



Is the hospital of the future here today?

Transforming the hospital business model

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Executive summary

THE COVID-19 PANDEMIC has turned the health care industry upside down and accelerated many of the ideas for the future that some thought would take decades to take hold. Hospitals quickly deferred or cancelled elective procedures, discharged non-COVID-19 patients, used data and technology to analyze and forecast demand, implemented virtual health solutions, and moved some of their workforce to remote work. The use of virtual health technology for screening, monitoring, and e-visits as well as consumer preference to stay away from the hospital during the pandemic offer a glimpse into how the hospital of the future might operate.

In mid-January 2020, the Deloitte Center for Health Solutions crowdsourced health care experts and futurists for their vision on the hospital of the future. We also interviewed several physicians and hospital operations and technology executives in mid-April to confirm our initial research and to consider how we should be thinking differently in the aftermath of the pandemic.

When asked what the hospital would look like in 2040, the crowdsourced experts said:

- While there will still be a need for some hospitals, most of the care delivery will shift away from the hospital setting, driven by technological advances in clinical care, value-based payments, and scientific discovery (personalized medicine, genomics, DNA sequencing, for instance).

- Hospitals will transform their business models toward narrower physical offerings, focused on high-acuity, complex cases, and with increased virtual offerings.
- Technology and data will be pervasive and transform care delivery models.
- Smart spaces and digitally enabled hospitality will be a necessity, given consumer demands.

The experts said that hospitals were up against the wall due to COVID-19, and while several hospitals were challenged by this unprecedented crisis, a few have already started to act like the hospital of the future, particularly with regard to virtual health and use of technology.

The question is: Will these changes persist, or will hospitals go back to how they've always done business? The speed to decision and execution in this recovery phase is critical. Hospitals cannot go back to their old business models. It most likely is not viable given where health care is heading. As the industry begins to recover from the pandemic, hospital executives should consider how they can maintain their momentum toward operating as a hospital of the future and position their organizations to thrive.

Introduction

COVID-19 FORCED ORGANIZATIONS to transform their operations overnight, and in the process debunked many widely held conventional beliefs.

- Hospitals deferred or canceled elective procedures and some consumers tried noninvasive interventions (e.g., physical therapy for back pain instead of surgery).
- Adoption of virtual-visit and remote-monitoring technology increased rapidly due to cancellation of in-person visits by hospitals and doctors and consumers' safety concerns.

So far, both physicians and consumers have welcomed these changes. Consumers in particular preferred to stay away from the hospital.

Even as the pandemic curve appears to be flattening in many areas, the impact on the market is likely to last. Many hospitals are now looking toward recovery of their business, staff, and operations. Executives contemplating steps toward recovery should also take into consideration how their business can thrive in the future. To that end, we suggest they adopt *the hospital of the future* as outlined in this article.

RESEARCH METHODOLOGY

The Deloitte Center for Health Solutions conducted an online crowdsourcing exercise in mid-January 2020. Participants included 24 experts from various regions around the world—the United States, Canada, the United Kingdom, Asia, and Russia—with backgrounds in health care, policy, technology, and customer experience.

By crowdsourcing ideas and use cases, these experts developed multiple visions for a hospital 20 years from now. They generated more than 300 idea posts on three themes (elaborated in this article). The top insights from each theme were further fleshed out into key takeaways.

We also interviewed five physicians, hospital operations executives, and technology executives in mid-April for their perspectives on the hospital of the future, given COVID-19's impact on the industry.

Three main themes emerged on how hospitals will transform by 2040

THE EXPERTS AGREED that there were many reasons for hospitals to transform their business models, including the quest to reduce costs, better engage consumers, leverage technology, enhance clinician experience, and compete with new entrants. The COVID-19 crisis has shown that care can be delivered and monitored in virtual settings, that consumers prefer to stay away from the hospital, and technology and interoperable data are critical.

Theme 1. Hospitals will have transformed business models

According to the experts, hospitals will pick a path and become one of the following:

1. Specialty care operators/focused factories for complex procedures: In

2040, the overall market will have significantly fewer hospital beds with most hospitals becoming focused factories catering to procedures for critical care, complex, and specialized populations. We envision that the hospitals will focus on trauma/critical care, pandemic/epidemic, and complex specialties as listed below.

