

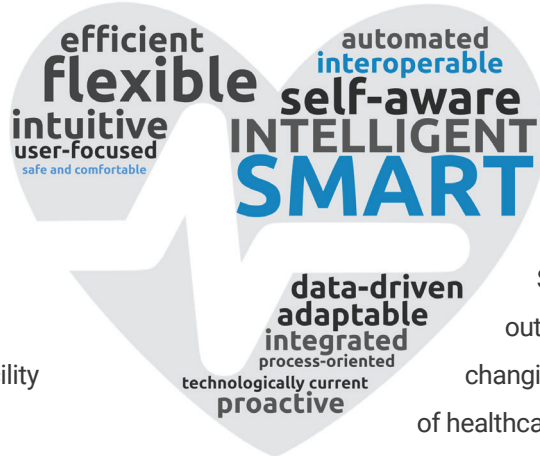


# Beginning the smart hospital journey: Planning, executing, and sustaining an intelligent healthcare building

By Eric Vandembroucke | Brendon Buckley | Corey Gaarde

No other building type can benefit from intelligent building design more than a hospital or other healthcare facility. The hundreds of clinical, IT, security, and building operation systems offer a wealth of opportunities to operate in a smart, integrated, and highly efficient fashion.

Numerous definitions of a “smart” or “intelligent” hospital exist. Most definitions share many of the same attributes, with the facility overall seen as being “self-aware,” flexible, and able to operate proactively to its ever-changing needs. The “smartest” of smart hospitals also extend their capabilities outside the physical building itself—for example, utilizing smartphone apps to connect at-home patients with care teams, and facilities staff with building systems. (Think of how airlines continually communicate with passengers



to keep them aware of departures and arrival times, gates, etc., well before they leave their home for the airport.) Such intelligence-powered outreach is critical to the changing landscape of healthcare.

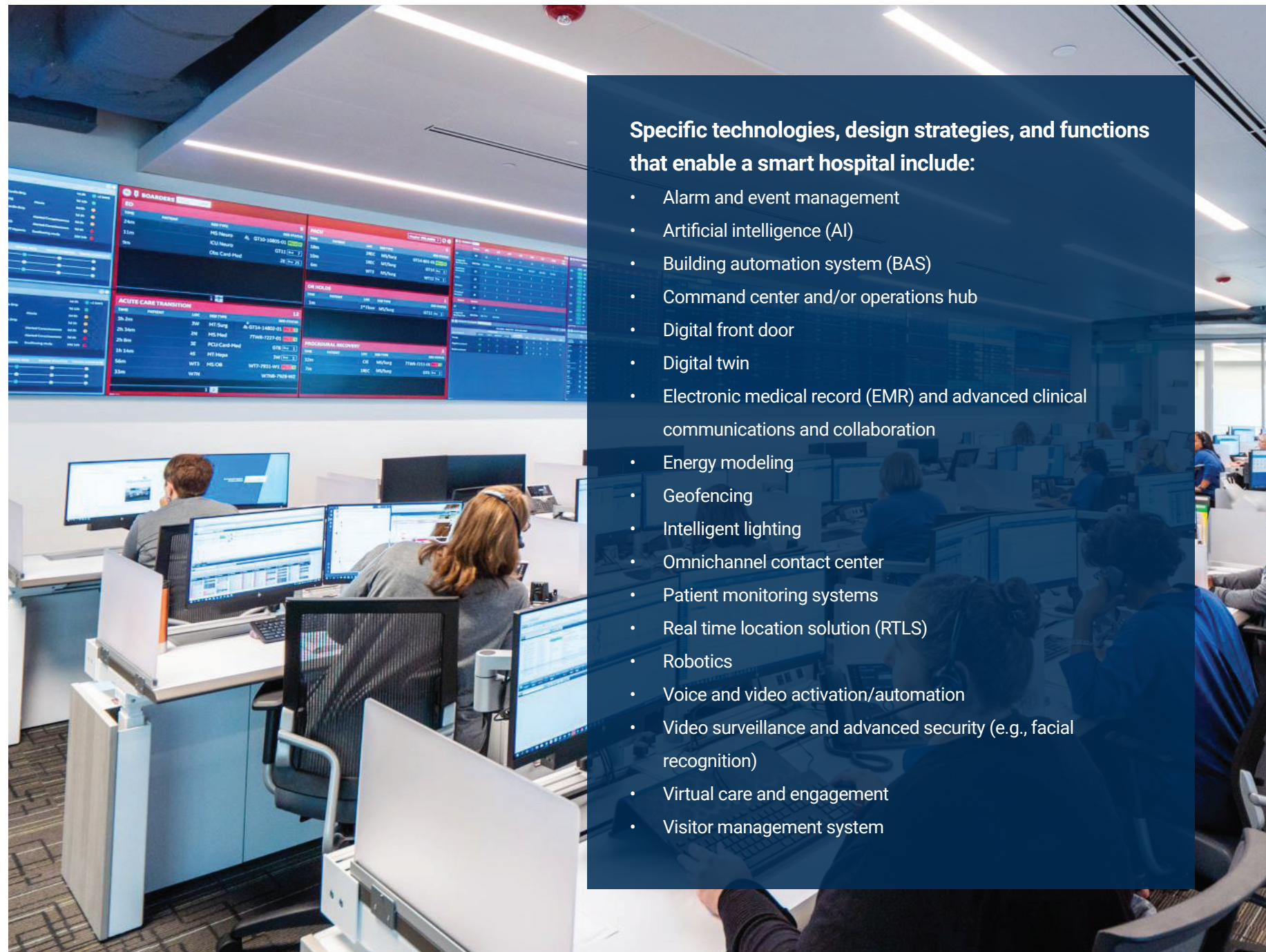
“Healthcare will require a cloud-enabled platform approach to address multiple compelling events—increased disease burden in population, aging population, population decline (workforce crisis), workforce skilling, and healthcare costs that can no longer scale.”



