanding services to meet growing market demand, and replacing aging infrastructure. Evidence or experience has shown that facility design can support:

   - Reducing hospital-acquired infections, patient falls and injuries, and medication errors. What are the current rates for each?
   - Improving patient and family-member satisfaction with care. How well does the existing facility provide patients and families social support, privacy and confidentiality, sleep and rest, nutrition, communication and education, spatial orientation,

FIGURE 3: TEN STRATEGIES FOR EFFECTIVELY IMPLEMENTING EVIDENCE-BASED DESIGN	
1	Start with problems and challenge existing paradigms.
2	Use an integrated multidisciplinary approach with consistent senior involvement.
3	Maintain a patient- and-family-centered approach.
4	Focus on financial operating impacts.
5	Take a broad and disciplined approach to participation and criteria management.
6	Establish quantitative criteria linked to incentives.
7	Use strategic partnerships to accelerate innovation.
8	Support and demand simulation and testing throughout.
9	Use a lifecycle perspective.
10	Overcommunicate

exposure to natural light and positive distractions? What are current satisfaction rates, and are they acceptable?

- Reducing staff injuries, such as back and other musculoskeletal injuries that are associated with patient handling, needle-stick injuries, and workplace violence.
- Improving staff performance and operations, such as reducing staff fatigue, noisy and chaotic environments, and eye strain; improving team effectiveness; and increasing time with patients and families.
- Improving staff satisfaction as measured through staff surveys, rates of retention, ease of recruitment, and number of adverse patient events.
- Improving staff efficiency by reducing the work burden; improving workplace conditions; decreasing the costs associated with staff turnover, recruitment, and orientation.
- Reducing direct patient-care costs as a result of shorter lengths of stay and decreased use of medications. Are there changes in patient capacity or throughput that deviate from the norm or that you want to improve (e.g., length of stay, cost per admission)?
- Increasing market share and philanthropy because of greater patient, family-member, and community satisfaction.

2. Use an integrated multidisciplinary approach with consistent senior involvement that overcomes silo thinking by developing institutionwide perspectives and goals.

When it comes to solving complex problems, staff members naturally gravitate to the comfort zone of their respective specialties, whether it is clinical care, information technology, or facility management. Frequently, the CEO is the only leader who can stimulate synergy between different community silos to exponentially maximize efforts and outcomes by ensuring that everyone with potential problem-solving tools is included. No single tool will solve the problems healthcare faces, but hospital executives such as Dana-Farber's Janet Porter and Dublin Methodist's Cheryl Herbert emphasized the importance of identifying both the disruptive innovations that can transform healthcare and the staff that can lead the transformation.

These innovations typically require a systems response, a bundle of related changes that includes technology integration, care process reengineering, and cultural transformation (Figure 1). For example, Clarian Methodist was able to reduce patient falls significantly by providing larger acuity-adaptable rooms, instituting a fall-reduction program, and providing electronic bed monitors. Dublin Methodist has started to eliminate all patient transfers by creating universal rooms and changing nurse-patient ratios and nurse assignments while they are in the patients' rooms. These efforts are successful because they integrate improved care processes and staff training with evidence-based facility design. Successful projects often undergo processes of joint optimization, where culture and the built environment are optimized at the same time. *(For more on cultural change and facility design, see Hamilton, Orr, and Raboin.)*

3. Maintain a patient-and-family-centered approach.

Exemplary projects consider excellent patient and family experience to be a key outcome and define it in a variety of ways, such as reduced wait times, reduced walking distance, an improved sense of control of the clinical experience, ability to control the place and time of the clinical experience, and quieter and better-lit settings. Successful projects also include multiple patient and family representatives in many or all decision-making groups.

4. Focus on financial operating impacts.

Successful project teams deliberately get past the paralysis of first-cost (capital-cost) thinking and study the business case for design decisions, exploring the cost-effectiveness of design options over time (Berry, Parker, Coile, Hamilton, & Sadler, 2004; Sadler, DuBose, & Zimring, 2008). *(See Sadler, DuBose, Malone, & Zimring for a fuller discussion of how to create a business case.)* For example, Kaiser Permanente has adopted resilient flooring systemwide because of the reduction in falls and staff back injuries; PeaceHealth has installed overhead ceiling lifts in most patient rooms after finding that they reduced the cost of nurse back injuries by approximately 83% (Joseph & Fritz, 2006); the Military Health System is computing the cost effectiveness of installing ceiling-mounted patient lifts as part of a comprehensive patient-handling program to reduce staff and patient injuries.