- Trauma/critical care: Emergencies, transplants, trauma services, and ICU/NICU
- Pandemic/epidemic: Infectious disease and quarantine/isolation services

- Specialized procedures: Complex patients (cancer, cardiac surgery, orthopedics, neurological surgery, etc.) who require specialized treatment or multiple specialists

2. Health hubs: The hospital building would become a health hub and part of a larger system that offers outpatient, ambulatory, retail, virtual, and home services. In 2040, the hospital building itself might offer:

- Ambulatory surgery, urgent care, and diagnostic services
- Drivers of health (social determinants of health) services that improve food security, housing, employment, utility access, and other needs that impact health
- Holistic care services and treatments that would focus on mental, social, emotional, spiritual, and financial health of the community. Hospitals will have a relaxing setting

3. Hospital at home or virtual hospital: Care,

including monitoring, could be delivered outside the building in either a hospital at home or virtual hospital setting (see sidebar, “Virtual care delivery in action”). During the COVID-19 pandemic several hospitals quickly adopted virtual capabilities. Some have done this to monitor and treat both traditional outpatients through e-visits and certain inpatients such as those with congestive heart failure and chronic obstructive pulmonary disorder through hospital-at-home models.

Our experts noted how growth in adoption of virtual care delivery in the months of the COVID-19 pandemic has been greater than any that occurred over the last decade. An estimate in the *Lancet* is

that there has been a ten-fold increase in the number of virtual patient consultations since the pandemic began.¹

VIRTUAL CARE DELIVERY IN ACTION

Hospital at home: Patients receive care at home. Staff and technology in centralized monitoring locations oversee patient care and can intervene remotely if there are signs of medical issues.

Several hospitals are incorporating treatment options for a “hospital with no beds.” Services are provided to acutely ill, elderly, or complex patients in their home to improve quality of life, patient experience, and outcomes, and, ultimately, reduce costs. These services could also potentially be extended to include infectious diseases and pandemics in the future, especially for noncritical patients and patients requiring post-discharge care, and to supplement the modular space of physical hospitals in the future (see the section on modular space). Some examples include:

- **Mount Sinai at Home, New York:**² Mount Sinai launched its hospital at home program in 2014 as part of a three-year Centers for Medicare and Medicaid Services (CMS) innovation grant, offering in-home rehabilitation, observation, and primary care services. In this model, nurses visit the patient periodically and monitor their blood pressure using a tablet connected to a blood pressure monitoring system. In addition, physicians are available round the clock and are in close contact with community paramedics who can go to the patient’s home at any time. Patients who participated in Mount Sinai’s hospital at home model between 2014 and 2017 had shorter stays, lower readmission rates, and fewer emergency department visits. Currently, the program has been beneficial in freeing up hospital beds for COVID-19 patients by providing care to certain subsets of patients at home.
- **Johns Hopkins Hospital at Home, Baltimore:**³ Johns Hopkins launched its hospital at home program to treat elderly patients who either refused to go to the hospital or were at risk of hospital-acquired infections. In this model, patients remain at home and their care is managed using advanced remote monitoring and telemedicine, coupled with periodic visits from a physician. Hospital at home patients experienced better clinical outcomes, lower average length of stay, and cost savings of 19–30% compared to traditional inpatient care.

The virtual hospital concept: Clinicians in hospitals that do not have the capabilities/specialists for certain types of care could connect virtually with specialists at other hospitals to guide them on how to serve this type of patient without having to transfer the patient. Patients are treated in other hospitals/facilities but overseen virtually. Virtual staff are located in a centralized building and more efficiently able to care for patients in other hospitals without having to transfer them. Some examples include:

- **Mercy Virtual Care Center:**⁴ Mercy Health launched Mercy Virtual, a four-story hospital with no beds, in October 2015. The care center provides an array of telemedicine offerings to care for patients remotely, either at their own homes or other Mercy facilities, around the clock. The staff at Mercy’s Virtual Care Center conduct video calls with patients and monitor their vital signs in real time through devices such as pulse oximeters that connect to a tablet. Mercy Virtual also works as a virtual ICU where the staff and analysts analyze massive data generated from devices to make sure that clinicians at the patient’s bedside have the right information at the right time.

