

Why interconnecting virtual and physical health care is a smart move

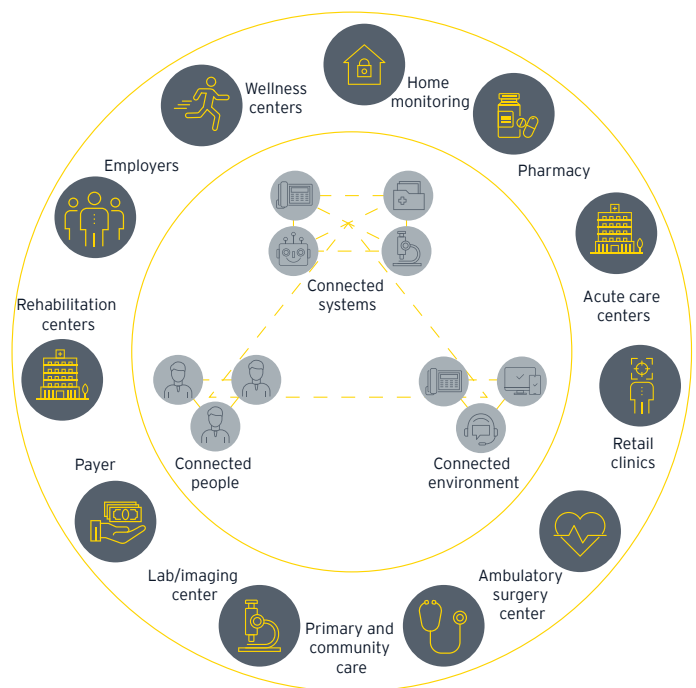
Interconnecting people, the environment and systems is where health becomes smart. Highly interdependent, one can't live without the other.

Technology-enabled innovation is accelerating the care models of tomorrow, many of which can only be imagined today. Technologies that enable, automate and engage consumers differently make possible a suite of new health solutions around well-being, remote care, smart homes and communities. Health care becomes about bringing care to the patient, rather than the patient to care, and this applies whether the person is at home, in the hospital, or anywhere in between.

But just changing information into a digital form falls far short of achieving the end goal of seamless and connected care. To move into the future, health systems and hospitals will need to become smart – highly technologically advanced and interconnected. Algorithms, through machine learning and artificial intelligence (AI), will create insight from aggregated user-generated and clinical data; robotics will reduce errors and improve reliability; and systems will be hyper-connected.

A new smart infrastructure will ultimately create a symbiotic relationship between the virtual and the physical (Figure 1). It is against this background that hospitals and health systems are looking to redefine themselves.

Figure 1: Decentralized anywhere, anytime care



Unbelievably smart

When highly advanced technologies make possible the care models of tomorrow that are only imaginable today, the result is smarter health care. To reach this state will require harnessing technologies for:

- ▶ **Smart health ecosystem transformation** to bridge the information and communication gap between different stakeholders and care settings. This includes bringing together the right partners, defining collective and individual relative value, and adopting partnering principles to support seamless integration, data flow and scalability. This will result in better continuity of care, better care outcomes, and reduce overall system cost through minimizing duplication and waste. Overall, this will accelerate the shift from sick care to preventative and wellness-oriented care.
- ▶ **Smart hospital transformation** aims to deliver efficient and effective operations within the hospital setting and to extend care beyond the hospital to connect and coordinate hospital-at-home care and well-being. This includes embracing automation, removing non-value-added activities, and adopting an evidence-based, data-driven analytical mindset for strategic planning and operational decision-making.
- ▶ **Smart experience** seeks to transform and modernize the end-to-end consumer and workforce experiences. By building trust, demonstrating empathy, and understanding patients' and employees' preferences, values, behaviors and needs, health institutions will realize stronger engagement and higher stakeholder satisfaction, as well as ultimately better health outcomes.^{1, 2}

As we build a combination of physical and virtual spaces, everyone and everything are connected. Embedded sensors in objects connect buildings and spaces, allowing control of the physical environments and easy location of equipment, materials and personnel. Connected systems collect, process and distribute data. This allows for real-time intelligent decision-making about people, the physical environments and systems. In addition, user experiences are enhanced by seamlessly integrating information sources and having them available across many devices.

A digital backbone will underpin the smart health care system. This is a system-level infrastructure architecture that serves a three-part purpose: safe clinical care, appropriate automation of clinical and back-office operations, and the delivery of personalized care and prevention. Core information systems, such as EHRs, imaging and laboratory systems, all form part of the broader data ecosystem.

