

TRANSFORMING HEALTH CARE DELIVERY

Leveraging data
to improve
quality of care

Report from the front lines

TRANSFORMING HEALTH CARE DELIVERY: Leveraging data to improve quality of care

It wasn't that long ago that hospitals had to search for data. Now, in part thanks to the prevalence of electronic health records (EHR) and the requirements of quality reporting, organizations are nearly drowning in it. How can hospitals leverage the value of data for clinicians, patients, individual health care organizations, and the system as a whole?

The volume of information in EHRs doubles every 24 months. Patients, clinicians and hospital administrators alike know there's value in that information, but the sheer volume is overwhelming, often obscuring the potential. Nurses often stay hours after their shifts to catch up on documentation. Meanwhile, patients must log on to multiple portals to piece together their medical history. Hospitals spend so much time manually extracting quality data from charts for quality reporting that they hardly have time to analyze what it means for their organization and community.

The ability to make sense of this avalanche of data is key to improving quality and affordability of care. On April 16, clinicians, hospital administrators, vendors and other leaders in the field gathered in Irving, Texas, for the American Hospital Association (AHA) Health Forum Critical Conversations in health care event — this one focused on leveraging health care data to improve the quality of care.

The attendees — clinicians and representatives from information technology, quality, and financial departments from a variety of urban, rural, critical access hospitals, and academic medical centers — were there to learn ways to “squeeze more from data” to standardize clinical practice, redesign workflows and work smarter. They sought to learn how to make data more meaningful and gain knowledge to help them convince clinicians of the value of the data they can obtain from their EHRs.

“We are at the intersection of data and health,” observed Michelle Dardis, director of clinical quality for the AHA's Health Research & Educational Trust. With her background as a

nurse informaticist, Dardis focuses on how hospitals can analyze and use data to improve quality and re-configure care delivery. “The AHA is focused right now on ‘redefining the H,’ rethinking hospitals as more than the facility we go to in our most acute moments to think about how the hospital as a member of the community can best support community health.”

THE DIFFERENCE IS DATA

“As health care professionals, data are the foundation of everything we do,” Dardis pointed out. “Data have led to some of our greatest successes and present some of our greatest opportunities,” to improve the patient and clinician experience, refine the quality measures reported, identify disparities, increase health equity, and deliver high-value care that meets the needs of patients and populations.

Suzanna Hoppszallern, senior editor of data and research for the AHA, asked the participants about the primary drivers in their organizations for changing their delivery model to improve affordability and quality of care. Answers included



patient satisfaction, managing the volume of capitated patients, the need to do more with less money and competition for patients, especially those with insurance.

What has the biggest impact on quality? “It’s knowing what the problem is in the first place,” said Christopher Menzies, vice president and chief medical informatics officer for Children’s Health in Dallas. “You can’t change what you don’t know.”

And that takes data.

For example, Menzies pointed out that his organization must see six to seven commercial patients to cover the costs of just one Medicaid patient. “We have to be cognizant that those who support our ability to carry out our mission are health care consumers who have a choice,” he said. “And we have to make sure they choose us. That enables us to focus on providing the highest possible quality of care for all patients.”

The usual approach is to try a variety of different things to address the identified problem and hope that something works. But often, organizations don’t go back and analyze what made the biggest impact, instead relying on assumptions.

Analyzing data can prove — or disprove — the hypothesis, paving the way to sustainable change. Actually, data plus intelligence make the difference, said J. Marc Overhage, M.D., Ph.D., vice president of population health intelligence for Cerner. “Data are nothing without intelligence, and intelligence is nothing without data,” Overhage explained. He encouraged the group to “look beyond the walls” of the hospital for ways to make health

care more efficient. Before joining Cerner, Overhage served as a physician at Eskenazi Health, the oldest and largest public health system in Indiana. “I thought a lot over those years about how we make care more efficient. We can’t just throw more people at it.”

Artificial intelligence and data science can translate the overwhelming volume of data into actionable information for clinicians, hospitals, and health systems, as well as patients.

