

Version 1:

Children's 'cardboard city' aids in design of clinical tower

Mock-ups of key facilities are helping the hospital see the plans for an 11-story clinical tower in lifelike 3-D

By Priyanka Dayal McCluskey GLOBE STAFF JULY 17, 2015

A team of doctors and nurses in scrubs and surgical masks crowd over the small patient and work feverishly to control his bleeding heart.

It looks like a real operation. But the "patient" is a toddler-size mannequin, and the operating room a makeshift space of brown cardboard.

The setting was a 40,000-square-foot "cardboard city," a mock-up of a new building that Boston Children's Hospital is planning for its Longwood Medical Area campus. The simulated surgery was part of an exercise by hospital executives and architects to test the most efficient use of space.

At 11 stories and a half-million square feet, the new building will be the largest expansion in the hospital's history: 150 patient beds, a dozen operating rooms, a pediatric heart center, and a bigger intensive care unit for newborns.

The expansion plan includes renovating other Longwood properties and adding hospital beds to the outpatient clinic in Waltham. Executives said patient growth is strong enough to justify the \$1.5 billion expansion.

"Twenty years from now, we don't want to be in the same position we are in today, which is not enough space," said Melissa Burke, director of operations for the simulator program. "We're doing this to make sure we make good decisions about how to design these spaces, make optimal use of the real estate, and have very efficient workflow."

One of the big challenges of constructing a hospital building in Boston is the shortage of land.

"Real estate is so expensive," Burke said. "The standard hospital room can be much bigger in a place like Texas. Here, every inch of space is critical."

The cardboard setup allows clinicians to move doorways, walls, and equipment around while they consider how big the doors should be, for example, which way patients should be facing, and where to place the many trays of surgical tools. Such details are critical, clinicians say, during complex medical procedures, which require that both personnel and tools be optimally placed.

Shepley Bulfinch, the Boston firm designing the building, has created cardboard hospital mock-ups before, but not one where doctors and nurses ran simulations of medical scenarios.

“This will be really helpful in the design process,” said Andre Kamili, an architect at Shepley Bulfinch. “If you just do a paper design, you will find something doesn’t work. Doing it this way is actually cost-saving.”

Children’s spent more than \$75,000 to build the cardboard city and run three days of simulations. The hospital said the cost was small, compared to the benefits of an efficient space, such as the potential for fewer medical complications.

The simulations this week began with briefings of doctors, nurses, and other clinicians, who then went quickly to their stations in the cardboard operating rooms as if responding to a real medical situation. They stopped after each mock procedure to discuss the experience.

“How does this room feel?” Dr. Catherine Allan, clinical director of the simulator program, asked a member of the surgical team. After several minutes of back-and- forth, the team moved the cardboard walls and equipment around to see if another configuration felt more comfortable.

“It’s extremely important we do this as we build a facility for the next 30, 40 years,” said Dr. Aditya “A.K.” Kaza, a cardiac surgeon who participated in the exercises.

“Things look great on paper until you bring the patient in and see maybe there’s a better way.”

<https://www.bostonglobe.com/business/2015/07/16/children-hospital-constructs-cardboard-city-design-new-clinical-building/BuuwOZKyjBIlnfFZs7EsK/story.html>



Doctors, nurses, staff, and observers participate in a simulated pediatric bypass surgery in a vacant building space not too far from Boston Children's Hospital.



The patient is moved on a stretcher toward the mock operating room.



• From left) Dr. Francis Thompson, Dr. Aditya Kaza, nurse Kathryn Franklin, Dr. Barry Kussman, and Dr. John Mayer were briefed on the Boston Children's Hospital simulator program before the procedure.



The staff from Boston Children's Hospital start the exercise.



Nurse Megan Nolan reaches for a surgical instrument during the simulated pediatric bypass surgery.



A simulated pediatric bypass surgery is performed by Dr. Aditya Kaza and staff in the cardboard space.



A debriefing takes place in the mock operating room after the procedure to discuss possible adjustments to the design of the room.



Dr. Barry Kussman, an anesthesiologist, moves "equipment."



Nurse Megan Nolan talks during the debriefing after the mock surgery.



