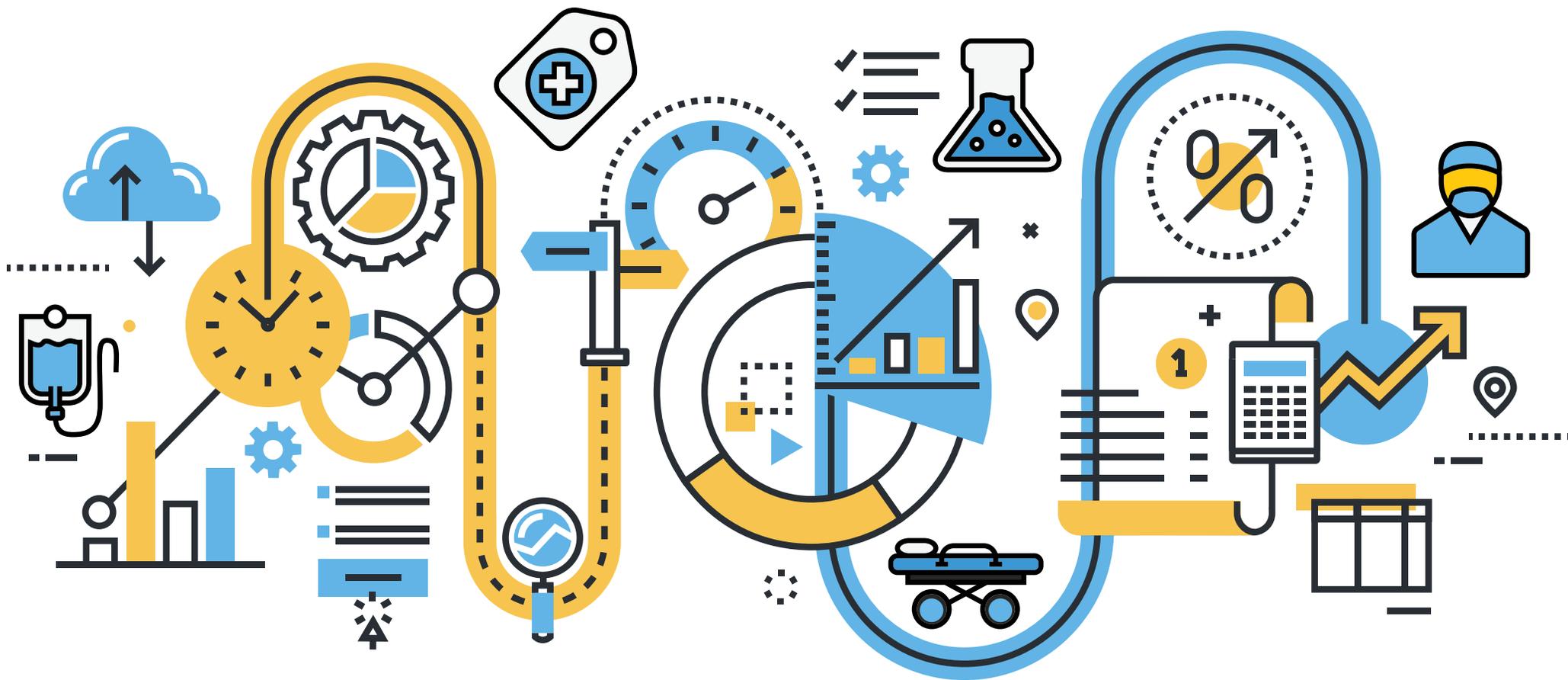


How hospitals and health systems can transform themselves into data-driven organizations to create more value for their patients and communities

Leveraging Data for Health Care Innovation



Leveraging Data for Health Care Innovation



Throughout the COVID-19 pandemic, one of the things hospital and health system leaders learned is the value of rapidly collecting and understanding data for response and adjustments. Hospitals and health systems leveraged data and analytics tools to understand the spread of COVID-19 in their communities and how many COVID-19 patients to expect in their emergency departments (EDs). Executives used data to manage capacity and allocate resources appropriately, answering a barrage of questions: How many of those patients will be admitted? How many admitted patients will need intensive care unit (ICU) beds because their health will deteriorate? How many ICU patients will need ventilators? What team members do we need to deploy as needs change? How much personal protective equipment will staff need to safely care for patients in each setting and for how long?

