

# The Project Afterwards:

## Using Post-Occupancy Evaluations to Improve Healthcare Environments

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Michael Forth is a Project Executive at Suffolk Construction. Michael has a distinguished background across all construction-related disciplines, including project management, owner's representation, and engineering. His construction expertise spans 23 years in the industry and includes multiple hospital facilities, high-tech research facilities, academic campuses, and large-scale athletic arenas. Since joining Suffolk, Michael has worked on the master plan for Baystate Medical Center as well as a high-tech fit-out for Quest Diagnostics in Marlborough, Massachusetts, and a medical office building delivered under integrated project delivery methods for Lawrence and Memorial Hospital in Connecticut.

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## **Abstract**

In recent decades, Post-Occupancy Evaluations (POEs) have been embraced by the design industry, but they are far from widespread or standardized today. These systematic tools allow administrators and architects to assess whether a project's performance meets its objectives by examining how occupants and users experience a space once it is operable on a daily basis.

While most projects could benefit from a POE, they have not become ubiquitous due to the expense and resources necessary. In this paper, we offer a case study that demonstrates how POEs can be utilized not only in retrospect but also to inform a project's entire lifespan.

We discuss an investigative POE conducted on a unique multi-phase project at Baystate Medical Center in Springfield, Massachusetts. Survey questionnaires and focus group evaluations were conducted on Phase 1 of a completed hospital wing in order to inform the planning, design, and execution of a second wing that was originally intended to replicate the first. We reflect on key design principles that were challenged and then revised as a result of these POE findings.

This case study demonstrates the importance of POE studies on healthcare projects, where the culture of an organization's day-to-day workflow patterns cannot always be predicted until a space has been occupied for some time. With the objectives of a POE in mind, we were also able to create a culture of constant improvement throughout the entire lifespan of the project, using target-value design strategies guided by an Integrated Project Delivery (IPD) method. As a result of this collaborative team effort, we completed the project three months under schedule and \$1 million under budget.

## **Keywords:**

Post-Occupancy Evaluation  
Target-Value Design  
Integrated Project Delivery  
Patient Satisfaction  
Staff Questionnaires

## **Category:**

Environment

## Introduction

Post-Occupancy Evaluations (POEs) examine how occupants experience a space when occupied, helping architects and administrators assess whether a project's performance meets its objectives (Preiser, 1995).

Originally introduced in the UK in the early 1960s, POEs have been increasingly embraced by the design industry worldwide, though they are far from widespread or standardized today (Cooper, 2001).

Unlike quantitative measurements, POEs evaluate "softer" features such as "psychological needs, attitudes, organizational goals and changes, and human perceptions" (Preiser, 2002), providing "valuable two-way communication" between an organization and the people who occupy their facility (Steinke, 2010). POEs document successes and failures so they can be passed from one project to the next, from one professional to another, and—as in the case of this study—from one phase to the next (Preiser, 1995).

The following case study demonstrates how POEs can be used over the course of a project's lifespan, not just in retrospect. On a multi-phase hospital project, POE results from one phase were applied to the planning and design of another, which had originally been intended to replicate the first. Motivated by this POE, we were able to develop a project culture aimed at continual improvement, using the POE to guide an Integrated Project Delivery (IPD) method and target-value design (TVD) strategies. This collaborative TVD process put designers in "conversation concurrently with those people who will procure services and execute the design" (Macomber, 2007).

## Objectives

The investigative POE <sup>1</sup> was conducted at Baystate Medical Center, a non-profit academic tertiary / quaternary medical campus in central-western Massachusetts. Baystate's 15-year master plan features the Hospital of the Future (HOF), a 641,000 square-foot, three-wing campus expansion project.

