



## From Chapter 10: Lean Design

From the book

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# LEAN HOSPITALS

Improving Quality, Patient Safety, and Employee Engagement

Third Edition

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## **Lean Design at East Tennessee Children’s Hospital**

East Tennessee Children’s Hospital (Knoxville) has been using Lean design for a new tower that will open in September 2016 that is designed to provide a better patient experience and improve efficiency for everybody involved.

The existing outpatient surgery process flow includes parking a block or two away, walking to registration and then to the lab (on the same floor). The patient goes to two additional floors for surgical prep, in a semi-private room, then to a holding room, in a large open bay, and finally to surgery. The Post-Anesthesia Care Unit (PACU) is on the same level, but the patient returns to the fourth floor for “phase two” recovery before going home.

In the future design, parking will be underneath the building, with spots reserved for surgery families. Patients will be preregistered, meaning they can get the rest of their care in a single floor, with the pre- and postsurgical rooms being directly next to the operating rooms. The PACU space

is designed to be multi-function, meaning patients can be prepped or recovered in the same space. Patients will now be in a private room pre- and postsurgery, except for the most critical patients who will still be recovered in an open bay PACU. The need to keep some open bay space was a design criteria that came from the anesthesiologists and PACU nurses based on their need to “swarm” a patient if something is wrong.

The hospital’s architecture firm, Shepley Bulfinch, proposed Lean design, including input from user groups and mockups. “The architect was open to us experimenting, doing measures, getting feedback, and modifying layouts,” said Isaac Mitchell, director of Lean for the hospital.<sup>9</sup> On weeks alternating with the architects’ biweekly meetings, Mitchell led a series of improvement sessions with different groups of hospital staff. The following week, he would meet with the architects to determine how to support these changes architecturally. User groups were involved from the beginning, including the outline of the space, the rough-cut layout, and the physical floor plan. The hospital frontline staff used spaghetti diagrams to understand all of the flows, all of the places people were going, and how to accommodate their needs. Additionally, architects completed direct observations with hospital providers and staff to better understand their operating requirements and hospital culture.

Initial full-scale mockups were done in a small 800-square-foot space, which limited them to individual rooms. But it allowed them to look at the detailed design, including getting input from parents (whose requests included a power outlet near their chair for charging a phone).

What did the hospital learn from the mockups? They learned that 11 of the 40 rooms would have been “unusable for full size beds because of columns centered on the headwall of the room.” That “would have been an expensive and frustrating mistake,” said Mitchell, had they not changed the design at that early stage. The hospital also changed the door design to a tri-fold design, as they learned a dual sliding door would not have left enough clearance for everything including emergency equipment. Some relatively simple spreadsheet modeling also showed that the hospital could feel comfortable reducing the number of pre- and postsurgical beds and operating rooms because “patients will be flowing instead of just sitting there.”

Based on this initial experience, the hospital is now developing a more formal 3P, or production preparation process. This includes creating a full-scale unit mocked up in rented warehouse space, as shown in Figure 10.2. The department can “see not just how it’s going to look, but how it’s going to operate,” which has reassured people that the vastly different design will work. This is in contrast to the old approach of saying “here’s your space, figure it out” once it was already built.



**Figure 10.2** A full-scale mockup, showing the view of a patient room from the nurses’ station.

They have worked through scenarios and learned how things will work “so they are ready to go on day one.” As part of an interesting partnership with a local manufacturing company, employees of Denso visited the mockup space to give input from an “outside eyes” perspective.

While some organizations’ first exposure to any Lean concepts is through design efforts, East Tennessee Children’s Hospital was building upon prior Lean experience, as did Seattle Children’s Hospital. “Lean design was a natural extension of Lean daily management,” said Mitchell, “and the culture helped people feel comfortable in speaking up instead of just nodding their heads and agreeing with the plan that was being presented.” Lean thinking is also driving the hospital to work toward smoothing and leveling the schedule and flow of patients instead of asking them to all arrive early. And, they are improving their processes to make sure the right information is available in advance of procedures, rather than discovering a problem the morning of surgery.

As with all things Lean, Lean design and daily Lean management (discussed more in Chapter 11) are about focusing on the patient and involving everybody continuously improving workflows and the design process itself. Those efforts certainly won’t end when the first patient arrives to the new tower for surgery.

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