Evidence-Based Design Touchstone Award Winners and EDAC Champion and Advocate Firm Projects

EVIDENCE-BASED DESIGN IN PRACTICE 2020
Evidence-based design (EBD) is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes. EDAC Champion and Advocate Firms take an additional step, ensuring their healthcare teams become EDAC certified and actively incorporate EBD in their healthcare projects. Each of the projects highlighted in the EDAC Advocate Brochure describe how the evidence-based design process was applied to address challenges in their projects.

To become an Advocate Firm, contact edac@healthdesign.org

Steelcase Health is EDAC’s Educational Partner, offering study sessions and other resources to help prepare for the EDAC exam.
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 environments. This educational program teaches you how to find, use and create relevant research to improve healthcare outcomes and add to the knowledge base of EBD.

Since its launch in 2009, more than 2,600 individuals worldwide have obtained the EDAC credential. Currently, 44 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.

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

Evidence-Based Design Touchstone Awards

Evidence-Based Design Touchstone Awards recognize the use of an evidence-based design process in the pursuit of increasing value, improving outcomes, and engaging stakeholders.

Submissions are judged upon their achievement across three touchstones of the EBD process:

- **Collaborate**: Submissions must demonstrate interdisciplinary team and stakeholder education, engagement and development.
- **Evaluate**: Submissions must demonstrate the extent to which research was found, evaluated, and applied to link design to outcomes and measurement of results.
- **Share**: Submissions must demonstrate how the EBD process was applied and how the knowledge gained was captured, disseminated, and has the potential for application to future projects.
This project will complete the Children's Pavilion as a comprehensive, integrated healthcare facility exclusively for children's inpatient and outpatient care. The new Children's Hospital (CH) will replace the existing pediatric inpatient unit with all private rooms and will provide new operating rooms, imaging capacity, emergency services and family amenities. Opens in December 2022.

Collaborate: An interdisciplinary project delivery model was selected for the development of the CH prior to the request for proposals. Aligned with VCU’s Interprofessional Care Team initiative, interdisciplinary teams were formed to design the Children's Hospital, including community and patient stakeholders. Frontline staff and key leadership members from each department were identified to provide feedback on operations, programming, planning, and design on a monthly basis. The team continues to collaborate throughout the design process, participating in activities including visioning, current state assessment, future state operational planning, design and planning, transition planning and post-occupancy evaluation.

Evaluate: An evidence-based design (EBD) approach was not only considered very important but mandated by VCU. Every presentation begins with EBD information about the research that informs the topic of that particular workshop or presentation. Further education is provided in regular email updates about the project that includes relevant evidence. The evidence-based Vision and Guiding Principles continue to serve as decision-making tools for the project. Every major decision is documented in an Evidence-Based Decision Document. These documents include: the situation, background, assessment, and recommendation, with relevant evidence, citations, precedents, and a weighting of the recommendation according to the goals and objectives established for the project.

The project is an in-progress research study. Baseline metrics were collected at the onset of the project to inform ongoing studies. Data was collected during each of the completed, ongoing, and future studies. Analysis has been conducted as appropriate to each phase of the project.

Share: The CH interdisciplinary project team has been diligent in documenting all processes and elements of the project. This extends to the development of an interactive PDF that links touchpoints on the patient experience journey,
based on experience mapping, to key design documents. A living document, this PDF will be an all-inclusive record of all tools utilized on the project, all reports developed for the project and all EBD strategies implemented. It will inform individuals who operate the facility in the future to fully understand the intent, set the basis for the post-occupancy evaluation, and serve as a learning tool for future projects, both at VCUH CH and for the industry.

INTERDISCIPLINARY PROJECT DELIVERY MODEL

Children’s Hospital of Richmond at VCU Interdisciplinary Project Delivery Model

ADOLESCENT & YOUNG ADULT (AYA)

AYAs have unique psychosocial needs.

81% of teens admitted to adult units feel out of place

53% of teens admitted to pediatric units feel out of place

77% of teens thought a specific teen room would be an improvement

COMFORTING & ENGAGING

PSYCHOSOCIAL SUPPORT

SPACES FOR SOCIALIZATION, RESPITE, & EDUCATION

LOCATION

PRIVACY & CONTROL

Case study: Baylor All Saints AYA Oncology Unit
(Fort Worth, TX)

Children’s Hospital of Richmond at VCU EBD Example: Adolescent & Young Adult

Images courtesy of HKS
Overview: Opened in 2015, the New Parkland Hospital (NPH) is one of the busiest public safety-net hospitals in the U.S., with more than 1.5 million encounters per year. The hospital serves a full spectrum of populations across Dallas County, from neonates to the elderly, and is also a teaching hospital. At the post-occupancy stage, several interested firms and Parkland created the NPH Research Coalition. Members are HDR, Blue Cottage, Corgan, Herman Miller Healthcare, Mitchell Design and Parkland Hospital. A Charter and research collaboration agreements were developed to conduct an integrated evaluation.

Collaborate: The interdisciplinary project team for the (NPH) project evolved over time due to individuals changing roles and organizations over a decade from preplanning to post-occupancy evaluation. HDR and Corgan, in a joint venture, led the design. Mitchell Design designed wayfinding. Herman Miller Healthcare conducted a qualitative study with Parkland nurses. American Art Resources and HOK were responsible for art and furniture specifications.

