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The digital hospital
Powering a future without boundaries

What's at stake

Hospitals and health systems are operating in a period of significant disruption, the result of shifting incentive models, advancing technologies, evolving patient expectations, and transforming medical education. In today's increasingly value-focused health care market, could the traditional practice of treating most patients within a brick-and-mortar hospital become a thing of the past, as payers and patients seek more cost-effective ways to deliver high-quality care? To survive and thrive under a new paradigm, many health care providers may find that they need to go digital. Specifically, to become a digital hospital, organiations will need to evolve their operating model and use next-generation technologies to link and leverage the delivery of many services in both ambulatory and hospital settings.

Becoming a digital hospital requires three foundational elements:
• Electronic health record (EHR) systems
• Next-generation interoperability to enable remote patient monitoring and app connectivity
• Analytical capabilities to generate patient and population health insights.

These three elements, working together, can help integrate ambulatory and inpatient care by digitally connecting clinicians across care sites.

Benefits and challenges could be significant

The potential benefits of digitally connected ambulatory and inpatient health services could be numerous and far-reaching.

Among the possibilities:
• Early detection and intervention, reducing risk for more acute complications
• Accelerated return to previous health levels with recovery occurring in the home
• Reduced hospital-acquired infections due to a shorter stay
• Potentially reduced treatment costs
• Ability for patients to engage with care providers quickly and effectively, thus improving the patient experience
• Ability for hospitals to leverage technology to maximize resource use

While the above benefits are exciting to contemplate, health care innovators are likely to face considerable challenges along the path to full implementation of a digital hospital. One is the impact of increasing digitalization on the patient-provider relationship. While digital systems and processes may one day soon surpass humans in diagnostic accuracy, determining the right and best course of treatment is likely to remain in human hands. Human understanding and empathy are essential elements of high-quality health care and no computer to date has been able to learn these innately human characteristics. It is easy to get caught up in the excitement of nascent technologies in health care but it will be equally important for hospitals to counterbalance increasing technology use with proven, valuable human interactions.

Another significant challenge is over-reliance on automation. While automated processes can reduce errors, they can also result in automation bias, which occurs when people strongly trust the accuracy of computer-generated information to the extent that they discount other sources, including their own senses. So while automation may reduce errors, it can also amplify the consequences of the errors that do surface.

Finally, this world of interconnected systems can sound a bit like "Big Brother" from George Orwell's novel *1984*. Ensuring data security and privacy will be paramount to build patient trust for hospital systems and processes.

Case in point: Rachel's end-to-end digital hospital experience

Imagine it's a few years in the future; say, 2025. Four-year-old Rachel's hospital operates under an incentive reimbursement model driven by quality and care outcomes for the populations it serves. Because Rachel has a history of medical complications that places her within the hospital's higher-risk populations that require close monitoring, her care team authorized several sensors to continually track Rachel's vitals.

Rachel is asleep in her room at home late one night when the sensors pick up abnormal readings. The sensors notify the hospital's command center system which, in turn, accesses Rachel's medical history and genetic sequence. It runs algorithms against a large database of historic medical data to determine if any significant irregularities exist and require action. The goal at this point is to determine whether Rachel requires acute critical care and intervention.

Once the command center system makes this determination, an operator notifies Rachel's dad of the situation. The operator also dispatches an ambulance and EMS team with portable, advanced diagnostic equipment to Rachel's home, which arrives within minutes.

Rachel's dad awakens to the notifications on his phone, reviews the reasons for the system's intervention and the status of the advanced diagnostic equipment being delivered. The phone also displays instructions for waking Rachel, initiating contact with the hospital care command center, and preparing for diagnostic tests.

While the hospital command center is keeping track of Rachel's situation it is also monitoring patient conditions across the hospital population. The system shows operators at the command center that there are 32 ambulance calls on the county's north side; Rachel's among them. If the statistical history holds true, 30 percent of these calls will require that the patient be admitted, in which case the hospital will need to staff up to meet this demand. Operators are closely monitoring how the situation progresses while in parallel preparing to increase capacity with gig-based workforce services. (As of 2016, 16 percent of the health care workforce is composed of contracted, or gig-based employees, up from 10 percent a decade ago). [1]

Returning to Rachel and her family, the diagnostic equipment has arrived at their home. It is worth noting that this equipment, including portable x-ray and MRI machines—is advanced, compact, and easy to use. In one test, the EMS technician takes a single drop of blood from Rachel's finger; analyzing the pattern of activity of 1.000 genes in Rachel's white cells provides a diagnosis of acute appendicitis.

A pediatrician on call for each of the county's six hospitals joins Rachel and her dad for a virtual physician visit. This staffing method allows hospitals that see relatively low volumes of pediatric emergencies to have a board-certified pediatrician take care of their pediatric patients from the beginning of a care episode. Using an augmented reality headset in her home, the pediatrician examines Rachel and confirms the system's diagnosis of acute appendicitis. She approves the system-generated plan to bring Rachel into the hospital immediately.

Once the pediatrician gives the order to proceed, the command center goes into action, allocating a care team, rooms, medications, blood supplies, etc., based on the accepted leading practice for a four-year-old with acute appendicitis. Care team members are notified and begin a case review.

