

White paper

This changes everything

The COVID-19 pandemic leads to a significant acceleration of digitalization in healthcare

Siemens Healthineers
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Executive summary

The COVID-19 pandemic has placed unprecedented stress on health systems around the world. It has also accelerated adoption of digital technologies. We will see higher investments than pre-pandemic levels in digital technologies used for customer-engagement, care coordination, enabling a remote workforce or telemedicine. Telemedicine, already undergoing rapid growth,¹ has quickly become a key tool for both preliminary COVID-19 screening and also for non-urgent care and consultations.

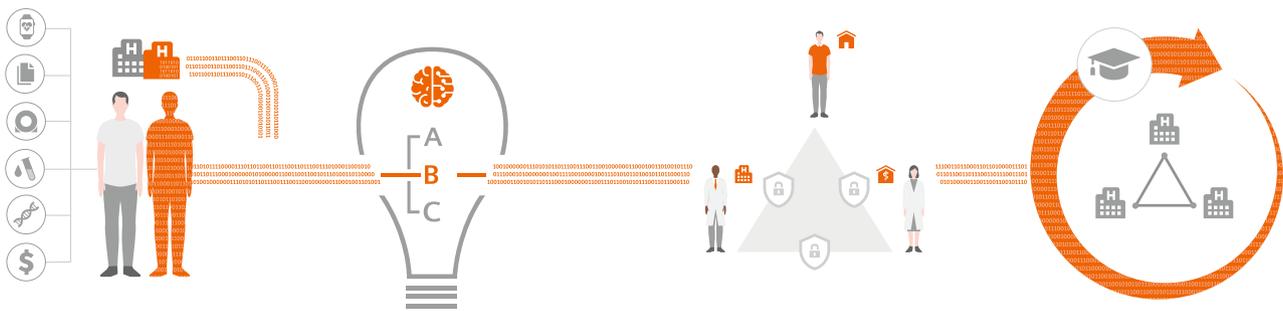
We expect that use of technology-based solutions will continue to grow after the immediate threat of COVID-19 has waned, as patients, providers, and payors alike discover the benefits of virtual forward triage and Electronic Intensive Care Units (eICUs), remote care, home monitoring, and digital communications. Healthcare systems must prepare for this tectonic shift now, even as they cope with the strains imposed by the COVID-19 pandemic.

An effective shift towards building a digital enterprise requires a commitment to manage data as a strategic asset. Health systems have to integrate data from multiple

sources, like wearables, imaging, diagnostic laboratory, genetics, social determinants, and payors, on secure and easily accessible data platforms. Reliable and secure data together with advanced modeling and AI empowers data-driven decisions within a health system – be it in the clinical or operational space, or even directly helping consumers to make the right decision in their care.

But data and digital technologies can be also used to better connect care teams and patients, bridging the physical separation between them and unifying fragmented systems of care. Along these lines, healthcare providers will embrace the concept of “moving information, not patients.” Home monitoring and secure tele-consultation technology will enable some patients to receive hospital-quality care at home; this shift to home care will be enabled by digital decision support tools that can more accurately identify candidates for home-based outpatient care. Through remote care and telehealth, patients will gain more transparency into their own care, and become more active participants in their care, as well as in the prevention of disease.

Digitalizing healthcare – How to build a digital enterprise



<p>Manage data as a strategic asset</p>	<p>Empower data-driven decisions</p>	<p>Connect care teams and patients</p>	<p>Build a learning health system</p>
<p>Integrate accurate data from fragmented sources. Create a holistic understanding of patients and enterprise visibility with digital twins.</p>	<p>Leverage analytics, benchmark insights and use AI-companions to simplify workflows and to enable decision support.</p>	<p>Connect caregivers and patients for better coordination and knowledge sharing. Strengthen integrated care across the health system.</p>	<p>Continuously optimize, expand and advance digital adoption, enterprise performance and patient outcomes.</p>

Similarly, healthcare enterprises will learn how to extend the reach of their expert clinicians through services like teleradiology, which will give remote locations and stand-alone imaging clinics access to teaching hospital-quality care. Clinicians will be able to collaborate and share information productively in virtual spaces, reducing information loss during care transitions, and without the time, expense, and – in the age of COVID-19 – the risk of travel. Throughout these changes, data security and patient confidentiality must be preserved.

