Evidence-Based Design in Practice:

Healthcare Design Case Studies from EDAC Champion and Advocate Firms

Fall 2012
Evidence-based design is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes.

—The Center for Health Design

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**Pebble Project Pioneers:**
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Become EDAC certified.

Evidence-based Design Accreditation and Certification (EDAC) assesses your knowledge of the evidence-based design (EBD) process and its application in the design and development of healthcare projects. This educational program teaches you how to find, use and create relevant research so you can improve healthcare outcomes and add to the knowledge base of EBD.

Since its launch in 2009, more than 1,300 individuals worldwide have obtained the EDAC credential. Currently, 38 industry organizations endorse the program. Champion Firms participated in the beta testing phase and were the first to commit staff to take the exam. Advocate Firms dedicate a minimum of 25% of their healthcare teams to become EDAC certified. Pebble Pioneers document their use of the EBD process.

The evidence-based design process includes eight steps:

1. Define EBD Goals & Objectives
2. Find Sources for Relevant Evidence
3. Critically Interpret Relevant Evidence
4. Create & Innovate EBD Concepts
5. Develop a Hypothesis
6. Collect Baseline Performance Measures
7. Monitor Design & Construction
8. Measure Post Occupancy Results

In this booklet, the following Champion and Advocate Firms highlight how they are using EBD in their projects.

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Contact CHD at 925-521-9404 to become our next Advocate Firm.
EBD Goal:
The interdisciplinary design team pursued the creation of a total environment of care with the following objectives:
Reduce patient and visitor stress
Reduce wait times and improve flow
Improve staff sightlines both for security as well as clinical care
Capture natural light and views of nature at an urban edge
Challenge: The team was challenged to plan and design a facility that would accommodate the delivery of new models of care. The major challenge involved adding 20,000 square feet of new construction to 32,000 square feet of existing operational space.

Solution: Upon entering the new adult emergency environment of care (EEOC), patients and families are greeted by a triage nurse and a registration staff team. Name and chief complaint are requested as they are visually triaged by the nurse and immediately escorted to the appropriate care area. Further triage and diagnostics are done once assigned to the correct care staff and location. Should the initial triage indicate a physical examination is needed, triage rooms have been located behind the three initial triage/quick registration desks. Once assigned to the appropriate care location, unobstructed views support a highly technical and critical operation, improving communication between caregivers. This proposed process is to assure the appropriate level of care and expedite delivery of care for each patient.

Chair-centric care delivery has been approved for patients triaged at Emergency Severity Index (ESI) Levels 4 and 5 and some preliminary findings are indicating that this approach reduces patient stress, medication levels, and required square footage while increasing patient satisfaction and throughput. A research study has been planned to collect data that will further question or support these findings.

Safety is an issue in urban healthcare settings but corresponding design solutions should never compromise the healing environment. Security is strategically located adjacent to the triage desks to allow for direct visual and physical access to the entrance and family support areas without overwhelming the entry experience. The glass curtain wall system and the adjacent glass vestibule allow visual assessment of any potential threat prior to entering the building, while also calming visitors with views of the outdoors and daylight.

Visual access to nature and natural light were also maximized in both the clinical/staff and public areas. The image exemplifies the implementation of this design intervention in a chair-centric exam area. Art-enhanced wayfinding solutions were also incorporated into this project. Regionally specific artwork is strategically placed to create memorable moments while providing direction and diversion.
EBD Goal:
It was a mission of the new UCSF Medical Center at Mission Bay to be designed for health—for the individuals who will use the new Medical Center, the Mission Bay community, and the greater global environment.
Challenge: While the building industry has started considering environmental criteria in choosing building materials, the long-term human health component has not really been tackled yet. During early design work and sustainable brainstorming for the new UCSF Medical Center at Mission Bay, the Stantec design team realized that the very buildings dedicated to providing healthcare are known to contribute to some of our greatest health problems. The team also realized that there was no proven system of researching and testing what materials were potentially harmful to the health of building inhabitants.

Good resources for known carcinogens are lists developed by the U.S. Department of Health & Human Services National Toxicology Program (ntp.niehs.nih.gov). Unfortunately, a good centralized database of known teratogens and mutagens does not yet exist.