Building blocks of the digital backbone

- ▶ **Accessibility** – to deliver the right care at the right time to the right person
- ▶ **Integration** – where data are discoverable, liquid and able to be acted on, allowing for participatory, preventative and personalized care
- ▶ **Intelligent** – where AI and analytics turn complex information into usable insights and new solutions
- ▶ **Scalability** – able to extend across an entire population seamlessly

Redesigning the way that services are delivered will transform how care is organized and experienced. Better alignment with consumers' expectations and preferences brings a clear recognition that consumer and clinician experiences matter.

“

Digital technologies are now part of the DNA of everything that we do in health care. What we once thought of as happening behind the scenes is now central, as health care information architecture evolves into a highly interconnected health ecosystem built upon data liquidity.

Rachel Dunscombe
CEO NHS Digital Academy

Four key features of smart health systems

1. Anytime, anywhere care through a decentralized, interconnected system

Health care will become further decentralized, as virtual care consolidates as a core service delivery platform in a digital-first delivery model. Taking advantage of the full scope of digital technologies to scale across health systems allows for new and alternative models built around very different ways of accessing care.

Technology underpins alternative care models

	What this means	What this delivers
Hub and spoke	A smart hospital is the anchor in a hub-and-spoke model, connecting both traditional and nontraditional sites of care.	Hospitals form part of a larger system of ambulatory, retail, virtual, home, community and social care connected through platforms and virtual technologies.
Virtual care	Virtual hospitals: Bed free and technology rich, clinicians treat patients remotely, monitor vital signs and health status, and provide expert advice to patients and health professionals alike.	Patients are cared for in their local communities, saving time and travel. Scarce specialist expertise is available to those in remote and rural locations. A full spectrum of care is possible from e-ICU through to rehabilitation at home.
	Hospital-at-home: Acute care is provided at home through a combination of clinical-grade home technologies, remote monitoring and coordinated at-home visits.	Care for conditions, such as acute exacerbations of COPD or asthma and community-acquired pneumonia, have been found to be safely treated at a lower cost and with a positive impact on patient satisfaction. ^{3,4}
	Virtual consults: Telehealth platforms remotely connect patients and clinicians either by telephone or video.	Used extensively during the COVID-19 pandemic for triage screening of potential COVID-19 cases, acute visit and chronic condition management in lieu of or in addition to in-person visits, depending upon the clinical presentation. ⁵
	Remote specialist care: Use cases exist for a range of specialties, including neurology, psychiatry, ICU, nephrology, infectious disease management and radiology. ⁶	Clinician-to-clinician telemedicine can round out service gaps (for example, in psychiatry); bolster clinical capacity at adjacent, understaffed sites, as well as support health systems looking to extend their labor footprint beyond core campuses to broaden service mix and revenue opportunities.
Partnerships	Nontraditional players: Entrepreneurs, retail organizations, life sciences, medtech, communications and technology companies see opportunities in consumer-driven health care, potential market size and prospects for growth.	Alliances that blend the technical capabilities of one partner with the health care expertise of another thrive in a new environment of partnerships, alliances, new locations and a consumerist orientation. Health systems partner with retail clinics to offer virtual care or play a lead role alongside community groups in addressing the root causes of the social determinants of health (for example, through food and social housing programs).

2. Consumer and clinician experience

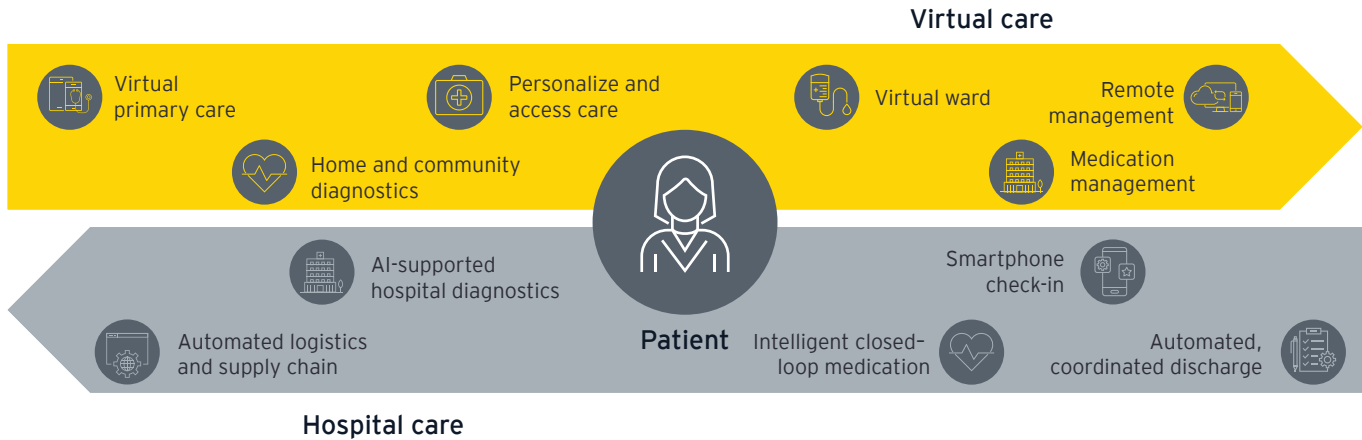
Smart hospitals place consumer experience (before entering the hospital, during their stay and after they leave) at the heart of their model design (Figure 2). In a smart hospital, the patient journey is reimagined as a digital-first experience. Through technology and automated features, patients are digitally

engaged at every major step of their health care journey. Starting with a digital front door, the consumer experiences highly personalized information and guidance and is directed to the optimal care setting.