PROGRESS IS UNDERWAY

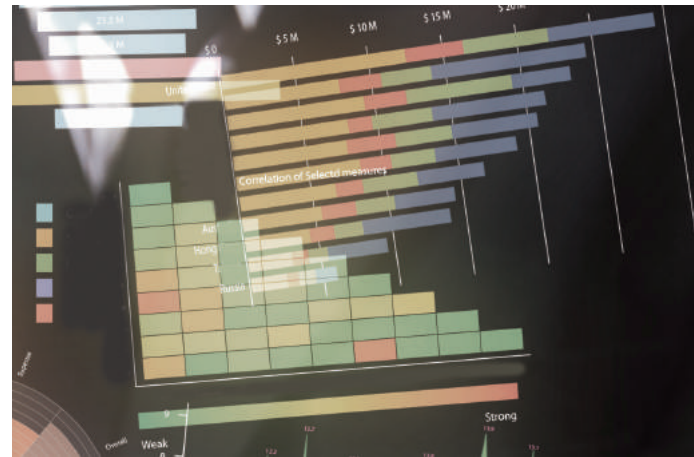
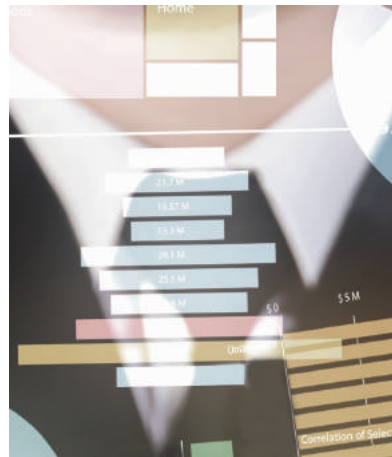
Dardis pointed to significant strides made since the Institute of Medicine (now the National Academy of Medicine) released its report “To Err is Human” in 1999. Quality reporting has led to improved care since then: 91 percent of reported measures now show stable or improving performance. There have been 70,000 fewer unplanned admissions (2011-2015) and 12,000 fewer deaths following hospitalization for heart attack (2008-2015).

The AHA is directly involved with these quality improvement efforts, including the Health Innovation Improvement Network (HIIN), which it has supported since 2015. In the current phase, the AHA works with more than 1,600 hospitals and 34 state hospital associations to reduce readmissions and hospital-acquired infections. In the program’s first year, participating hospitals avoided more than 50,000 harms and saved almost 4,000 lives, resulting in monetary savings of \$500 million.

Acting on insights from data made the difference in many cases, Dardis said. For example, Concord (N.H.) Hospital dug into its falls data and found that 59 percent of those who fell suffered



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from delirium as a secondary diagnosis. “With that finding, it was able to improve environmental and patient safety assessments to significantly reduce the fall-with-injury rate,” she reported.

Sidney (Mont.) Health Center — a critical access hospital with a large diabetic population — used data to determine that in-hospital hypoglycemic events occurred primarily in the evening. So, it added an alert to remind staff to do evening finger sticks on patients — and reduced hypoglycemic events to zero.

NEW OPPORTUNITIES AND CHALLENGES FOR LEVERAGING DATA

Data can help us to understand health care’s challenges — and lead to solutions.

Affordability is one of these issues. For example, 43 percent of adults with health insurance have difficulty paying their deductibles. Nearly a third of Americans have trouble paying medical bills, and 7 of 10 are cutting back on other spending to pay for health care.¹

“The challenge of affordability in health care is starting to affect how patients live at home,” observed Dardis, affecting social determinants that influence overall health.

Thanks to patient portals and informational websites, people have more access to information for making decisions about their care. Seventy percent of patients report greater engagement in their health care, up from 57 percent in 2016. “Now that we’ve exposed patients to electronic health portals and telemedicine, they’re all about it,” Dardis said.

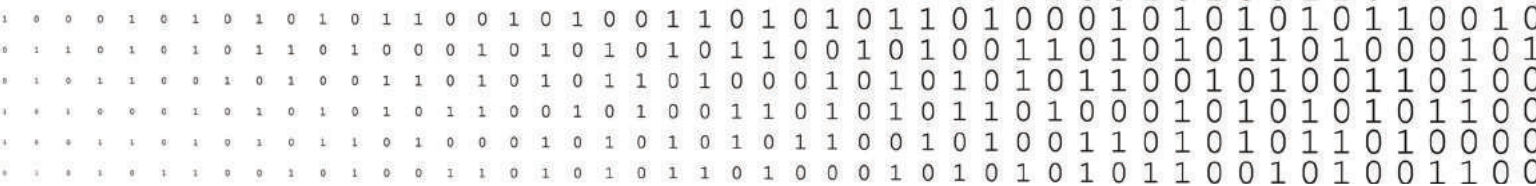
But that access to information can quickly become information overload. The average Medicare patient sees seven different physicians across four different practices, Dardis pointed out. “As an informaticist, I think about what that EHR must look like — or what the distributed network of applications the patient is touching must look like.”