With the need to better understand COVID-19, health care organizations from different sectors and in different parts of the world started to work together to find solutions. Health care organizations adapted quickly and accelerated the pace of change. New ways of collecting, sharing and evaluating data will likely expand after COVID-19, leading to new technological advancements. With better data, increased collaboration and faster analysis, hospitals and health systems could transform patient care and prepare for any future emergencies.

About This Report *The AHA Center for Health Innovation developed this Market Insights report for hospital and health system executives who are working to transform their hospitals and health systems into data-driven organizations and who want to leverage data for health innovation. This report is based on information and insights from interviews with a panel of 25 health care data experts and leaders who are identified on Page 14. The report also is based on reviews of published health care reports, surveys, articles and research on health care data and innovation. A complete list of the source materials appears on Page 15. The AHA Center for Health Innovation thanks everyone for their contributions to this report.*



This Market Insights report from the American Hospital Association's Center for Health Innovation offers hospital and health system leaders a blueprint for becoming an organization that leverages data for health innovation and for improving clinical, financial and operational performance.

As health care organizations adopt more value-based care delivery models, the integration of data and information assets into care delivery will be table stakes. Health care providers will need to be able leverage their unique position as creators and aggregators of data to improve patient experience and outcomes, and reduce cost.

The digital revolution is disrupting every field and transforming entire systems of production and communication, creating entirely new ways of consuming goods and services. Consumerism is driving convenience and ease of use in the health care experience. With the upsurge in the use of machine learning (ML) and artificial intelligence (AI), this change will only accelerate. And as disruption in health care accelerates, hospitals and health systems need to enhance efforts to embrace data and analytics with AI and ML to adapt to consumer needs faster, solve complex challenges and find opportunities for better outcomes. ●



Hospital and health system leaders can use this report to:

- Identify sources of health care data.
- Be aware of health data challenges.
- Transform into a data-driven organization with people, processes and technology.
- Invest in technology and tools that can integrate different data sets, enable users to find what they are looking for quickly and easily, and present data to facilitate action.
- Prioritize data capabilities and evaluate data projects that fit with the organizational strategy.
- Ultimately, refine or develop a comprehensive data strategy to create more value for their patients and communities, and embrace new opportunities.



Data-related resources available from the AHA Center for Health Innovation

- [Discussion Guide: Developing Data-driven Health Care Organizations](#)
- [Maturity Framework: Data-driven Health Care Organizations](#)
- [15 Criteria for Prioritizing Data Projects](#)
- [AHA MetricVu™](#)
- [AHA Hospital Statistics™](#)
- [COVID-19 Dashboards](#)
- [AI and the Health Care Workforce](#)
- [AI and Care Delivery](#)
- [Surveying the AI Health Care Landscape](#)