HOF was executed in multiple phases to accommodate operational and budgetary constraints. The West Wing involved three phases: (Phase 1) construction of shell and core, plus 300,000 square feet of interior fit-out: Heart and Vascular Center, six hybrid operating suites, 96 medical/surgical inpatient beds, and 30 intensive care beds; (Phase 2) lobby renovations and café; and (Phase 3) replacement of existing ED with a 94-bed Emergency and Level-1 Trauma Center. These phases were completed in January 2012; planning for Phase 4 (South Wing) began in June 2012; and Phase 1 POE was conducted in September 2012. The South Wing's 76 medical/surgical inpatient and 20 intermediate-care beds opened on June 5, 2016.

Since Baystate was transitioning from a double-occupancy model to single-occupancy inpatient rooms in the HOF, the team wanted to evaluate the effects of this conversion on patients, families, and staff as well as changes like decentralized nursing stations and off-stage work areas. Only after the new space was occupied could we determine how staffing models and care delivery would be transformed. We aimed to use West Wing Phase 1 POE results to shape design of the South Wing.

1. (Preiser, 1995) defines an investigative POE as an in-depth study that uses interviews and survey questionnaires in addition to photographic/video recordings and physical measurements. They typically involve a number of buildings of the same type. According to Preiser, two other kinds of POE include indicative (quick walk-through evaluations) and diagnostic (long-term longitudinal studies).

## Methods

After Phase 1 was operational for six months, an online survey questionnaire was sent to doctors, nurses, and support staff, and follow-up meetings with a survey questionnaire were conducted with patient/family groups.

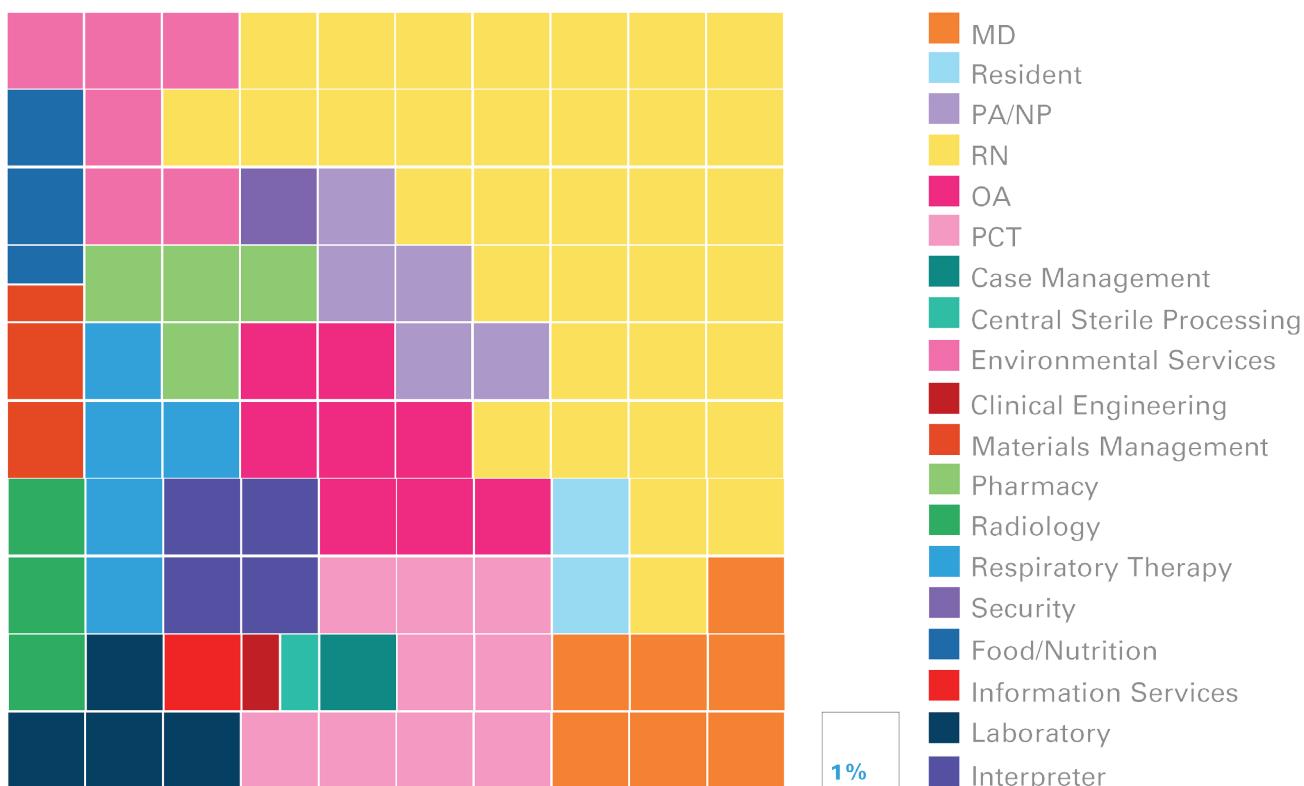
Developed collaboratively by designers and Baystate's clinical leadership, administration, research specialists, and facilities departments, the online survey solicited feedback from a range of workers, including clinical, nursing, mid-level, and ancillary staff (environmental services, pharmacy, laboratory). The questionnaire was completed by 310 employees, 34% of whom were nursing staff (See Figure 1).