- **Intermountain Connect Care Pro virtual hospital, Utah:**⁵ Intermountain invested in the Connect Care Pro virtual hospital model, which comprises 35 telehealth programs and around 500 caregivers. It includes services such as mental health counseling, intensive care, and newborn critical care. Nine out of 22 Intermountain hospitals have already established this model to reduce the cost of care and length of stay. For instance, Intermountain has already lowered the cost of care by more than US\$2.1 million over several years by reducing the need for transfer of ill newborns to other hospitals.

Theme 2. Care delivery models will be disrupted by ubiquitous data and technology

The crowdsourced experts said that hospitals will be both “high-tech and high-touch,” with connected interoperable data and systems, streamlined operations, and efficient clinical care

GLOBAL SPOTLIGHT: CARE MEETS INNOVATION⁶

To promote open innovation in the medical arena, Israel-based Sheba Medical Center launched ARC *innovation center* in 2019. ARC—accelerate, redesign, collaborate—works as an incubation hub for startups to work with hospital executives in identifying unmet clinical needs through breakthrough solutions. It currently focuses on innovation in six areas—precision medicine, telemedicine, virtual reality (VR), big data and AI, surgical innovation, and rehabilitation—each headed by Sheba’s senior physicians, along with the startups. One of ARC’s major implementations is the creation of fully digital reality-based departments of the medical centers. Sheba is working with extended reality startup XRHealth to use their digital reality platform for cognitive therapy, physical therapy, pain relief, and many other applications throughout the hospital. XRHealth’s platforms are of particular use in helping medical professionals analyze patient data in real time to track their recovery both physically and remotely.

delivery. Technology will be used for monitoring, prediction, and care delivery.

They also identified artificial intelligence (AI) and machine learning as the emerging technologies most likely to transform the industry in the next 10 years.

Envisioning the technology hospitals would use in 2040, many agreed that some of today’s technologies will be more mature in the future. Radically interoperable data, AI, machine learning, and other cognitive technologies will drive the hospital’s clinical care delivery, operations, and experience. In our [recent survey](#) of technology