The digital transformation can be only successful and sustainable if healthcare leaders move beyond adopting technology solutions and begin to transform their institutions into learning health systems. This is a vital development for the future of healthcare, and one that will prepare providers to respond to new COVID-19 outbreaks or other infectious disease events. How? By including data and technology that is easy to use and frees up the time of caregivers, by establishing an organization committed to digital transformation, and by rigorously measuring and disseminating patient outcomes. Measuring outcomes is the basis for course correction and makes it possible to scale the right measures toward continually optimizing, expanding and advancing enterprise performance. The learning health system will be better prepared for both “routine” care and for extraordinary circumstances like COVID-19.

Digital transformation of healthcare is inevitable; COVID-19 has merely sped up the timeline and underscored the need. This transformation isn’t easy; challenges to successful digital transformation include low quality of data, an inability to securely and conveniently access operational and clinical data, low interoperability of systems, and the fragmented care systems in place in many countries. The greatest challenge, though, may stem from a lack of understanding of the ongoing commitment that is necessary for successful digital transformation. COVID-19 has highlighted some of these challenges, but it has also spurred healthcare enterprises to meet these challenges head-on as part of a comprehensive response to the pandemic.

Enduring value-generating partnerships between healthcare providers and medtech companies can help provider organizations leverage technology to upgrade their organizations both in the near term, to better cope with the urgency of the pandemic, and in the long term, by investing in strategic digitalization efforts. In collaboration with medical technology partners, healthcare enterprises can create more value for stakeholders and deliver meaningful improvements in clinical and financial outcomes.

COVID-19 has accelerated digitalization trends

Telemedicine has been in the spotlight due to the COVID-19 pandemic and the social distancing measures put in place by governments around the world. But a movement toward digitally-enabled remote care had been slowly taking shape and gathering momentum before the pandemic struck.

A review of U.S. claims data revealed that use of telehealth services increased by 624% from 2014 to 2018, albeit from a low baseline rate.¹ Remote monitoring was also on an upward trajectory, with Grandview Research projecting (pre-COVID-19) an annual growth rate of 13.5% through 2026.²

COVID-19 has indeed changed the face of medicine. Telehealth became the norm virtually overnight at many institutions; one institution reported an increase in the share of telehealth visits from <1% of total visits to 70% of total visits, reaching more than 1000 video visits per day in just 4 weeks.³

Digitally-enabled care delivers positive outcomes

Overall, there is substantial evidence that home-based telemedicine reduces care costs in a number of chronic conditions including congestive heart failure and diabetes.⁴ When done well, telemedicine can also deliver patient satisfaction that is at least equivalent to in-person care.⁵ There will always be a role for in-person care, but the benefits of telemedicine and remote monitoring point to sustained growth in their utilization in the coming years.

Remote monitoring has also emerged as a driver of positive health and financial outcomes. For example, remote monitoring of implanted cardioverter defibrillators is a cost-effective way to reduce morbidity and mortality.⁶ Other benefits of remote patient monitoring include delivery of health data to clinicians in real time, improved quality of life for patients, and reduced healthcare costs.⁷

The need for strategic digital transformation

When the safety concerns that are driving the current meteoric rise in telehealth utilization subside, patients' expectations for telehealth quality will rise, and they will flock to healthcare providers who deliver a high value patient experience. "As a provider, you have to get it right the first time. If a patient has a poor initial telemedicine experience with a provider, no matter how good the care they provide is, the patient is going to go somewhere else," said Asif Shah Mohammed, a Principal at ECG Management Consultants of the Washington DC office.

The time has come to think about how to implement telehealth services ranging from outpatient care to sophisticated telesurgery services in an effective, patient-centric way.