Evaluate: Literature was accessed and reviewed at multiple points in the project, to inform design, and then to provide further context and input for evaluation. The design concepts and strategies were all based on existing evidence, although evidence was sometimes limited or offered mixed findings. The team made efforts to evaluate the evidence in light of Parkland’s population, service orientation and design goals, and made the best decisions at the time based on the guiding principles. At the post-occupancy stage, new searches were run to identify any recent publications of relevance, and literature was reviewed thoroughly as part of the research planning and protocol development.

The central hypotheses were derived from the major design concepts/strategies and corresponding goals, objectives and research questions.

- Hypothesis 1 - Architectural differences between the old and NPH units will be associated with differences in key adult acute and neonate patient outcomes (patient satisfaction, length of stay (LOS), adverse events, and falls (adults only).

- Hypothesis 2 - The caregiving staff experience will be improved with new unit design, but may relate to previous experience and effective change management and leadership.
Hypothesis 3 - The new wayfinding system will function well from the user perspective.

Share:

Results from the NICU population were presented at the 2018 HCD Expo & Conference. A marked increase in LOS for the term infants only was a surprise result at the time of the move, and could be due to the Parkland population (95% of babies on Medicaid) and other factors. Further meetings exploring this result have taken place with the NICU Director and Chief Medical Officer. A manuscript will be submitted to the Journal of Neonatology.

Overall, adult LOS, controlled for acuity, was on an upward trend before the move and has been on a downward trend since the move. Analysis by department showed no change for Women and Infants (WISH). For falls, only Medical Services experienced a change in trend and decreased post-move. Analyses of caregiver data are still underway. Preliminary findings indicate that, while caregivers believe the new facility is better for patients, they find the environment challenging, especially in perceived lack of contact and learning from other caregivers. Themes around learning and wellness from the qualitative data are being triangulated with survey data, and manuscripts will be forthcoming.

Analysis of post-occupancy facility constructs, supplies, and wayfinding results are underway. The predesign wayfinding research was published in the HERD Journal, and the post-occupancy findings will add to the depth of knowledge around this challenging topic that has major financial implications for organizations.

EVALUATE

Post-Occupancy Research Focus Areas

PATIENTS

AIM: Determine whether design differences between the old and new Adult and NICU inpatient units are associated with important patient outcomes.

APPROACH: Time series analysis of acute inpatient outcomes over 5 years in the old and new facilities, controlling for confounders.

STAFF

AIM: Explore and identify issues related to the single room and decentralized patient unit design and operational change and support coinciding with the physical environment change.

APPROACH: Exploratory mixed methods study incorporating validated survey scales and qualitative data from multiple focus groups.

New Parkland Hospital “Evaluate”
Image courtesy of HDR
Overview: The setting was a centralized medical-surgical unit in a Midwest metropolitan academic hospital. The original vision was simply to copy and paste from a sister unit renovated several years before. However, staff expressed concerns about the design and requested a complete re-evaluation. The vision changed and the team stepped back to reimagine a unit to support their needs and the needs of patients and families.

Collaborate: Because of the concern that staff voices would not be heard, and needs would go unmet, the formation of a strong interdisciplinary project team was crucial at the beginning. Healthcare team members—nurses, nursing assistants, nursing leaders, physicians, residents, therapists, environmental services, supply chain workers, and nutritionists—were all engaged and empowered to influence design decisions. Additionally, diverse perspectives were provided from industrial engineering, research, architecture, interior design, construction, mechanical and electrical engineering. Patient and family representatives as well as vendor stakeholders also provided valuable insights, and executive leadership remained engaged and involved through post-occupancy.

To ensure the team shared a set of assumptions, a researcher presented the EBD process early in predesign. A conceptual model merging Lean, EBD, and change management was presented during the kick-off meetings to educate and inform all participants. Patient and family education using family-centered care surveys was used in both pre- and post-occupancy phases.

Evaluate: A series of Lean exercises and research tools were deployed to create a Lean + evidence-based unit design. Literature findings on relevant design and operational concepts (e.g., standardization and decentralization of nursing units) were shared. When selecting studies, researchers considered the sample size, constructs of the study, and validity of the findings; if considered reliable, the information was presented during user group meetings and included in a database.

It was hypothesized that transitioning to a decentralized unit would improve staff efficiency, patient and staff satisfaction, and patient safety. Baseline data led to the development of critical-to-quality metrics used to guide planning and design decisions to achieve quality outcomes. Data was analyzed using descriptive statistics and independent t-tests. As predicted, patient and staff satisfaction, staff efficiency, and patient safety improved in the new unit.
The design researcher presented findings and implications at the architecture firm’s monthly Medical Planning Roundtable. Results were also presented at an internal “3i” (investigate, initiate, and innovate) forum for colleagues. Recordings of the meeting are posted on the firm’s internal website along with a database of research findings that was created, updated, and shared on a continuous basis.