The Explosion of Health Data

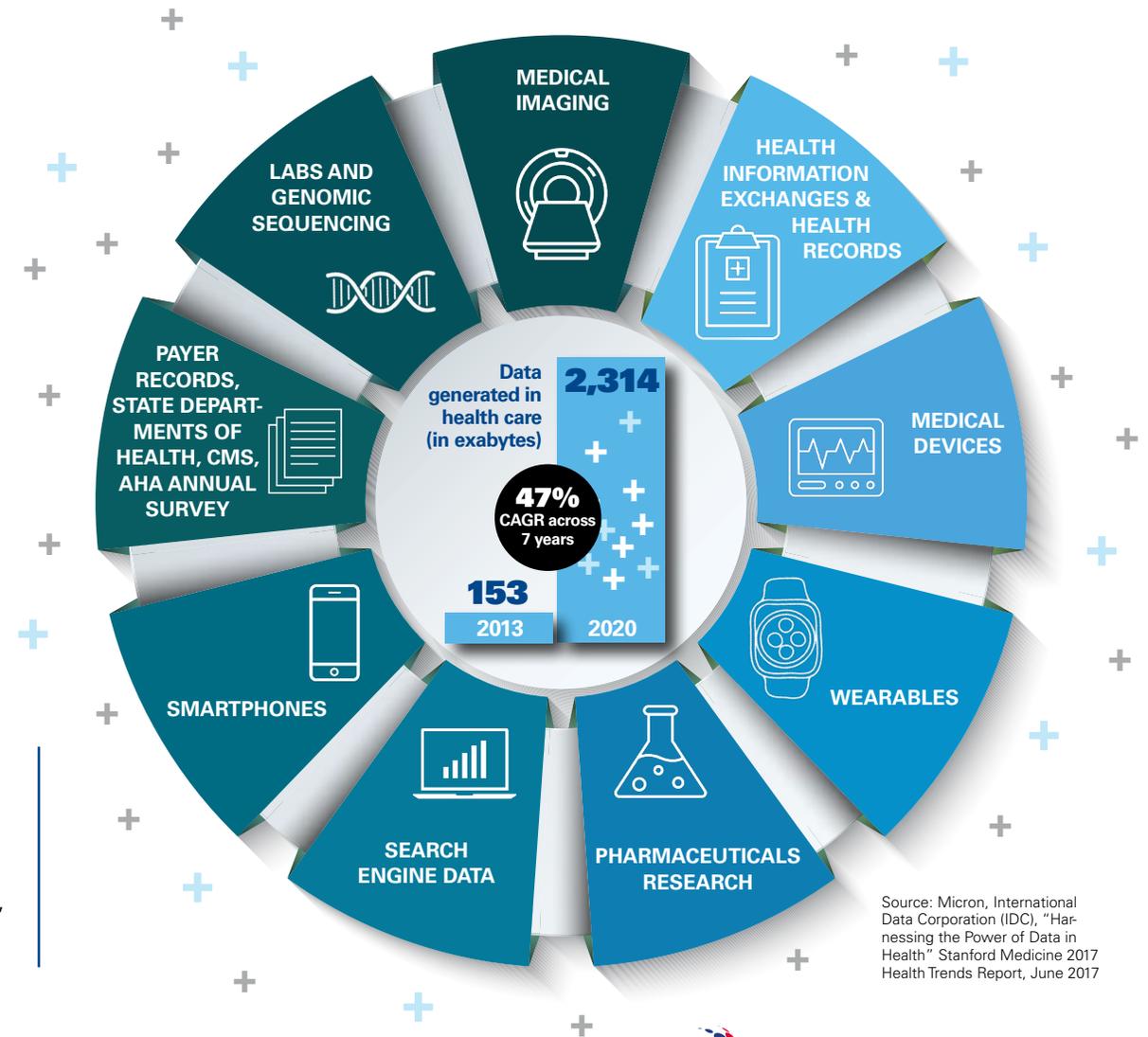
In a world marked by constant change and volatility, health care organizations need to be agile enough to adapt to the realities of a digital world. Hospitals and health systems that use analytics to improve their operations, streamline internal processes and identify opportunities to enter new markets or change their organizational model will be ready to take advantage of opportunities and thwart potential disruptors.

The volume of big data is projected to increase faster in health care over the next seven years than in any other field. The expansion of data is accelerating and generating more data of various types. To reveal meaningful information from high-volume, high-velocity and high-variety data requires advanced tools — analytics and algorithms. It also requires investing in digital talent and modernizing legacy systems to offer real-time solutions and addressing security issues. ●

INSIGHT

A truly data-driven health care organization is one that believes that there's a **wealth of information** available in the widest variety of places you can imagine. They're not limited to the clinical information in patients' medical records.

Where Is All the Health Data Coming From?



Prioritizing Data Projects

Both the data and the opportunities to innovate are extensive, but resources are not. So, how does a data-driven hospital or health system choose when and where to spend its data capital?

INSIGHT

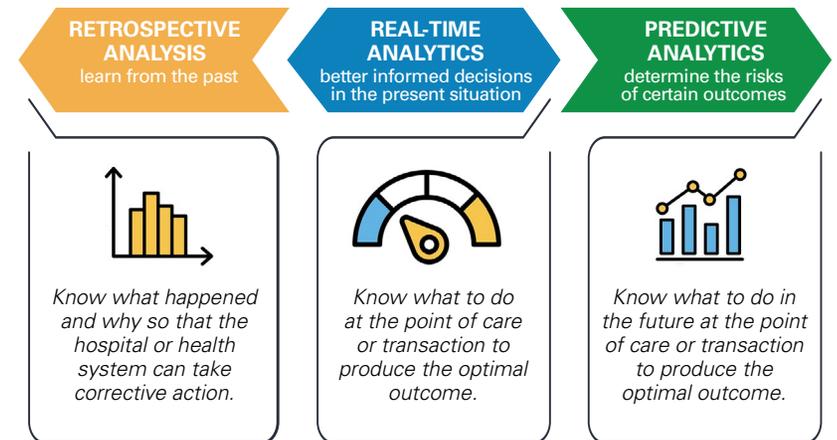
The bigger problem of saying “no” to everything is saying “yes” to everything, because you’ll run out of resources and won’t complete anything.

