

Healthcare Facilities of the Future

Designers say major changes to healthcare delivery systems will affect locations, designs, material choices, and other factors

— By Craig A. Shutt

Healthcare has become a high-profile topic with the roiling debates over the Affordable Care Act (ACA) now being implemented. The law, in fact, is one response to what medical executives have seen coming for some time: Dramatic changes in how healthcare is delivered will impact locations, square footage, design, and material choices, among other factors.

“Healthcare is undergoing an enormous transition now because it’s clear that it’s not reaching a large segment of the population that needs care,” says Ellen Belknap, president of SMRT Architecture, Engineering and Planning based in Portland, Me. “In the United States, healthcare costs are very high, and outcomes don’t measure up, especially compared with the care provided in other developed countries.”

The gap occurs especially in caring for

chronic illnesses that often can be treated easily and less expensively if caught early, she explains. Chronic illnesses take up about 75% of all healthcare costs, consuming about \$1.5 trillion from \$2 trillion spent on medical expenses. “The goal is to deliver better care at a lower cost, which requires a different approach.”

People are becoming aware that options exist and costs are uniform, adds Richard Molseed, executive vice president at Avera Health in Sioux Falls, S.D. “There is more consumerism today, and more people are price sensitive, which can be seen in the decline in elective surgeries,” he says. “They want better access to healthcare earlier in the process.”

ACA’s goal is in line with those changes, notes John Messervy, director of capital and facility planning at Partners Healthcare System in Boston, Mass. “The trend has been coming for some time, and it’s being accelerated by ACA,” he says. “It is turning

financial incentives on their head, because it motivates healthcare providers to keep people well in a lower-cost setting. That focuses more attention on lifestyle and wellness planning and how to address that.”

Ambulatory Care Grows

Wellness planning and avoidance of chronic conditions leads to a focus on educational and early-warning programs as well as diagnostic visits to catch problems early. “As hospitals move to a model of care that involves caring for patients’ lives with a renewed focus on health and wellness, ambulatory care will be an increasingly important delivery setting,” says Paul E. Strohm, senior vice president and director of healthcare projects at HOK in St. Louis, Mo. “Hospitals are being financially rewarded or penalized based on patient outcomes. This is driving a renewed emphasis on outcomes and patient satisfaction.”

If patients are visiting diagnostic centers more regularly, they need readily accessible facilities. “Our approach to population health management is to focus on providing healthcare in increasingly retail settings at more convenient locations,” says Messervy. “Facilities have to be on normal travel paths so it’s convenient to drop in or to walk further down the mall.”

Avera provides three sizes of clinics: smaller ones with traditional designs, larger ones with more dedicated space per patient, and major-sized ones. The middle option is growing fastest. “When we provide more space for care, with support services adjacent, doctors have higher productivity, see more patients per day, and spend more time being a doctor,” Molseed says.

For major clinics, administrators are focusing on making systems as lean as possible before committing to capital

Contributing Experts



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Avera Health's Prairie Center Cancer Institute in Sioux Falls, S.D., features precast concrete panels with inset thin brick, inset stone and several textures on the panels, saving more than \$1 million over the original handset-brick design. Opened in 2010, the building set a new standard for the company in reducing energy consumption, using environmentally friendly construction materials, and sourcing materials locally. Gage Brothers in Sioux Falls fabricated the components. Photo: Avera Health.

'We as designers have to be responsive to making buildings resilient through siting, material use, and layouts.'

improvements. "Lean systems have been given lip service in the past, but now it's a focus," Molseed says. "They want to get their processes efficient before they start any capital allocation."

Hospitals with smaller facilities in more easily accessible locations will need more examination and consultation rooms along with diagnostic equipment, with fewer operating rooms and intervention spaces, Belknap says. "Hospitals will become less asset-driven and focused on bricks and mortar and more focused on the systems of care they deliver."

Flexibility Needs Rise

Smaller, decentralized treatment facilities are encouraged by the miniaturization of diagnostic equipment and the ability to monitor patients wirelessly from home, among other technologies. "Technology advances are huge," says Belknap. "There are a lot more personal devices today with the goal of keeping patients out of the hospital." Adds Strohm, "Technology is one of the most significant drivers impacting the changes in healthcare-treatment design. Technology is helping physicians and caregivers create better

outcomes, operational efficiencies, and reduced costs. It's constantly evolving. We are building in as much flexibility as is financially feasible to accommodate the ability of buildings to evolve over time."

Equipment is being reduced to the point that some hospitals now have portable MRI machines, notes Messervy. But much of it is still heavy and sensitive, requiring structural support and attention to vibrations to avoid disruptions. Despite the ubiquity of wireless systems, much of a hospital's records are still hard-wired, owing to the large size of digital images and medical files. "We need to keep offices flexible so they can take advantage of new technologies as they change. Flexibility of communication, power, and cooling systems has to be designed into any building being constructed today."

