PRE- AND POST-OCCUPANCY EVALUATION:

An Underutilized Tool for Best-in-Class Healthcare Design

BSA

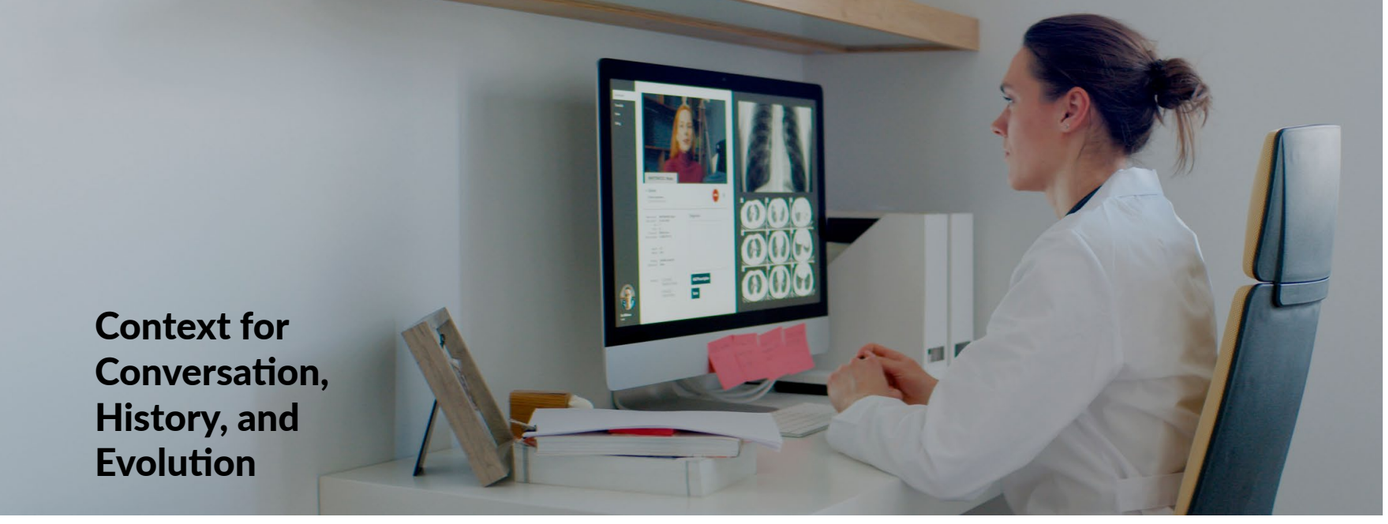
Introduction

In early 2020, a long-term fear of many healthcare officials became a reality as a novel coronavirus spread out of China quickly became a global pandemic. Over the next several weeks, entire healthcare systems were overrun with what became COVID-19 patients. As the virus made its way to and across the US, there was little time to ascertain the risk and make appropriate accommodations. To help ensure the proper steps were being taken, the pre- and post-occupancy evaluations (POEs) of alterations in healthcare environments began to take shape. This pandemic has forever affected how we think about disease transmission, safety, and knowledge from care providers about how to innovate in healthcare settings in less than 24 hours.

Occupancy evaluations in the lens of a pandemic have furthered the importance of pre- and post-occupancy tools and processes for the future of healthcare design.

In August 2020, it seemed the emergent reactive portion of the effort had possibly passed. It appeared there was an opportunity to document the steps taken by different teams – from a facilities' and operational perspective – within many healthcare environments. As we know, many surges have occurred since March 2020. Key ideas that are emerging from post-occupancy evaluations that are impacting healthcare design include flexibility of healthcare spaces, high acuity patients need a high acuity room, visualization to other care providers and patients is key, and staff respite and retention is now of utmost importance.

This paper includes a multidisciplinary perspective of why we believe the POE process and the use of developed processes/tools are critical in optimizing future healthcare environments.



Context for Conversation, History, and Evolution

During the covid pandemic, the relationship between airflow, isolation, and safety became a topic of all healthcare providers and institutions. Often the question was – can I make this room negative, or can we make this unit negative airflow? This will be a question added to our POE tools in the future.

Context and Need

The COVID-19 Pandemic has impacted the healthcare delivery process in many ways. One constructive outcome is that telehealth services are more readily available and even encouraged through CMS support. This provides an opportunity for healthcare organizations to reach a much broader patient population through multiple channels simultaneously. Another positive result is that it has ushered in a new appreciation for the future-ready design of facilities, as many hospitals had to undertake expensive renovations and MEP retrofits during the pandemic. Unfortunately, the pandemic significantly contributed to staff burnout and critical staff shortages.

The need to ensure that new projects are flexible and cost-effective, combined with the rising nurse and staff shortages, has resulted in healthcare organizations re-evaluating how new facilities should be designed. Cost considerations drive possible flexibility, putting greater scrutiny on which items should be fixed and which can be more flexible.

Pre- and post-occupancy evaluations (POEs) are excellent tools to help healthcare organizations obtain the best value for their design and construction dollars.

A **pre-occupancy evaluation** is conducted before the design process and documents the current state of how well a space supports the clinical staff and enhances the patient experience. The findings help inform the design process and decision-making by identifying workflow, spatial, and programmatic opportunities to improve with a new design.