For the phased post-occupancy investigation, an executive summary was provided to the nurse manager after the first two phases, with a final, comprehensive report provided at the end of the third phase. Nursing leadership acknowledged the success of the EBD process by using it as an example in their Magnet recertification report. They shared lessons learned and outcomes with many different audiences. Facilities across the country have come to view the unit. A leadership tool and “lessons learned” guide was developed offering tips and recommendations for nursing leaders involved in design projects. Due to the success of this project, the resulting unit design—referred to as the “evidence-based floorplan”—has become a model for all new remodels at the hospital.

### Post-Occupancy Results

**Nurses’ Time Spent, 6% ↑ in Efficiency**

<table>
<thead>
<tr>
<th></th>
<th>Existing Unit Current State</th>
<th>Benchmark Decentralized Studies</th>
<th>Decentralized Prototype Prediction</th>
<th>Post-Occupancy Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Rooms</td>
<td>39%</td>
<td>45-54%</td>
<td>+5-15%</td>
<td>45%***</td>
</tr>
<tr>
<td>Charting Stations</td>
<td>43%</td>
<td>32-39%</td>
<td>-4-8%</td>
<td>39%</td>
</tr>
<tr>
<td>Medication &amp; Supply Rooms</td>
<td>5%</td>
<td>1-5%</td>
<td>0-3%</td>
<td>6%</td>
</tr>
<tr>
<td>Support Rooms</td>
<td>1%</td>
<td>2-5%</td>
<td>0-2%</td>
<td>3%</td>
</tr>
<tr>
<td>Traveling</td>
<td>13%</td>
<td>5-8%</td>
<td>-4-8%</td>
<td>7%***</td>
</tr>
</tbody>
</table>

**Visitor/Patient Satisfaction, 16% ↑**

Froedtert & the Medical College of Wisconsin Post-Occupancy Results

*7NT, 2013 completed
CV ICU, 2016 completed
Application of design concepts to future units*

Froedtert & the Medical College of Wisconsin Legacy
Images courtesy of HGA
Spero Academy is a public K-6 elementary charter school in Minneapolis that provides a national model of tailored education for children with special needs. In order to accommodate planned programming expansion and to meet growing demand, Spero Academy hired HDR to design a new school facility that embodied their mission. The team’s design process was informed by emerging research and best practices on spaces for children with special needs, as well as focused discussions with Spero Academy staff related to ideal learning environments for the student population. Evaluation of the new building is underway studying outcomes related to staff and student outcomes.

**Overview:**
Spero Academy is a public K-6 elementary charter school in Minneapolis that provides a national model of tailored education for children with special needs. In order to accommodate planned programming expansion and to meet growing demand, Spero Academy hired HDR to design a new school facility that embodied their mission. The team’s design process was informed by emerging research and best practices on spaces for children with special needs, as well as focused discussions with Spero Academy staff related to ideal learning environments for the student population. Evaluation of the new building is underway studying outcomes related to staff and student outcomes.

**Challenge:**
The overall guiding principle for this project was empathetic design. The designers sought to understand how children with autism spectrum
disorders (ASD) experience the environment and were open to a different way of looking at space and how children interact with it. They found that identifying design considerations for learning environments for children with ASD is challenging due to a wide range of differences in impairments and abilities of each individual. However, many of the difficulties these children have often relate to sensory processing abilities and negative effects of an overly stimulating environment. The challenge of this project was to create spaces that incorporate a range of qualities and features to allow the best possible learning environment for all children.

**Solution:** The design team made every effort to base design decisions on current knowledge. Also, realizing that findings from empirical studies were limited, the broader team recognized the need to design and conduct additional empirical research about how a learning environment can impact children with special needs. Once a comprehensive literature review was completed, the architectural team worked with client leaders and researchers to conduct focus groups with school faculty and staff to understand the needs of this school's students, faculty, and staff in terms of design. In addition, ideas and recommendations from literature were taken into consideration. Design features in the new school design include a welcoming entry sequence, specifically zoned spaces with varying levels of stimuli, calming and adjustable lighting, purposeful color palettes for different types of spaces, and ensuring non-toxic content of furniture, equipment, and building materials.

**Results:** The multidisciplinary group discussed how best to assess the impact of the new design on all those who use the school. It was decided that faculty and staff outcomes would be assessed through a pre-post survey design, and existing school-collected data would be used to evaluate changes in student academic and behavioral performance. This study will be one of the first to provide empirical data in the realm of educational facility design for children with ASD. Data on both student and staff outcomes are included in the study. Baseline data collection includes a faculty/staff online survey with demographics and faculty/staff experience and outcomes working in the old school facility, as well as secondary data on student educational and behavioral outcomes. All baseline data will be compared with data collected from the new facility.

The team found that even within the old facility there was high faculty and staff engagement and collaboration. However, experience of the environment was generally poor with issues noted from noise and distractions, temperature, natural light, and availability of individual learning areas for students.

Based on key findings from the baseline data, the team anticipates improvements in the environmental conditions in the new school, especially related to different types of areas for student learning. Thus, significant differences in student outcomes are hypothesized. Once student data are available from the new school, the hypotheses will be tested by comparing follow-up to baseline data using both pre-post and interrupted time series analyses.
Cherokee Indian Hospital was planned, constructed, and funded by the Eastern Band of the Cherokee Indians (EBCI) and follows their “It Belongs to You” design directive.