Clinicians from Boston Children's Hospital move pieces of cardboard furniture after discussing the best way to lay out an operating room.

https://www.bostonglobe.com/business/2015/07/16/children-hospital-constructs-cardboard-city-design-new-clinical-building/BuuwoZKyjBIlnfFZs7EsK/picture.html?p1=Article_Gallery

Version 2:

Simulation in clinical design: Testing a building before it's built

Posted on 24 Mar 2016 by Erin Horan

Posted in Innovation, Pediatric Dose, Quality & Safety



How do you go about building a new medical facility that improves upon current workflow and safety but also anticipates technologies and care models yet to be developed?

It's a daunting task, and one that demands collaboration among all stakeholders: clinical staff, patients/their families and building architects. A workgroup from Boston Children's met with consultants from **FKP architects** to come up with a vision for a brand new clinical building set to open in 2022. As part of the pre-planning process, FKP proposed a bold idea: constructing *life-size* cardboard replicas of clinical areas for doctors, nurses and patient families to "test" with simulated scenarios.

"There are no disadvantages to this approach," says **Uma Ramanathan, AIA**, lead architect on the project for **Shepley Bulfinch**, the architecture firm designing the new building. "If only everyone could use this level of detail!" Shepley Bulfinch joined the simulation project to observe and record data and insights.

"For architects, visualizing space comes easily," Ramanathan adds. "Not so much for others."

‘Cardboard City’

In July 2015, “Cardboard City” came to life across the street from the hospital. The project workgroup ultimately involved a wide spectrum of stakeholders, including the **Boston Children’s Simulator Program**, physicians, nurses, architects, administrators and parents.

Catherine Allan, MD, clinical director of the Simulator Program, directed the project through every stage: initial planning, running the simulations, debriefing, and data analysis. As a critical care cardiologist, Allan also offered her insights as an inpatient provider with the Heart Center, which will gain a significant amount of clinical space with the new building.

“The simulation component is what made this innovative,” explains Allan, “because architects and builders have been ‘mocking up’ spaces for clients to walk through for years.”

“What we’re doing,” she says, “is letting clinicians understand what it will be like to work in that space. You could miss things that are relevant to doing a job by just walking through.”

During the simulations, teams of clinical staff ran through the motions of various complicated scenarios in the designated “rooms” of the cardboard hospital. They simulated surgeries, catheterizations, placing patients on cardiopulmonary support and outpatient scenarios. Allan’s colleague **Sarah de Ferranti, MD**, director of the **Preventive Cardiology Program**, volunteered to share her thoughts from an outpatient provider’s perspective.

Lessons learned from simulated scenarios

“The simulation revealed a lot about patient and provider entry and exit, the flow of movement,” says Allan. Door placement turned out to be a key issue.

“[In the operating room], surgeons want the bypass on right side of the table, behind the lead surgeon,” she says. “But the way the doors were set up, it would have to be wheeled all around.” In the end, the doors were re-positioned diagonally opposite one another to optimize workflow, cleanliness and safety. One door connected the operating room to the clean equipment space, and the other led out to the hall.

“That made it hit home to me, that you need flexibility in your process to allow unforeseen learnings,” says Allan.

Doors played a large role in the outpatient simulation, too. The team experimented with having two doors to a patient room: one for patients and families to enter from the waiting area, and the other for providers to enter from a central, isolated workspace. But providers said they like interacting with patients in the hallways, and in reality, “the doctor entering from another room seemed a little theatrical,” says de Ferranti.

The second door was scratched.



In the outpatient arena, another important insight was that all of the “components” of a room— the computers, the patient beds, the tables— should be movable. In all areas, sink placement proved to be another important but oft overlooked factor.

“Safety and infection control are top priorities,” says Ramanathan, who is keenly aware of the extensive regulations instituted by the Massachusetts Department of Public Health. “The clinicians should be able to immediately wash their hands upon entering a room, before they touch a patient,” she says. “And at the same time, a parent wants to see the doctor washing her hands, so visibility from the back of the room is also key. Life-size mockups help you see where things fit.”