Solution: Stantec teamed with chemists at McDonough Braungart Design Chemistry (MBDC) to develop filtering criteria to help determine if considered building materials contained the following:

- Known carcinogens
- Teratogens or mutagens (toxins that cause DNA malformations in fetus development)
- Chemicals on the U.S. Environmental Protection Agency’s list of “Chemicals of Concern,” that pose a risk to the public
- Chemicals on the California Proposition 65 list
- Chemicals known to cause reproductive harm

The team set about creating a scoring system to rank comparable materials and was surprised to discover that the worst offenders usually appeared as the additives and optional extras. For example, flame-retardants, stain-resistant finishes, and sealers were toxic, which led the team to try to make better choices to reduce the need for these products.

However, even with the filtering criteria and assistance by chemists, the team discovered that the process to investigate each material requires a significant investment of time. Often, full disclosure (or lack thereof) of material content is a major hurdle that stymies the entire process. Weighing the findings of dozens of reports and research results that were often in disagreement was also a challenge.

The team found that a vision of a 100% toxin-free environment is unachievable in today’s market. The process for bringing these kinds of human health criteria into the mainstream can be slow. However, as designers, pushing the manufacturers and asking the right questions Stantec hopes to create a domino effect that will have a positive impact on the healing environments and human health.
ArchiMed
Vikaergaarden – An Innovative Rehabilitation Center, Aarhus, Denmark

**EBD Goal:**
To rebuild an old nursing home creating a high-end, cutting-edge innovative rehabilitation center to help those with disabilities. Additionally, the center had an imperative to integrate the development and testing of new healthcare technologies and processes.

**Disposition of Area**
- Living Area
- Activities
- Office Space
- Service Area
- Storage

**Disposition and Fluid Boundaries**
- Degree of Accessibility
- Degree of Publicity
- Degree of Intimacy in Activities

**Outdoor and Park Area**
Challenges:
The design team had to create a rehabilitation center with almost no role models in the market. Creating an innovative building concept and business model was challenging enough, but when added to existing problems, it became even more challenging. The existing nursing home remaining as a running business proved to be a logistical challenge to the building project, but also created a context of ambidextrous organizations, where old values, norms, and processes often weigh down the more innovative and creative ideas and solutions. Add to this challenge, the city’s mantra, “better and faster rehabilitation.” The municipality of Aarhus aims to reduce the level of expenditures for patients who are in the hospital solely for rehabilitation, which results in an increased demand for primary healthcare solutions – a challenge for the Danish tax funded healthcare budget.

Solutions:
The master plan was developed utilizing all eight steps of the evidence-based design process from day one. By introducing the logic and visibility between end-results and evidence-based design, links were created that connect the complex system of architecture, processes, technology, culture, and organization. ArchiMed is not only designing a unique new building and landscape, but also designing a whole new way of looking at and working together with patients and their needs. ArchiMed teaches and facilitates the EBD learning process with its clients to provide a deeper understanding of the essence of healing architecture, space, and rehabilitation. Over the next year, Vikaergaarden will change from a dark and old-fashioned nursing home to a new technologically-advanced rehabilitation center built with the best evidence-based design knowledge.
**Challenge:** In Singapore, the high demand for new acute care beds coupled with the “silver tsunami” – the rapidly growing population of elderly patients – is driving a design strategy based on acuity-adaptable inpatient environments that will allow acute care units to flex down to accommodate longer stay rehabilitation patients. For the elderly patient in a sub-acute care setting, the challenge is to mediate the stressors associated with an acute care hospital by applying design interventions to normalize the healing environment. And unlike hospitals in North America where single patient rooms are now the norm, the multi-bed room remains the standard in the public government-funded healthcare system, demonstrating the need for future-proofing the inpatient environment in line with evidence-based design findings.

**Solution:** The issues central to healthcare delivery in Singapore, while certainly culturally-based and driven by a public healthcare policy framework, are in many respects universal. At Changi General Hospital, evidence-based design strategies have been interpreted and applied to optimize direct patient care time enabled by a design that is operationally efficient and also supports the family as partner in the active care and rehabilitation of the patient. Eight and twelve bed patient rooms have been re-constructed around the concept of a smaller five bed cluster complete with family area, outdoor terrace (a.k.a. healing garden), abundant natural light, and views to the outdoors. The larger unit floor plate design provides generous space for communal family engagement and on-ward rehabilitation facilities with a view to creating “healing communities” among patients and healthcare staff. Prototype mock-ups will inform the design process and post-occupancy evaluations will be conducted to test the efficacy of the design solution.
EBD Goal:
The program for the competition-winning Changi Hospital project includes an integrated building component that is conceived as a new paradigm for acute/sub-acute care for a growing elderly population. The goal is to provide the infrastructure/platform for flexible, acuity adaptable inpatient accommodation that actively integrates patient rehabilitation with a patient and family-centered model of care—all designed to improve healthcare outcomes and expedite the patient’s return to the community.