“We believe that we can serve our community better than anyone else and we are committed to that goal,” Cherokee Indian Hospital CEO Casey Cooper said. “We believe that the new building will help us foster an environment of wellness, so our patients don’t just come to us when they are sick, they come to us as friends and partners in wellness.”

The original, multimedia Cherokee art now found throughout the hospital supports, honors, and celebrates modern EBCI life and culture.

The Cherokee Indian Hospital Authority partnered with Design Strategies LLC and Distinctive Art Source (DAS) to create a hospital designed to meet the specific needs and aesthetics of the Eastern Band of the Cherokee Indians. The artistic challenge was to continue the intentional design direction, using local art to bring the Great Smokey Mountains into the interior of the building while reflecting Cherokee history and contemporary life in a manner that celebrates native legends, language, and lore of the rich history belonging to the EBCI. The art program tells the story of the EBCI through the eyes and hands of its enrolled members and depicts the joy that defines modern EBCI life while also featuring works by non-enrolled members of the community since, for the first time in history, this hospital will serve both.

The evidence-based design process began with a visioning session within the EBCI community, including tribal elders, to define the art goals of visualizing history and culture in traditional and contemporary art forms. From there, we researched EBCI cultural history informing the need for proximity to nature while indoors, as well as the need for artful representation of traditional and contemporary EBCI art forms. Evidence shows that providing contact with

EBD STEPS APPLIED:

1. Overview: Cherokee Indian Hospital was planned, constructed, and funded by the Eastern Band of the Cherokee Indians (EBCI) and follows their “It Belongs to You” design directive.

2. Challenge: The original, multimedia Cherokee art now found throughout the hospital supports, honors, and celebrates modern EBCI life and culture.

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Goal

The goal of the art program was to respect and visually reflect modern-day life as an EBCI member while celebrating the unique Cherokee culture through original, multimedia artwork created by tribal members.

Cherokee Indian Hospital Large Wall Graphic, Distinctive Art Source, 2017

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nature and positive distractions can help decrease patient and family stress. With this direction, we created concepts for the art program that all visual elements should reflect culture and joy while celebrating EBCI history.

The art program also involved the community by personally inviting artists to participate. By creating large scale nature photography combined with authentic EBCI artwork, DAS hypothesized that reluctant tribal members would feel more comfortable within the space and more readily seek wellness in a space that induces pride in their own heritage. DAS commissioned EBCI artists, monitored their progress, and timed completion of art elements to coincide with construction schedules to not disturb or delay the project. The program included multimedia dimensional artwork of glass etching, wood carving, quilts, acrylics on canvas, basketry, beadwork, and wall weavings.

The art program allows visitors to sit among the trees or walk along the flowing river while travelling through the concourse from clinic spaces to the dining area. The community art project involved 86 12x12 canvases, each featuring one syllabary symbol. The syllabary wall reiterates a source of community and cultural pride, leading to a strong focus on teaching the Cherokee language to the youth through the release of the Cherokee Syllabary app.

After a year in operation, Cooper says the building is exceeding expectations. “With such strong community and cultural connections, there is about a 20% increase in patient visits: the clinic had 2,311 visits from May 1 to July 29 in 2015 and 2,964 patient visits from the same period in 2016,” says Cooper. “And not only are more patients making appointments, they’re keeping them as well,” states Joyce Biberica, Dental Director at Cherokee Indian Hospital.
Kentucky Children’s Hospital (KCH), part of the UK HealthCare system housed within the Chandler Campus facilities, creates a hospital within a hospital. Research was integrated throughout the project to help create the Project Guiding Principles, gather the voice of the customer, collect baseline pre-occupancy metrics, inform design decisions (including mock-ups) and, during post-occupancy, to evaluate the effectiveness of those goals. HGA’s research team was on the project from beginning to end to assist with these evidence-based design activities.

Overview: Kentucky Children’s Hospital (KCH), part of the UK HealthCare system housed within the Chandler Campus facilities, creates a hospital within a hospital. Research was integrated throughout the project to help create the Project Guiding Principles, gather the voice of the customer, collect baseline pre-occupancy metrics, inform design decisions (including mock-ups) and, during post-occupancy, to evaluate the effectiveness of those goals. HGA’s research team was on the project from beginning to end to assist with these evidence-based design activities.

Challenge: The research challenge for this project was to identify the appropriate research hypotheses to test (there were many, and had to decide which ones would be the most important given limited time and resources), who

Goal
The project reimagines how a Neonatal Intensive Care Unit (NICU) can function in the future to achieve better outcomes.
best to collect the data, and which research methods to use. HGA, GBBN and Smith Hager Bajo were involved in early research projects to inform the design and programming. Following that, a meeting was held with multiple interested parties to discuss, prioritize and assign research projects. As a result of this meeting, the HGA research team, accompanied by GBBN and PNNL (lighting researcher) decided to use pre-post studies as the research method for the related questions.