Survey questions addressed the project's original Guiding Principles, which were aligned with the Institute of Medicine's six aims: safety, effectiveness, responsiveness to patients, timeliness, efficiency, and equity. Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores and comments informed the survey, and managers from each of Baystate's units were involved in developing specific questions in five categories:

- Safety and security
- Access and wayfinding
- Patient room and bathroom design
- Off-stage and on-stage work and support areas
- Design of clinical suites

## Employee Post Occupancy Evaluation

Percentages of Employees to Complete the POE,  
September 2012



Modeled on a Likert scale, the survey asked respondents "to specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements", which is designed to measure their intensity of feeling (McLeod, 2008). Fifteen principal questions each contained between two and ten sub-features. For example, respondents were asked to "Rate the following design elements of the Patient Bathroom," with a sub-list of features such as "access to bathroom," "bathroom size," etc. Respondents selected one of five bubble scores ranging from "very good" to "very poor" (or "not applicable"). They were also prompted to provide written comments.

Data was compiled by research specialists from Baystate's Division of Healthcare. Tables displayed percentages of responses for each element (See Figure 2). Using these statistical rankings, the project team evaluated relative success of each element. Successful features ranked above 75-80% with combined "very good" and "good" scores. Those requiring attention received lower than 75%. Follow-up discussions with security staff and nurses helped us address concerns related to low-scoring areas.

Focus groups were also held with Baystate's Patient and Family Advisory Council. An objective facilitator from Baystate conducted three sessions with 10-12 participants each. In 40-minute meetings, patients discussed their stay in the unit and reviewed room designs, ranking priorities for 26 room features such as ability to control lighting elements and room temperature, access to personal and medical technology, staff visibility, and visitor accommodations (See Figure 3).

# Patient – Family Advisory

## Scoring Elements

Importance of a large window/natural light to your mood and healing

Ability to have a family member stay in the room overnight

Importance of understanding the plan for emergency evacuation

Importance of a large window/natural light to your mood and healing

Ability to use your cell phone in the room

Ability to control different levels of light in the room (including reading light)

Minimize lighting required by caregiver at night for check-in with patient

Ability to select mealtime menus from a television interface from bed

Ability to see the names of hospital personnel who enter the patient room on a television screen