B+H Architects
Changi General Hospital, Integrated Building, Singapore
Challenge: The facility planning and construction occurred during a time of acute economic hardship for the community. The closing of a large local automobile assembly plant, in tandem with pressures from the national recession, caused the Janesville metropolitan area to have the highest unemployment rate in the state. With patient and staff satisfaction goals in mind, the project team was challenged to create a facility that met the highest standards for design and quality – while at the same time reflected the local culture, identity, and landscape.

Solution: Critical design decisions throughout the facility were informed by both regional influences and evidence-based research, particularly those that relied on the use of natural elements.

The following strategies worked together to create a place that patients and staff would find welcoming, comfortable and familiar:

- Artwork: Local artists were commissioned to create pieces to make the space feel warm and familiar to patients, and to serve as a positive distraction. One example is a sculpture that was designed for the Pediatrics department. This tree – made of poured glass and wrought iron – evokes a park environment, is symbolic of growth through the four changing seasons, honors Janesville’s identity as a “Tree City,” and is an effective way-finding landmark.

- Views of nature: Oversized windows are integrated throughout the facility to connect to the natural environment and reduce patient anxiety. Most patient areas and waiting rooms are designed with outdoor views.

- Healing Garden: A healing garden with walking trails, an intimate meditative hollow, a spiritual labyrinth, and a variety of native landscaping was designed as a critical element of the campus for patient and staff respite. It includes a patio adjacent to the oncology unit, allowing for patient choice and flexibility in their treatment environment.

- Finishes and Materials: The pallet of interior elements such as paint, decorative wall panels and graphic images, flooring, furniture, and upholstery patterns and textures, was inspired by the local landscape of wheat grass and open farm fields.

- Environmental Consciousness: A variety of patient-focused strategies – influenced by the LEED system -- were implemented to conserve natural resources, use of low-emitting materials and finishes, and leveraged natural daylight.
ERDMAN
Janesville Medical Campus, St. Mary’s Janesville Hospital and Dean Clinic, Janesville East, Janesville, WI

**EBD Goal:**
To create a warm, inviting, calm and patient-centered environment for patients and staff.
Challenge: Fort Belvoir is one of the first integrated healthcare networks serving U.S. military active-duty service members, retired veterans, and their families to use evidence-based design methods. Fort Belvoir Community Hospital encompasses 1.2 million square feet and is comprised of five interconnecting “pavilions,” each with its own thematic identity. As part of an integrated way-finding system, the artwork participates in and supports a thematic structure encompassing subject, color, and orientation. At the same time, the selection, production, and placement of hundreds of art objects generate aesthetic interest and provide positive distraction through calming and inspirational natural subjects in a great variety of styles. One-third of the nearly 1,000 works of art installed at Fort Belvoir are integral to the facility’s way-finding strategy.

Solution: Way-finding functions both locally and globally to reduce demands on hospital staff, reduce stress and misdirection among visitors, and orients all users according to the organization’s own branding strategy. The artwork, located in corridors, common areas, and lobbies that bridge neighboring pavilions, reflect broad thematic subjects and colors that orient patients and staff and indicate transition points between the five pavilions.

The thematic subjects of the way-finding program—each a subject from nature -- granted opportunities to install artwork that incorporates calming natural imagery, which is a positive distraction that reduces pain and stress for patients and improves the outlook of the staff. The artwork also creates meaningful relationships to the plentiful views of the outdoors and natural light available in these areas.

The careful balance of creativity and consistency achieves and sustains aesthetic interest throughout the art program by sustaining curiosity. Patients, staff, and family members encounter a great variety of artwork, with a tremendous range in medium, scale, dimensionality, texture, and style.

A one-of-a-kind installation, including approximately 100 original works of art, identifies Fort Belvoir Community Hospital as a facility committed to excellence and devoted to its patients and their families.
EBD Goal:
To integrate a comprehensive art program into Fort Belvoir Community Hospital’s sophisticated way-finding system, designed to serve patients, family, and staff. To bring Fort Belvoir’s physical setting in line with its stated goal to foster a “culture of excellence,” and provide patient- and family-centered care.