The health care data experts tapped for this report agree that hospital and health system leaders must have a formal system in place to evaluate and prioritize data projects. For example, they need a single, organized and standing multidisciplinary committee or body that reviews, evaluates and prioritizes all data project requests. That committee or body should have an intake system for accepting data project proposals and established and agreed-upon criteria upon which to evaluate and prioritize them.

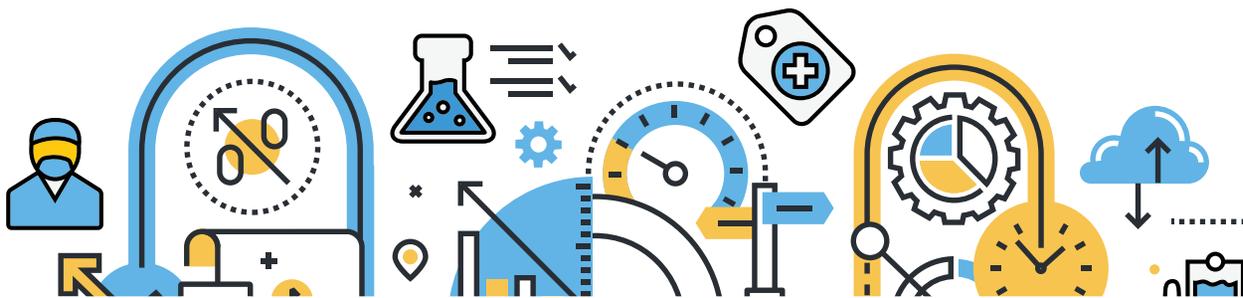
The criteria should include, but are not limited to, the following considerations:

- How does the project support one or more strategic objectives of the organization?
- Does the project serve the patient first?
- Does the project optimize the workforce?
- What are we not doing to allow this project to flourish?
- What data sets are required to execute the project?
- What analytics are required to execute the project?
- What technologies are required to execute the project?
- What is the estimated cost of the project?
- What is the estimated return on investment?
- What is the organizational model (enterprise, departmental or hybrid)?
- Does the project adhere to the data-governance policy?
- What is the timetable?
- How soon do the users need the actionable information from the project?
- What is the potential impact of the project’s outcomes?
- Does the project duplicate another data project?

Hospital and health system leaders must consider how insights from data are going to inform the decision-making process:



Making evaluation criteria and the data project queue transparent to all users internally fosters collaborative decision-making and problem-solving across the organization. There also needs to be a mechanism in the evaluation and prioritization system that allows an urgent or critical data project to jump the line, so to speak. A public health emergency like the COVID-19 outbreak would be an example. The hospital or health system could put other projects on hold to focus its data resources on successfully managing such an emergency •



Top Data Challenges for Health Care

Turning data assets into data insights and integrating them into clinical and operational processes can mean healthier patients, better patient care, lower care costs, more visibility into organizational processes and performance, increased staff morale and productivity, and higher consumer satisfaction rates. The path to meaningful health care analytics requires that provider organizations take a close look at how they collect, store, protect and share their data with staff, business partners and patients.



1 | Maintaining data integrity with volatile health care data. Capturing data that are clean, complete, accurate and formatted correctly for use in multiple systems is an ongoing issue for organizations. Identifying and monitoring how quickly the data are being created, moved or accessed give providers an edge in practice improvement. Some data, such as patient vital signs in the ICU, must update in real time at the point of care. The velocity and variety of data continue to rise with the internet of things, medical devices, genomic testing, machine learning, natural language processing and other novel data-generation and processing techniques.

2 | Storing vast amounts of data. As the volume of health care data grows exponentially, cost, security and performance become concerns for the information technology department. The cost of storing the data and maintaining an on-site data center may be expensive to scale, difficult to maintain and prone to producing data silos across departments. Cloud storage offers agile disaster recovery, lower up-front costs and easier expansion, but organizations must be careful about selecting partners that understand HIPAA and other health care-specific compliance and security requirements. Many organizations end up with a hybrid approach to data storage.