The workforce experience is modernized through AI-optimized workflows, remote collaborations and training, and seamless data sharing in real time between locations and with other members of the care team. Prediction of health care outcomes of interest at the individual patient level enables providers to intervene earlier, with curative or preventative interventions.

Population health management and real-time data supporting operational decision-making at all levels become possible through AI-supported analytics. At the enterprise level, the organization itself, as well as the work culture, are transformed by the use of data and informatics that have not been previously available.

Figure 2: The end-to-end consumer experience



3. Highly technologically advanced and always connected

In a smart health system, technology intelligently enables the continuous improvement of processes, enhancing the patient journey, quality of care and overall efficiency. They are highly data driven – data moves across the system, eliminating

information silos and supporting the integration and alignment of care (physical, remote and virtual).⁷ Permissioned data sharing among all ecosystem partners enables a high-quality, efficient, convenient and precise health care delivery.⁸

Smart systems are:

	What this means
Clinically accurate	Research suggests that, in some domains, AI now has a diagnostic accuracy rate comparable to that of human physicians. ⁹ IoT and smart sensor technology collects and shares real-time data about patients, significantly improving patient outcomes.
Operationally efficient	Intelligent automation replaces high-volume, repetitive human activity and significantly boosts the overall productivity and accuracy of hospital care. Robots and drones replace error-prone human activity, enable new medical procedures, and improve speed and availability. ¹⁰
Preventive and predictive	AI can give an early warning of deterioration through predictive modeling of data from existing patient-monitoring systems. Several health systems in the US, Canada and Europe have established AI-powered command centers (much like air traffic control centers) that allow real-time monitoring of patients and help to synchronize care delivery, reduce errors and predict pressure points. ¹¹
Personalized and precise	Genomics and precision medicine, for example, enable an individualized approach to care, from the proactive diagnoses of illnesses using a personal genome to tailored wellness and prevention interventions.
Participatory	Oriented around the person rather than the care setting.

4. Sustainability

Futureproofing smart hospitals and wider health systems means a whole life cycle approach to the design and operations of facilities and services. Designing flexible and adaptable structures help them to remain fit for purpose over the long term and not only reduces the need for constant upgrades but delays obsolescence. Energy use, life cycle duration, pollution controls and reducing carbon footprints all shape the architectural and technical design briefs for smart health facilities. Rotterdam-based Erasmus Medical Center, Netherlands, for example, introduced an on-site anaerobic digestion system for medical grade hazardous materials, wastewater and nonbiodegradable items as part of its new hospital construction project.¹²

Moving to a hybrid care environment

Virtual health alone can't address the current challenges and drivers of health. It is the union between the physical and virtual worlds that will make a difference.

Becoming smart means integrating into the wider ecosystem and creating a virtual care platform that integrates data through interoperable patient record systems and digital enablers such as IoT, 5G, AI and remote monitoring. To sustain and capture value faster in this new model, the organizational culture of health systems will need to transition toward a more agile and responsive model. For some health systems, this transition will be a complete organizational transformation. For others, this will be incremental, targeting efficiency and patient experience improvement through digital enablers.

It is abundantly clear that the future of health is smart and that advances in smart technology, smart algorithms and smarter care models will shape the way care is delivered and experienced. This new frontier will enable us to deliver the right insights, to the right people, at the right time, leading to smarter, better informed and more cost-effective care for providers and patients.

Top questions for health executives

Executives and health care leaders should ask themselves several questions as they reimagine their smart health transformation:

1. Is your health system's operating model intelligent enough to respond to today's customer and clinician needs, let alone those of tomorrow?
2. How agile is your current health technology infrastructure, and will it be relevant five to seven years from now?
3. How are information standards and specifications defined and governed at the health sector level and integrated at the organizational level to enable the evolution toward a more connected health ecosystem?
4. Do your acquisition and procurement strategies reflect your need for interoperability, or are proprietary data models and expensive custom integrations holding you back?
5. How are you measuring and evaluating the usability factors of the technology you are considering? Maybe it is time to think about how to truly partner with technology innovation firms to realize the right products and features for your clinicians and patients.
6. Have you evolved the way that you are measuring outcomes and experience to align with your new hybrid care delivery model?