says Antoinette Thomas, MSN, RN, NP, Chief Experience Officer and Industry Advisor for Microsoft’s Health and Life Sciences. “This will require central observability to support the future of healthcare—Healthcare 2.0, which is essentially healthcare that is delivered beyond the four walls of a hospital and extend to the community, home, and relationships with payors and retail health.”

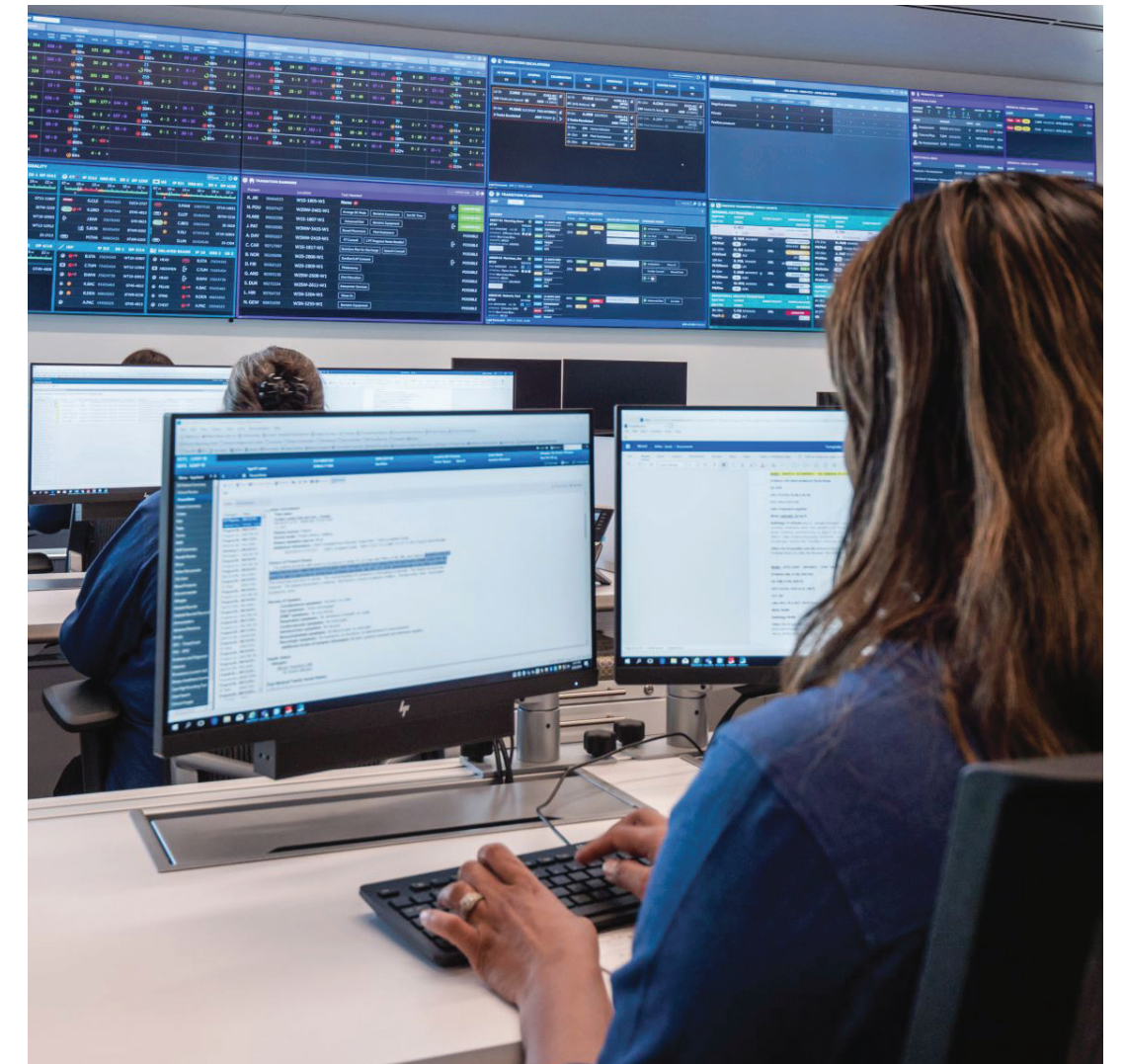
Meeting healthcare’s challenges through intelligent building strategies also is not solely the purview of new facilities in the planning stages. Existing hospitals can become intelligent as well through carefully planned renovations that include updates to key systems.