Importance of seeing and hearing the person behind the video camera

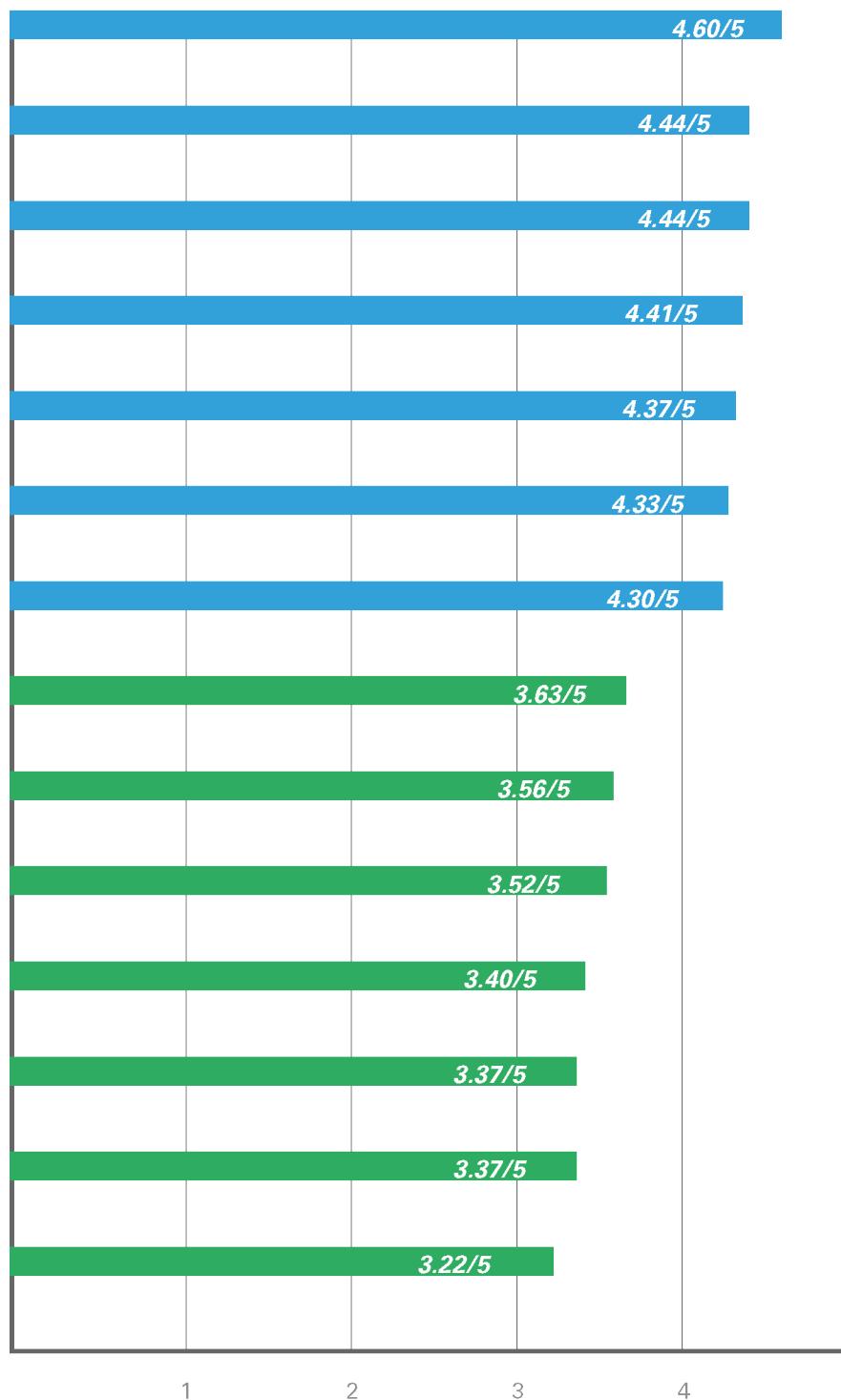
Importance of a large window/natural light to your mood and healing

Ability to see flowers, cards, etc.