The focus will be on redesigning and revamping existing buildings to take advantage of new systems and approaches, Belknap says. "Renewal and replenishment of existing facilities so they are more versatile will be important. Previously, hospital costs were focused primarily on campus in-

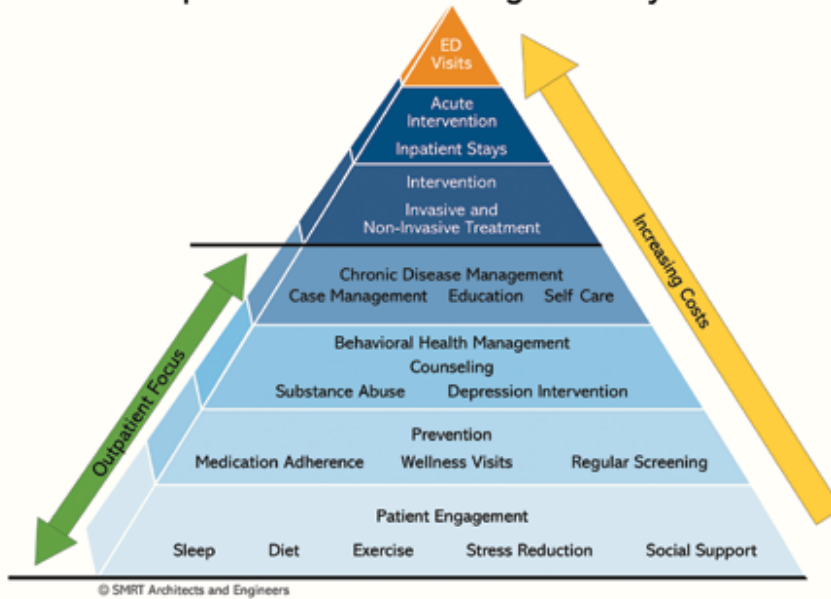
frastructure. In the future, they will be divided among technological changes, communication, and more decentralized community based facilities."

More Resiliency Needed

In addition to flexibility, healthcare facilities must address resiliency, says Belknap. "We as designers have to be responsive to making buildings resilient through siting, material use, and layouts, because we are experiencing more extreme weather events. Healthcare facilities especially have to be protected from storm damage and flooding. Hurricane Katrina and Superstorm Sandy are wake-up calls that climate change is intensifying the effects of storms." New FEMA maps are expanding coastal land areas potentially exposed to 100-year and 500-year floods.

Climate change is making it onto the list of business risks for healthcare facilities. "Our CEO added climate change to his list of business risks last year," says Messervy, "and we are fully engaged in evaluating the potential exposures and developing the strategies to maintain operations. It's a very different scenario than hos-

Population Health Management Pyramid



The Population Health Management Pyramid organizes the types of healthcare services available in the Patient-Centered Medical Home model of care, with those lower in the pyramid cheaper and easier to provide. Patients without insurance often rely on service in the peak, going to emergency rooms for serious problems not caught or prevented earlier. Source: SMRT, 2013.



Healthcare designers are using more prefabricated components to speed construction and lessen site congestion. At the new Wexner Medical Center at The Ohio State University, James Cancer Hospital, and Solove Research Institute and Critical Care Tower in Columbus, Ohio, some 1,200 precast panels with thin-set brick in five colors and three sizes were erected at night, picking them from the truck and setting them into place immediately. Gate Precast Co. in Winchester, Ky., served on a design-assist basis and fabricated the components, which were erected by Precast Services in Twinsburg, Ohio. Photo: HOK.

pitals have planned for, and it's going to require very different solutions."

Resiliency extends to creating facilities that incorporate sustainable-design techniques, Belknap adds. "We as designers must do anything we can to prepare buildings to be resilient and to be lighter in their carbon footprint in the long term. It's a challenge that administrators are taking very seriously today."

Emphasizing green building comes naturally to facilities that want to encourage healthy living, notes Molseed. "Our recent facilities have all incorporated green techniques. There is still some premium for using these products, but it's much less than it was." Indoor air quality is a key concern, he adds, pointing to the company's recent completion of the Prairie Center Cancer Institute in Sioux Falls, where it was paramount not to introduce any potential carcinogens into the air from materials being used.

'Performance of the building envelope is as important as the optimization of building systems.'

Hospital's intensive use of energy is receiving more attention. "Performance of the building envelope is as important as the optimization of building systems," says Messervy. "The building enclosure is now being commissioned much as HVAC systems have been for the past 10-15 years. Great leaps have been made in the development and sophistication of design and modeling applications to allow the owner to optimize the performance of enclosure and mechanical systems."

'There is no excuse today for a leaky building that is an energy sieve.'

"Energy efficiency has to be a primary outcome of design today," says Belknap. "That includes wall and roof systems and providing higher R-values through the tightness of the building envelope. There's no excuse today for a leaky building that's an energy sieve. Administrators realize they have to step up to the plate and pay for buildings that are responsible."