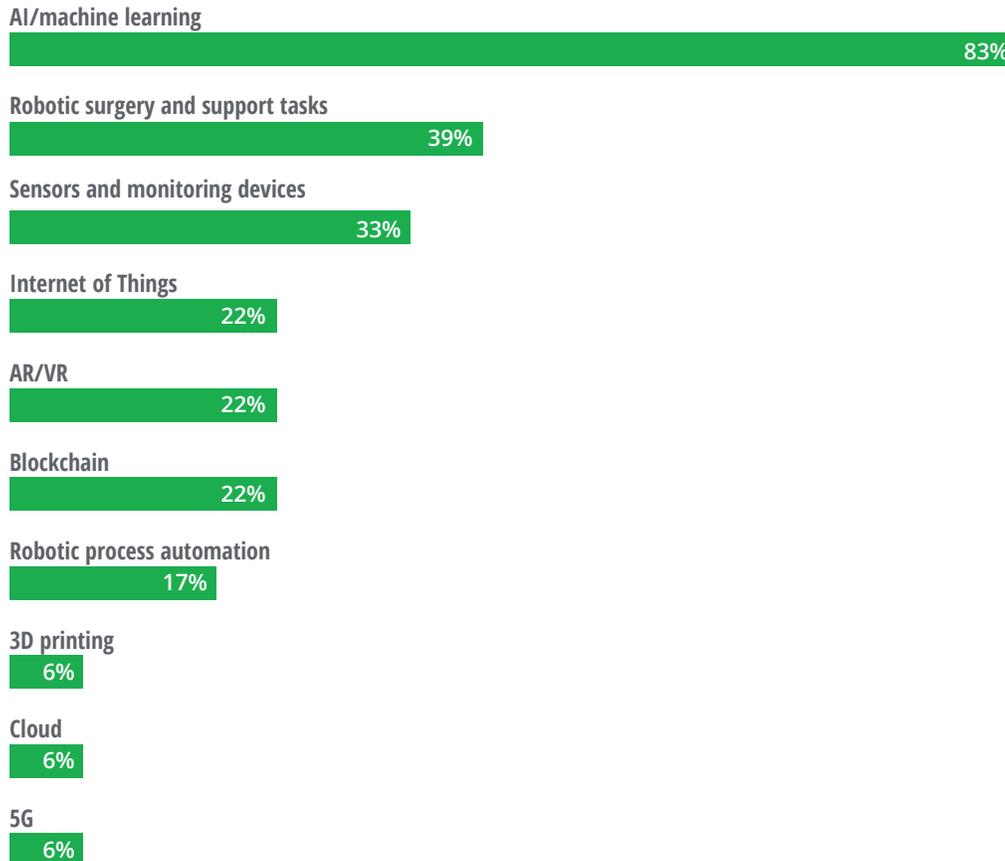
GLOBAL SPOTLIGHT: DIGITWINS⁷

Dublin-based Mater Private houses one of Ireland’s leading radiology imaging institutions. Located in the city center, the institution was prone to high wait times due to increased demand and delay in scans and results. As expanding the facility was difficult due to space constraints, it created a digital twin of the department—a four-dimensional digital view—to maximize workflow efficiencies. Some of the key improvements from the implementation were 1) shorter wait times—a 25-minute reduction for MRI scans; 2) increased equipment utilization—a 32% increase in MRI usage; 3) lower staffing costs—a 50% reduction in MRI overtime pay per day. The most important benefit, of course, was improving the patient experience.

FIGURE 1

AI and machine learning are the most likely technologies to transform health care in the next 10 years according to the crowd

Which of the following technologies will be the most transformative for hospitals in the next ten years? Select the top two.



Note: N=18.

Source: Deloitte crowdsourcing on the hospital of the future.

executives on interoperability, they said that it would benefit cost of care (44%), consumer experience (38%), and care coordination and outcomes (36%).

Examples of how technology and data could be leveraged in the future include:

Digital twins: A digital twin refers to a digital replica of potential and actual physical assets, processes, people, places, systems, and devices. In health care, the experts envisioned using digital

twins to help streamline the admission process and update clinicians on patient status and medical history. Before a patient arrives at the hospital, appropriate staff will already have reviewed and analyzed the patient's data, which could include electronic health record (EHR), information from medical devices, vital signs from wearables, and scans from diagnostics procedures such as MRI.

Digital command centers/Traffic control towers: Future hospitals could use digital command centers to predict and determine their

service (operations, logistics) and clinical/procedural needs, in addition to improving the patient experience. Using predictive analytics, the command center could analyze hospital (clinical and operational) and community health data to forecast business, experience, and clinical needs.

For example:

- **Clinical needs:** Digital real-time monitors could track a patient's health in the hospital, and the command center could use AI and predictive analytics to help with diagnosis and treatment plans.
- **Supply chain, operations, and other logistics:** Technologies can predict staffing, supply chain, operations, and logistics needs to ensure efficient use of resources.
- **Patient experience:** Another possibility is the patient-facing virtual assistant powered by natural language processing (NLP) and AI in the command center/control tower. The device is equipped in each room and takes verbal requests from the patient, uses NLP to process the requests, and then uses AI to assign them to the most appropriate person (or robot) based upon efficiencies.
- **Pandemic or epidemic disease:** Monitoring and tracking of biometrics and test results could

identify a potential infectious disease on the rise before it spreads more broadly.

Robotics and digital reality: Some nurse and clinician tasks will likely be conducted by robots. Robots could deliver and administer medication, take and document vital signs without waking the patient, and conduct minor procedures such as putting in IVs and drawing blood. Clinicians will oversee the work from the command center/control tower. While robotic surgeries have gained popularity in recent times, the adoption is currently limited to specific, mostly noncritical procedures. This will change—robot-assisted surgeries for several major procedures will become commonplace.

In addition, digital reality—AR/VR—will be mandatory and pervasive for procedures, data visualization, pain/dependence management, behavioral/mental health, and even medical training. For instance, it could be used to train surgeons on complex procedures. Also, AR/VR glasses can enable physicians to view patient data as they simultaneously interact with the patient.