But digital transformation of a healthcare enterprise goes well beyond the kinds of decentralized care that have risen to prominence during the COVID-19 pandemic.

Indeed, telehealth and remote monitoring services can be seen as merely the tip of the iceberg that is digital transformation.

Digitalizing healthcare requires profound changes in the way healthcare systems operate. This change begins with prioritizing collection and analysis of validated data on both the individual and population level. Provider organizations will need to make substantial investments in IT infrastructure and digital tools to remain competitive. Key among these investments is adoption of AI-powered clinical decision support tools, which can enable data-driven decision making among clinicians, administrators, and even patients.

True, sustainable digital transformation goes beyond adopting new tools and technologies. It requires a culture change and re-orientation around more data-driven care models. Simply digitalizing current processes and procedures won't be enough; healthcare providers, medTech companies, government agencies, payors and patient advocates will have to work together to sustainably deliver seamless digitally enabled care across a wide variety of care settings. Realigning organizations around data-driven, digitally enabled processes and care models is paramount to the long-term success of healthcare enterprises. The following pages include some key steps healthcare organizations can take to accelerate digital transformation for success in the era of COVID-19 and beyond.



What has changed:

- Widespread adoption of telemedicine and remote care experiences
 - Move toward decentralized care accelerated
 - Decentralization of testing and greater emphasis on point of care solutions
 - Remote workforce enablement, e.g., remote patient monitoring, remote operation of devices
 - Recognition of need to become a data-driven enterprise
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Key steps toward digitalizing healthcare

1 Manage data as a strategic asset

Data is the foundation of a digital healthcare enterprise. Data has become a hospital’s most valuable asset – and one of the most challenging to manage. Providers struggle with setting a strategic direction and collecting the right data from fragmented data sources with low interoperability. Analyzing poor-quality data may result in conclusions that are ineffectual or incorrect. Healthcare systems should follow four steps to fully leverage data: The first step is to set a data strategy including the identification of clinical and operational use cases and defining data models managed by data governance departments. Both clinical data and operational data should be collected with specific goals in mind. Innovative institutions like Mount Sinai Health System in New York have taken up this challenge. Mount Sinai recently named its first Chief Data Officer, a move that will promote data access and sharing, and innovation throughout the organization. The creation of a comprehensive imaging research warehouse to give researchers access to imaging and EHR data on more than a million patients is representative of Mount Sinai’s drive to leverage the power of clinical data.⁸

A key barrier to digitalization is the act of data entry itself. Capturing data securely and validating data automatically is the next step in managing data as a strategic asset. Some institutions are piloting use of voice assistants to simplify and automate data entry. Others, like Bumrungrad International Hospital in Bangkok, are working with partners to automate integration of multiple data sources in order to develop personalized treatment regimens.⁹

Collecting data is only half of the story. That data has to be connected to secure and easily accessible data platforms from fragmented sources – Community Health Systems, a leading operator of general acute care hospitals in the U.S, is increasing interoperability and patient data access by making user-friendly digital health records available via mobile devices at more than 100 affiliated hospitals in the U.S.¹⁰

Reliable and secure data as basis for better decision making

Reasons data is not fully leveraged:



Limited strategic direction



Limited data access



Low-quality data



Fragmented sources/ low interoperability



Set data strategy and establish governance



Capture data securely and automatically



Validate data via automated clean-up



Connect data via secure accessible platforms & EHRs



Reliable and secure data for better clinical and operational decisions

Steps to create smart data management

Around the world, health systems are devising novel ways to integrate accurate data from fragmented sources and use it to create a holistic understanding of their patients and their enterprise in order to inform clinical and operational decisions. This drive to manage data as a strategic asset is no mere trend – it is a crucial step to ensure long-term viability of healthcare enterprises.