Whether a new or existing facility, any hospital aspiring to truly operate intelligently requires comprehensive interoperability



**Specific technologies, design strategies, and functions that enable a smart hospital include:**

- Alarm and event management
- Artificial intelligence (AI)
- Building automation system (BAS)
- Command center and/or operations hub
- Digital front door
- Digital twin
- Electronic medical record (EMR) and advanced clinical communications and collaboration
- Energy modeling
- Geofencing
- Intelligent lighting
- Omnichannel contact center
- Patient monitoring systems
- Real time location solution (RTLS)
- Robotics
- Voice and video activation/automation
- Video surveillance and advanced security (e.g., facial recognition)
- Virtual care and engagement
- Visitor management system



and communication among all building and clinical systems (including clinical engineering, security, and facility operations). This is made possible through thoughtfully chosen design strategies and equipment and a variety of state-of-the-art technologies.

Regardless of how a healthcare organization chooses to define its smart hospital, which technologies it includes, and how it is designed and built, the goals are the same: Attain the greatest operational and clinical efficiencies, offer a state-of-the-art working environment for staff and caregivers, and provide optimum experiences and outcomes for patients.

This executive guide focuses on the journey toward a smart hospital, the best practices for executing and sustaining such a facility, and how to get started.



## Creating your vision

Designing and implementing a smart hospital should not be driven by technology. Rather, the journey—which takes years to complete—should be guided by a carefully developed vision of the ideal patient, family, visitor, and care team experience. Then, and only then, can the appropriate technologies that enable the vision and experiences be identified.

“The future of clinical care is not just about devices and applications exchanging data; it’s about creating a connected ecosystem where everything operates in harmony,” says Troy Yoder, Global Industry Director of Cisco’s Financial Services and Healthcare. “By merging the control of the physical and digital realms into one digital twin, we give healthcare professionals a new kind of superpower, turning the physical facility into an active participant in care delivery.”

Having the proper framework and structure in place is critical for envisioning, implementing, and supporting your smart hospital—as well as for collecting and acting on continuous feedback throughout the journey. Several key steps include:

**1.** Establishing a multidisciplinary team of champions to identify key criteria for success, scalability, and sustainability. The team must include patient/care team advocates, IT personnel, facilities and operations staff, security staff, supply chain personnel—i.e., representative members of any group that will have a touchpoint on the facility or the care it will provide. This team will identify, through an envisioning process, the metrics that will lead to the development of the organization’s smart hospital vision and, in so doing, set the stage for improving patient and staff experience metrics (such as HCAHPS and Press Ganey/Gallup) as well as operations



and workflows tied to regulatory requirements (such as The Joint Commission and Centers for Medicare and Medicaid Services).

**2.** Identifying guiding principles that align with clinical and operational metrics. This in turn can drive key technology themes such as health equity, staff optimization, patient and care team experience, artificial intelligence, and operational efficiency. During the visioning process, the team should:

- Gather available data from various inputs and decide how to leverage the data to address the problems or goals you are trying to accomplish. This identifies where your organization is, what should be improved, how it will be improved, and how the improvements will be monitored.
- Assess and maximize current investments relating to vendors, solutions, or consulting relationships. (Many times, organizations forget about existing relationships or resources until there is a catalyst to make a change.)
- Understand that there isn’t just one vendor or solution and all must collaborate, integrate, and be aligned with the healthcare organization’s goals.