Skyline Art Services
Fort Belvoir Community Hospital, Fort Belvoir, VA
EBD Goal:
To set a new standard and image of healthcare delivery, using EBD to achieve positive patient outcomes in the expanding hospital system. The owner’s goal was to incorporate operational efficiencies with advanced technologies, a connection to the scenic outdoors, and the usage of elements and materials to project warmth.
EBD STEPS APPLIED: 1 4

Challenge: Being a new start-up hospital, the initial planning was conducted with surrogate users, as the hospital staff had not yet been hired. After the employees were brought in, close collaboration between the architect and these permanent users identified concerns and influenced changes to best achieve the goals and needs for the hospital and patients and staff.

Solution: The hospital’s design embraces EBD principles throughout. Some of the principles include:

• Family Accommodations: Comfortable sleep/ waiting areas, nourishment, and retail amenities.

• Way-finding and Signage: Distinct access points, parking, and key information points.

• Access to Natural Light: Large windows in public spaces, patient rooms, and clinical areas

• Infection Control: Private patient rooms, conveniently located hand washing stations, easy-to-clean finishes with anti-microbial properties.

• Patient Safety: Decentralized support areas on units, visibility by staff from corridor, handrails from headwalls to baths, appropriate lighting levels, and 5’6” wide patient room door openings.

• Noise Reduction: Walls are extended full height to the support ceiling and high-performance sound-absorbing ceiling tiles are utilized.

• Healing Environment: Wooded setting and walking trail around a lake, plants, natural materials, two-story water wall in the lobby, children’s play area, Wi-Fi connection throughout, bridging of patient care units and minimized duplication of services.

• Staff Efficiency: Work areas designed with lean principles to improve workflow, spaces available for team interaction, decentralized work areas, and integration of systems.

• Flexibility and Adaptability: Flexible and expandable departments to adapt to changes and advances in technology and medical treatment.
Corgan Associates, Inc.
Lonestar Family Health Center,
Conroe, TX

**EBD Goal:**
To create a patient-centered healthcare facility using EBD. Objectives included:
- Wayfinding integrated into the architecture
- Zoned circulation - separation of on-stage and off-stage flow
- Clear access to patient care areas with minimal travel distances
EBD STEPS APPLIED: 1 4 7

Challenge: The client needed to combine several locations with distinct identities into one 71,000 square foot, two story, federally-qualified healthcare clinic in Conroe, TX. The multidisciplinary clinic would provide comprehensive care, offering the services of family medicine, OB/Gyn, dentistry, imaging, pharmacy and laboratory as well as counseling and patient education for the WIC (Woman’s, Infants, and Children) program, diabetes and other chronic disease care management. The facility would also incorporate teaching space for a primary care residency program. The objective was to design a healthcare facility that is distinctive and modern in design and easily accessible with clear way-finding for a range of patient populations.

Solution: With the opportunity for new construction, way-finding was integrated from the initial concept and site plan throughout the implementation of the project. The sweeping curved, stone accent wall along the entry, guides visitors and creates a central circulation zone from which all services are accessed. Once patients enter any of the five practice area pods, waiting areas are intimate and travel distances within the pods is minimal. Physician and staff circulation is routed along the outer rim of the clinic. The pharmacy has been positioned near the entry for easy access. The imaging department and lab are centrally located in proximity to the pods, so patients do not have to walk long distances to access these services.

Other considerations:

- Patient privacy with acoustical intervention above the ceiling and in exam room walls
- Day lighting and views integrated into staff work areas
- Indoor air quality improved with PVC free wall protection
- Infection control enhanced with walk off mats at all entryways

These evidence-based design features are expected to result in improved operational efficiency and reduced patient anxiety enhancing the overall patient experience.
Visions in Architecture
Bryan LGH Medical Center Foundation, Lincoln, NE

**EBD Goal:**
To provide a separation of the clinical and public/family access areas and study the patient’s emotional and psychological needs in order to design a solution that optimizes clinical outcomes and the patient experience.
Challenge: It is widely accepted that there is merit in the “Disney Experience,” the concept that the patient experience and the needs of the staff are enhanced by recognizing a separation between the “On Stage” area of the patient room, exam room etc. and the “Off Stage” or “Back Stage” clinical and support functions. If the door connecting these two areas is left open, an atmosphere of noise is created, there is lack of privacy and the movement of people and materials is heard. The patient suffers as a result. If the door is closed, the patient feels isolated and alone and may feel bored and neglected. Again, the patient suffers.