A traditional **post-occupancy evaluation** is conducted six months to one year following building occupancy and assesses how well the design meets both functional and programmatic requirements. In addition to collecting information on user satisfaction and workflow efficiency, post-occupancy evaluations often measure ergonomics, walking distances, and how the seven Lean flows in healthcare are integrated into the design. There are also components that are engineering-related data regarding energy use and environmental conditions, including temperature, humidity, sound, and lighting levels that relate to well-being, comfort, and sustainability. Whether conducted before design has begun, following building occupancy, or as a continuous performance evaluation effort informed by metrics and analysis (supplemented with human interpretation), rather than driven by them, POEs can be a powerful tool to help healthcare leaders balance competing priorities when creating spaces that support the efficient delivery of care. The information creates an optimal environment for staff recruitment, satisfaction and engagement, continuous quality improvement, and revenue generation.

History and Evolution of POEs

The foundation of today's POEs began in the mid-1960s when social scientists, designers, and planners recognized a shared concern regarding how buildings were affecting the well-being of occupants. The emerging field of environmental behavior research identified the need for a tool that could offer insights and measurable data to help understand the built environment's impact on occupants and led to the development and evolution of today's pre- and post-occupancy evaluation tools.

While the earliest POE tools focused primarily on assessing intangible aspects of design that were difficult to measure accurately, such as aesthetics, user satisfaction, and comfort, POE tools have become increasingly sophisticated. Tools now use multidisciplinary research techniques to provide baseline and benchmark measures for building system technical performance, energy use, sustainability, and evidence-based design comparisons. Today, we have more sophisticated means of measuring how humans interact with space, unearthing the human adaptability hidden beneath the guise of user satisfaction. Data is organized and analyzed in multiple ways—from macro issues like volume, programmatic and flow analysis to micro issues like space configuration and ergonomics.

While POEs can inform the design process, historically, they have not been embraced within the industry. The time and cost associated with conducting POEs is a significant factor, as the service is not included in base architectural fees and few clients want to incur the additional cost. In addition, fear of liability issues stemming from the evaluation has caused many design firms to shy away from implementing them regularly. Add to that the lack of an approved process or metrics, and it is no surprise why POEs are not conducted more often. However, with consolidation in the industry focusing on efficiency through systemization, each project furthers the standardization of patient rooms, exam rooms, and nurse stations. These decisions have immense financial consequences that far outweigh the POE investment. Many see that short-term investment can mean long-term savings, which has increased acceptance and recognition of the benefits of integrating evidence-based design data into the healthcare design process, and POEs are becoming more mainstream.

Definition Types and Benefits

POE Definition

In their 1988 book, “Post Occupancy Evaluation,” which was re-published by Routledge in 2015, authors Wolfgang Preiser, Ph.D., Harvey Z. Rabinowitz, and Edward T. White defined the POE as “the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time.”

As the concept of pre- and post-occupancy evaluations is a relatively new application of a tried and true concept, the definition and implementation processes have varied considerably from their original form. At a minimum, a POE should:

Implement a methodology for qualitative and/or quantitative data collection

Identify a specific space/program area for study

Incorporate information on the user experience

Compare FTE efficiency benchmark data with actual FTE efficiency statistics

Compare building benchmark data with actual building performance

Document both successes and shortcomings of building design and operation

Types of POEs

Wolfgang Preiser identified three types of POEs in his 2001 book, Learning from Our Buildings: A State-of-the-Practice Summary of Post-Occupancy Evaluation. While each share components, each has a different purpose, depth of study, and time frame.

Rather than conducting individual POEs, some healthcare organizations that embrace continual improvement methodologies use continuous POEs, which track key performance metrics over time across multiple projects. This helps organizations understand the ROI of specific design and engineering solutions.

POE TYPE	DESCRIPTION
Indicative *1 to 3 Days*	Provides an indication of major strengths and weaknesses of a particular building’s performance. • Ideal for small projects. • Easiest, least formal system. • Includes review/analysis of building plans and specifications. • Informal interviews with user groups • Building walkthrough is made without testing or developing performance criteria. • PowerPoint presentation summarizing results.
Investigate *1 to 3 Months*	Provides more in-depth analysis and a thorough understanding of the causes and effects associated with building performance. • Best for mid-size or specialty program areas. • Requires a formal research strategy identifying types and extent of data that will be collected and studied. • Program-specific questionnaires. • Structured focus group interviews. • Data collection, review, and analysis. • Formal report summarizing results.

Diagnostic
Several Months to a Year
	Provides a correlation between physical, environmental, and behavioral measures with subjective occupant responses.
	• Appropriate for large-scale, costly, highly sensitive projects, such as an entire new building.
	• Most comprehensive of the three methods.
	• Involves multiple research tools:
	  • In-depth interviews
	  • Patient/staff questionnaires
	  • Patient/staff observation
	  • Technical data measurements
	• Structured focus group interviews
	• Data collection, review, and analysis.
	• Deliverables reflect an academic level of detail.

Benefits of Conducting a Pre- or Post-Occupancy Evaluation

No matter when or how frequently, conducting a POE offers benefits for both clients and design teams.