Innovative leaders are also making the connection between the new trends in pay for performance, not charging for hospital-caused harm, and comparable publicly required customer satisfaction scores that will further strengthen the business case. At the same time, the business case is often made more complex by a regulatory construction and licensing reimbursement environment that does not always keep up with innovation. For example, Palomar Pomerado Health and Kaiser Permanente are negotiating with state permitting agencies to be able to charge differential daily rates if a patient goes from acute to intensive care in the same variable-acuity patient room, thus avoiding the perverse incentive of having to transfer the patient to a differently designated unit.

5. Take a broad and disciplined approach to participation and criteria management.

Planning, programming, and design decisions inevitably require tradeoffs and choices, and these choices are driven by explicit or implicit criteria for making decisions. Disciplined participation and criteria management processes derive their criteria from engagement with the full range of stakeholders, during which criteria conflicts are resolved and made transparent. Successful projects have been more deliberate about gathering all relevant criteria upfront from a broad and active participatory process, including all major stakeholder groups (Walrath & Augenbroe, 2007). Such successful projects have given stakeholders the mandate and the

resources to consider how they might deliver care in the future and how the building could help support these changes. Instances of this have included structured processes such as: (1) St. Joseph's learning lab, which focused on safety; (2) Palomar Pomerado Health's champion groups of employees, focused on quality, customer service, financial strength, and work-force and workplace development; and (3) Dublin Methodist Hospital's experience mapping, which explored the culture and experience of patients as they entered the hospital.

Too often, unrecognized goals or priorities can lead to late and expensive design changes or dissatisfaction. For example, a major hospital did not consider the impact of the facility design on safety until late in the design process, delaying the project for months as the design was reexamined and costly changes were made. Recently, some clients and consultants have applied facility decision tools developed by decision scientists in economics and organizational development. These structured decision-making tools such as SWOT analysis, analytic hierarchy processes, and decision trees call for priorities and values to be made explicit upfront and to be quantitatively weighted. Whereas many structured decision-making tools are well-established for critical technical aspects of buildings, such as structural, fire safety, or energy design, they are less familiar to many architects or architectural programmers for other kinds of architectural decision making. Structured decision making can also be applied to EBD to extend its reach to issues such as healthcare quality, safety, and financial performance.

6. Establish quantitative criteria linked to incentives.

While people are inspired by lofty goals, they are more likely to change their behavior based on measurable goals that are linked to incentives. For example, the drug company Ciba-Geigy contracted with the architecture and engineering firm, HLW International LLP, and the contractor, Sordoni Skansa Construction, to put their design and construction profits ($300,000 and $1.2 million, respectively) at risk for the new $39 million Martin Dexter Laboratory in Tarrytown, NY.

The profits were based equally on three issues: (1) the ability of the firms to deliver the building on schedule, (2) their ability to deliver the building within the original budget, and (3) post-occupancy evaluation (POE). The POE was based on responses from scientists working in the building to 14 survey questions concerning the following issues: HVAC, acoustics, odor control, vibration, lighting, fume-hood performance, quality of construction (finishes), building appearance, and user-friendliness.

The questions were binary-choice (acceptable or not acceptable), and the building had to reach 70% satisfaction to pass the test. Some aspects such as sound transmission were also assessed using physical measures; if the user satisfaction measures failed to meet the criteria, physical measures could be substituted (Gregerson, 1997). The designers and contractors consulted the scientists throughout the process, showing them alternatives for the facade design and full-scale mockups of the lab benches and range hoods.

The building passed on all criteria other than satisfaction with the range hoods, which were modified after the evaluation as a response to user input. Sordoni Skansa has since used POE in several other projects.

With the entire design and construction profit at risk, setting measurable goals not only increased motivation, it changed the nature of the interactions such that the design team became heavily involved with the end users, establishing criteria, creating mockups, and doing simulations. It is critical to establish interim as well as final goals and, in conjunction with the board of trustees, develop a plan to reward the team for achieving them.