What has changed:

- Pressing need for institution-wide data strategy
 - Increased volume of data generates more requirements for validation and security
 - Drive for secure connections to data to inform clinical and operational decisions
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2 Empower data-driven decisions

Longitudinal patient and person data together with enterprise-wide, real-time operational data is the basis for better decision making in health systems. Collecting and connecting high quality validated data enables development of three types of decision support tools: clinical, operational and consumer.

Clinical decision support tools help health systems make sense of the deluge of clinical and operational data they are confronted with. According to BJ Moore, Chief Information Officer of Providence St. Joseph Health, “...we can... use AI and machine learning to identify precursors for diseases” by parsing the volumes of medical data now available from imaging, genomics, health records, remote monitors and wearables, and other sources. AI is also useful in non-clinical contexts as well. Sheba Medical Center, near Tel Aviv, Israel, has developed AI-based tools with its technology partners to detect the presence and severity of coronavirus infection via sound and odor.¹¹

AI-powered tools are currently being developed and used to benchmark insights, provide clinical decision support and to optimize workflows. It is even possible that AI could play a role in detecting infectious disease outbreaks and preventing them from developing into pandemics. Success in this role depends on global cooperation to collect and share validated, trustworthy data.¹²

Operational decision support spans asset and fleet management (e.g., enterprise-wide utilization, protocol, image management) to workforce and workflow management (e.g., workload balancing and aggregated scheduling systems) to hospital and enterprise performance systems enabling centralized oversight for integrated patient journey management. Health systems like Health First, in Brevard County, Florida, are reaping benefits from technology solutions that help them make data-informed decisions. Since launching an initiative that combined IT solutions with lean management principles, Health First has seen a 300% increase in adult transfers, and a 37% decrease in time from ED admission and hospital bed occupancy.¹³

Digital simulations and AI support better decision making

Transform data ...

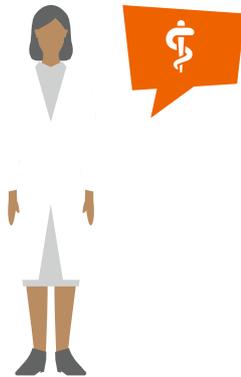


Longitudinal patient and person data



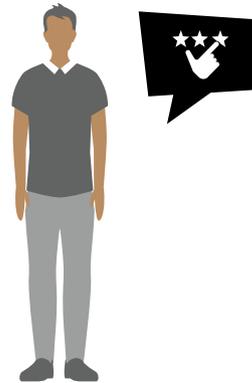
Enterprise-wide, real-time, operational data

... into insight for better decision making



Clinical decision support

- Prediction of intervention
- Therapy decision support
- Chronic disease management



Consumer decision support

- E-scheduling systems
- Personal health informatics
- Predictive wellness coach*



Operational decision support

- Asset and fleet management
- Workflow and workforce mgmt.
- Enterprise performance systems*

Consumer decision support will become increasingly important in the future. Mobile-based tools like e-scheduling systems, which patients use to book their appointments and get access to diagnostics and treatment, will passively adapt and refine their behavior based on patients' preferences. The next level in consumer decision support will be active decision support, like health informatics apps and dashboards for personal health data. In the near future, predictive wellness coaches may provide continuous advice to help patients adopt customized healthy behaviors using life-long patient data to prevent sickness. Stakeholders will come to expect this kind of tailored support, so it is vital that healthcare enterprises begin creating the tools and systems necessary to support it.



What has changed:

- Data-driven decisions more important than ever in COVID-19 pandemic and future infectious disease events
- AI-enabled technology will help predict and control future outbreaks
- Development of more health informatics apps and dashboards for personal health data management

*This feature is based on research, and is not commercially available. Due to regulatory reasons its future availability cannot be guaranteed

3 Connect care teams and patients

Health systems struggle with fragmented systems of care. Interoperability between hospital and primary care physicians’ data is often lacking. As a result, information during care transactions can be lost, access to the right clinician at the right time is variable, and patient data is not fully leveraged when developing care plans.