Enhances Clarity. From the client's perspective, it can clarify how the building supports clinical staff and identify critical issues that must be addressed to ensure staff retention and satisfaction. For example, a POE conducted at a hospital that had been designed with an emphasis on creating a best-in-class patient-centered environment revealed that while the patient rooms were generous in size and beautiful, the nurse stations were undersized and poorly laid out. Nurses require an efficient setting to provide the best care. Staff satisfaction is essential and impacts patient outcomes.

Connects Stakeholders through Conversation. The POE process can help diverse stakeholders understand issues impacting decision-making through a different lens, contributing to consensus building. In Stephen R. Covey's book, The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change, he explains, "Where we stand depends on where we sit" this way: *"Each of us tends to think we see things as they are, that we are objective. But this is not the case. We see the world, not as it is, but as we are—or, as we are conditioned to see it. When we open our mouths to describe what we see, we, in effect, describe ourselves, our perceptions, our paradigms. When other people disagree with us, we immediately think something is wrong with them."*

This is often the case when planning a new healthcare facility with five distinct stakeholder groups: Caregivers are primarily focused on patient care, C-Suite participants focus on financials, the patients/communities the facility serves are focused on outcomes, the architects and engineers place their emphasis on the design of the building, and the facilities management team is concerned with its long-term viability. To ensure a successful project, the stakeholders need to talk to one another in a way everyone understands and explains their perceptions to improve efficiency, outcomes, and cost. They need to embrace the Lean concept of Gemba and go to the places where the work is actually being performed to observe the opportunities for improvement. By participating in the POE process, each stakeholder group gains a better understanding of how other factors need to be addressed in the design of the building.

Provides Proof. People want proof (study findings) that a certain practice or design decision will result in positive outcomes. A well-structured POE provides data that becomes a resource with long-term application. The POE can inform overarching principles that allow for better decision-making, and healthcare leaders can refer to the POE to explain why one solution was selected over another.

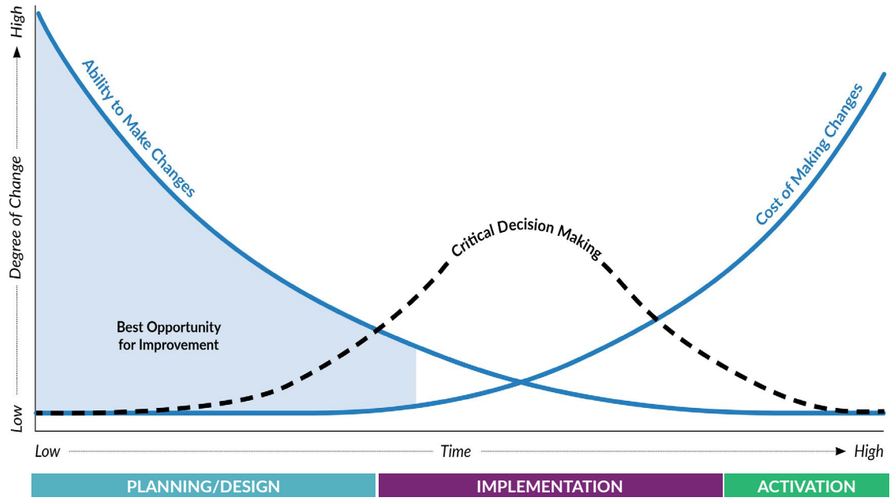
Enhances Clarity: in-class patient-centered environment

Connects Stakeholders through Conversation

Timing and Investment

When to Conduct a POE

Information gained from a properly conducted post-occupancy evaluation can be invaluable when applied to the next project for a hospital system or the next project of an architectural firm. However, post-occupancy evaluations are traditionally conducted six to nine months after the project is completed. Unfortunately, stakeholders have lost interest in potential findings by that time, so many clients do not want to fund the evaluation.



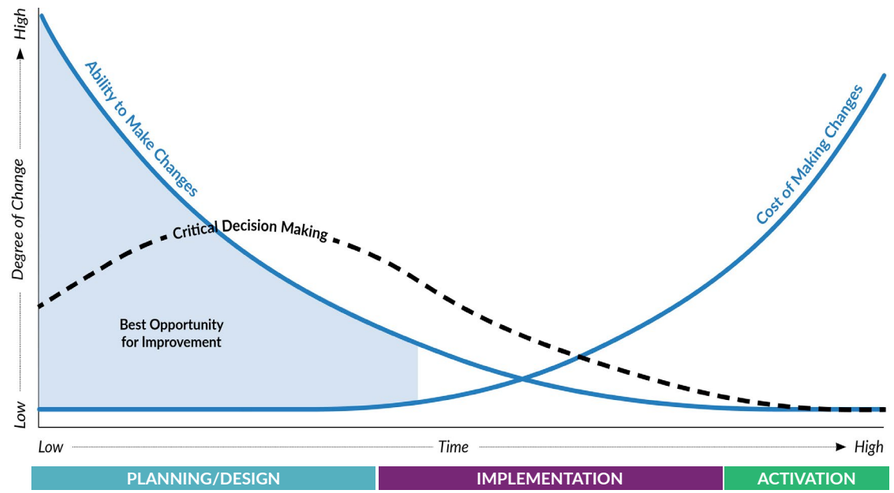


FIGURE 1A & 1B
The MacLeamy Curve

Recognizing that the best time to make critical design decisions with minimal impact to cost is at the beginning of a project, consider conducting a pre-occupancy evaluation. Figure 1A is the MacLeamy Curve, named after Patrick MacLeamy. He observed that critical decisions are often made at the pivotal stage in the project, where the ability to change things is diminishing while the cost of making changes is increasing. He posited that moving critical decisions forward could be more efficient and less costly for the project. Pre-occupancy evaluation is one of the best ways to move the decision-making curve to the left.