Using the patient corridor as access for family and visitors compounds this situation. The public and patients are exposed to floor cleaning machines, clinical activities, movement of clean and soiled linens, transportation of supplies, and the movement of other patients. Both the experience of the patient and the family, friends and other supportive visitors is diminished.

Scientific study has established a strong relationship between the healing process and access to nature (Ulrich, R., 1999; Hartig, T., Mang, M., Evans, G.W., 1991; Calabrese, J.R., Kling, M.A., Golld, P.W., 1987.)

Solution: A logical conclusion reached by the acceptance of the above information led to a design solution that enhances the positive aspects and diminishes the negative aspects of the patient experience. This conclusion is that families and visitors should enter the patient rooms from a separate circulation path into the family/visitor zone of the patient room. The nursing staff and medical staff along with supplies and pharmaceuticals should enter from the opposite side of the room. If the circulation space also contains natural plants and materials, the patient experience is further enhanced resulting in positive health outcomes.

Also adding an adjacent family room serves as an ante room to buffer the entrance of a visitor from the patient. It provides a place where visitors can go while a private examination or consultation takes place and an overflow space when multiple visitors overwhelm the patient. This small room has air pressure less than the surrounding spaces to help protect the patient from outside sources of airborne contamination.
**EBD STEPS APPLIED:** 1 4 7

**Challenge:** The expansion at Phoenix Children’s Hospital consists of 750,000 square feet of new space and includes a new patient tower and an ambulatory care building. The primary challenge for the art program was creating a harmonious flow of significant works of art in a very open design plan. It was vital that each work of art be unique to hold the attention of viewers in order to provide positive distraction. At the same time, each work had to complement the others in order to keep from creating a sense of discord. Additionally, the art needed to provide the functional aspect of enclosing workspaces reducing stress for patients and staff alike.

**Solution:** In keeping with the “oasis” design theme created by the architects, the art program draws from regional themes depicting indigenous flora and fauna for much of its imagery. The team workstations are wrapped in murals of desert life, and each floor has a distinctive plant or flower which becomes part of the way-finding program. The atrium features a monumental “rain” sculpture suggesting growth and rejuvenation and relief from the harsh reality of stress. Larger-than-life mosaic animals greet viewers on each of the building’s 12 floors of elevator lobbies. Each patient floor features numerous original works of art designed to be a positive distraction for patients and families waiting in clinics. Works range from paintings to glass to metal, all chosen with the unique challenges in mind. Lastly, all of the art was selected to appeal to a broad range of ages and to have an underlying sophistication that will also keep adults engaged.
EBD Goal:
The goal for the hospital’s art program was to create an environment in which art would aid in reducing stress and foster wellbeing while functioning as a supportive component in the overall healing process. The art should be child-appropriate and adult-friendly with a broad ethnic, cultural and socioeconomic appeal for the immensely diverse clientele.
EBD STEPS APPLIED: 2 3 4 5

Challenge: The World Health Organization states that nosocomial infections affect roughly 1.7 million patients in the U.S. each year, racking up an annual cost of $6.5 billion and contributing to more than 90,000 annual deaths. This epidemic is an operational issue in hospitals and a challenge that the design community can help address by developing design strategies. As insurance companies change policies and no longer cover the time needed in the hospital to recover from the healthcare associated infections, healthcare organizations are looking at their procedures and policies.

The challenge facing both the design community and hospitals is that the definition of a well-designed standard process for basic handwashing is variable and changes with every institution. Developing a standard process for handwashing may help address the issue.

Solution: Three hypotheses drove the design; first, creating a standard one direction flow for the caregiver leads to better compliance, second, easy viewing of the handwashing process by the patient/family may lead to better satisfaction scores ("observing staff washing hands"), and third, placing the handwashing accessories on an equipment rail allows adjustment in the system without creating damage to the wall and potential home for pathogens. The outcome of meeting these goals may lead to a reduction in the spread of infections that occurs through direct caregiver and patient contact.