A nurse on the care team is assigned as the patient liaison and video chats with Rachel and her dad during their ambulance ride, explaining what they can expect when they arrive at the hospital and answering any questions they may have. Based on the consumer profile for Rachel and her family, insurance is queried, confirmed and notified. The hospital is already tracking expected care and cost guidelines against actual trends and is able to monitor as the case progresses.
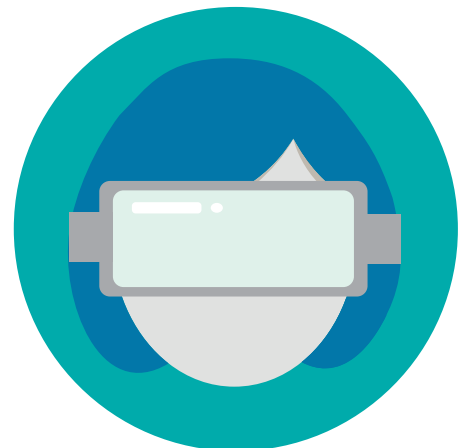
Concurrently, the hospital's system is updating work plans based on Rachel's latest medical readings and notifying the team as the work plan is altered. The system is also updating the financials for Rachel's hospital visit and providing new estimates as more information on Rachel's condition is gathered. Throughout Rachel's hospitalization, a cost accounting system tracks all of the resources used in her care. Because the hospital receives a fixed reimbursement for this diagnosis, adjusted by the patient's age and other medical conditions, the information isn't needed for a bill; however, the cost accounting system can notify the Director of Utilization if Rachel's care is using resources outside of or in addition to those expected.

Upon arrival, Rachel and her dad are greeted by their liaison and other staff, who immediately prepare and admit Rachel to surgery. Surgical staff may be operating in person or remotely, depending on specialties required and onsite resource availability. As the surgery progresses, the hospital's system regularly updates Rachel's family. The surgery is minimally invasive and, rather than requiring Rachel to stay overnight, she is discharged at 5 a.m. following the surgery and sent home with monitoring equipment adjusted for her new health situation. The hospital systems provide an immediate update to Rachel's pediatrician upon discharge and, according to the pediatrician's protocol, contacts Rachel's dad and suggests times for a video appointment that afternoon. Rachel's dad confirms one of the appointments via his smart phone.

Meanwhile, the hospital's command center has already reallocated Rachel's scheduled room for another patient. Staff exchanges the room's equipment and reconfigures the walls to enlarge the room to meet the needs of the new patient.

Once home, various sensors continue to monitor Rachel for any irregularities. For example, the hospital's system is integrated with Rachel's family's grocery delivery service, Rachel's wearable monitor, and sleep sensors. Rachel is also prompted by the system to emoji how she is feeling each day. If an irregularity is found or if Rachel deviates from her recovery plan, then the system notifies Rachel's liaison via his dashboard and he responds. According to protocols defined by statistical treatment results for four-year-old appendicitis patients, Rachel's liaison periodically provides reminders and educational materials; in addition, Rachel's dad can contact the liaison through a messaging app as questions or concerns arise. Her dad can also review a dashboard showing needed medications or appointments in Rachel's recovery plan.

A pharmacy in the vicinity of Rachel's home is automated and contains a high-speed 3D printer to customize all of her supplies and medication doses. The pharmacy delivers medications and supplies to Rachel's home within minutes of receiving the order. In this case, the digital hospital supply chain expands beyond the traditional inpatient pharmacy to serve the patient population under health system management, regardless of location.

To conclude our narrative of Rachel's experience, it is important to note that her complex scenario—while representative of the end-to-end operations of a digital hospital—is not likely to be the norm. Most of a patient's interactions with a digital hospital are likely to be ambulatory and occur outside the facility's walls to adapt to the patient's needs and preferences. For every patient admitted, thousands of other patients that would typically trek to the hospital will instead be treated remotely, whenever possible, in an ongoing attempt to avoid a costly inpatient intervention.

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Heading into the digital future

Will hospitals' digital capabilities in 2025 mirror those in Rachel's story? It's not likely; however, directionally this story illustrates some future possibilities for the digitalization of health care and a more seamless connection between ambulatory and inpatient care.

Deloitte's annual CIO survey found that "digitally maturing companies…place a strong emphasis on innovation and are over twice as likely to be investing in innovation than are early-stage entities—87% versus 38 percent. More than 80 percent of digitally maturing companies plan to develop new core business lines in the next three to five years in response to digital trends. Only about half of early-stage companies have similar plans." [2]

Where does your organization stand in terms of digital maturity when it is evaluated against these ten integrated capabilities?
• Foundational EHR system
• Analytics and data management
• Patient awareness/marketing
• Care tracking and health maintenance
• Revenue cycle integration
• Contact center
• Care treatment and readiness
• Scheduling and digital notification
• Remote monitoring and telehealth
• Digital shared services
• Next-generation ERP

If your hospital is already making investments in applying technologies to solve patient needs and evolve your business model, then the concept of a fully powered digital hospital may not seem that far in the future. If, however, this narrative seems more like science fiction than reality, then it could be time to encourage your organization to embrace and invest in technological advancements that could shape health care's future.

Finally, remember that technology on its own rarely results in an innovation that solves a significant problem—technology must be paired with the right people and processes. Deloitte's annual CIO survey concludes: "Evolving to compete in an increasingly digital world is not just about implementing more and better technologies. It involves aligning your company's organization with the demands of the digital environment by increasing appetite for risk, investing in digital opportunities for your employees, streamlining organizational structures for agility, and rethinking how and by whom work is done. Only when these organizational factors come together can your company move from doing digital to being digital." [3]

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Let's talk

Are you ready to power a future without boundaries? Let's talk about how your organization can deliver care beyond the brick-and-mortar facility.

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3. G. C. Kane, D. Palmer, A. N. Phillips, D. Kiron and N. Buckley, "Aligning the Organization for its Digital Future" MIT Sloan Management Review and Deloitte University Press, July 2016. p. 16

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