- Challenge vendors to achieve the targeted goals. (Organizations should not be afraid to cut ties with vendors who are risk averse.)
- Consider working with outside organizations or consulting firms as the intelligent building landscape is continuously evolving. The [Healthcare Information and Management Systems Society](#) (HIMSS) offers several resources for optimizing data and technology, while [WiredScore](#) and [UL Solutions](#) provide guidance on achieving their smart building certifications—[SmartScore](#) and [SPIRE](#), respectively. IMEG’s healthcare and building intelligence experts, meanwhile, can provide services from visioning through design, testing, and operations.

**3.** Developing clinical and operational use cases and testing them in a controlled environment to ensure change management and adoption strategies. The use cases should start simple in a “crawl, walk, run” approach to help build the baseline and prove success. They also can tie to divergent goals such as energy consumption and bed management. Leveraging both building and clinical metrics to expedite the discharge process and turnover is one example of what an integrated smart hospital can achieve.



**4.** Creating a plan that establishes a path for design and budgeting, identifies key milestones, and executes the use cases. The plan also should clarify how to define and measure success, execute change management practices, and identify the team members best suited to champion specific efforts—e.g., integrated technologies, operational models, etc. This high-level, “crawl-walk-run” roadmap sets the stage for the future but also identifies first steps/near-term applications and celebrates early successes to build excitement and get people on board. It should also be a fluid document that can change as the organization adapts to lessons learned.

With a smart hospital vision and plan in hand, a healthcare organization can continue forward on its journey and benefit from what the National Institutes of Health describes as [“new value and insights on patient safety, quality of care, cost-effectiveness, and patient-centeredness.”](#)

Above all, the envisioning team should keep an open mind and embrace the art of the possible. (For an example, see “A Day in the Life of a Smart Hospital,” at right.)



## Testing and executing your vision

With a vision and plan fully developed, your healthcare organization can now begin to test the various use cases and operations through virtual reality simulations and mock-ups—e.g., a smart patient room, visitor interaction, etc. Testing, evaluating, and proving concepts and operational models is critical for risk avoidance—especially for improving existing facilities. Such “proof of concepting” of identified technology, combined with innovation and integration, can take “blue sky visioning” and make it happen—before spending the allocated money and resources on construction. (Read the “IMEG Labs” sidebar on page 5.)

Don't underestimate the challenges and opportunities of technical and operational integration—and remember that technology is not the only solution. Test, test, and retest, and leverage continuous process improvement to arrive at solutions that make sense and are user-friendly. You also can extract adaptable solutions from other industries that have succeeded in aiding their consumers along their



# A Day in the Life of a Smart Hospital

A smart hospital does not operate in a “silo” mentality. Rather, all systems and technologies are completely integrated and operate holistically. To illustrate use cases for several of the typical technologies and practices, here's how a day-in-the-life of a smart hospital could unfold.

**7 a.m.** Before leaving home, the hospital's facilities director views the critical facility systems report on his smart phone and sees that all are functioning correctly. Once in the building, he notices the hospital census is high, and knows that the building automation system (BAS) is adjusting for the different occupancy levels of each room, as well as for patient needs.

**10 a.m.** A community resident is bringing her ill husband to the hospital and uses the facility's app to alert the staff of his symptoms prior to their arrival. The app also offers turn-by-turn directions from her home to the ED department entrance and uses geofencing to notify the patient command center that the couple is on their way.

**Noon:** A surgical team prepares an interventional suite for a scheduled procedure and identifies and scans the needed kits. The scan reconciles the serialized tray with the sterilization management and inventory system and associates the tray and contents with the patient's EMR.

The surgical director leverages the AI platform to quickly assess the status of ORs and suites for staffing and status of cases and cleaning.

**2 p.m.** The facilities director views the hospital's digital twin on one of several monitors inside the operations command center. The digital twin is always working in the background to provide advanced system analytics, fault prediction, performance optimization, and simulation modeling for possible and forecasted events. This modeling capability helps the hospital best respond to high-impact events, like pandemics, mass casualty situations, and power failures.

**4 p.m.** An influx of visitors occurs at the end of the afternoon. Digital wayfinding signs and color-coding helps them find their way through the halls and corridors, where unnoticeable weapon detection technology assists security in keeping everyone safe.