Theme 3. Smart spaces and digitally enabled hospitality will be essential

Whatever path hospitals choose, the experts, both those crowdsourced and those interviewed, were

GLOBAL SPOTLIGHT: THE WALL OF ANALYTICS⁸

In November 2019, the Bradford Teaching Hospitals NHS Foundation Trust (BTH) opened a digital command center to help a centralized “control” team see the full picture of hospital activity in real time. The team monitors a “wall of analytics”—multiple digital screens on the wall—that pulls streams of data from various sources such as BTH’s EHR system, patients’ vitals sensors, and other scheduling systems to make a real-time impact on all operational, clinical, and financial decisions. With over 96% utilization and 40% increase in ER visits in the past 10 years, the command center will help optimize the resources and improve how patients move in and out of the hospital without hassles. “The wall” is already making an impact—faster ambulance transfer times, faster patient movements intrahospital, getting home quicker, and even fewer surgery cancellations due to winter pressures.

unanimous in envisioning smart spaces and the integration of digital technologies into every aspect of hospital space, transforming not only the physical structure but also providing a hotel-like personalized experience. Modular spaces will be part of hospital design so that services can be scaled up or down based on surges in demand.

Not only do the experts expect the physical space to transform, but they also predict hospitals will be able to integrate virtual with physical offerings. Virtual offerings will be a seamless part of the experience for the patient—data will always be available, clinicians will always be accessible, and treatment will always be delivered—whether in their own home or in a hospital. Miniaturized, self-contained, and mobile equipment will support the ability to be modular or deliver care in the home. The hospital of the future will bring the technology to the patient instead of bringing patients to the technology.

Examples of how smart space and digitally enabled hospitality will help transform the physical offerings of the hospital of the future include:

Wayfinding and push notifications: The hospital’s app could become active as soon as patients make an appointment. Even before they enter the hospital, the app could advise them on best parking areas, provide them with forms or paperwork that can be filled out ahead of time online, and offer “what to expect” material. Once the patient enters the hospital, the app can analyze the patient’s records and provide turn-by-turn directions to guide them to the correct department. Visiting physicians and nurses can also use the same wayfinding system to navigate through various departments. In addition, patients will receive push notifications in their preferred language about physician availability, appointment times and updates, and other information related to their visit. When a patient is ready to be

discharged, the platform/app could enable discharge planning, education, and postdischarge engagement to reduce readmissions and a speedy recovery.

Seamless diagnosis and treatment

experience: Miniaturized, self-contained, and mobile equipment will support the hospital’s ability to be modular. These tools can assist the patient across the care experience, starting before they enter the hospital and after they are discharged. For example, diagnosis can begin at home using tools such as virtual triage and symptom checker. The virtual triage tool combines the patient’s responses with the results from the symptom checker tool to generate diagnosis and provide suggestions that direct the patient on how or where to seek care—hospital, outpatient facility, virtual visit, or otherwise. The COVID-19 pandemic has demonstrated how these tools can help streamline the care process. Going forward, these tools also have broader applicability for various health scenarios in different health care settings.

If the patient requires care at a hospital, smart wearables will begin monitoring their vitals, such as heart rate and blood pressure, as they proceed to their allotted exam room. The physician can then access those results in advance of seeing the patient and save time for both the physician and the patient and streamlines the visit experience. In addition, instead of having a physical chatbot, each patient will have access to a personal robot-shaped health-bot which will appear in the form of a hologram and accompany the patient throughout the process to answer any queries. After the patient’s diagnosis is complete, cognitive computers will organize logistics and ensure zero waiting time for the patient by notifying the pharmacy to prepare a prescription.

As diagnostic equipment becomes digital, smaller, and more portable, it will limit patient movement—often cumbersome—enhancing their experience

and improving efficiency. Smart equipment will predict and prioritize demand for diagnostic testing and scans, and it will be delivered to the patient seamlessly without the patient having to wait. In other words, the hospital will bring the technology to the patient instead of bringing patients to the technology.