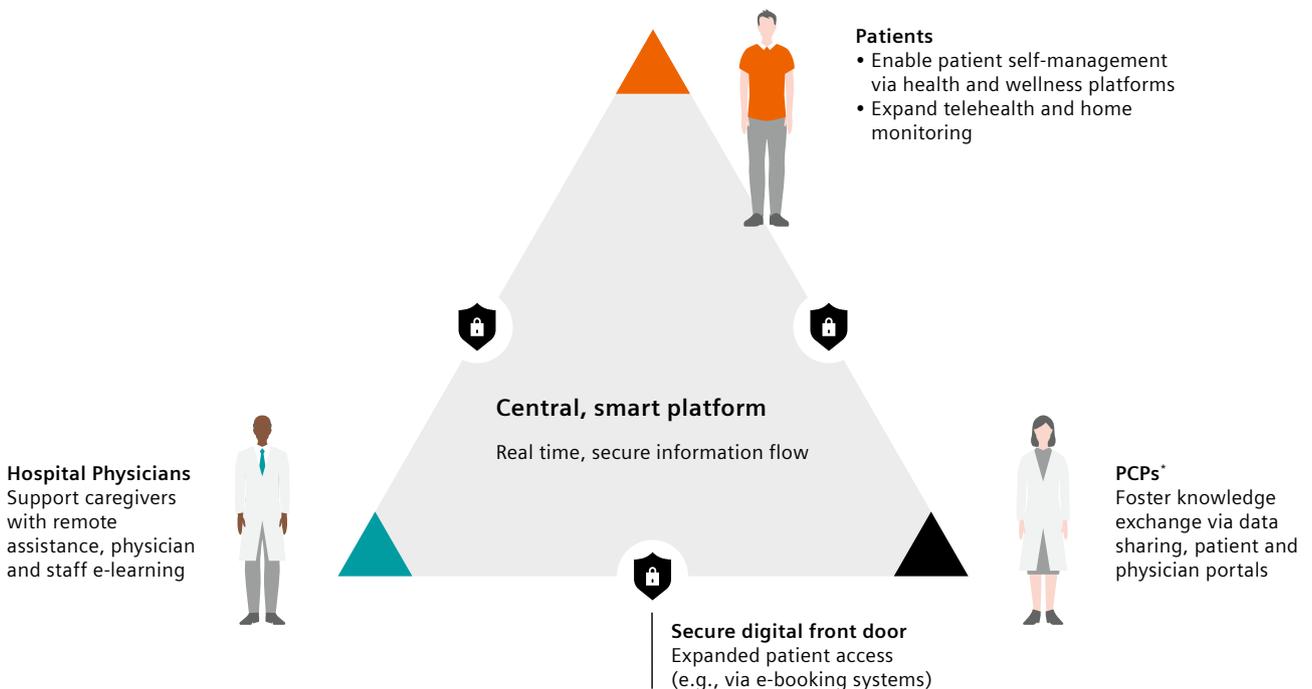
The COVID-19 pandemic presents a challenge to forging connections between patients and their care teams. Digitalization can help connect caregivers and patients for better coordination and knowledge sharing while strengthening integrated care across the health system.

The most important stakeholders are patients, hospital physicians, primary care physicians and other referrers. Healthcare providers will increasingly engage patients outside traditional healthcare settings, e.g., via tele-consultations and remote monitoring.

Mercy Health, which serves four states in the American Midwest, is a pioneer in advanced telehealth, with an eICU program that achieves outcomes like reduced mortality (25% lower than APACHE predictions) and shorter hospital stays. The eICU is part of a comprehensive virtual care center that serves as the hub for 75 telemedicine services.¹⁴ Innovations like this will continue to pay dividends after the initial threat from COVID-19 has waned.

Through digital technologies, it is possible for clinicians to provide care at a distance. Some specialties, including radiology and pathology, have already adopted technology to enable consultations from a distance. Telesurgery has become a viable way of providing access to highly specialized care from a distance. These applications of telehealth allow specific clinical expertise to be shared across a wider area, and help providers deliver vital services to remote or less developed areas where healthcare infrastructure is lacking.¹⁵

Towards effective integrated care and care continuity



* PCP: primary care physician

Connecting patients and care teams: Telemedicine

Standardization of image formats and the near-ubiquity of broadband internet connections have made telemedicine an established practice in both industrialized nations and developing countries. With radiologists in short supply, telemedicine brings continuous radiology coverage to even smaller or remote locations, allowing more patients to benefit from specialist care.