The situation is not much better on the other side of the EHR. Among physicians and other clinicians, information overload and challenges top the list of factors contributing to the currently high rates of burnout.

Improving interoperability and data consolidation remains key to improving the patient and clinician experience. “For patients with affordability issues who need care coordination, streamlining data exchange and sharing relevant information seem to be great opportunities for simplifying data for the patient and the clinicians who care for them,” Dardis said.

Data also can help hospitals to understand their patient populations and how to best meet their needs. Patients who have one or more chronic conditions account for 86 percent of health care spending.² One quarter of seniors on Medicare have four or more medical conditions.³ Treatment for one condition may contradict recommendations for another condition.

By melding the information from different EHRs and community organizations, clinicians can have a more complete picture of their patients, manage their conditions to avoid hospitalization, and improve overall health outcomes.



COORDINATED CARE requires bringing together data from disparate systems — not only EHRs from other providers, but also records maintained by schools, police departments, community-based organizations and social-service agencies.

To be helpful, data must be digested and presented in ways that make a difference to both the patient and the clinician. The effects of information overload can be seen in the frustration of patients who want high-quality care to be more convenient and accessible and in clinicians who experience burnout from trying to make sense out of the volume of available information.

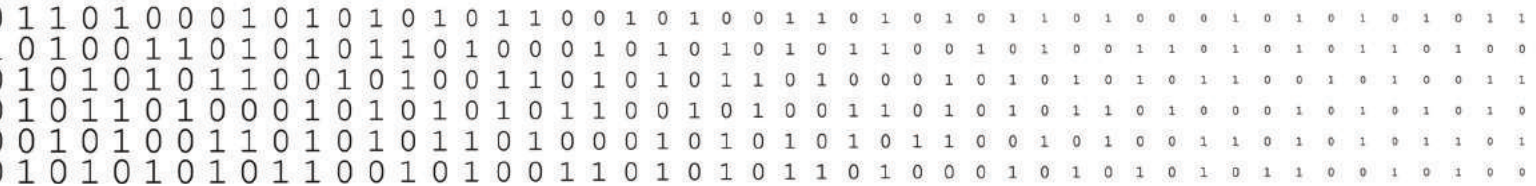
“We focus too much on analytics and dashboards, but what clinicians want are insights integrated into their workflows,” said Bharat Sutariya, M.D., vice president and chief medical officer for Cerner.

One way to do this is through the adaptation of clinical guidelines for the digital age. Currently, it can take up to 17 years for research insights to become integrated into clinical practice. That’s about 16 1/2 years too long, according to goals set by the Centers for

Disease Control and Prevention. Groups like the Nursing Big Data group are working to standardize definitions and coding to close that gap and bring actionable insights from research to the point of care. This will put health care organizations in a better place to share data and benchmark progress, Dardis said.

Care coordination can help to determine the optimal time, place and delivery method for care based on a variety of factors. It also can help patients to engage in their own care.

As health care organizations start to appreciate the full impact of social determinants on health outcomes, truly coordinated care requires bringing together data from disparate systems — not only EHRs from other providers, but also records maintained by schools, police departments, community-based organizations, and



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social-service agencies. For example, food insecurity significantly raises the risk for readmissions, but most health care providers don't have easy access to that information.

Dardis pointed out that there are actually ICD-10 codes for social determinants — Z55-Z65 — but they are used infrequently because, until recently, they required physician documentation. Now that documentation from any clinician can be used to support these codes, they may catch on more quickly.

Still, documentation of social determinants takes time, and current incentives don't necessarily encourage this.

As Bob Honeycutt, CEO of LifePoint Health's Ennis Regional Medical Center and Parkview Regional Hospital in Texas, pointed out, most hospitals are incentivized to grow volume, and physicians are incentivized to see more patients. Even consumers do not have incentives to make choices based on their implications for health outcomes. What changes are needed — in terms of regulations and incentives — to move health care in the "way [regulatory agencies] want us to move, we want to move and, most importantly, our patients want us to move?" he asked.

THE NEED FOR INNOVATION

Solving these problems requires innovation — and maybe a bit of disruption.

"We need to start thinking about innovation not as an abstract concept, but as an actual skill set," Dardis said. "Just as we move to being more high-reliability organizations, we also need to work toward being more agile and flexible organizations, and to give leaders and staff the skills to think out of the box."