A pre-occupancy evaluation of existing spaces similar in function to the proposed new spaces helps identify issues within the existing space and the way it functions. Conducting this evaluation before the design process begins allows stakeholders to weigh their priorities and achieve consensus regarding potential solutions. For example, all stakeholders agree that patient safety is a priority in design, which is why a code requirement dictates that staff must be able to see into a patient room. Glass doors are more expensive than wood or composite doors. Often glass doors are value-engineered out of the project due to cost because stakeholders who view projects primarily through a cost lens do not connect the decision as a safety issue tied to an outcome. A pre-occupancy evaluation that correlates design decisions to patient safety outcomes could identify this.

Cost of POE vs. Cost of Not doing a POE

In healthcare design and construction, the cost of construction materials – the "sticks and bricks" – is often the major factor in decision-making. The focus on upfront capital construction costs de-emphasizes ongoing operational costs like staffing and retention, maintenance and retrofitting, and lost revenue due to low HCAHPS scores. These long-term performance metrics have a much more significant impact on the project's lifespan. POEs can help healthcare leaders understand why including the impact of "staffing softs" and other long-term performance measurements are important. The 2022 NSI National Health Care Retention & RN Staffing Report found that staff burnout due to COVID-19 increased the turnover rate for staff RNs by 8.4% in 2022 to 27.1%. The cost of turnover can have a profound impact on diminishing hospital margins. According to the survey, the average cost of turnover for a bedside RN is $46,100 resulting in the average hospital losing between $5.2M and $9M each year. Each percent change in RN turnover will cost/save the average hospital an additional $262,300/year. If nurse station design is deprioritized below patient room design as in the example POE mentioned earlier, and a recently hired and trained nurse leaves in six months, the hospital bottom line takes a $262,300 hit. A POE that measures staff satisfaction with their work environment could help identify potential design interventions to reduce staff turnover.

Practices, Tools, and Processes

POE Best-in-Class Implementation Practices

Regardless of the type of POE selected, best practice implementation strategies help ensure a robust report with actionable findings. These include:

Determining the purpose and objective of POE. The initial assessment of the project and existing conditions guides the goals of the POE efforts. This information may be achieved from a preliminary meeting with the owner, an introductory site visit, or an informal interview with on-site personnel. Defining the objective of a POE guides the evaluation scope, data collection methodology, schedule, or suggested measurement tools.

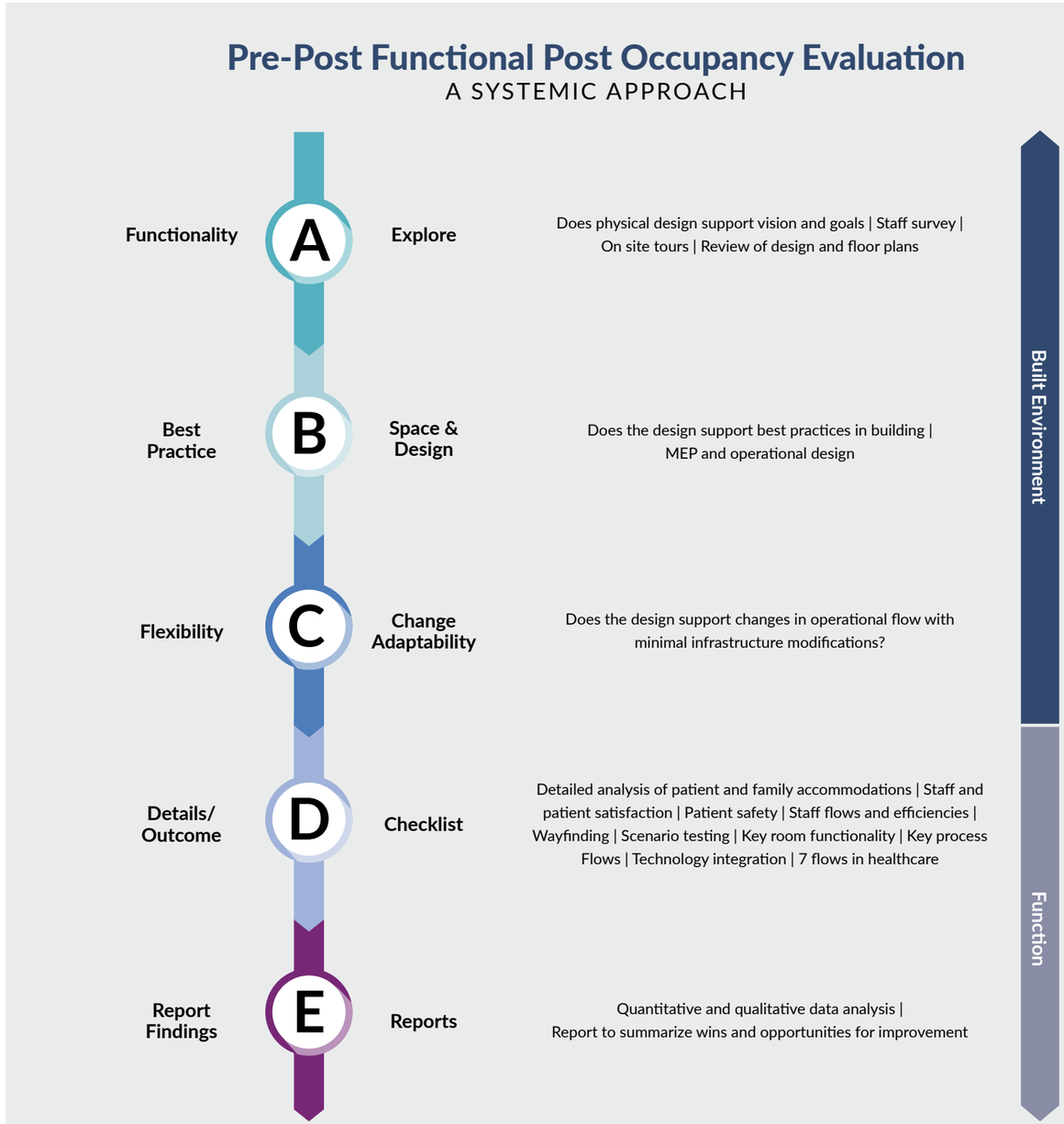
Create multidisciplinary teams. When developing POE teams, invite members from various disciplines. Multidisciplinary teams allow for different perspectives, and their interaction leads to insights greater than the sum of their contributions. This can help architects better understand the healthcare workflow process, and clinicians understand the design constraints. For example, a nurse may ask that location of patient rooms be based solely on operational workflow and not understand why all rooms cannot be arranged along a single corridor. The architect will explain that the room layout needs to also take the structural column grid and vertical transportation constraints into account.