3 | Securing data in the wake of cyberattacks. The frequency, sophistication and severity of ransomware attacks on health care providers has increased over the past several years. Data security is one of the uppermost concerns for health care providers. Ransomware and other

cyberattacks have changed from a crime that is financially motivated to an act that also represents a threat to life and endangers public health. See [“AHA Testimony: Senate Hearing on Cyber Threats Amid Pandemic”](#) and [“Ransomware Attacks on Hospitals Have Changed.”](#)

4 | Sharing data for population health management and value-based care. To improve health and care, interoperable systems must expand the reach of information sharing to support population health, address social determinants of health and facilitate remote monitoring and patient-generated data. The current state of interoperability is still a patchwork system. The AHA report [“Sharing Data, Saving Lives: The Hospital Agenda for Interoperability”](#) focuses on the benefits of fully interoperable data for patients and providers, outlines current challenges and provides suggestions for how all stakeholders can work together.

5 | Protecting and owning health data. Under federal and state laws, patients have legal privacy, security and accuracy rights related to their health care information. Health care organizations have a responsibility to protect patient privacy and safeguard sensitive data. If the health care provider de-identifies or removes personal information, the data are no longer protected under HIPAA. It can be used for a number of purposes, including aggregation into a specific data set that may be owned by the creator of the data set. These datasets are valuable and of interest to pharmaceutical and medical research companies that are working on medical breakthroughs.

6 | Addressing bias in data that lead to inequities in care. Medicine has struggled to include enough women and minorities in research, despite knowing they have different risk factors for and manifestations of disease. A study published in the journal *Science*¹ found that data elements used for algorithms to allocate health care to patients have been systematically discriminating against black people. The algorithm assigned people to high-risk categories on the basis of costs; those biases were passed on in its results: Black people had to be sicker than white people before being referred for additional help. ●

¹Obermeyer, Z. et al. “Dissecting racial bias in an algorithm used to manage the health of populations.” *Science* 336 (2019):447-453; DOI: 10.1126/science.aax2342



Building a Data-driven Hospital or Health System

How hospital and health system leaders make decisions today and in the future will be different. Today, some leaders might say, "I think we should take this course of action. Are there any data to back me up?" Tomorrow, most leaders instead will ask, "What direction should we go based on the data?"



81%

Percentage of surveyed health system executives who say **analytics** is "extremely important" or "very important" to their leadership performance.

Source: Deloitte Center for Health Solutions, 2019

Data play a role in answering both of those questions, but it's a fundamentally different role. In the first case, the data are subordinate to the experience, instinct and knowledge of the leader. In the second, the leader is subordinate to the data. The data drive the action rather than support it.

The data experts interviewed for this report unanimously agree that using data the way that they're used in the second example will produce better decisions for the hospital or health system and, ultimately, for its patients and communities.

Transforming into a data-driven organization, like all transformations, comes down to people, processes and technology. Let's address each of those transformational components in order.

PEOPLE: Who you need to become data-driven

Any discussion of people and transformation must start at the top because, to positively rephrase an old adage, transformation rolls downhill. It's essential for the hospital or health system CEO to believe in the power of data to improve every aspect of the organization's operations from clinical outcomes to business results to population health.

How important is the CEO's role in creating a data-driven culture? The CEO's own reliance on data in decision-making and improving the organization sends a powerful message to the rest of the organization and can change the culture. As for the CEO, his or her job then becomes threefold.

First, the CEO supports other C-suite personnel with the resources, staff and technology to do their jobs. Second, the CEO leads by example. CEOs make decisions based on the data, holding themselves to the same standard set for all other decision-makers. Third, and perhaps most important, the CEO connects what the other C-suite colleagues and their analytics staffs and technologies are doing to the overarching strategic objectives of the organization.

Giving Data a Seat at the Table

How does the CEO's belief in the power of data to drive innovation manifest itself in the C-suite and throughout the rest of the organization? One way is to give data a seat at the table. Hospitals and health systems should consider creating such positions as:



Chief analytics officer



Chief data officer



Chief digital officer



Chief medical analytics officer



Chief innovation officer



Chief medical information officer

These C-suite positions are responsible for managing the talent, resources and analytics strategy, and building and running the processes and technologies that a hospital or health system needs to generate data for better decision-making. The chief digital officer or chief digital strategy officer can establish effective two-way communication by encouraging users to ask questions, showing them where to start looking for answers and facilitating that process to establish a data-literate culture to drive transformation.



They're also responsible for creating and filling other jobs to operate those processes and technologies. The other positions include, but are not limited to:

APPLICATION SPECIALISTS customize existing software, install new software and troubleshoot any problems related to computer system performance.