Ability to have notes left for you by family members on a white board

Access to the interpreter via webcam on the television

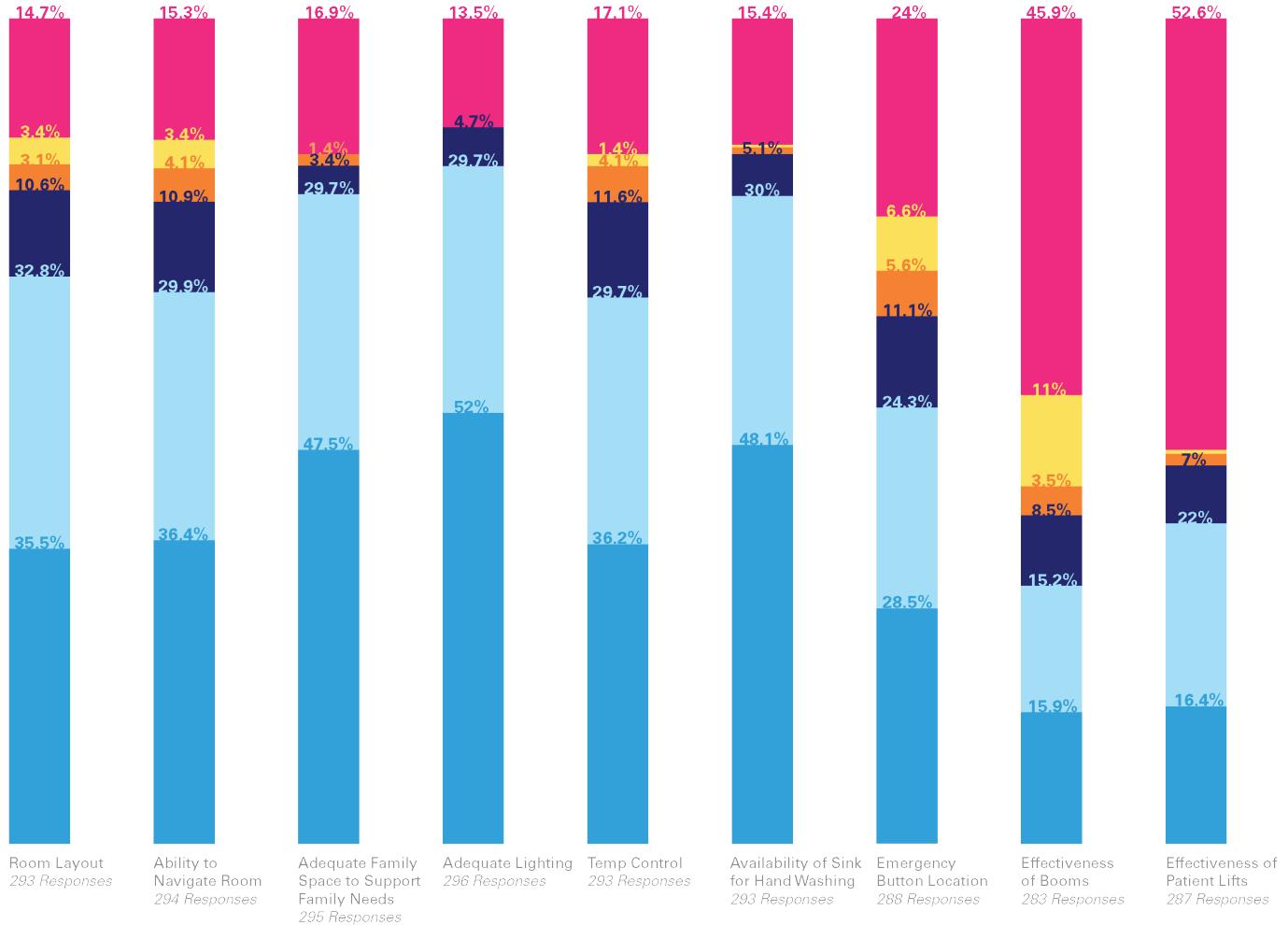
## Scores on a Scale of 1 to 5



**Figure 2**

## Sample Question

*Please Rate the Following Design Components of the Patient Room*



**Figure 3**

## Ratings



## POE Findings & Implementation

For each category, Phase 1 POE results informed Phase 4 target-value design by guiding whether we kept, removed, or enhanced individual design elements based on feedback. Target-value design involves design and budgeting based on informed collective decisions, where team members "work together to define the issues and produce decisions, then design to those decisions" (*Macomber