Develop a communication map. The very purpose of a multidisciplinary team is to bring different perspectives to the table. However, each member speaks a different language. At the beginning of the POE process, ask each member to share their expertise and how they like to review data. Use this information to develop a communication map, so the team understands how best to incorporate all perspectives. To promote effective communication, clearly identify the type of information being requested, explain why you need the information, and instill the importance of each person, ensuring the information is conveyed clearly and accurately.

Processes

Structure is essential in a POE, and tools specifically designed for a POE provide this framework. While the efficacy of these tools is somewhat inherent, much depends on their application.

The first step to successful implementation is introducing the tools to leadership and stakeholders, so they know what is being evaluated and confirm the tools align with their goals. This involves consulting leaders and clinicians on what they like about the tools and what challenges might result from them.



The Tools

POE Checklist Tool. The Center for Health Design has developed a POE Checklist tool – frequently used and well-documented with resources – that has helped develop POEs. BSA LifeStructures has used this as a base of our process.

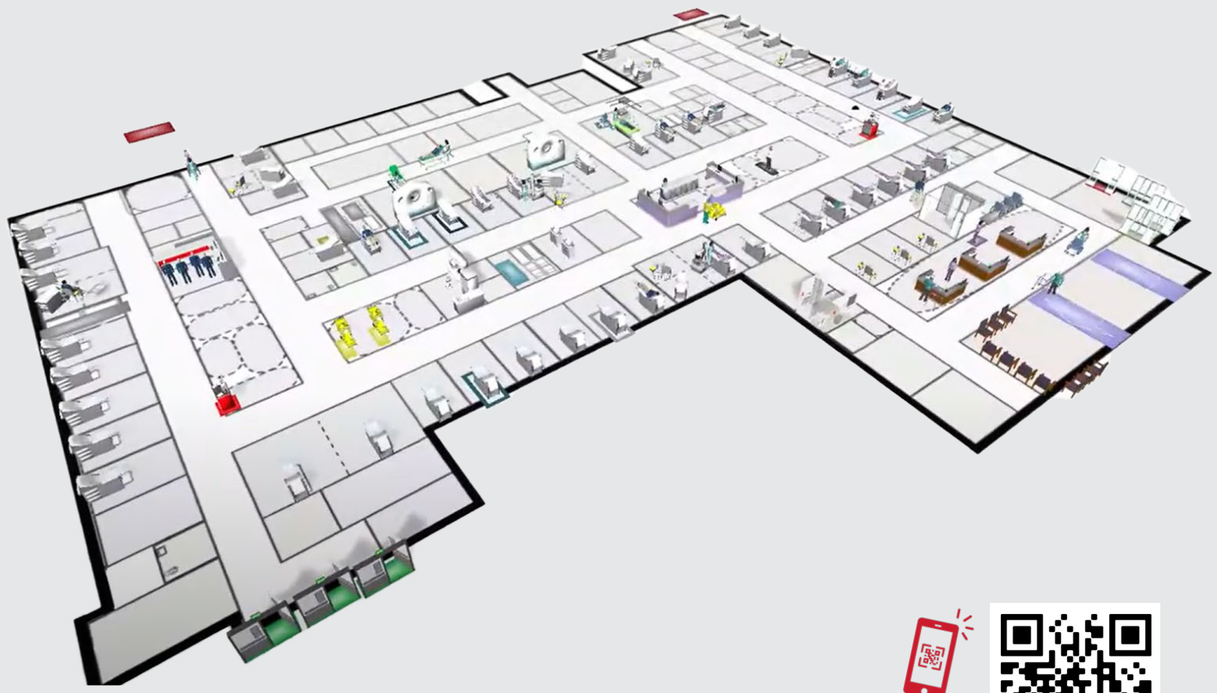
Center for Health Design Medical Surgical Patient Room POE Tool. This tool evaluates how a patient room performs against evidence-based goals for healthcare. The data is based on metrics in several key areas of safety (both patient and clinician), quality of care, patient experience, and organizational performance. Scored on a scale of 1-5, anything over 4.5 is a strength, and anything scoring below 3.5 is an opportunity for improvement. The scoring mechanism gives the leadership and stakeholders a starting point for project direction.