High-efficiency HVAC systems are

becoming standard, Messervy says, and even operable windows are being reconsidered. Open windows haven't been popular, especially in healthcare facilities, he notes, because of infection-control concerns. But Partners recently completed the Spaulding Rehabilitation Hospital in Boston and included operable windows in public areas and therapy spaces, as well as in patient rooms via a key that building operations can access.

"Buildings that are sustainable operate at a lower cost and are healthier for the environment," says Strohm. An example he cites is the Eskenazi Hospital in Indianapolis, which has gone to a 100% outside air system for the hospital and ambulatory-care building while targeting LEED Silver, with the possibility of Gold.

Material choices play a key role in achieving sustainable design. "There is increasing awareness of chemicals in products, including formaldehyde in drywall and chemicals in furniture," says Molseed. "Carpeting, ceiling tiles, and paint all are changing formulations to be healthier, and there is more transparency today so designers can make more informed choices."

Hospital aesthetics also are evolving, including the design of their façades. As buildings become smaller in size and spread through more neighborhoods, a wider variety of styles will be needed to fit their locations, requiring some versatility.

"Healthcare buildings continue to evolve their design aesthetic," says Strohm. "The evolution includes a transformation to an aesthetic that is warm, brings in a lot of natural light, is high performance to help meet the sustainability-performance needs, and is visually appealing. Clients are exploring ways to evolve an aesthetic that can become a signature element in their branding program when multiple facilities are involved in the real-estate portfolio. A similar branding of the interiors of hospitals is being implemented to help target outcomes and patient experiences."

Integrated Project Delivery

The pressure to remove redundancy and waste from the design and construction process is driving the use of integrated project delivery says Belknap. The goal is to align the owner, designer,

Integrated Project Delivery's Defining Characteristics

DEFINING CHARACTERISTICS

Mindset	Trust
	Willingness to Collaborate
Structure	Early Involvement of Key Participants
	Joint Project Control
	Shared Risk (Risk Sharing "Bubble")
	Shared Reward Based on Project Outcomes
	Reduced Liability Exposure
Catalysts	Jointly Developed Validated Targets
	Building Information Modeling
	Lean Design and Construction
Outcomes	Co-Location of Project Team
	Schedule Acceleration
	Enhanced Pre-Fabrication
	Quality and Value to the Owner

Using an integrated project delivery model requires a host of elements, from the mindset that runs counter to typical design-bid-build delivery methods to the structures needed to ensure it works to the tools that help it operate efficiently. Source: SMRT, 2013.

and construction team early in the process, going beyond design-build or construction-management formats to allow collaboration among all parties, including subcontractors.

"We have to get each construction partner out of isolation and allow them to collaborate," she says. "Real collaboration spurs innovation. This is an exciting emerging trend that produces positive results. By collaborating more closely, the team can accelerate the schedule and provide higher quality and value to the owner."

A key element of integrated project delivery comes from collaboration among subcontractors, which allows for prefabricating more components and integrating systems before materials arrive at the site. "IPD encourages the use of prefabrication," Belknap says. "You don't have to get isolated bids without true knowledge of what will be required. Subcontractors can team up to put pieces together in the plant. Building in the controlled environment of the plant and bringing prefabricated components to the site speeds construction, provides better quality, and reduces activity at the site. Everyone wins."

'We're very interested in using as many prefabricated components as we can.'

Messervy agrees. "We're very interested in using as many prefabricated components as we can," he says. "It's being aided by the spread of BIM and offsite capabilities by subcontractors to provide high-quality while other work progresses. Prefabricated components can reduce time to market, improve quality control, and create a better environment." Partners is presently studying the development of a 20-bed, 100,000-square-foot hospital on Nantucket, Mass., constructed in nine months using predominantly prefabricated components assembled on the mainland.

Adds Strohm, "We are seeing new ways to utilize larger and pre-manufactured wall assemblies off-site. The assemblies are then brought to the site, lifted into place, and installed. This technique saves time, is less costly, and can achieve a high-quality assembly due to fabrication under controlled conditions."

He points to the company's work on the 20-story Ohio State University Hospital in Columbus, Ohio, which uses precast concrete panels with embedded thin brick and curtain wall. The envelope units were preassembled and delivered for immediate erection at the site. "There is a trend toward high-performance façades that deliver a more comfortable environment for patient care. Closer attention is being paid to continuity and quality of air barriers in an effort to control both air and moisture infiltration into the healthcare setting."

As these trends gain momentum, designers will need to respond by staying current with techniques, material choices, and collaboration opportunities. "Healthcare must respond to the Institute for Health Improvement (IHI) Triple Aim to simultaneously improve population health and the experience of care while lowering per capita costs," says Belknap. "We are driven by the idea that the best healthcare is the least amount that is needed." 

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