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Phase 1: Existing Design</th>
<th>Phase 2: Post-occupancy (6 &amp; 12 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the impact of private patient rooms &amp; NICU neighborhoods on staff &amp; family member’s perception of the environment and quality of care?</td>
<td>Online questionnaire</td>
<td>Online questionnaire*</td>
</tr>
<tr>
<td>What is the impact of the architectural lighting scheme on staff &amp; family member’s perception of the environment and quality of care?</td>
<td>Data from lighting measures</td>
<td>Data from lighting measures</td>
</tr>
<tr>
<td>What is the impact of sound on staff &amp; family member’s perception of the environment and quality of care?</td>
<td>Data from acoustical measures</td>
<td>Data from acoustical measures</td>
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*12-month data not evaluated at the time of this publication

**Results:**

**Hypothesis #1:** If private patient rooms are provided, then staff will be more satisfied.

Staff findings were almost exclusively ranked as more satisfying for all the patient room elements post-occupancy. One exception was safety and security, which ranked slightly above neutral pre-occupancy. Qualitative data indicated that in the shared patient rooms staff felt safe in direct visualization of their teammates. However, post-occupancy ‘safety’ was ranked higher in satisfaction but this is unexplained.

**Hypothesis #2:** If a cyclical controllable lighting scheme is provided, then staff will be more satisfied.

Lighting data is continuously gathered through the lighting control system in every room. The control system records every change in the lighting system, whether programmed or initiated by an occupant in the space. The initial data shows there are more changes between 8:00 PM and 8:00 AM than during the day, indicating the programming of the lights during the day is meeting the needs of the occupants.

**Hypothesis #3:** If sound levels are decreased, staff will be more satisfied.

Acoustic readings indicate post-occupancy sound levels in the patient room were consistently higher than the recommended standards. The sound findings for NICU patient rooms is consistent with other studies that related this outcome to noisy equipment needed to support the typical NICU baby.
The guiding principles for the new Veterinary Center, which replaced a 30-year-old facility, are animal care, education, destination and discovery. These principles are demonstrated primarily with the covered observation deck that has tiered seating and a viewing platform to allow visitors to witness surgery and procedures as they occur. Public traffic is separated from back-of-house functions to enable staff to perform daily tasks, while encouraging animal and visitor safety. The new facility includes an OR, treatment room, an ICU, nursery, X-ray room, lab, pharmacy and other ancillary spaces.

The challenge was how to accomplish this melding within budget while creating the needed environment for animal care. The site had been a dumpsite for rock and dirt on the Zoo’s property, and it was determined that the large rocks on the site could be used in the landscaping. The facility’s use of building materials illustrates the convergence of nature and man with the natural materials of wood, stone and rock contrasting with metal, concrete and glass.

Prior to beginning the Veterinary Center’s design, evidence-based design principles were analyzed to determine how they could be incorporated to achieve best possible outcomes. Every opportunity possible was created to include natural light and a connection to the outdoors in all animal care spaces: the nursery, surgery, ICU and treatment rooms. A tall clerestory brings light into the main corridor and lab. Treatment and holding areas incorporate daylighting to help preserve animals’ natural circadian rhythms. For the benefit of staff, the classroom, lobby, conference room and offices have access to natural light. Other EBD strategies include:

- Positive distractions – observation deck; interaction with veterinarians; natural light in the OR, treatment rooms and nursery; art/sculpture/architectural features/furniture

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**Goal**

The mission of the Zoo’s veterinary center is: “we are a window for the world to witness compassionate veterinary care and collaborative research to conserve all species.” In order to achieve this, the goal was to meld the natural world with the manmade world.

Viewing Platform, ESA®/Chad Mellon, 2019
• Social support – animal keepers; other animals; enrichment resources (food grown on premises, such as bamboo)
• Environmental controls – separate HVAC systems for temperature and humidity control for animal holding areas; low exterior light pollution; bio retention pond; use of natural materials
• Access to nature – gardens, nearby exhibits and greenways

The former veterinary center had no nursery for newborns; they were placed in offices for care. The new nursery provides a temperature-controlled environment allowing for better care and monitoring for hand-reared neonates. Viewing windows into treatment, surgery and nursery spaces, supported by interpretive staff, allow personnel to educate the public about conservation and healthcare provided to the animals. Guest experiences are now being measured.

The Center began operation in December 2018. Records of procedures and testing show improvement when comparing results conducted in 2019 and 2018 (comparison period, March 1 to June 1).

Overall, comparisons support the fact that even with more zoo exhibits, healthcare of the animals is now more efficient than before. Most of the lab tests are being conducted in-house, allowing for more rapid diagnosis and treatment. In addition, the facility was awarded a Silver-Level LEED certification.
Surrounded by the majestic Catskill Mountains, tranquil forests and rushing waters of the Esopus River, the Emerson Resort & SPA is nestled in the heart of Mother Nature’s playground. What better place to rejuvenate your body and soul than in nature where it positively affects our brain, body and overall health and wellbeing. Blurring the line between this interior and the majesty of this nature preserve was the quest. Besides, “SPA” is an acronym or the literal translation of the Latin words, Salus Per Aquam or Health through Water.

When you have an engaged client there are no challenges, just the task of doing the investigative research and developing the best design interventions to meet the goal. A strong Emersonian approach to a nature retreat was used, much like what was done for the inn and restaurant, with the added challenge of addressing the need to fill the resort off-season. The spa had to become a primary destination, and marry the indoors with the outdoors during the shoulder seasons between fall leaf peeping and the winter ski season. Therefore, the design of the spa not only had to have design qualities that complemented its restorative service qualities, but also had to contribute to its economic outcomes by filling inn and lodge rooms and restaurant seats.