The project team—including the infection control representative, nurses, administrators, and the design team—developed a process that facilitated the appropriate procedure for handwashing. It was very important for gloves to not be the first item on the wall when entering the room as this could be a staff member's attempt at "sterilizing." At room entry the proposed proper sequence is hand sanitization, soap, sink, paper towel, and then gloves. The process is viewable by the patient and family, and this design also facilitates an exit strategy with the linen and trash hampers at the door and the hand sanitizer in close proximity to be used prior to exiting the room.
EBD Goal:
To create a standard process that facilitates the practice of appropriate hand washing prior to caregiver interaction with the patient.
Challenge: Little baseline evidence was available during the design stage of this project. The design team utilized the literature review “Evidence for Innovation: Transforming Children’s Health through the Physical Environment” published by the National Association of Children’s Hospitals and Related Institutions in collaboration with The Center for Health Design.

As the budget was continuously monitored by an independent project manager, several features were value-engineered out of the base project during various phases of the project and relegated to the fund raising efforts of the Foundation.

Solution: In the high desert of El Paso, Texas, brownness lingers in the horizon until the sunsets and spring blooms in full living color. It is in the extreme color spectrum of nature that this project finds its voice much as the native Indians, the Spanish Conquistadors, and American cowboy did years before CAMA came to El Paso. The ethnic forces that shape the region, both historically and currently, allowed for the development of a palette of colors and vocabulary of imagery that served to imbue resonance and richness into a budget driven project. A spirited backdrop of modest materials became the ideal setting for an art program gleaned predominantly from local and regional artists.

Additionally several outcomes were addressed:

- Reduced spread of infection - private rooms, hand washing sinks in every room
- Reduced medical error - standardization of patient room
- Increased social support - space for families in all patient rooms and on all units, overnight accommodations for two
- Increased patient and family satisfaction - patient and family control over privacy and environmental conditions
- Age appropriate play areas
- Access to natural light
- Reduced anxiety – family destinations, positive distractions
- Spatial orientation - effective way finding landmarks such as significant works of art or interior design features.

A unique canopy of illuminated stars at the footwall of the patient room (pictured), creates an immersive focal point noted in the literature as a positive distraction in order to reduce feelings of pain, and like the first floor enchanted forest, the more immersive the environment, the greater the pain reduction.
CAMA, Inc. + KMD Architects
El Paso Children’s Hospital,
El Paso, TX

**EBD Goal:**
To establish the first separately licensed children’s hospital in the community of El Paso, Texas with an interior environment that is patient-centered, family focused, community accessible, culturally compatible and a magnet for the recruitment of pediatric medical staff. CAMA | KMD considered the building “through the eyes of a child” and while the final design addresses a number of outcomes, a primary goal was to create whimsical spaces influenced by research to delight the senses and thus reduce anxiety.
EBD Goal:
To improve patients' overall outpatient surgery experience by reducing wait times, reducing the number of transfers/handoffs for each patient, and increasing on-time starts for surgical procedures.
**EBD STEPS APPLIED: 1 6**

**Challenge:** At the existing hospital on the day of surgery, patients walked (or were transported) between 16 destinations over three floors during their outpatient surgery experience. Communication challenges occurred when the surgery team was ready for a patient and again when surgeons had to travel to another floor to the patient’s post-op room. A series of bottlenecks occurred in both the pre-op and post-op processes. The design and construction of the replacement hospital allowed Monroe Clinic the opportunity to redesign both its physical space as well as its operational protocol related to outpatient surgery.

**Solution:** When planning began for the replacement hospital, the process was studied using a systems approach incorporating Lean and evidence-based design. The design team facilitated process improvement workshops for an integrated hospital and multi-specialty clinic using the basics of Lean thinking in combination with the Six Sigma DMAIC process: Define Measure, Analyze, Improve, and Control. Representatives from areas of both the clinic and hospital worked together to collect baseline information. The current building layout was analyzed and the team completed value stream mapping exercises and workflow modeling. The multidisciplinary team worked to evaluate current processes and then determined the best process going forward in the new hospital for scheduling, registration, check in, prepping, transferring to surgery and discharging the patient. It was determined that the existing layout created way-finding issues, extensive waiting for patients and material movement and worker motion and ergonomic concerns for movement of patients, supplies and equipment.