To get in contact with an EY Smart Health solutions team member, email smarthealth@ey.com. To read further EY Smart Health insights, visit ey.com/exploresmarthealth.

Contributors:

Emily Mailes | Director, Health Consulting, EY New Zealand

Sheryl Coughlin, PhD | EY Global Health Sciences & Wellness Senior Analyst

Ankur Sadhwani | EY Global Health Analyst

References

- 1 Jared Conley, Colin W O'Brien, Bryce A. Leff, Shari Bolen and Donna Zulman, "Alternative strategies to inpatient hospitalization for acute medical conditions: a systematic review," *JAMA Internal Medicine*, 1 November 2016.
- 2 Thomas C. Tsai, Ashish K. Jha, Atul A. Gawande, Robert S. Huckman, Nicholas Bloom and Raffaella Sadun, "Hospital board and management practices are strongly related to hospital performance on clinical quality metrics," *Health Affairs*, August 2015.
- 3 Scott A. Berkowitz et al., "Association of a care coordination model with health outcomes and utilization: the Johns Hopkins Community Health Partnership," *JAMA Network Open*, 2 November 2018.
- 4 David M. Levine, Kei Ouchi, Bonnie Blanchfield, Augstina Saenz, Kimberly Burke, Mary Paz, Keren Diamond, Charles T. Pugh and Jeffrey L. Schnipper, "Hospital-level care at home for acutely ill adults: a randomized controlled trial," *Annals of Internal Medicine*, 21 January 2020.
- 5 Judd E. Hollander and Brendan G. Carr, "Virtually Perfect? Telemedicine for COVID-19," *New England Journal of Medicine*, 30 April 2020.
- 6 "Telehealth for acute and chronic care consultations," *Agency for Healthcare Research and Quality website*, accessed 16 July 2020.
- 7 "Interoperability roadmap: accelerating the shift to a fully interoperable health ecosystem – Wellington," Ministry of Health, New Zealand, September 2020.
- 8 "The Center for Medical Interoperability Technical Report. Foundational & Clinical Data Interoperability Overview," *Center for Medical Interoperability website*, accessed 1 October 2020.
- 9 Xiaoxuan Liu, Livia Faes, Aditya Kale, Siegfried K. Wagner, Dun Jack Fu, Alice Bruynseels, et. al., "A comparison of deep learning performance against health-care professionals in detecting diseases from medical imaging: a systematic review and meta-analysis," *The Lancet Digital Health*, 1 October 2019.
- 10 Zeashan Hameed Khan, Afifa Siddique and Chang Won Lee, "Robotics utilization for healthcare digitization in global COVID-19 management," *International Journal of Environmental Research and Public Health*, 28 May 2020.
- 11 Tanya Egbert and Emily Paxman, "Operational Command Centers 2018: An Underutilized Approach to Improving Efficiency and Outcomes," *KLAS Research website*, 18 December 2018.
- 12 "Simplifying hospital waste with bio-based disposables," *European Commission website*, accessed 8 October 2020.

About EY

EY exists to build a better working world, helping create long-term value for clients, people and society and build trust in the capital markets.

Enabled by data and technology, diverse EY teams in over 150 countries provide trust through assurance and help clients grow, transform and operate.

Working across assurance, consulting, law, strategy, tax and transactions, EY teams ask better questions to find new answers for the complex issues facing our world today.

EY refers to the global organization, and may refer to one or more, of the member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. Information about how EY collects and uses personal data and a description of the rights individuals have under data protection legislation are available via ey.com/privacy. For more information about our organization, please visit ey.com.

About EY's Global Health Sector

Across the world, health care systems and entities are under unprecedented pressure. Spiraling costs, exacerbated by aging populations and emerging market growth, are bringing newfound focus on value and outcomes. Mobile health and data analytics promise to revamp care delivery but are also bringing in competitors from other sectors. For governments, payers and providers, these trends create a host of challenges: extracting insights from "big data," partnering in new ways, boosting operating efficiencies and more.

EY's Global Health Sector brings together a worldwide network of more than 10,000 sector-focused assurance, consulting, strategy, tax and transaction professionals with a range of health care and business backgrounds. Our wide-reaching network allows us to rapidly share leading practices and solutions around the globe and deploy diverse delivery teams to meet your needs. ey.com/health

© 2020 EYGM Limited.
All Rights Reserved.

EYG no. 007835-20GbI
2006-3519001
ED None

This material has been prepared for general informational purposes only and is not intended to be relied upon as accounting, tax or other professional advice. Please refer to your advisors for specific advice.

ey.com