In addition, adds Ramanathan, the simulations can help everyone envision and plan for technologies that are rapidly advancing and may need to be incorporated into structural designs. For example, “If we know that a display wall is coming in the future, we can provide all the backend work that might be necessary to accommodate that tool. We have to all be ready to digitize everything.”

All about the patients

Overall, says de Ferranti, the simulations yielded important and unexpected feedback. “Parent feedback was very helpful,” she says. “And so were comments from nurses, who do things that the doctors may not be aware of.”

She says some teams have used the simulated set-up “ad hoc” in addition to the scheduled times, and the simple act of getting together to talk openly about the layout has been valuable.

Still, she notes that any conversation about advancing clinical care “is about *how* we take care of patients, not just the space in which we see them.”

<https://notes.childrenshospital.org/simulation-in-clinical-design-testing-the-form-and-function-of-a-new-building-before-its-built/>

Cardboard operating suite works out kinks before construction starts

By Margaret Moffett margaret.moffett@greensboro.com, Apr 22, 2016

GREENSBORO — Suppose you're building something — say, a suite of operating rooms at a hospital.

You could sketch it out on drafting paper.

You could build a 3-D model with a computer program.

Or you can do what Cone Health did: create a full-scale model made completely of cardboard.

It's a tryout of sorts, a way to work out the kinks in the \$38 million remodel of Wesley Long Hospital before mortar is poured and the plaster is raised.

It all took place at a sprawling warehouse on Hines Chapel Road, which Cone Health is renting.

There, built out of giant panels of cardboard, is the new operating suite that will open at the hospital in the fall of 2018.

All 38,000 square feet of it.

The 10 identical operating rooms. The recovery area and isolation unit. The hallways and storage rooms.

They even sketched out where to put the “push plates” that open the doors, and the warmers that make those post-surgery blankets so toasty.

Why?

Here's the convenient thing about cardboard: you can move it around. You can see, for instance, whether a full-size stretcher will fit through the operating room doors, or whether the halls are wide enough to maneuver that stretcher around the corners.

Better to sketch it out with cardboard than have to tear down concrete and plaster, said Paul Jeffrey, president of Wesley Long Hospital.

During traditional construction projects, the people who design the space won't use the space or really understand how it needs to be used, Jeffrey said.

He said the people who do use it invariably ask: “Who built this? Why is this here? It doesn't make sense.”

That's exactly what they were trying to avoid.

Cone Health had a variety of employees walk through Cardboard City — surgeons, nurses, cleaning crews, people who work in the space.

They made recommendations about what would work and what wouldn't.

Here's an example: Nurses told project managers that the isolation unit needed to be on the other side of a hall.

So they changed the plans.

Sandra Caudle, the assistant director of Wesley Long's operating rooms, said the staff has been energized by how much they've been included in the process.

She and Jeffrey said that was another intended effect of the cardboard mock up. They said they wanted the staff to know their opinions are valued.

"(Employees) feel engaged. They really are excited they have had input into all of this," Caudle said.

http://www.greensboro.com/news/cardboard-operating-suite-works-out-kinks-before-construction-starts/article_ob73d498-187c-5634-8d45-c68dd5e91c9e.html



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Cone Health constructed a life-size cardboard mock-up of 10 operating rooms — 38,000 square feet — to use as they fine tune the design of the planned operating rooms to be built at Wesley Long Hospital. The cardboard construction has been modified and is serving as a big asset in the planning on Thursday, April 21, 2016, in Greensboro, N.C.



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Cone Health constructed a life-size cardboard mock-up of 10 operating rooms — 38,000 square feet — to use as they fine tune the design of the planned operating rooms to be built at Wesley Long Hospital. The cardboard construction has been modified and is serving as a big asset in the planning on Thursday, April 21, 2016, in Greensboro, N.C. The information technology team meets to discuss where all the technology will be placed in the new construction.



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Paul Jeffrey, president of Wesley Long Hospital, talks about nurses recognizing an easier and more efficient route to move a patient once in the operating room as he shows off a life-size, cardboard mock-up of 10 operating rooms Cone Health is using as officials fine tune the design of the planned operating rooms to be built at Wesley Long. The cardboard construction has been modified and is serving as a big asset in the planning on Thursday, April 21, 2016, in Greensboro, N.C.



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