The layout of the new hospital creates an integrated interventional platform with pre- and post-op rooms on the same floor as the procedural rooms with cardiac catheterization just one floor below. The new surgery experience will improve patient flow with less waiting, improve on-time start of procedures, improve communication flow, reduce hand-offs, and support increased cross-training of staff.
HDR Architecture
Central Washington Hospital
Patient Tower, Wenatchee, WA

**EBD Goal:**
To design a state of the art regional medical referral center configured for optimal patient care that features easily accessible services and a healing environment that inspires hope and confidence, promotes operational efficiency, and permits cost effective facility adaptation to changing technology and care delivery. Central Washington Hospital’s new six-story patient tower is one of the most evidence-based hospitals in HDR’s portfolio, and a true “smart” hospital, exuding the latest in healthcare technology.
Challenge: The design team was challenged to integrate the latest research findings, EMR technologies, evidence-based design strategies, and Lean operational efficiencies into the patient tower design and budget. Constructing 174 patient rooms exactly as the design team and hospital staff envisioned was another challenge. During concept and schematic design, mock-up rooms were built to test space, size, headwall, and operational needs. Construction level mock-up lights were made operational, equipment set in place, and nurse calls simulated to create perfect testing grounds for minor changes. The contractor used the mock-up rooms to test constructability and sequencing, the owner for staff training, and the foundation for fundraising purposes.

Solution: Evidence-based design principles that were utilized were standardized and same-handed patient rooms incorporated to decrease errors and increase caregiver efficiency. All patient rooms are universally sized to be adapted to meet a higher level of care. Family alcoves include sleeper sofas, and an expansive window offers an unimpeded connection to the outdoors.

Lean studies were performed during programming through construction as the staff transitioned into the new facility and began new care delivery models. A workflow analysis using handheld PDA devices to track staff travel time was proposed as part of a comprehensive process improvement study of travel patterns for nurses and doctors on the patient units of the existing hospital. This same study is currently being repeated (one year post occupancy) in the new bed tower. All data gathered is being compared to national benchmark databases to evaluate how effective the design will be in ultimately achieving a superior patient-centered model. Building user focus groups were also conducted after occupancy to gather feedback from occupants on how well the design of the building supports their work processes. The feedback from the focus groups was used to develop a post-occupancy evaluation survey to solicit opinions from the users about how well the built environment is meeting their needs.
Cannon Design
Dedicated Service Corridor in an Adult Cardiac ICU,
A Medical Center in the North Central United States

EBD Goal:
To reduce noise and distractions in the patient care environment through the design of a new adult cardiac ICU.
Challenge: Shared corridors immediately adjacent to patient rooms are generally noisy due to a variety of activities, including service deliveries and pick-ups. This phenomenon is thought to be detrimental to patient care by creating noise, negative distractions and environmental stress, which may contribute to medical errors and impact bedside caregiving.

Solution: This project team hypothesized that adding a dedicated service corridor to a typical racetrack-style patient care unit would help to reduce noise and improve patient care by separating support staff traffic from patient care traffic. Limited research has been done to investigate this design strategy and its impact on the sound levels in patient care environments and nursing performance.

A post occupancy evaluation compared the noise and staff performance in an ICU with a dedicated service corridor to those in the ICU’s previous environment, without the corridor. The same groups of staff in the ICU were surveyed to investigate their pre- and post-move environmental comfort, stress, and satisfaction. To collect baseline performance measures, the previous ICU was used as the control environment for the acoustical data collection and onsite observations.

Statistical analyses showed that the perceived noise level was lower and staff reported less stress and more satisfaction in the new ICU. Analyses of acoustical data confirmed that the new ICU was significantly quieter. The average sound levels in the new unit range from 51 (night) to 53 (daytime) dBA, which were lower by 2-4 dBA than the control environment.

In the new unit, sound profile was largely characterized by the sounding of alarms. In the control environment, observers did notice the HVAC noise more than in the new unit, which served as a constant background, disguising other noise. Observations and acoustic readings added a valuable layer of data to this study, providing firsthand information of the actual activities in the corridors, not just those reported in the staff surveys. The addition of the dedicated service corridor contributed to the reduction of noise and helped to improve nurse satisfaction and reduction of stress.
Connecting.
It may be the healthiest thing we can do.

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The Center for Health Design (CHD), formed in 1993, is a nonprofit organization whose mission is to transform healthcare environments for a healthier, safer world through design research, education and advocacy.

CHD began development of EDAC in 2005 with a grant from the Robert Wood Johnson Foundation. EDAC represents the cumulative work of volunteers, support from Nurture and CHD staff and consultants. The program launched in 2008 offering study preparation resources, access to healthcare design expertise, a comprehensive certification exam and continuing education.

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