Goal
The goal was to embellish nature’s restorative qualities with the benefits of this resort’s spa, both in the services provided and in the designed environment in which these services are delivered.

Overview:
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EBD STEPS APPLIED:

1. 2. 3. 4. 5. 6.
Solution: In the first phase of the resort project, the “Deep Thinking” phase, many strains of research were integrated into setting the project vision. CAMA conducted a literature review focused on nature’s impact on wellbeing as it has the most powerful draw to this location; this led to writing a paper describing the impact that nature and biophilic design interventions would have on the resort’s restorative qualities both inside and out. This paper set the tone for this multi-phased renovation project, the spa being just one phase. Studies emphasized the need for immersion in nature and the goal was to maintain that same benefit when the guest came indoors, especially for spa treatments.

CAMA drew upon nature’s patterns, variability and sensory qualities to amplify the experience of the spa. The greatest natural feature of the resort’s site is the Esopus River. Metaphorically, the water element and the river’s edge were repeatedly used in the design. The element of pause and centering was delivered by a large bespoke vessel and a powerful blown glass lighting fixture placed in the entry rotunda. At every juncture of passage, guests are moved toward natural light or backlit nature images. These interior explorations were reinforced by material pattern language.

A catalog of organic patterning approaches was developed that would allow for controlled calibration of one’s mood and directional assistance to move from one spa experience to the next without losing the benefits of the last, hence building and deepening the therapies. Hallways were one-sided light washed white birch walls that grazed light into a pebble edge, while the quietude of nature was reinforced by an asymmetrically laid tatami mat with leaf fossil casts on that opposite wall that one might find on a river’s walk. The relationships and themes from research, patterning, and insight from nature were deliberately accentuated.

Results: The spa has created its own draw as a destination, which was a goal to bolster the resort’s shoulder season. The renovated spa made its debut in September 2016, and the revenue base has increased by over 80%. Sale of retail products has increased by 102%. Guest feedback has measurably improved. Both overnight guests of the Emerson and day guests remark about the healing qualities of the natural design elements of the spa.

Employee satisfaction has also improved. In an area where qualified therapists are difficult to find, many therapists express a desire to work in the beautiful, yet functional, Emerson Spa.
Access Community Health Centers System is a federally-qualified health center (FQHC) serving people who face financial, cultural, or language obstacles to accessing health and dental care. ERDMAN was engaged to remodel the existing William T. Evjue Clinic in Madison into a 20,000-square-foot clinic that provides primary care, dental, behavioral health, and pharmacy services.

Meeting community needs and quantifying capacity is about more than physical facility space. Access receives an estimated 50,000 visits per year at the William T. Evjue Clinic, however the estimated demand is over double that number. Additionally, the clinic serves a multicultural patient base speaking over 39 different languages. The organization received a federal grant to remodel their aging facility; as an FQHC, it was necessary to maximize value. Designs were chosen with the greatest impact in the existing space, so the organization could continue their focus on serving as many patients as possible. The existing space lacked daylight, was confusing to navigate, needed to better support the children and caregivers visiting with patients, and had to reflect the multicultural make-up of the neighborhood.

Despite the challenge of using an existing space, the client and the design team combined their knowledge about how to best serve the community and recent research. Initial meetings with the client, their patients, the community and members of ERDMAN’s integrated services team informed the design process. Visioning sessions were held to discuss their goals. Once the goals were identified, the design team reviewed research about wayfinding, adjacencies and layout impacts on collaboration and efficiency, and effective waiting areas to create an initial design. The Access team brought their knowledge about best practices and experiences in serving a multicultural patient base; they knew that their patient base would come in for integrative care and social services, often with family members.

It was important to the organization that the patients feel respected and that they have an experience on par with leading providers in the area. Patients are greeted upon entry, see fresh flowers, bottled water is offered and there is an unobtrusive security presence. Patients now enter the clinic into a bright area with natural daylight, with navigation to the lower floor and registration clearly visible. On both sides of registration, waiting areas provide options for seating – quieter spaces further from the entrance and

EBD STEPS APPLIED:

1. **Goal**
   The goals were to: improve operational efficiency via flow and collaboration between the two existing levels; facilitate team-based care; improve patient safety and satisfaction; and improve wayfinding.

2. **Overview:** Access Community Health Centers System is a federally-qualified health center (FQHC) serving people who face financial, cultural, or language obstacles to accessing health and dental care. ERDMAN was engaged to remodel the existing William T. Evjue Clinic in Madison into a 20,000-square-foot clinic that provides primary care, dental, behavioral health, and pharmacy services.

3. **Challenge:** Meeting community needs and quantifying capacity is about more than physical facility space. Access receives an estimated 50,000 visits per year at the William T. Evjue Clinic, however the estimated demand is over double that number. Additionally, the clinic serves a multicultural patient base speaking over 39 different languages. The organization received a federal grant to remodel their aging facility; as an FQHC, it was necessary to maximize value. Designs were chosen with the greatest impact in the existing space, so the organization could continue their focus on serving as many patients as possible. The existing space lacked daylight, was confusing to navigate, needed to better support the children and caregivers visiting with patients, and had to reflect the multicultural make-up of the neighborhood.