Smart and personalized rooms: The architectural space of the patient's room will cater to individual patients' preferred ambience and feel more like a private guest suite instead of a hospital room. The design of the future will consider all five senses to put a patient at her happiest and most comfortable self, which will ultimately promote healing. Patient experience platforms will empower patients to have an integrated, voice-enabled personal space. For example, the décor can be made more appealing by hiding devices behind walls or other design elements. The patient can control the room environment and place noncritical requests through voice activation. For

instance, she can change the room temperature or lighting and access services such as aromatherapy and music or ambient sounds by speaking to a machine. This can reduce waiting time for the patient and reduce burden on staff, freeing them up to attend to other critical activities.

Revamped waiting areas and green spaces:

Waiting areas for visitors and families will be digitally designed to provide timely updates. Large-screen TVs, projectors, and tablet/mobile device stations will not only be used for entertainment but also educate the visitors about the patient's health issues and treatment progress. Furthermore, these areas will be modular and designed as cross-functional spaces, which can be used interchangeably as waiting areas, patient rooms, or surgery centers, thus maximizing functionality and minimizing footprint. Additionally, relatives and family members will be able to make use of on-site amenities and outdoor walkways and green spaces while they wait for the patient.

GLOBAL SPOTLIGHT: SMART SPACES, AUTOMATION, AND ROBOTICS⁹

Australia's Royal Adelaide Hospital is one of the first large-scale hospital complexes in the country to obtain a "4-Star Green Star—Healthcare as Built" rating. Rainwater harvesting, natural light optimization to boost energy efficiency, and high-efficiency fixtures for water recycling will help reduce greenhouse gas emissions by 50%. The campus also encompasses nearly four hectares of landscaped parks and internal green space, comprising over 70 courtyards, terraces, and sky gardens. The hospital aims to achieve net-zero emissions by 2050.

The hospital has also implemented a wide array of digital solutions. About 25 automated-guided vehicles (AGVs) carry goods around the facility, communicate with lifts, doors, and portable phones, and help hospital pharmacies track pharmacy items and reduce wastage. Electronic tags coupled with 3,200 wireless access points enable the triangulation of patients and equipment. Automated dispensing cabinets ensure that the patient has access to medication quickly and safely. Friends or relatives of the patient can print personalized directions from self-service electronic kiosks to navigate the hospital.

Designing the hospital of the future today

REGULATORY LEVERS AND rapid, agile decisions have enabled hospitals to quickly transform and respond to the COVID-19 pandemic. Executives who are now entering the recovery phase of the pandemic can take steps toward how they will ensure that their organizations will thrive. One of the most important steps will be to sustain changes made to operate as a hospital of the future. Consumers have shown that they are open to virtual visits, don't want to be in hospitals, and are comfortable having their procedures outside hospital walls. The speed to execute on this momentum can be critical. To do this, executives should consider how they can continue to:

- Build upon the acceleration of innovation today
- Plan for the future

This can be a challenging time for hospital executives. Facing an industry that has been disrupted by a pandemic, incumbents may face even greater challenges ahead, such as meeting pent-up demand, catering to higher levels of uncompensated care, addressing social determinants, educating nervous consumers, and

competition from new entrants. New entrants—not the typical health care providers of today—and consumers are expected to drive change and innovation in health care in the next 10 years (figure 2). This was in response to a question asked before the pandemic, and the disrupted industry may be even more ripe for consumers and disrupters to demand and bring about change.