In addition, telemedicine services allow staff to perform complex or highly specialized scans that may not otherwise be available in their institutions by leveraging expert knowledge digitally.



syngo Virtual Cockpit is an IT solution from Siemens Healthineers that makes your experts' knowledge accessible across sites in real time. In cases requiring advanced skills, technologists can always call on an expert for live support.

Connecting patients and care teams: Telesurgery

Telesurgery relies on robotic technology and broadband internet connectivity to enable surgeons to perform procedures from a distance. While telesurgery systems have been on the market for the better part of two decades, the technology is maturing, with much improved latency and new innovations like haptic feedback giving surgeons a more "live" experience while operating robotic systems remotely.¹⁶

In these and many other specialties, tele-practice capabilities help deliver high quality care to more patients.

New paradigm for data security and patient privacy

However, the promise of telemedicine and other forms of remote care and monitoring must be balanced with the need for patient privacy and security. Government agencies in the U.S. issued a number of HIPAA waivers in the wake of the COVID-19, which had the effect of easing the sudden transition to telemedicine. The waivers made it easier for patients and physicians to communicate via existing, generally non-HIPAA-compliant platforms.¹⁷

This allowed healthcare providers to deliver telehealth services via Apple FaceTime, Facebook Messenger, Google Hangouts and other consumer communications



Corindus, a Siemens Healthineers company, has created CorPath, an innovative and outstanding robotic platform for interventional physicians. The CorPath system was recently used by an interventionalist to place a stent in a patient more than 30 km away – the world's first robotic-assisted coronary intervention.**

platforms. But these waivers do not free providers from their responsibilities to protect sensitive patient data. The rapid increase in use of telemedicine services highlights the importance of data security, and the sheer volume of data that must now be protected will provide a new challenge to healthcare systems. In the post-COVID-19 world, it will be vital for healthcare enterprises to develop and implement sound strategies for data security based on an increasing volume of telehealth and remote monitoring data. Partnerships with companies that understand the unique data security needs of health systems may help many institutions adapt more rapidly to this new normal.

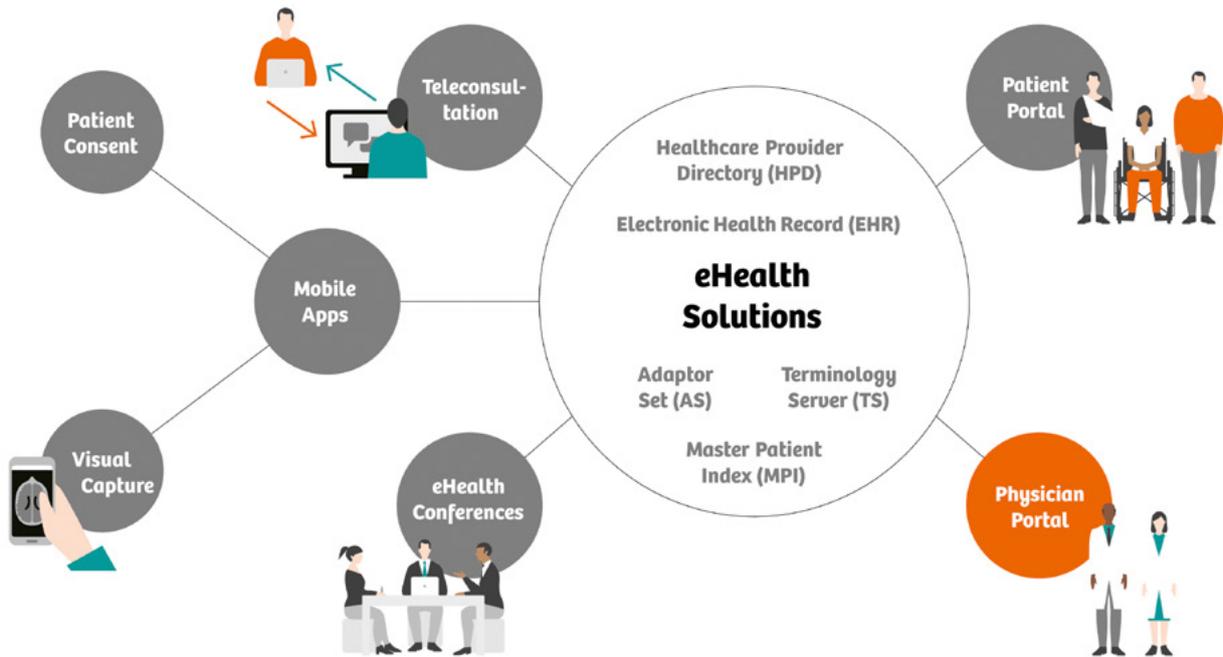
** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6833466/>