DATA ANALYSTS transform data into descriptive insights from massive data sets to help inform decisions or improve business practices. The analyst may also scrub the data to improve consistency, accuracy and reliability.

DATA ARCHITECTS design and manage vast electronic databases to store and organize data, and develop a plan to integrate current systems with a desired future state.

DATA SCIENTISTS are statisticians who can perform complex data mining and predictive analyses. They extract meaning from the varying types of data (e.g., structured, unstructured, semi-structured) that flow into the enterprise. They build and test statistical models or create reports that include easily understandable data visualizations.

DATABASE ADMINISTRATORS ensure the optimal storage and access to an organization's data by making sure software programs are designed, managed and maintained to permit rapid access by authorized personnel. They also work with cybersecurity professionals to safeguard the data from unauthorized access and damage.

VISUALIZATION DEVELOPERS create a variety of ways to display information, including infographics, charts, graphs, data maps or interactive data interfaces.

PRO TIP

It all starts with a **visionary leader** who decides that the hospital or health system of the future is a data business. You need people who are trained to make decisions based on information, not instinct.



Options for data and analytics competency partners

Not all hospitals and health systems have the resources to hire in-house specialized expertise and develop a data warehouse. Fortunately, there are several options that won't require major investments in hardware or software, or the development of in-house expertise in analytic processes.

Hosted analytics service providers offer comparative analytics and benchmarking with other health care organizations.

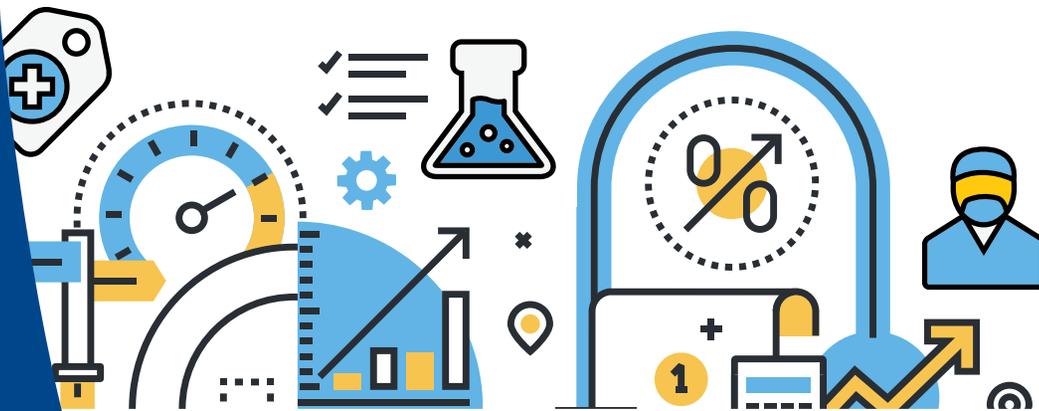
Single-solution analytics applications are available from developers to target specific analytic opportunities.

Major electronic health record (EHR) vendors offer closed-loop analytics that drive analytics back to the point of care in the EHR and clinical workflow for an incremental cost.

Large non health care-specific technology vendors with whom the health system already has a relationship can provide resources for enterprise-scale digital solutions.

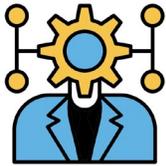
Health care-specific enterprise data warehouse vendors offer solutions with a high degree of analytic flexibility and adaptability.

Large health systems with advanced analytics can provide capabilities for clinical and population health functions. ●



PROCESSES: How you become data-driven

How a hospital or health system becomes data-driven is all about the processes — processes to access data throughout the organization and create a culture where performance data are shared transparently and used to drive decision-making. And for those processes to work to meet the strategic objectives of the organization, hospitals and health systems need a set of rules to follow, which they codify in data-governance policies and procedures. Data governance provides a formal structure for data management so organizations can extract clinical and business value to support key organizational initiatives.



44%

Percentage of surveyed hospital **CIOs & CMIOs** who say their organizations have adopted an enterprisewide data governance capability.

Source: Dimensional Insights, 2017

To fully leverage clinical, financial and administrative data for decision-making, leadership support is vital to promote awareness and adherence to hospital and health system data policies and procedures based on the following questions:

- What data can be used?
- What sources of data can be used?
- In what formats can the data be used?
- Who can access the data?
- For what can the data be used?
- For what can't the data be used?
- With whom can the data be shared?
- How is the privacy and security of the data protected?
- How is the privacy and security of patient information protected?
- What are the specifications on the technologies used for data?
- Who controls the data?
- Who approves the use of the data?