Center for Health Design ED Tool Kit. This tool assists in planning and design efforts around throughput strategies in emergency department (ED) environments. The tool tracks three time intervals that make up a typical ED visit: 1) arrival to provider, 2) provider deciding to admit, and 3) decision to hospital inpatient admission. For each of these three intervals, the tool evaluates strategy, operations, and process, as well as the built environment, and rates their effectiveness. The tool's metrics and evaluation criteria are tied to research and data.

BSA POE Tool. This tool Incorporates the seven Lean flows in healthcare. It utilizes a matrix scale for evaluators to rate each department. On a 1-5 scale, any item 4.5 or above is addressed as a strength. Any item scoring less than 3.5 is addressed as an opportunity for improvement. Standard questions allow for a uniform data collection process and easy comparison/graphing, while opportunities for comments from assessors and participants optimize the depth of feedback.

Simulation Modeling, Figure 1. This tool allows the leaders and clinicians to view throughput or unit activity in real time, including peak activity times and their impact on the unit. This facilitates understanding spatial and building relationships for the seven flows in healthcare.

Space Syntax, Figure 2 (pg. 16). This tool provides a glimpse into the day-to-day operations of the unit, far beyond recorded outcomes. The tool visually represents the lines of sight and walking distances for staff. The lines of sight impact patient and staff safety within each unit, and walking distances to key rooms affect emergency response to critical situations. Unnecessarily long walking distances contribute to staff frustration and burnout.



Scan here to see simulation model in action

FIGURE 1
Simulation Modeling

Additional items BSA LifeStructures leverages to optimize POEs include:

- **Questionnaire Evaluation.** A questionnaire or research survey is a quick, powerful, and relatively inexpensive research method tool to obtain information from a group of respondents. During POE evaluations, questions can be targeted to gather important information about the existing design conditions and current bottlenecks from a more significant number of stakeholders. Targeted survey questions contribute to developing future design goals and communicating priorities from a stakeholder's perspective to project decision-makers

- **Behavior Mapping.** Behavior mapping is a systematic and objective methodology for recording user behaviors, postures, or location utilization in the physical environment. The outcome displays the patterns of behaviors associated with location attributes. Pilot data collection and practicing observation on site before the formal behavior mapping data collection are recommended for refining the codes and shortcomings.

- **Shadowing, Figure 3 (pg. 16).** In this approach, the observer "shadows" a targeted user in everyday activity to understand flows, inefficiencies, and processing outcomes. This tool provides qualitative and quantitative information about the context. Objectivity is achieved through pre-defined behavioral codes with recorded time durations and frequencies. The qualitative context is attributed to documenting the observer's interpretation of activities and experiences in the context.

FIGURE 2
Space Syntax

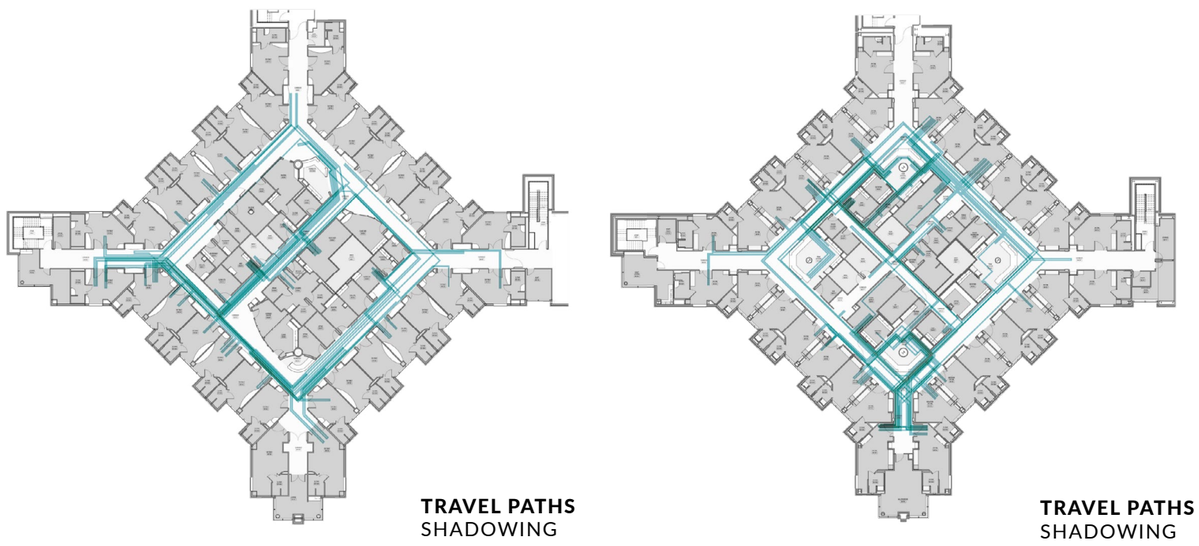


FIGURE 3
Shadowing

Benefits

AWARENESS TO DISCOVER NEW SOLUTIONS.

