HCA: How a Large Healthcare System Is Looking Beyond the Electronic Health Record

The Agency for Healthcare Research and Quality (AHRQ) has developed a series of case studies to help health system chief executive officers and other C-suite leaders better understand the concept of a learning health system (LHS) and the value of making investments in transformation. Building this understanding is part of the Agency's ongoing effort to accelerate learning and innovation in healthcare delivery in order to ensure that people across America receive the highest quality, safest, most up-to-date care.

AHRQ defines an LHS as one in which internal data and experience are systematically integrated with external evidence, and that knowledge is put into practice. As a result, patients get higher quality, safer, more efficient care, and health delivery organizations become better places to work.

No health system becomes an LHS overnight. Nor is the term "learning health system" widely used yet, even in systems doing this work. As this and other case studies show, becoming an LHS is an iterative journey characterized by strong leadership, effective use of data in the clinical setting, and both a culture and workforce committed to continuous learning and improvement.

Becoming an LHS is also increasingly an imperative in an era of health system transformation. There is growing recognition that "business as usual" is no longer a sustainable model. Driving this change are new Federal and private-sector initiatives to redirect incentives away from volume and toward a focus on value: better patient outcomes and quality at lower costs. This value-based care framework includes providing clinicians with strong, actionable data and tools —and identifying the right performance metrics to hold them and their teams accountable for their patients' care. This framework also includes breaking down silos between medical care and community services to prevent disease before it occurs and rewarding providers and health systems for results and not activities.

As more organizations look at value-based care and pursue their LHS journeys, those that do not rethink how they operate risk being left behind.

For HCA Healthcare, the journey to an LHS began to take shape in 2009 with the passage of new legislation to facilitate the electronic exchange of health information. HCA defines its LHS as committed to using data for continuous learning and the improvement of future healthcare.

This is HCA's LHS story.

Snapshot of the Health System

HCA Healthcare, headquartered in Nashville, is a for-profit health system serving patients in 21 States and the United Kingdom. The system includes 185 hospitals and 119 freestanding surgery centers and has more than 28 million patient encounters and 8.6 million emergency room visits per year. HCA has 249,000 employees, including 87,000 nurses and 38,000 physicians.

HCA adopted the LHS concept early on and committed to capturing and using its data broadly to improve patient care. Today, HCA is focused on using its data in increasingly sophisticated ways and has put in place the people and resources to ensure that learning and knowledge translate into better data and better care.

OPERATING IN **21** STATES

AT A GLANCE

HCA Healthcare

EMPLOYEES	LOCATIONS	PATIENTS
249,000 TOTAL EMPLOYEES	**185** HOSPITALS	**8.6M** EMERGENCY ROOM VISITS PER YEAR
38,000 PHYSICIANS	**119** FREESTANDING SURGERY CENTERS	**28M** PATIENT ENCOUNTERS PER YEAR
87,000 NURSES		
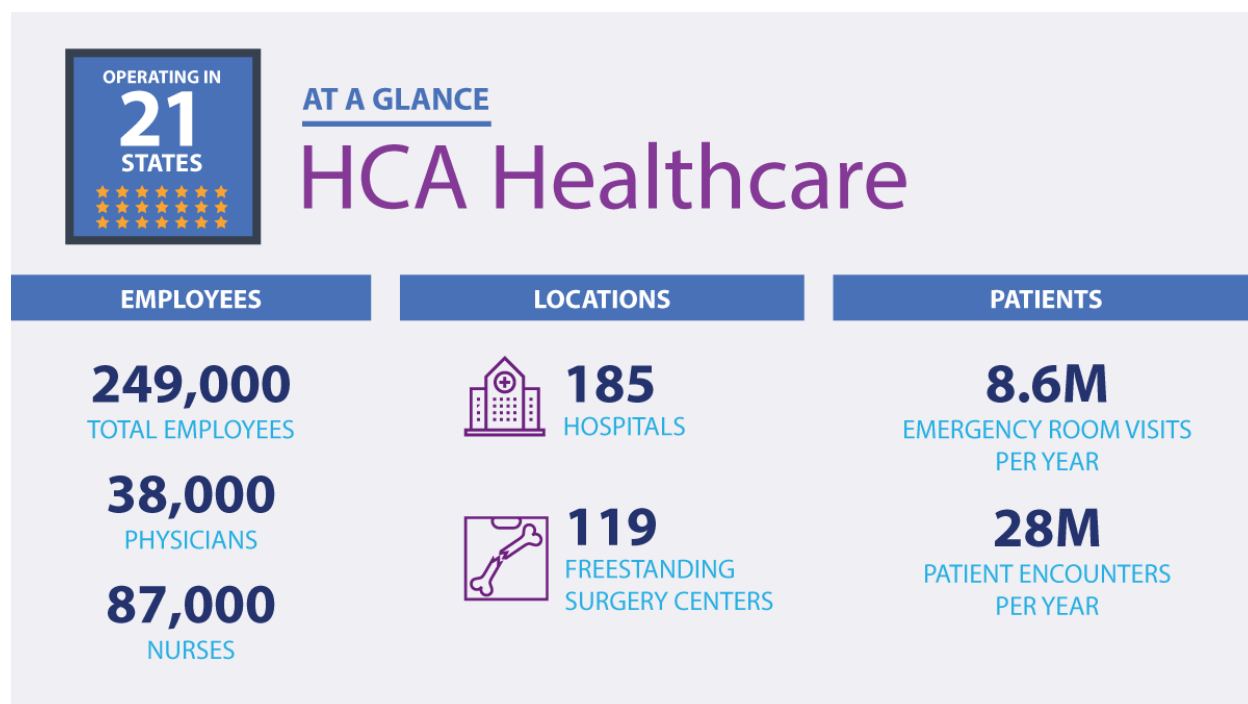
Making Significant Investments in Data Infrastructure