Hospitals and health systems that want to become data-driven can use data governance as the vehicle to drive their comprehensive data strategy and leverage their data for health innovation.

For example, a hospital or health system can use data governance to create common definitions. Different departments or units may calculate length of stay differently. Different surgical team members may define operating room productivity differently. Standardizing definitions standardizes the data, which then, and only then, is ripe for valid analysis.

A hospital or health system also can use data governance to build

more complete pictures of individual patients to facilitate precision medicine programs as well as broader population health initiatives. It can do that by curating, analyzing, preparing and sharing data from other sources, including social determinants of health data, clinical data from other providers who have seen the patient, patient-reported outcomes, data from wearable health devices, data from social service organizations, community groups, community health clinics and claims data from patients' health insurers and more.

When you integrate both internal and external data sources beyond the hospital's boundaries, you get a wider view because outside situations can directly affect what happens internally. This allows users to pose more interesting questions, gain deeper insights, test assumptions to reduce risk, anticipate emerging opportunities and tell more compelling stories. With [AHA Data](#), your team can define your cohort and develop comparative insights within your region by understanding important benchmarks and foundational data, including utilization, technology usage and payment models.

The richer the data sets, the more numbers to crunch and the more useful and actionable the insights from the data become.

TECHNOLOGY: What you need to become data-driven

Of the three essential ingredients to transformation — people, processes and technology — technology likely is the easiest to master for a hospital or health system that wants to become data-driven. For the leaders of hospitals and health systems, technology really comes down to answering five questions:

1 | Centralized, decentralized or hybrid IT network? Hospitals and health systems can put their data from all sources on a central data warehouse or platform. No data sets exist outside of the warehouse or platform. They can decentralize it and allow data sets to exist outside of the warehouse or platform, though the systems are interoperable and users can share data with each other. Or, they can use a hybrid with some data sets centralized and others in the hands of qualified users.

Centralized uses standard tools that allow analysts or data architects to move more easily between domains. Having a standard set of reporting tools makes it easy to roll up reports and view them in



It's Not the Data But What You Do With the Data That Matters

The levers of people, processes and technology are in place. Knowing which ones to pull, when and by how much will determine how successful hospitals and health systems are in innovating health care delivery.

Now what? The health care system generates millions, if not billions, of data points annually — every episode of care, every action, every reaction, every transaction.

To innovate, hospital and health system leaders need a plan if they want to leverage all the data. How do they use their data-driven organizations powered by people, processes and technology to create more value for their patients and their communities?

The health care data experts interviewed for this report agree that hospitals and health systems need a plan lest they drown in data, conflicting priorities and unfinished projects. They suggest that executives organize and prioritize their projects by the Quadruple Aim:

- Improving the health of populations.
- Enhancing the experience of care for individuals.
- Reducing the per capita cost of health care.
- Improving the work life of clinicians and staff.

Opportunities to use data to innovate around

Here are four case studies, one for each branch of the Quadruple Aim, that members of the expert panel cited as examples of how leading hospitals and health systems are spreading their data-driven wings to improve value for patients and their communities.

1 | Improving the health of populations

Health systems can develop a better picture of a patient's health status and use of health services by examining patient use of EDs, claims data, primary care interactions and pharmacy records. Additional data on social determinants of health can help understand and address barriers to care and foster relationships with care providers and community services to improve health. (See Case Study 1)

2 | Enhancing the experience of care for individuals

Stratify your patient satisfaction, patient experience and patient-reported outcomes data by race and ethnicity and compare the results for each

INSIGHT

Without the data, how do we really know that we're providing the most appropriate care at the most appropriate time in the most appropriate setting?

INSIGHT

The overarching purpose of your data strategy is to **improve the value** that you're delivering to your patients and to your community.

CASE STUDY 1

Critical access hospital fills patient care gaps with HIE and claims data

By working with their health information exchanges (HIEs), Nemaha County Hospital, a 16-bed critical access hospital in Auburn, Neb., now develops a more complete picture of each patient's health status, allowing its staff to bring data science to the art of caregiving.