4. **Solution:** Despite the challenge of using an existing space, the client and the design team combined their knowledge about how to best serve the community and recent research. Initial meetings with the client, their patients, the community and members of ERDMAN’s integrated services team informed the design process. Visioning sessions were held to discuss their goals. Once the goals were identified, the design team reviewed research about wayfinding, adjacencies and layout impacts on collaboration and efficiency, and effective waiting areas to create an initial design. The Access team brought their knowledge about best practices and experiences in serving a multicultural patient base; they knew that their patient base would come in for integrative care and social services, often with family members.

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a new dedicated children’s waiting area with reading nooks, play options, and bright colors. Patients now have an easier, clearer navigation pathway with more daylight, clear signage, and a variety of wall colors and flooring to indicate location. A large art piece completed by all 383 students at the neighborhood elementary school and several pieces by local Hmong and Guatemalan artists provide positive distraction and reflect the unique community served.

The integrated services layout is centered around two pods with team-based workspaces for providers and touchdown points for charting at the far ends. Social support offices and space for small groups are provided, along with rooms for consultation and respite. Moving dental services to the lower level allowed the clinic to serve their patients separately. Behavioral Health has integrated with family medicine on the upper floor in the two pod-based layouts.

Results:

The clinic provides a positive patient and staff experience with improved waiting areas, team-based integrative care layouts, improved wayfinding, natural daylighting, and spaces and art that reflect the diverse community served. Access has reported, since opening, that the improvements to the patient experience will lead to better patient engagement in preventive care, follow-up, and management of chronic conditions. The staff estimates the volume of patients will increase this year and preliminary reports indicate staff and patients are very satisfied with the space. The team hopes to gather data one year after being open to compare results to years prior to the project and to other locations.
The purpose of this study is to evaluate an innovative canine housing habitat at the Animal Humane Society (AHS) in Golden Valley, MN. This new habitat holds no more than six dogs at once. The hypothesis for this study is that if the dogs are housed in a small pack versus alone, their stress level will decrease and they will become more relaxed and social. As a result, potential adopters will be able to observe the dogs behaving as they would once adopted with the goal of increasing the number of successful adoptions.

There is a significant lack of research in this area. However, due to a mock-up built on site, a comparison research study is planned. A ‘test’ habitat is currently

Goal
1. To create a research study similar to those used in healthcare settings to evaluate the impact of the new canine housing habitat model.
2. To understand the impact of the designed environment on staff, volunteers and the dogs who are housed there.

Overview:
The purpose of this study is to evaluate an innovative canine housing habitat at the Animal Humane Society (AHS) in Golden Valley, MN. This new habitat holds no more than six dogs at once. The hypothesis for this study is that if the dogs are housed in a small pack versus alone, their stress level will decrease and they will become more relaxed and social. As a result, potential adopters will be able to observe the dogs behaving as they would once adopted with the goal of increasing the number of successful adoptions.

Challenge:
There is a significant lack of research in this area. However, due to a mock-up built on site, a comparison research study is planned. A ‘test’ habitat is currently
built at the AHS and houses up to six dogs (see photograph #1). All other dogs are currently housed in individual kennels which are concrete on two sides with metal fencing on the face and back with a staff access-only corridor (see photograph #2). This multiple method study will include perceptual surveys of the staff (paid and volunteers) and visitors, decibel level measurements of the two different housing areas, and video tape analysis of the dogs and their interactions with the staff and visitors, along with testing cortisol levels of the dogs in each setting.

This study will provide baseline data to compare and evaluate co-housing of shelter dogs with traditional methods of single housing shelter dogs and its impact on the dogs, as well as the staff and visitors. The overall goals of this study are:

- To evaluate the impact of housing features on dogs in shelter, and to determine if living in small packs in a habitat decreases the dog’s stress level.

- To evaluate the impact of housing features of dog shelters on the staff and visitors.

Survey work has been completed for this study and the observation study is currently underway. Findings will inform future design and construction of the Animal Humane Society’s new buildings, be disseminated in a peer-reviewed journal, and inform the public of the AHS’s desire to create healthy environments for their dogs.

Few studies have been conducted in this area. The challenge of finding research methods to understand the impact of the environment on dogs was addressed by using the same research tools used in healthcare settings to understand how design elements impact the most vulnerable of our population, the neonate. Understanding how to conduct research in that area allowed the researchers to simply expand the same methodology to this non-verbal population of canines.
The Thompson Autism Center at Children’s Hospital of Orange County (CHOC) will evaluate children with autism spectrum disorders (ASD) and promote better outcomes. Opening in late 2019, the 20,000-square-foot center will be a patient-focused environment and is one of the few clinics in the country dedicated to ASD patients. In partnership with Chapman University, the Center will also help patients and their families navigate the education system, from preschool to college. The Center has space for acute behaviors, safe spaces, toilet training, Adaptive Behavior Analysis (ABA) therapy, and education, as well as patient modules for assessment, consultation, and clinical evaluation.