7. Use strategic partnerships to accelerate innovation.

Healthcare organizations have worked with a range of partners such as Cisco Systems, Cardinal Health, Cerner Corp., Hill-Rom, Nurture by Steelcase, and others to speed up innovation and share costs. This reflects the reality that hospitals are often very significant customers, and they can use this leverage to create innovative new products or services that better fit the healthcare organization's needs and provide a competitive edge. For example, these partnerships have resulted in innovations such as support of physical mockup and innovation centers, innovative patient beds that consolidate all patient information, the bar coding of drugs, artificial skylights in patients' rooms that change color over the course of a day, new nurse servers, and many others.

8. Support and demand simulation and testing throughout.

Simulation can mean many things: assuming the patient's perspective in experience-mapping exercises to understand what they will see and experience as they move through a setting; doing lean design throughput simulation and modeling; creating lighting, energy, and other kinds of models; and creating computer visualization. Whereas most large healthcare projects use some kind of physical mockup, several organizations have demonstrated their commitment to ongoing testing and participation by setting up permanent physical and computer-based simulation and innovation centers.

For example, Kaiser Permanente has created the 37,000-square-foot Garfield Innovation Center, which develops simulations, technology testing, prototyping, product evaluations, and training. The Mayo Clinic has partnered with Nurture by Steelcase and others to create the SPARC Innovation Corridor to identify, develop, and measure innovative processes for healthcare delivery through real-time experimentation in a clinical setting (Steelcase, 2008). The Massachusetts General Hospital's Ambulatory Practice of the Future project is taking advantage of its employee clinic to test new patient-centered clinic designs that provide increased patient control and involvement and much-improved integration with information technology and remote monitoring of chronic disease.

9. Use a lifecycle perspective.

Healthcare buildings have a 30- to 50-year lifecycle, and the CEO is responsible for a facility over the course of its life. For example, a recent study (Foliente et al., 2005) looked at project planning of healthcare facilities from the perspective of the owner and concluded that, though the CEO makes many key decisions that set direction in the early planning stages, important planning decisions are made over the lifecycle of a building (Walrath & Augenbroe, 2007). (The Walrath and Augenbroe guide provides an excellent overview for owners to navigate the landscape of the construction industry.)

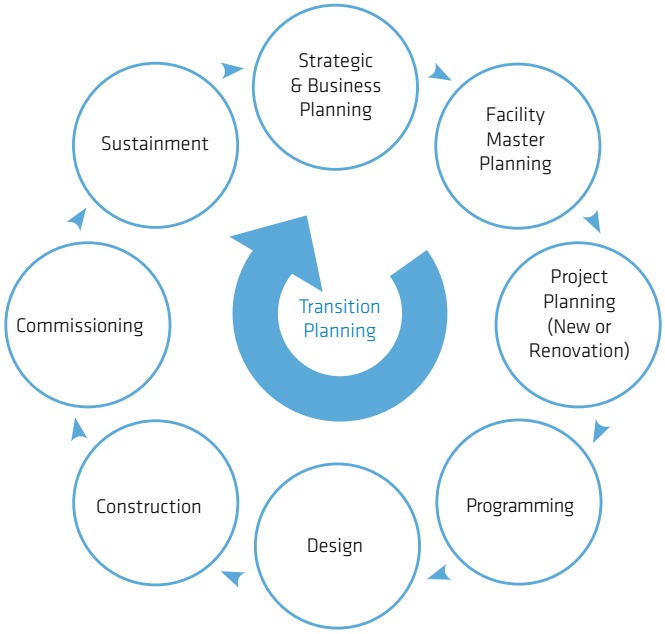
The lifecycle of a building can be divided into four phases: (1) preplanning activities, such as strategic and business planning; (2) project-specific activities, such as facility master planning, project planning, programming, and design; (3) construction and commissioning; and (4) sustainment. Successful projects look for opportunities to use the facility as a strategic tool at each step in the lifecycle of the building and especially to explore the lifecycle return on investment of design strategies as they impact safety and work-force outcomes.

The Military Health System's Facility Lifecycle Management and Performance Model, conceptualized by the U.S. Army Health Facility Planning Agency in 1996, is shown in Figure 4. While EBD helps create a business plan in strategic and business planning, it can be used during sustainment—occupancy of the building—to guide low-cost renovation choices, such as increasing the number of alcohol rubs or adding sound-absorbing ceiling tiles.