and Barberio, 2007*). Particular successes carried over from Phase 1 to Phase 4 were on-stage/off-stage organizational layouts, acoustic levels from reduced traffic, and patient room décor and space. Specific results and implementation included:

### **Safety, Security & Wayfinding**

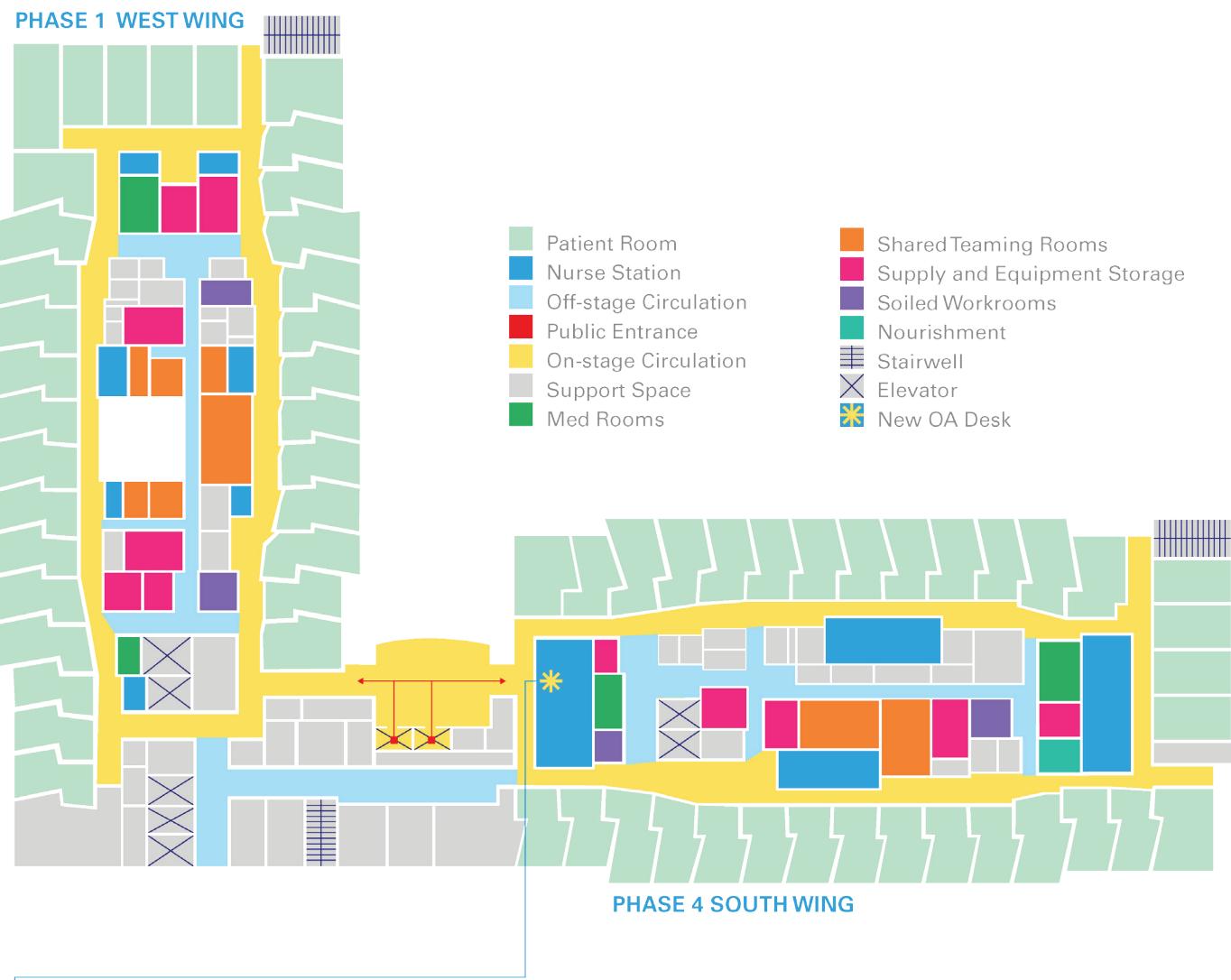
Seventy-six percent of survey respondents rated the building as "very safe" or "safe," with significant factors being adequate lighting (80%) and badge access (75%). Building access was rated as "very good" or "good" by approximately 75% of respondents, but signage ranked lower. Wayfinding categories rated low, receiving 45-55%. Staff expressed concerns about functionality and location of panic buttons.