While every health system generates data, the amount and types of data available in actionable ways varies from system to system. The heart of HCA's approach is its belief that every piece of data generated helps to tell a story and can be used to improve everything from processes to patient care. As a result, the health system has committed to capturing data broadly and using that information to provide insights and generate knowledge. "Our data ecosystem goes far beyond the electronic health record [EHR]," says Jonathan Perlin, M.D., Ph.D., HCA's chief medical officer. "The EHR is just a transactional system within the larger information ecosystem."

For example, when a lab test is ordered for a patient with heart failure, it generates data. In addition to helping that specific patient, how else might these data—deidentified and aggregated—be used? Can the data inform care for other patients with heart failure? What can be learned about the context of the data, like where the blood was drawn, what time it was drawn, or where it was processed? By asking these questions, HCA is not only using data to address a patient's immediate need but also repurposing the data "byproducts" in a broader context to learn additional things to make the health system better.

"The EHR is not your information ecosystem. It's a transaction system, like your checkbook. Our data warehouse is our savings account, and it's bringing analytics to all the accounts that help us learn and make better decisions."

—Jonathan Perlin, M.D., Ph.D., Chief Medical Officer

HCA has a lot of data to work with: the health system has captured every clinical data element in its system since 2009. These data are contained in a clinical data warehouse that is linked to additional data systems housing discrete business functions such as human resources for the health system. Over time, HCA is working to create a single enterprise data warehouse that contains both a traditional structured data center and an unstructured information system that will include notes and images and, ultimately, audio and visual elements as well.

Through the LHS lens, HCA leaders have begun to use their data to look prospectively. Data are viewed both predictively (what's going to happen?) and prescriptively (what should we do?). To achieve this, the health system has brought in a team of data scientists to apply machine learning, natural language processing, and artificial intelligence. Their aim is to help improve how the health system operates to improve patient care.

For example, HCA is using natural language processing and machine learning to segregate pathology reports into benign and malignant reports and to identify the type of cancer. As a result, HCA's cancer coordinators no longer spend the bulk of their time reading through pathology reports. Instead, they now spend 75 percent to 85 percent of their time working with patients. More importantly, patients now have their biopsy results within 24 hours.

HCA has also rolled out a program that uses predictive analytics to identify sepsis before a clinician typically can spot the infection. Under the Sepsis Prevention and Optimization of Therapy (SPOT) program, a series of algorithms in the health system's data centers comb through every significant piece of patient information in real time (e.g., lab reports, vital signs, demographics) and trigger an alert when signs of sepsis show up. SPOT is not only identifying sepsis far more rapidly than clinicians can, it is also twice as accurate at excluding patients who

don't have sepsis. The program has greatly increased the number of patients in HCA hospitals who survive sepsis.