The growth of innovation centers at many hospitals and health systems is part of this realization. Ninety-one percent of health care leaders report that their strategic goals include increasing their innovation skills by 2022.

Companies like Apple, Amazon, Walmart, Google, and CVS may not wait that long. They are already diving into these challenges, bringing new ways of thinking about health care delivery.

As Laura Sittler, chief nursing officer at Baylor Surgical Hospital at Fort Worth, Texas, pointed out, we can "move a package across the world using enormous data systems, but we can't connect to coordinate patient care and flow within our own facilities. Why is it so difficult to manage the human side of logistics controls?"

SCENES FROM THE CONFERENCE

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Some disruptor solutions are platform businesses like Uber and YouTube that don't directly provide services or content but provide the tools and technology that connect users to them.

"I can't wait for disruption," agreed William W. Feaster, M.D., MBA, chief health information officer at Children's Hospital of Orange County (Calif.). "We are in such need of being disrupted. The only way we're going to solve many of the current problems in health care is through something that's very uncomfortable for all of us, because just doing what we're doing now and not radically changing isn't going to work long term."

HOW AI CAN HELP

According to Overhage, "embedding intelligence into the process is the only way we'll get" to a more efficient, effective health care system that results in better outcomes for patients and communities.

Artificial intelligence (AI) is not new to health care. For example, Cerner has had a surveillance algorithm that looks for sepsis across hundreds of hospitals in multiple countries — and it has saved lives while reducing costs for health care organizations.

AI is a rising bar, Overhage said. In the 1970s, it was optical

character recognition. The 1980s and 1990s brought rules-driven systems. Today, that's all considered "simple stuff." Now, organizations like Cerner are looking at such concepts as longitudinal care plans that pull data from disparate sources so clinicians can more effectively manage patients and populations. "We are not clinicians or experts in heart failure, but we are good at providing the underlying capabilities that help clinicians to manage patient care more effectively," he added.

According to Overhage, health care AI falls into four categories:

- **DATA EXTRACTION** takes unstructured data and normalizes it so that a machine can understand and interpret it. An example is retina-image analysis, which is under development by DeepMind for Google.
- **COGNITIVE INTERACTION** includes chatbots that are creeping into daily life to help with airline reservations or provide technical support. Scheduling health care appointments is a task ripe for cognitive-interaction tools, Overhage said: "It's not that cool, but think about the time and resources" hospitals could save with automated-appointment scheduling.



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- **OPERATIONAL-PROCESS MODELING** can optimize case order to keep clinicians from running late — something that affects patient and employee satisfaction. Overhage reported that Intermountain Healthcare, Salt Lake City, used operational-process modeling to reduce its cesarean-section rate and neonatal ICU days by not inducing childbirth before the patient’s due date.

- **CLINICAL MODELS** predict which patients are at risk for readmission, death, or another outcome. These have been used by hospitals to anticipate the need for hospice services, which can relieve pain and suffering for patients and their families.

While operational-process modeling and clinical modeling can be done by people as well as by AI, Overhage said that AI can “reduce the cost of achieving positive outcomes.”

“Frankly, we have not fully delivered on the promise of health care IT systems in the world today,” Overhage admitted. With the incentives of the HITECH Act and quality reporting, providers across the country have invested money and effort in EHRs and other health information technology. “We haven’t gotten the full value out of that investment yet.”

LONGITUDINAL CARE PLANS INTEGRATE RESOURCES

One of the technologies under development at Cerner aspires to push health care systems to think outside the walls of the hospital to develop an overall plan for patients that considers data from across the health care system — and beyond.

Care plans gained prominence in health care in the 1990s. A patient with congestive heart failure would have a care plan that outlined what treatments, therapies, and actions would help to drive a positive outcome. If the same patient had diabetes or depression, his or her clinicians might have additional care plans for those conditions.

A longitudinal care plan, Overhage explained, is a synthesis of all these plans, driven by all members of the patient’s care team — including doctors, nurses, and physical therapists, of course, but also the community pharmacist, the patient and family, friends, and other informal caregivers. “Patients spend a few hours a year in the health system, but thousands of hours with a spouse, adult children or other people in the community,” Overhage said. Unlike a care plan that may get tweaked but is largely constant, the longitudinal

care plan is in constant evolution, adjusting as the patient at the center shifts care settings, economic situation, or in access to transportation, fresh food, or other social determinants of health.