Finally, digitalization can help forge stronger, more productive connections within care teams and groups of colleagues. Health systems can foster knowledge exchange among primary care physicians and other referrers via data sharing, patient and physician portals. Far from the early days of online message boards, these virtual workspaces provide secure, user-friendly environments for far-flung clinical teams and colleagues to share best practices, increase productivity, and tackle complex problems. Extending the reach of clinical experts will be of paramount importance for health systems in the near future.



What has changed:

- Social distancing strains connections between patients and caregivers
- Acceleration of technology solutions will have positive impact on patient-caregiver relationship and patient experience



eHealth Solutions from Siemens Healthineers helps to create healthcare networks and connect healthcare providers to facilitate successful cooperation. It makes comprehensive medical data accessible to you, your patients, and all health professionals involved, no matter when or where they want to access the data. Please consider requirements like e.g. available internet connection.

4 Build a learning health system

Sustaining the digital transformation is a challenge for many health systems primarily because of a lack of commitment to both digital transformation and a culture of continuous improvement. These obstacles can be overcome through the creation of a learning health system (LHS).

A LHS leverages data and user-centric technology and frees clinicians from repetitive or time-consuming low-value tasks. Team-based care and care automation technologies, for example, enable distributed care delivery and automation of routine tasks, and deliver simple, intuitive user experiences.

Further, a learning health system requires leadership buy-in with joint targets, aligned incentives, and a commitment to transformation. Building the right organizational structures, including a dedicated team to support evaluation and learning activities throughout the organization, is another important lever for the shift to learning health systems.^{18,19} Institutions like Memorial Sloan Kettering Hospital, Kaiser Permanente, and Mayo Clinic have demonstrated their commitment to ongoing digital transformation by appointing their first Chief Digital Officers, a position that existed in only 6% of top global companies as recently as 2016.²⁰ The goal of these high profile organizational changes is to leverage digital technology to deliver more convenient, personalized, and affordable care.

Rigorous measurement and secure sharing of patient outcomes is the crucial third step of the learning cycle.

Multi-year patient data, Patient Reported Outcomes Measures (PROMs) data, social determinants, and patient preferences all must be measured and tracked over time.^{21,22,23} And most importantly, a learning health system should make outcomes transparent throughout the health system, using patient outcomes dashboards (for each clinician) that are regularly shared and reviewed inside the organization.

Measuring outcomes is the basis for course correction and makes it possible to scale positive changes toward continually optimizing, expanding and advancing enterprise performance. Patient and family engagement can give the right insights for setting up enterprise learning programs using improvement and evaluation trainings (e.g., lean, 6-sigma, qualitative, quantitative).