FIGURE 4:
THE U.S. ARMY HEALTH FACILITY PLANNING AGENCY (MALONE, MANN-DOOKS, & STRAUSS, 2007)

Facility Lifecycle Management and Performance Model
The Facility Lifecycle Management and Performance Model consists of planning, programming and design, construction and commissioning, sustainment, and restoration or renovation.

EBD can be applied at any stage in the cycle for all kinds of projects.



Strategic and business planning: Strategic planning represents the long view, exploring internal and external threats and opportunities. Business planning quantifies the current and strategic state in terms of costs and revenues.

Facility master planning: A facility master plan, sometimes referred to as the facility portfolio, represents the facility capital resource for a healthcare organization and includes an inventory and condition assessment of each building, functional assessment of each space, projected future workload demands and their effects on space needs, concepts of operations and clinical process for each department, and description of future capital investments specific to mission, scope, cost, and schedule.

Transition planning: Transition planning underpins all projects—from life-safety upgrades to renovation—and is a step-by-step process to successfully realize all of the needed changes: new policies and procedures, staff education and training, equipment and building familiarization, a communications plan, a patient move plan...and much more.

Project planning: Project planning represents a detailed concept of operations for each clinical or administrative unit, including mission statement, current and projected work volumes, current and projected staffing, key operating assumptions and parameters, desired adjacencies, desired workflow, and major equipment.

Programming: Programming translates the concept of operations into a line-by-line space program document that specifies intended users, functions, and performance of each space including, sizes, materials, finishes, equipment, and special considerations.

Design: Design involves the creation of drawing plans using a multidisciplinary approach for the builders to use in construction. Designs are submitted in an iterative fashion, which typically go through many design reviews. Design is increasingly using building information modeling (BIM), a process for representing building information that allows much more effective coordination between designers, builders, consultants, and facility managers.

Construction: Construction represents the actual building of the facility, including placement of some of the built-in equipment. Historically, construction began after the design was completed. Today, construction may begin as design is being completed, to shorten the time between the decision to build and facility occupancy.

Commissioning and occupancy: Commissioning is the process of outfitting the building with the equipment and furniture not included as built-in features during construction. Most equipment must be certified, and the materials necessary for care delivery are stocked during this time. Artwork is hung and the final interior finishes are completed.

Sustainment: Operations begins with the postoccupancy EBD evaluations and represents the routine maintenance, repair, and renovation activities necessary to keep the building in good working order and functional for the mission of the organization over the life of the building.

10. Overcommunicate

The CEOs stressed that, to be successful, they needed to communicate much, much more than they had anticipated; one CEO said 10 times as much. They explained the desired outcomes to their teams in financial terms as well as by using compelling stories to ensure that all team members clearly understood what was at stake. Successful CEOs kept their board of trustees, clinical staff, and community members involved at each step in the process by attending meetings, sending out newsletters, creating Web cams, and other tools.

CONCLUSIONS

There is growing evidence that CEOs can transform healthcare safety and quality if they can lead an organization to a broad recognition of the organization's problems, create an openness to change, require general knowledge of key evidence, instill willingness to measure, and create the organizational agility to confront results with speed and integrity. We have identified 10 strategies for achieving these important ends:

1. Start with problems and challenge existing paradigms.
2. Use an integrated multidisciplinary approach with consistent senior involvement.
3. Maintain a patient- and family-centered approach.
4. Focus on financial operating impacts.
5. Take a broad and disciplined approach to participation and criteria management.
6. Establish quantitative criteria linked to incentives.
7. Use strategic partnerships to accelerate innovation.
8. Support and demand simulation and testing throughout.
9. Use a lifecycle perspective.
10. Overcommunicate.

Each of these strategies is difficult and requires constant attention. But experience from billions of dollars in healthcare construction is demonstrating that they can lead to substantial ongoing gains in healthcare quality and safety—particularly when implemented in coordination with clinical and operational process improvements as well as supportive cultural change. They can help reduce harm to patients, reduce costs, increase revenue, and make the healthcare experience much less stressful for patients, families, and staff. Most of all, these strategies can help create what we all strive for: a genuinely healing environment.

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The authors would like to thank the following people for providing invaluable feedback on drafts of this paper: Susan Grant, Chief Nursing Officer for Emory Healthcare; Cheryl Herbert, President of Dublin Methodist Hospital; and Dane Peterson, Chief Operating Officer for Emory Healthcare.