Pulling data from disparate systems and using patient-centered terms to articulate health goals (such as “walk my daughter down the aisle”), the plan outlines activities and milestones to get the patient to that point, such as adherence to blood-pressure medication, a low-sodium diet and follow-up medical care. Feedback and accountability are built into the system.

“Part of our job is to bring together the data not just across a particular vendor’s platform, but across many different platforms,” Overhage said. The system then “normalizes the data, applies intelligence, and develops a feedback loop that triggers and tracks service delivery and outcomes.”

This type of virtual assistant to the care team helps to apply best practices for disease management and risk reduction that otherwise can’t happen at scale.

Plus, the system has the capability to cull through reams of patient-generated data like blood-glucose monitoring and alert both the patient and the provider when a patient is in the “yellow zone” with the hope of preventing a full-scale emergency.

A longitudinal care plan can have benefits in both fee-for-service and capitated/value-based care by reminding patients about recommended assessments, immunizations, and other care, and by suggesting the most cost-effective setting for that care. Having the system perform these activities saves time for care managers and enables them to focus on the things that are performed better by a human. “Automation plus the human brain is a stronger approach,” Overhage said. ●

A good data system should normalize the data, apply intelligence, and develop a feedback loop that triggers and tracks service delivery and outcomes.

¹“Data Note: Americans’ Challenges with Health Care Costs,” Bianca DiJulio et al., Kaiser Family Foundation, KFF.org, March 2, 2017

²“Multiple Chronic Conditions Chartbook: 2010 Medical Expenditure Panel Survey Data,” Jessie Gerteis, MPH, et al., Agency for Healthcare Research and Quality, April 2014

³“Futurescan 2017-2022: Healthcare Trends and Implications,” AHAs Society for Healthcare Strategy & Market Development, 2017



Children's Hospital of Orange County (Calif.)

Case study on leveraging data to improve quality

CASE STUDY

Analyzing and applying intelligence on a real-time basis

Children's Hospital of Orange County (Calif.)

To learn how AI can change care delivery, participants heard from William W. Feaster, M.D., MBA, chief health information officer at Children's Hospital of Orange County (CHOC), a 350-bed hospital with a network of ambulatory clinics, an active research division, and a broad selection of programs for patients and families. Since 2016, CHOC actively has applied data science to improve patient satisfaction and safety, and has begun to explore the use of advanced AI tools.

"We're just like you, awash in a sea of data," said Feaster. "But we're certainly trying to surf that data." Instead of relying on manual chart abstraction, data verification, and static monthly reports, CHOC has moved into analyzing and applying intelligence to data

on a real-time basis and building it into the care process to truly understand their quality of care and patient satisfaction scores.

CHOC uses Cerner's *HealthIntent*SM platform to bring in data from different sources, including various EHRs, pharmacies, and payers. The system normalizes the data and builds "smart registries" for certain high-cost pediatric conditions.

These registries go beyond tracking patient status and outcomes for a defined population, Feaster explained. Built on top of multiple EHRs and other data sources, they extract data and then feed key patient information to clinicians at the point of care, creating a living tool, rather than a more static reporting mechanism. Adherence to clinical guidelines at CHOC has improved progressively with the advent of these smart registries.

Using a registry, rather than enterprise data, provides several advantages, Feaster said. The registry curates the data and defines the population with inclusionary codes to create more homogeneous groups of patients. This makes it easier to compare outcomes and develop relevant measures for specific groups. All registry data are validated



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and attributed to a provider, which helps to pinpoint problem areas.

CHOC also has started co-developing with Cerner the *HealthProgramsSM* functionality for predictive and proscriptive analytics (applied intelligence) to improve asthma care quality and outcomes. Asthma affects as many as 13 percent of CHOC's capitated population of 150,000 Medicaid patients, so proactively optimizing this population's care is critically important. Intelligence algorithms are applied to data from CHOC's population health database to correctly classify asthma patients and to determine their level of control. Once defined, a high-risk population is recommended for home monitoring of peak flows and care management follow-up.

In the near future, CHOC will have data in the platform to identify times of increased air pollution, pollen counts, and other asthma triggers to alert caregivers and care managers, to assess the patient's peak flow and immediately address any deterioration caused by asthma triggers in the ambulatory setting, in order to avoid unnecessary emergency department (ED) visits. "The more you reduce the number of patients who don't need the ED, the better care you can provide to those who do need to be there," Feaster said.