**6 p.m.** A code blue alarm sounds on the sixth floor. The hospital's real-time location service (RTLS) identifies the nearest care team members, alerts them to the location of the event, and, if needed, holds the nearest elevator for them to quickly get to the patient's floor to provide intervention.

much different journeys—Disney and Apple, for example, as well as the airline industry as mentioned earlier.



Remember, however, to keep health equity front and center; different levels of adoption exist for various population demographics, and not everyone has a cellphone. The individuals and teams responsible for specific tasks, goals, and integrations will earn their stripes as they navigate through this critically important phase of the journey.

This also is a good time to engage your marketing and patient advocacy staff to communicate, internally and externally, the “what” and the “why” of the healthcare organization’s journey.

Sharing the progress and successes along the way builds buy-in from the public and encourages continued embracing of the journey by staff, all of which helps to sustain the overall effort.



IMEG Labs provides early validation of the technologies and integrations that have been specified for new or renovation healthcare projects—before technology is replicated, purchased at scale, and installed. This provides risk avoidance as owners strive to deliver smarter environments by pushing the envelope with existing technologies and developing new ones when necessary.

Our third-party, vendor-neutral team includes experts in IT, clinical, and facility systems integration, application development, and testing, as well as building intelligence. Services include technology development, testing, and demonstration for clients at our workshop in Chicago. IMEG Labs can validate the technology and smart integration of facility operations and security systems as well as healthcare-specific systems including:

- Smart patient rooms
- Smart operating rooms
- Patient engagement and monitoring
- Clinical command centers
- Visitor management
- Nurse call

Our experts also are capable of innovating technology solutions that a client has envisioned but that are not yet otherwise available on the market.



## Measuring success

There are many ways to measure success in healthcare, but the key is always rooted in data. This could be empirical data or just general feedback from all aspects of the journey. Specific approaches to mining various types of data and measuring success include:

- Revisiting the goals of the journey as defined from the start and looking for related outcomes. This can include examples of meeting themes such as improving health equity, improving operational efficiencies, enhancing safety and security, or embracing technology.
- Logging narratives of the intangibles—for example, a care team member who was able to engage with a patient virtually.
- Measuring against healthcare’s many benchmarks, such as HCAHPS or quality metrics. Even the

slightest improvement when leveraging a smart experience is a win.

- Collecting personal perspectives of the patients, their families, and their care team members. What were their experiences, outcomes, and, overall, how did they feel?

As mentioned before, celebrating successes is vital for boosting your healthcare team’s confidence and keeping them motivated. At the same time, however, acknowledge where you are coming up short. It’s OK to fail if you learn from your shortcomings and work to find ways to be successful. This is where innovation can lead to new solutions and, eventually, success.

Above all, understand that measuring success is ongoing and requires continuous improvements over time, guided by the team that began the journey.



## Getting started

The journey of planning, designing, and building a smart hospital, or renovating an existing facility, is a huge undertaking. Having a carefully developed vision and plan and a dedicated team of stakeholders makes it less daunting and more achievable—and you may discover that you already have some tools and resources at your disposal.

Seeking outside help and advice from peers, consultants, and other healthcare experts is also critical and invaluable, as is keeping up to date with the latest developments in the industry. The needs, technologies, and delivery of healthcare continue to change, and it is vital to be prepared and able to pivot and adapt as needed during your journey.

Keep in mind, too, that creating your smart hospital is a multi-year effort and the journey needs to continue long after the hospital is designed, built, and functional. Establishing an on-site innovation and simulation center is a powerful and effective way to keep up with continual change and advancements in patient care and integrated technology.

Ensuring that your hospital is built and designed to be smart and has the infrastructure, flexibility, and processes to continually adapt will provide the highest return on your investment. More importantly, this approach will lead to the best working environment for your facility and healthcare personnel—and, above all, the best experiences and outcomes for your patients.

## Learn more

IMEG's healthcare, technology, and building intelligence experts provide a full range of services for the development of smart healthcare facilities—from envisioning to design, testing and validation, construction and activation, monitoring and continual innovation.

Contact the authors for more information.



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## Related reading and listening

Podcast: [Data is the key to getting more help from your building](#)

Podcast: [Digital twin uses building data to model effects of system changes](#)

Blog: [Key considerations for designing a smart patient room](#)

Blog: [The digital front door: Make sure yours is open and engaging](#)

Guide: [Advancing the Quadruple Aim through data-driven decisions](#)



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