The most significant finding was that staff felt isolated. A key design element involved multiple decentralized nurse stations to avoid typical overcrowding at central stations. Due to the large floor plate, however, staff noted in written feedback that other employees and security felt distant.

In Phase 4, we remedied these issues by locating panic buttons at all nurse stations and educating staff on their location and use. The number, size, and placement of nurse stations were studied rigorously to minimize feelings of isolation and enhance connectivity. We worked with staffing models to ensure at least two staff would be on-stage at each desk per shift. In order to increase staff presence, the front OA station maintains visible access to the unit entryway, family waiting area, elevator lobby, and off-stage entryway (See Figure 4).

# Baystate Medical Center

## Hospital of the Future



New OA Desk



Figure 4

## Patient Rooms

Layout and navigation rated mid-60% for combined “very good/good” scores. Features such as lighting, hand-washing, bathroom size, and access were well received, ranking in the 70-80% range. Several functionality issues were revealed, however, involving location and access to nurse call buttons, staff emergency buttons, and clocks.

To address these concerns, Phase 4 relocated nurse call button and staff assist buttons to more easily accessible areas. Clocks were removed from room entryways and placed above patient wardrobes for increased visibility.

Survey feedback led to meetings with Baystate’s Patient Family Advocacy Group. Representatives offered insights into the features that impacted the feel and functionality of patient rooms. Families appreciated the three separate room zones for nursing, patients, and family space, and loved the warm wood tones of the décor. The natural wood headwall reinforced the hospitality-style impression, making patients and visitors feel more comfortable. Lighting fixtures for reading were key. Less important, however, was tiling and sconce along the footwall, which patients had neither noticed nor used. Millwork platforms and shelving were eliminated because patients and physicians were not putting them to use (See Figure 5).

## Off-stage/On-Stage Work Areas

This section of the survey confirmed problematic distances between nurse stations. Line-of-sight was limited; since staff assignments were spread out, nurses could not see all patient rooms from a single workstation. Off-stage areas were highly successful, reducing noise of cart traffic in corridors and adding teaming spaces to engage clinical team collaborations.

Since Phase 1 work areas lacked direct access to main corridors, Phase 4 added a door and windows for more direct connections between work areas, corridors, and nurse stations. Phase 1’s decentralized stations were consolidated into larger stations, with corner nurse stations connected by open work areas, which enable staff to see one another between stations. Direct links were built between off-stage team areas and nurse stations.