First, awareness of how a patient moves through the facility—a scenario test —is critical to understanding how the tools can be leveraged. This provides a clear picture of how the staff provides patient care each day and why seemingly insignificant issues are important from the staff's perspective. Only after ideas/scenarios are reality-tested in the setting does a team discover new aspects no one may have considered before.

ALIGNMENT TO OPTIMIZE SUPPORT AND ADVOCATE FOR RESOURCES.

A key benefit is uniting leadership and clinical staff to align with what is happening at the bedside daily. Bringing people together and having these discussions helps leadership understand their clinical staff's perspective, better support them, improve staffing patterns and models, and advocate for needed resources.

EFFECTIVE MEANS TO DRIVE CHANGE THROUGH CLINICAL STAFF PARTICIPATION AND BUY-IN.

The more transparent and inclusive leadership can be of the clinical staff, the more accepting the staff will be of the result. Clinicians need to feel that they have been part of the process. One highly effective way to achieve this is by engaging them with the tools from the beginning. If staff are involved in the analysis and walkthrough steps and can voice their view, they will be more invested and excited about the coming change.

PROVIDE A LENS TO SEE HOW THE ENVIRONMENT IS REALLY UTILIZED.

It is also essential to see the environment as it is being used. A crisis like Covid tests the environment and determines real-world resiliency. Is it flexible/adaptable enough? If not, what areas need improvement, and how will those improvements be manifested?

UNDERSTANDING "WHY" LEADS TO BETTER BUDGETING AND MORE DECISIVE VALUE ENGINEERING.

Understanding the built environment and the "why" through a POE or pre-POE process helps with budgeting and value engineering because stakeholders understand costs upfront and the negative implications of removing elements later in the project cycle.

LEADS PARTICIPANTS TO SEE THE VALUE OF EVIDENCE-BASED DESIGN.

The POE process leads participants to understand how evidence-based design assists with patient healing and outcomes. This means 1) how these elements are linked to the built environment, and 2) which, in turn, affects the understanding of workflow, the HCAHPS scores, and patient outcomes that must be reported to CMS and affects the amount of funds awarded.

PERSPECTIVE FROM A MULTIDISCIPLINARY TEAM.

Another opportunity the POE process presents is the perspective that comes from collaboration with a multidisciplinary team consisting of a designer, architect, engineer, nurse, and sometimes a physician. Change management is a challenging healthcare area that focuses on moving from one environment to another more effectively. Nurses, clinical staff, and CEOs don't often have to interact, so it's important to intentionally bring the administration and clinicians together to communicate and collaborate.

Decisions and Outcomes

Small Decisions, Significant Implications

Small decisions can have significant implications in new construction and renovation projects. Examples from three healthcare projects demonstrate this power through the tools and processes discussed.

UNC Hospitals Hillsborough Campus Bed Tower Addition – Center for Health Design Tools and Space Syntax at Work

A new bed tower was added to the five-year-old UNC Health Care campus. At the time, the campus had been opened approximately five years prior. For the new project, UNC requested that the design team walk through the tower they currently occupy to see the unit's layout and the existing state of operations.

The COO was a former ER nurse, and the new project focused on improving nurse workstation placement and design. There were certain factors regarding the existing unit they wanted the design team to see to ensure they were not replicated in the new tower. The unit under scrutiny was the medical-surgical unit.

The design team leaders decided from the outsell to use the Center For Health Design tools to provide data collection, analysis, and decision-making framework. It was also a tool referenced with research and a scoring system, making it appropriate for the COO and the UNC Hospital clinicians familiar with the Likert Scale. The idea was that the medical-surgical tool scoring system would be comfortable for them to easily understand the first part of the project process.

An additional part of the project scope involved relocating the UNC Acute Rehabilitation Unit from the UNC main campus to the new tower. As the project team toured the unit, the team used the same tool and scored it. After, they developed the new tower design based on those results. The design featured the rehab unit on the third and fourth floors, with the medical-surgical unit on the second floor.

The tool and the process unfolded to meet the unique objectives at UNC. The design leaders ensured all questions were answered in each facility area, and all stakeholders placed their scores on the tool. The process is also qualitative, based on thoughts, ideas, and conversations in their area of expertise. With a scale of 1-5, the design team and the stakeholders scored each item based on their area of expertise during the walking tour of the unit. The tool calculates scoring and – using embedded prioritization – identifies the top 10 design priorities. Low-scoring items indicate a red flag that the team would need to address later.