Build upon the acceleration of innovation today

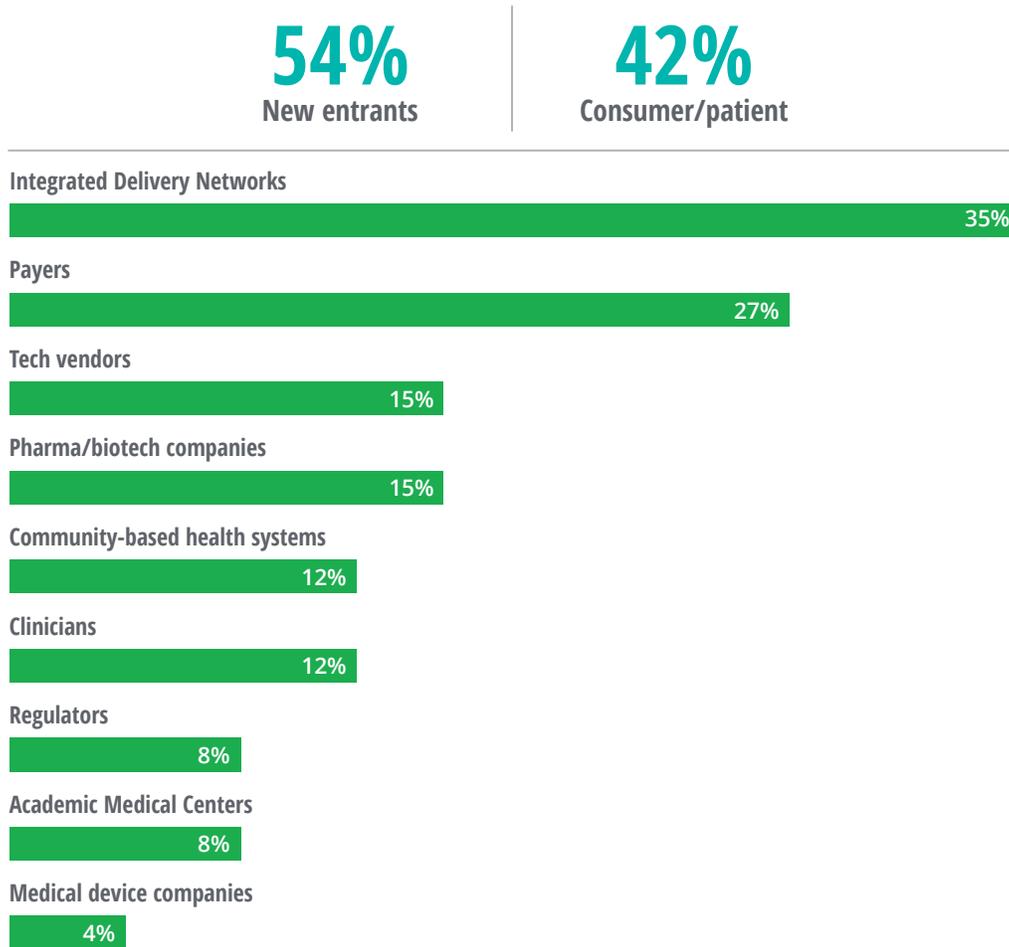
Hospitals had to shift their investments and priorities rapidly to respond to the pandemic. To sustain innovation, they now should continue to invest in the following:

- Data and interoperability capabilities
- Virtual health and digital solutions
- Offerings to enable the shift of patients out of the hospital
- Improving consumer experience and meeting their expectations

FIGURE 2

New entrants and consumers will drive change and innovation in health care in the next 10 years according to the crowd

Which of the following groups will drive future change and innovation in the health care industry in the next ten years?



Note: N=26

Source: Deloitte crowdsourcing on the hospital of the future.

Plan for the future: Strategy, capital, and workforce

TODAY'S EXECUTIVES SHOULD ask themselves the following questions to help determine which business model they will use to position their organizations to thrive in the future:

- What is your market position today? What do you want it to be?
- What are your competitors up to and who are your competitors of the future?
- How are you going to win (or survive) in your market?
- How can you meet consumer expectations, and how are the expectations of your consumers evolving?

After strategic decisions have been made, an important step is rethinking the organization's capital investment strategy and making a plan to move forward. Instead of investing in beds, hospitals should focus capital investments on digital and technology capabilities, particularly virtual offerings.

Organizations should consider what parts of their COVID-19 response should remain as part of their new normal. Organizations need to consider:

- What investments are needed in new capabilities and technology
- How virtual health capabilities should be extended and strengthened
- How to rethink workforce, skills, collaboration models, and enablement. How to enable the types of collaboration required with the virtual and remote workforce
- Which partnerships and alliances are needed to execute on organizational goals
- How to revamp the supply chain to address the change in model and site of care

If anything, the devastating pandemic has taught everyone that hospitals can transform. The hospital of the future may be nearer than we think.

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