## Integrated Project Delivery (IPD) and Target-Value Design (TVD)

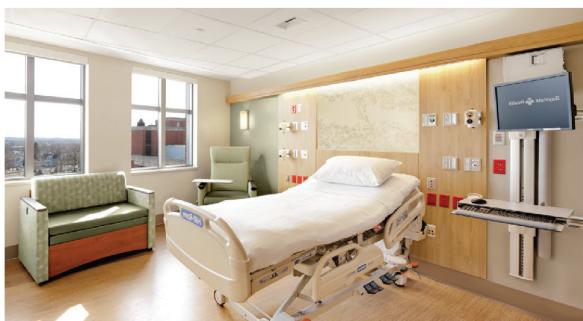
Phase 4 was planned as a holistic IPD venture, using “lean construction principles in a process-centered approach” that “requires all participants to focus on the flow of work on the entire project and not just for activity optimization within their own contractual silos” ([Bayer, 2012](#)).

Adopting this collaborative, collective teaming approach, we implemented POE findings through target-value design, evaluating furnishing and layout options against budgetary and aesthetic priorities set by POE results. In value-management sessions, design decisions were driven explicitly by feedback from patients, staff, and families.

Both POE and IPD emphasize making informed decisions with trust and collaboration between all team members. We were able to maintain schedules and budgets as well as design and construction quality by forming partnerships early on. The combined strategies of POE, IPD, and TVD contributed to our completing Phase 4 three months ahead of schedule and \$1 million under budget.

# POE Informed Changes

## Patient Room Headwall



### Phase 1



### Phase 4 Changes

Custom light soffit was removed and replaced with light fixture maintaining varying light levels

Removed sconce that was not used by patients

Maintained nursing zone with separate lighting

Kept warm tone wood to keep hospitality aesthetic

## Patient Room Footwall



### Phase 1



### Phase 4 Changes

Removed light soffit

Relocated clock for better visibility

Removed wall tile on non-wet surface

Maintained family zone and seat which converts to family sleeping

Figure 5

## CONCLUSIONS

As this case study demonstrates, POEs can impact projects from start to finish. Phase 1's HCAHPS scores suggested that patients enjoyed greater satisfaction with the HOF in comparison to older units on Baystate's campus: 90% felt patient rooms were quiet at night (compared to 75% before); 95% felt rooms and bathrooms were clean (compared to 89% before); and 95% felt lighting and temperature controls created a comfortable environment. The Phase 1 POE study allowed us to determine which particular features contributed to these overall successes and which ones may have been limiting.

In 2017, we will conduct another POE on the South Wing, after it has been opened for one year and the West Wing after it has been operational for five years. We believe one additional element will be useful to expand the precision of POE feedback. If possible, we will add a shadowing procedure, having objective evaluators witness operations of the unit during different days and times to corroborate survey responses with visual observations of how people use the space. In addition, we will ask surveyed staff to indicate how long they have been with Baystate, allowing us to correlate feedback as general observations or as comparisons with previous campus units.

While most healthcare projects can benefit from a POE, this tool has not yet become ubiquitous for a number of reasons. POEs require time, expense, and resources that clients and designers may be resistant to expend due to the risk of sharing responsibility for possible negative outcomes. Moreover, staff are not trained to conduct substantive studies, and outside help may be required. Shortly after the Royal Institute of British Architects introduced POE studies, they nearly evaporated in the UK, and have since only resurfaced as primarily an academic inquiry ([Hadrji, 2004; Cooper, 2001](#)). Misconceptions tend to exist, since clients believe POEs only provide retrospective feedback, that they do not benefit stakeholders, and that they cannot influence the lifecycle of a project ([Hadrji, 2004; Mohammad, 2014](#)). Our objective in this study has been to suggest the benefits of POEs can outweigh such potential objections.

Research studies continue to confirm that "factors such as noise, light, and room layouts" influence "positive or negative clinical, developmental, psychosocial, and safety outcomes among patients, families, and staff" ([Kotzer, 2011](#)). Without POE studies, designers "do not engage closely with the performance of the buildings they have created," missing "low-level, chronic problems" or failing to understand a project's "true successes" ([Bordass and Leaman, 2005](#)). As more healthcare organizations are becoming educated in these endeavors, we should recognize that Post-Occupancy Evaluations are essential to our success as designers.

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