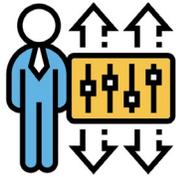
CEO Marty Fattig states, "We're not large enough to hire a data analyst and create the hardware and software systems internally to crunch the data and do a reasonable job of extracting useful information. It would be far too expensive to do on our own. The HIEs combine all the data from patients that we see from our area who travel to the tertiary, quaternary medical centers for care, which helps us enormously."

In Nebraska, all dispensed medicines have to show up in the HIE database, which gives providers an accurate picture of the medications that have been dispensed for each patient.

Additionally, like many small, rural hospitals, Nemaha County Hospital doesn't employ any physicians. The hospital uses claims data to fill in patient data from the physician's office. By accessing claims data from Medicare, Blue Cross or other health plans, the diagnosis code and CPT [current procedural terminology] codes on the claim provide a great deal of information, which can improve and lower the cost of patient care by avoiding duplication of services and unnecessary tests.

"One of the ways that we use data to a large extent is, of course, to measure our quality and make sure that standards of care are consistent and there aren't patients who are falling through the cracks," says Fattig. "Data help us evaluate that on a broader level." ●





86%

Percentage of surveyed health care executives who cite **improving clinical quality** as their top clinical priority for using analytics.

Source: HealthLeaders, 2019

CASE STUDY 2

Academic medical center uses data to foster culturally competent providers

After a major investment in an enterprise analytics platform and two years into their five-year journey to eliminate health care disparities, Froedtert & the Medical College of Wisconsin health network began to see a better picture of how the health system was doing and how it might be falling short on providing equitable care. For example, in the cancer service line, African American women with breast cancer were diagnosed at later stages, often Stage 3 or 4, compared with women of another race.

“We needed to look at this from an upstream perspective,” says Andres Gonzalez, vice president and chief diversity officer, Froedtert Health. “We decided to engage in a patient awareness campaign to show providers at our health centers, especially those that had a large African American population base coming in for those services, what the data are telling us today, what our future state could look like and what we’re striving for. How do we close that gap?”

By making providers aware of the disparities in breast cancer stage diagnosis in African American women and sharing a compelling case for why, clinicians got on board and would talk about mammograms every time they interacted with African American women. Next, clinicians looked at the mammogram ordering versus mammogram completion rates. When there wasn’t follow-through, they’d factor in ZIP codes to see if the women might not have access to resources for mammography services.

“The data liberate the organization’s ability to identify and look at the issues that can be addressed holistically across the continuum and the populations, and then to design the customized investment aimed at treating those populations,” says Gonzalez. ●

category that you capture. You might find statistically significant gaps in your patient satisfaction, experience and reported outcomes data by race and ethnic background. (See Case Study 2)

3 | Reducing the per capita cost of health care

Value-based reimbursement models have shifted the clinical and financial risk for a patient population to hospitals and health systems. To succeed clinically and financially under those models, you need to reduce the utilization of services and cost of those services that don’t provide a demonstrable clinical benefit to patients. One way is to look at your data for variations in outcomes and costs by patient and physician. (See Case Study 3)

CASE STUDY 3

Health system parlays meaningful insights into big cost savings

Experienced in value-based care, Allina Health in Minneapolis has been transforming its care delivery model and forging new relationships with payers to improve patient care and cut costs. To succeed at this level requires a comprehensive data strategy and a team that understands the clinical scenario or the operational question, has a deep understanding of the nuances of the data to provide meaningful insight, and then takes action and tracks the results.

For example, Allina’s data showed that patients with atrial fibrillation (AFib) after cardiothoracic surgery had longer lengths of stay by two days than patients without AFib. The questions were: “Why is this happening? What can we do to reduce the length of stay and improve their care?” The Allina team looked at the data and the detail behind the data. “We developed a protocol to empower nurses to manage routine AFib after cardiovascular surgery and then we closely tracked the results. Our protocol demonstrated an improvement in the care for post-op AFib patients. Specifically, when our protocol is used, these patients now have comparable outcomes to those patients without AFib in terms of adverse clinical events, length of stay and its associated costs,” says Craig Strauss, M.D., MPH, vice president for quality, innovation and advanced analytics at the Minneapolis Heart Institute, part of Allina Health. “Across the cardiovascular service line, we’ve saved the health system more than \$60 million over five years while simultaneously optimizing clinical outcomes. Multiple small projects roll up to a really big success.” ●



Expert Panel

The AHA Center for Health Innovation thanks the following people, organizations and sources for the time and insights that made this Market Insights report possible:



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