CHOC has analyzed patient satisfaction data to understand the results better. "Every patient survey comes back with a medical record number (MRN) attached," he explained. Connecting the data with the information in the health record enables the use of applied data science to analyze what factors are associated with higher patient satisfaction.

This analysis has yielded some surprising results. For example, as Feaster and his associates reported in an article in the journal *Pediatric Anesthesia*, higher postsurgical patient satisfaction correlated most closely with the quality of communication among the anesthesiologist, the patient, and his or her family before the operation. Nursing care also factored into high scores, but improved start and turnover times, reduced nausea and vomiting, and shorter PACU stays had little effect on patient satisfaction.

CHOC uses applied intelligence to analyze readmission rates. "We had done just about everything we could think of to reduce preventable readmissions," Feaster said, including case-manager reviews, bedside delivery of medications, and telephone follow-up for appointments.

In an unpublished initial study, readmitted patients, especially infants, were more likely to have a low blood urea nitrogen level.

This was curious, but led to the hypothesis that it may be related to protein malnutrition. CHOC had implemented nutritional assessments and counseling for hospitalized patients, and a subsequent published study found patients readmitted within seven days of discharge had a high rate of malnutrition, more than five times greater in infants younger than 1 year.

Another 30-day readmission project utilizing the Rothman Index along with variables not previously found in the literature, has improved the ability to identify patients at high risk for readmission and intervene prior to discharge, said Feaster. The Rothman Index, combined with other variables, is helping us predict patients likely to deteriorate on the patient care floor, and we hope will ultimately result in earlier transfers to the ICU, leading to less "intensive" care being required for stabilization, he added. On the outpatient side of the organization, CHOC is exploring how AI can help predict and prevent appointment no-shows.

Feaster said the organization is now getting more data from the *HealthIntent* platform than it does from manual extraction, an important milestone in applying data science and AI to quality improvement.

DATA SCIENCE POINTS THE WAY FORWARD

Sharing insights and experiences through presentations and interchange at the Texas Critical Conversation prompted aha moments and new ideas among the hospital representatives, industry experts, and other thought leaders in the room. Armed with tips on how to use data more meaningfully to support their clinicians, strengthen their organizations, and deliver high-quality care, they left the event better equipped to meet the challenges and seize the opportunities data present. Through the conversation, one overriding theme became clear: Data can help hospitals and health systems blaze a pathway to a redesigned health system that meets the needs of patients and communities, and builds a better work environment for clinicians and other staff. ●

Connecting the data with the information in the health record enables the use of applied data science to analyze what factors are associated with higher patient satisfaction.

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Resources from the AHA

- **HRET Hospital Improvement Innovation Network**

The Health Research & Educational Trust (HRET) Hospital Improvement Innovation Network (HIIN) is the largest and most diverse HIIN with more than 1,600 participating hospitals, 34 state hospital associations, six Quality Improvement Networks-Quality Improvement Organizations, and more. The HRET HIIN is pursuing the ambitious goals of reducing all-cause inpatient harm by 20 percent and readmissions by 12 percent by 2019. <http://www.hret-hiin.org/about/hospital-improvement-innovation-network.shtml>

- **AHA Central Office**

The AHA Coding Clinic published advice that allows the reporting of codes from categories Z55-Z65, which identify persons with potential health hazards related to socioeconomic and psychosocial circumstances. For additional information, see the article "ICD-10-CM Coding for Social Determinants of Health." <http://www.ahacentraloffice.org/PDFS/2018PDFS/value-initiative-icd-10-code-sdoh-0418.pdf>

- **AHA Innovation Solutions**

The AHA has created a suite of innovation-focused offerings and initiatives to spark the improvements needed by the health care field. <https://ahainnovation.org/>



At Cerner, we're continuously building on our foundation of intelligent solutions for the health care industry. Our technologies connect people and systems at more than 27,000 contracted provider facilities worldwide, and our wide range of services support the clinical, financial, and operational needs of organizations of every size.

Together with our clients, we are creating a future where the health care system works to improve the well-being of individuals and communities. By designing leading-edge health information technology, we offer strategies that enable organizations to know, engage, and manage populations. Our applications are developed with clinicians in mind so they can focus on people, not technology, and providers can manage their day-to-day revenue functions with our integrated clinical and financial systems. These helpful tools are designed to work for today and think for tomorrow.

From the beginning, we have innovated at the intersection of health care and information technology. Our mission remains to contribute to the systemic improvement of health care delivery and the health of communities.

Health care is too important to stay the same.™