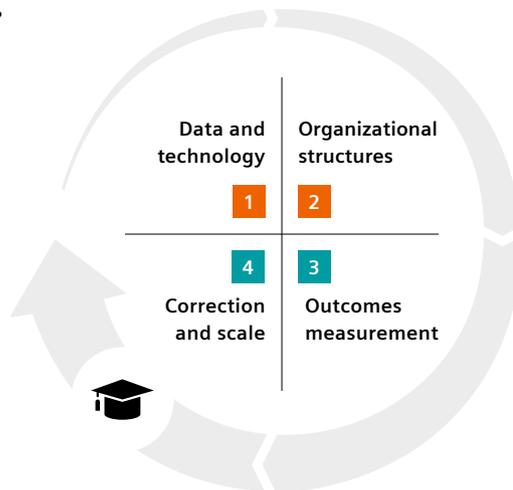
Geisinger Health System in Pennsylvania, USA, embodies the concept of a learning health system. Geisinger employs a system-engineering approach to continuously reduce variability and increase efficiency. Real world results include an algorithm that proactively identifies patients at high risk to miss an appointment. These patients receive a phone call prior to their appointment, resulting in a 24% decrease in no-shows.²³

Other healthcare enterprises have adopted methodologies, like agile development, to accelerate the pace of innovation and encourage data-based experimentation.

Fostering a culture of improvement

What is a learning health system?

A healthcare system that performs interventions, measures outcomes and course corrects based on evaluation of outcomes.



How do you create a learning health system?

- 1 **Leverage data and technology**
(e.g., decision support, care automation)
- 2 **Build organizational structures**
(e.g., value realization office, leadership buy-in)
- 3 **Measure patient outcomes**
(e.g., PROM*, transparency on outcomes)
- 4 **Course correct and scale**
(e.g., enterprise-wide learning program)

Degree of learning

This approach of continuous learning and refinement will be vital to success in combating future outbreaks of COVID-19 or other infectious diseases. A culture that adapts quickly to new data, especially in the face of a novel pathogen, will be better prepared for both typical clinical challenges and future pandemics than one that pivots more slowly.



What has changed:

- Health systems must be ready to pivot pandemic response rapidly in response to new data and analysis
- Culture of continuous improvement will remain after COVID-19 threat wanes

Conclusion

Digitalization is critical to success in managing COVID-19 and other infectious disease outbreaks. Many of the trends and technologies we have seen emerge during this pandemic – like telemedicine – have been developing for years, but have been thrust into the limelight since the emergence of the novel coronavirus.

Some processes and procedures were hastily adopted because of the pandemic, leaving substantial room for improvement. It is vital for healthcare institutions to consider long-term, strategic digital transformation now, in order to better serve patients in the future.

Because of the scope and complexity of digital transformation in healthcare, partnerships between healthcare provider organizations and medtech companies are vital to success. Medtech partners with broad and integrated healthcare portfolios hold particular advantages for healthcare enterprises that are ready to embrace digital transformation.

Siemens Healthineers is committed to forming enduring, performance-based Value Partnerships with healthcare providers. These Value Partnerships can include everything from technology management, to consulting and transformation, to design planning, to digital health, to operations management, and beyond. Perhaps most importantly, Siemens Healthineers has the know-how and experience to guide healthcare enterprises through digital transformation with strategic consulting to set a course for success, and change management and operational consulting services to keep the institution and its staff on that course.

Contact Information

Contact your Siemens Healthineers account manager to learn more about how Siemens Healthineers can be your partner for digital transformation.

Want to know more about strategic and transformational consulting partnerships with Siemens Healthineers?

Contact Value Partners for Healthcare Consulting:

 [siemens-healthineers.com/value-partners](https://www.siemens-healthineers.com/value-partners)

 consulting@siemens-healthineers.com

Contact ECG Management Consultants (for US and Canada only):

 [ecgmc.com](https://www.ecgmc.com)

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Enterprise Performance Systems / Patient Journey Management mentioned herein is under development and not commercially available. Due to regulatory reasons its future availability cannot be guaranteed.

The scientific overlay on the title is not that of the individual pictured and is not from a device of Siemens Healthineers. It is modified for better visualization.

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