The tool also offers a feature referencing best practices and expert opinions, which helps prove and validate design choices. For example, the rehab team was considering ceiling lifts for moving patients, with a premium price in the $5,000 to $10,000 range. The discussion went back and forth from the safety and best practice perspective. The tool proved invaluable, with research showing the lifts as the standard when moving patients with decreased mobility. The decision for the lifts was based on the discussion and key proofs regarding safety and best practices.

Another prime example is the placement of the nursing station for visibility and walking distances. Space syntax tools were used to show the heat map visibility of the larger unit. The research allows the team to make an improved 20-bed unit with the care team stations more central to decrease walking distances and increase visibility, which both aid emergency response and reduce caregiver burnout.

As demonstrated, this process is an exercise between leaders, care providers, and design team members. Perspective develops. Questions – among all participants – are asked and answered, which advances understanding, informs viewpoints, and optimizes results.

WakeMed Health and Hospitals Wendell Falls Stand-Alone Emergency Department – Simulation Modeling Resolves Challenges

In a second example, WakeMed Health and Hospitals system included multiple stand-alone emergency departments. The model was a 15-bed stand-alone ED with outpatient lab and outpatient radiology area. In some cases, a clinic was attached and shared diagnostic services with the ED.

WakeMed had built two free-standing EDs in a 10-year period. Before designing a new prototype, the project design team was charged with reviewing the site plan and conducting a walkthrough of existing facilities with the healthcare stakeholders to discuss with caregivers areas to celebrate and address. Interestingly, this project came in the middle of the pandemic, which gave a unique perspective in adapting to the COVID environment and again demonstrated the power of small changes to achieve significant increases in efficiency.

The design team utilized the Center for Health Design's Emergency Department Toolkit, knowing the project needed a synergistic collaboration analyzing throughput and patient care as the overarching goal was to move patients through the system efficiently. WakeMed wanted to keep every room the same size and all rooms configured around their core of care.

At the same time, the healthcare stakeholders wanted to address one key area: their care model. The existing prototype had a registration person in the front with three triage rooms. As volume increased (particularly during the pandemic), their model of care changed to "provider first." The space had to be flexible based on the total number of providers and patients in the emergency room at any given time.

Following the pre-POE, tool scoring demonstrated WakeMed was a high-performing ED, effectively performing all the functions required except for flexibility. To optimize flexibility in the prototype design, simulation modeling identified peak times to ensure the design achieved the right balance: design enough space to accommodate peak hours without overbuilding. The simulation also allowed the team to reality test the data to right-size the waiting room workspace.

Simulation modeling is extremely helpful when analyzing space with fluctuating volumes throughout the day. It becomes crucial to have a plan to deal with peak times while not overbuilding, thereby creating underutilized/empty space. Such modeling also helps plan for effective throughput while making healthcare stakeholders and clinicians feel more comfortable with the decisions and the final design.
In the WakeMed project, the most significant benefit of simulation modeling was convincing healthcare stakeholders the proposed redesign could accommodate their needs. Even with the design team's diagrams and workflow analysis, stakeholder questions continued. Simulation modeling helped them see what peak times would look like from a patient perspective and a physician and staffing perspective.

With simulation modeling, they could see scenario-based data, confirm the plan was financially viable, and verify the proposed changes would create a multi-functional space, optimizing their effectiveness.

Academic/Safety Net Hospital –
Forward Thinking Solutions

Although a project was completed in 2013, this example demonstrates small changes' power. While working through the design for the large academic/safety net hospital, the chief nursing officer (CNO) advocated for universal rooms based on the Joint Commission's latest preparedness models. The CNO felt the hospital needed the most flexible environment possible, including appropriate airflow for the ability to surge.

What is the outcome? The building utilizes 100% outside air. This means the HVAC system recirculates air that has been treated and filtered before it is used and exits the building. In addition, all the rooms are universal and can be flexed to critical care as needed. This provides continuity throughout the inpatient area, so staff does not have to orient to a new environment when changing floors or areas, focusing on patient care.

The final plan includes spaces built in pods of 12. The inpatient floor consists of 48 beds—four pods of 12—and each pod has its own airflow, so a pod can be made negative or the whole pod isolated if needed. Each pod has its own self-contained med room with its own supplies.

The project underwent a post-occupancy evaluation in 2021 to examine the pandemic response. The fresh air and the flexibility built into the pods worked precisely as planned during the pandemic. The vestibules, which had been an area of concern, were also developed for safety, allowing space for screening areas and the ability to lock down the hospital as needed. These spaces were successfully used during the pandemic as drive-up COVID testing centers. The unique forethought of the CNO in 2013 was put to the test through COVID and proved very effective.

Teri Joy,
RN, BSN, CEN, TCRN, EDAC, LSSYB
Director of Planning, BSA LifeStructures
tjoy@bsalifestructures.com

Melanie Harris,
AIA, LSSYB
Healing Practice Director, BSA LifeStructures
mharris@bsalifestructures.com

A special thanks to the following contributors:
Tim Spence, AIA, FACHA, LSSYB, President, BSA LifeStructures; Zahra Zamani, Ph.D., EDAC, LSSYB, Senior Design Researcher, BSA LifeStructures; Gary Schindele, FHFI, President, Paladin Healthcare LLC; Kate Newcomb-DeSanto, MSN, RN, MSW, EDAC, President, Connected Healthcare Resource Advisors

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