Fostering a Culture of Learning

While data is foundational to HCA's operations, being a true LHS requires being able to use existing data to inform practice and improve patient care. At HCA, using data in a continuous cycle of insights and learning is baked into its culture.

HCA's large size offers health system leaders the luxury to pilot projects in a single facility, two or more hospitals, or across geographic markets. Then, if they are successful, leaders can expand pilot programs to more facilities and across the organization. This also enables the health system to understand whether the change is sustainable across the different microcultures that exist within and between facilities. At each stage, HCA systematically collects data and evaluates results to understand the true impact of the change, whether it's testing a new hand hygiene technology, a new nursing structure, or a promising new workflow intervention.

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—Kenneth Sands, M.D., Chief Patient Safety Officer

"The paradox of being very large but also very nimble is that small tests of change can be surfaced efficiently and larger initiatives can be deployed broadly," says Kenneth Sands, M.D., HCA's chief patient safety officer.

One example came from HCA's approach to preventing healthcare-associated infections, including methicillin-resistant *Staphylococcus aureus* or MRSA. Under a study funded by AHRQ called REDUCE MRSA, a multidisciplinary team from HCA, the University of California at Irvine, Harvard Pilgrim Health Care Institute, and the Centers for Disease Control and Prevention evaluated the effectiveness of three different MRSA prevention practices. The study included 43 HCA hospital intensive care units (ICUs) and almost 75,000 patients over 18 months. The MRSA prevention practices included providing routine care, providing germ-killing soap and ointment only to patients known to have MRSA, and providing germ-killing soap and ointment to all ICU patients.

By collecting data and evaluating all three methods, HCA staff were able to rapidly identify that the use of germ-killing soap and ointment on all ICU patients was effective for preventing infections caused by MRSA and also by other germs. Adopting the new standard of care has led HCA to significantly reduce both its MRSA rates and the risk of all potentially life-threatening infections.

Dr. Perlin describes HCA as a performance-driven organization. "We measure everything," he says. "We want to understand the leading practice if an entity is performing particularly well. What can we learn? What's driving that positive variation?"

Much of the research and innovation at HCA flows top down. SPOT, for example, was in design and testing for 2 years before it was rolled out across the system. But there's also a role for innovations to spring up from the local level.

For example, one HCA hospital set out to reduce catheter-associated urinary tract infections. To achieve this, hospital staff put in place more stringent, evidence-based rules around the use of catheters in the emergency room (ER). As a result, the use of catheters decreased significantly. The local team presented its findings at a division meeting, where the results received the attention of senior leadership. As a result, new guidelines on catheter use were implemented across the health system. Use of catheters in the ER dropped by approximately 35 percent. More importantly, fewer patients are at risk of urinary infections as a result.

Valuing the Role of Staff in Continuous Improvement

In addition to its strong data infrastructure and culture of learning, HCA has also put in place the right people to ensure the health system is set up to learn, iterate, disseminate new knowledge, and launch improvements across its 200-plus facilities.

HCA leaders have achieved this by hiring staff for roles that support the LHS. Most notably, HCA has hired data scientists who understand how to find meaningful signals in a sea of data. The health system has also hired software and data operations engineers to take those signals and put them into useable systems such as SPOT.

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Along with data analytics, change management skills are critical. Health system leaders pointed out, for example, that it's not sufficient to simply announce a new technology. What's needed are people who can shepherd a new technology into use so that that it is embraced and embedded across the system.

HCA also holds learning summits to highlight successes and share best practices in topics ranging from nursing to behavioral health to transcatheter valve replacements. A summit on infection prevention, for example, brought together 1,500 people from various facilities to discuss best practices and learn from different

facilities' successes. In addition, participants shared checklists, screening forms, and other resources that worked locally and could be applied across the health system.

Key Takeaways

Leaders at HCA stressed that healthcare is evolving, and that you can't use antiquated tools and expect to have good outcomes. "The industry is reinventing itself: moving from intuition to decision support, redefining jobs, and improving care and efficiencies," says Dr. Perlin.

With its strong data foundation and commitment to continuous learning, HCA's LHS is a model for how a large for-profit health system can put its resources to use in an era of health system transformation. It also reflects how big, complex health enterprises can both leverage their economies of scale for rapid innovation and identify small changes at the local level that have the potential to have large impacts systemwide.