The number of children diagnosed with ASD is growing. Data from the Centers for Disease Control and Prevention in 2014 indicates one in 59 children has ASD — a large increase from 2004 which reported about one in 125 children diagnosed with ASD. While early diagnosis and intervention can be critical in delivering benefits throughout patients’ lives, the mean age of diagnosis remains around four years of age. There are few clinical spaces focused solely on early autism diagnosis, treatment and management.

With a $10 million gift from William and Nancy Thompson, the founders of The Thompson Family Foundation, CHOC wanted to design a centralized facility to raise awareness, support, provide interventions, assessment, therapy, education and research for children and families affected by ASD. The Thompson Autism Center at CHOC will focus on early diagnosis and intervention. The modular design allows for a team-based multidisciplinary approach that has adaptability for future care concepts, including possibly telemedicine and support for clinical as well as psychological interventions.

There is not a wealth of existing data about environments for autism patients. Therefore, evidence and supporting design solutions were derived almost entirely from primary sources: personal interviews with doctors, researchers, parents, and families.

One of the key planners is the father of a boy with ASD. He brought his passion to use the best evidence-based design (EBD) ideas to the project. Literature reviews yielded design ideas about controlling environmental parameters such as light, color, sound, spatial transitions, artwork, and safety suggestions. All
these factors were brought to the table and became integrated into the new center.

Some existing research that informed the space included:

• A 2018 Post-Occupancy Evaluation (POE) report from a school in Cairo, Egypt focused on students with autism, offering results related to the implementation of the Autism ASPECTSS™ Design Index developed by American University in Cairo professor, Magda Mostafa, in 2014. This index uses a matrix approach that ranks design attributes of acoustics, spatial sequencing, escape spaces, compartmentalization, transition zones, sensory zoning and safety.

• To inform the plan for lighting and acoustics, the design team consulted recent research from Dr. Shireen Kanakri, a professor at Ball State University and director of the Health Environment Design Research Lab (HEDR). Her insight informed design decisions related to color, light and sound. Kanakri suggested we dedicate one of the ABA therapy rooms for future studies.

Results:

The design team plans a full POE of the facility 6-12 months after opening. Given there are very few health centers dedicated to people with autism, the results could serve as a new resource for helping those living with autism.
At the gateway to the VCU Medical Center campus, the Children’s Pavilion consolidates existing pediatric clinics into a compact vertical urban pavilion. Adjacent to the city’s most important civic structures, the design establishes an identity that embodies VCU’s objective of being the region’s premier pediatric academic medical institution. With an emphasis on physical, visual and abstract connections to nature, the pavilion has a calming, restorative effect to promote healing. The 632,989-square-foot, 15-story pavilion features primary and subspecialty care, outpatient surgical/imaging services, retail space, a resource center, medical student education and clinical research studies.

**Overview:**

- Centralization: Outpatient clinics across the campus were centralized into a single location.
- Standardization: The clinic module was standardized to maximize flexibility, daily and long term.
- Cultural shift: In addition to standardizing space, the Pavilion standardized operations.

**Solution:**

Nine HKS-designed outpatient clinics were studied to identify areas of achievement, improvement and opportunities to optimize space and operational efficiency during the

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**Goal**

1. To provide an “oasis” for patients and their families with an emphasis on wellness, safety and security while being warm, inviting, and comforting.
2. To build the operating delivery model, partnering with other community providers, focusing on a “full service” outpatient continuum of care across sites (physician office, emergency room, hospital ambulatory, hospital inpatient, home care, community ambulatory care) and across levels of service (primary care management, specialty consultation and treatment and chronic care management).
design phases. Area take-offs were collected, input into the HKS Clinic Intelligence Database and compared across typology and key performance indicators and used as a benchmarking study to inform the design.

Biophilic design was used to enhance the arrival and patient experience. Tree canopy imagery was studied to identify patterns that could replicate the experience of being in a forest on a metal panel screen wall. A parametric model analyzed shapes, allowing for iterative explorations. Utilizing Rhino software, standard modules were organized into a randomized location system to facilitate sending panel cut-files directly to the fabricator and created a codified legend to integrate with the BIM model for documentation and construction.

**Results:** To understand how the environment supports the vision, guiding principles, goals, healthcare and new operational models, a framework was developed to evaluate the qualitative and quantitative outcomes:

- Analysis of current operating data including key metrics
- Department-specific assessment disseminated to hospital management, staff and physicians
- Interviews of hospital leadership to assess facility impact on organizational goals and outcomes
- Parametric Plan Analysis to assess travel distances, planning efficiencies and visibility
- Environmental Analysis to assess illumination, acoustics, air quality and temperature

**Benchmarking Study:** While the facility’s split flow clinic module wasn’t as efficient as any of the traditional, singular corridor clinics, the facility proved more efficient than most of the split model clinics surveyed. The exam room was sized right despite the dual entry points due to the use of sliding doors.

**Biophilia Design Study:** This study is currently collecting post-occupancy data. Patient experience mapping, patient/family surveys, environmental analysis and photo essays may be considered.

**POE Study:** Listed below are some of the functional performance results from the project:

- 93% patient/family satisfaction with facility
- 44 patient care service lines consolidated into a single location
- Completed 52 days ahead of schedule
- 13 awards for design excellence

*Children’s Pavilion at VCU, Courtesy of HKS*
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