

## INSIDE EDGE

# Integrating Data Across Systems of Care

### Introduction

In first approaching this report, we bandied about the subtitle “The New Knowledge Management.” After interviewing experts from Cerner, Geisinger, CHI, and Health Catalyst, however, we dropped that subtitle as premature. Integrating data across systems of care is still a work in progress, still in the plumbing stage. Health systems use integrated data for operational improvement and clinical purposes but the day of sophisticated knowledge management is about five years off.

Still, ‘the industry’ is starting to speak the same conceptual language and acknowledging that doing population health and analytics—the drivers for integrating data—is an emerging art form that depends on your organization’s perspective. Here are four of the most interesting we could find.

### Choosing your data lenses

Integrating data across systems of care depends on an organization’s perspective.

Population health, says John Glaser, senior VP for population health at Cerner, requires integrated data from the EMR, claims-data and county, state and federal sources. “There’s a bunch of data from many, many different sources. Layered on the top should be a single view from which to construct patient registries, compare cost data and logic and analytics for reporting purposes and direction-setting of the organization.”

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need all the environmental data. All I need is the information that tells me if this child is allergic to this medication. It’s a subset,” says Glaser.

Another perspective on data integration stems from health information exchanges (HIEs), which generally follow the federal HIE model. “From the lens of the doctor taking care of you, national standards apply and I really don’t

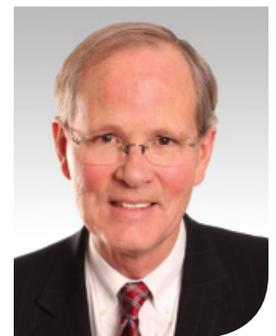
In contrast, from the lens of population health, the provider says, “I have thousands of chronically ill patients on Android smartphones or iPhones. How do I integrate all their data? There’s a zillion different definitions for conditions. And they’re all correct for someone, but completely unstandardized for population health. You need integrated aggregate data to compare the cost of hip replacements, for example. It’s a really big challenge when you’re at the scale of population health. It’s much harder than comparing only two hospitals,” he says.

### Data to match my payment

Within the next five to 10 years, Glaser predicts, healthcare reimbursement will be largely anchored in bundled and capitated payments that will generate even tighter control over care activities and events such as readmissions than even the “idiosyncratic” approach of today.

In the meantime, while health systems agitate vendors to make their EHRs compliant with national interoperability standards to facilitate data integration, these same providers will come to realize they are just beginning to learn how to manage population health. They often start to learn how, he says, by developing population-health strategies with their own employee populations. CIOs will become leaders at how to look at data and to translate it into action.

Clinicians, unaccustomed to continually monitoring and coaching patient populations over time, will have to develop the skills, abilities and processes to manage the health of populations using socio-economic data and by interfacing with community-based organizations like schools and churches.



John Glaser, SVP, Cerner



That will only increase the need for integrated data. “Getting data across systems of care that incorporate community resources will matter. Normalizing that data won’t be a wasted effort. Let’s settle in for a long haul,” he says.

### A medical specialist tackles data

Integrating data across systems of care for population health is part of Geisinger Health System’s identity.

Danville, Pa.-based Geisinger is an integrated health services organization serving more than 3 million people in 45 counties in central, south-central and northeast Pennsylvania and—with last year’s addition of AtlantiCare—in southern New Jersey. A physician-led organization with 30,000 employees, including 1,600 employed physicians, Geisinger has 12 hospital campuses, two research centers and a 510,000-member health plan.

As Geisinger’s chief data officer, Nicholas Marko, MD, an oncologist and neurosurgeon, breaks data into technical and strategic components.

Technically the question is, “How do we physically integrate data across a large healthcare organization that’s been shaped by mergers and acquisitions into an ecosystem with myriad EMRs? It is a purely technical challenge to create a coherent system from it all,” he says.

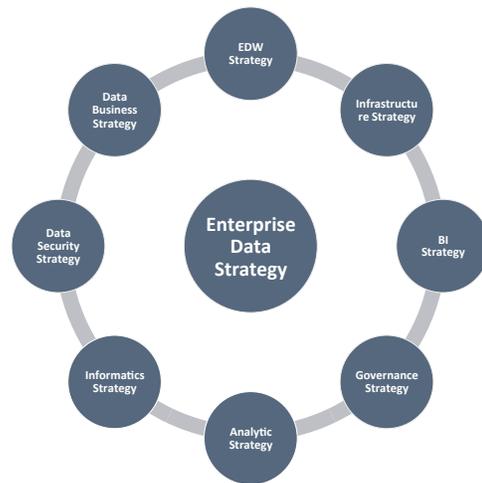
Strategically, the challenge is: to what extent does it make sense to achieve that integration? “We don’t want to do this merely because we can. How does being that large affect our decision to have an enterprise data repository? How effectively does an EDR help us meet our needs?” says Marko.

### Data domains

Marko’s role is to work in both technical and strategic spaces, which he further categorizes:

1. **Data Management**—enterprise data warehouse, data stack, business intelligence, reporting, dashboards;
2. **Data Science**—analytics, R&D and answering the question, “Can we employ data to solve some really complicated problems?”;
3. **Data Governance**—“This is how we make sure the right people get the right information at the right time. Getting the data where it’s usable.”
4. **Data Strategy**—determined by high-level executives from finance, research, clinical care and operations at each hospital. “We sit down to decide the key strategic uses of data. I spend a lot of time thinking about data strategy, which is both technical and strategic.”

### GEISINGER ENTERPRISE DATA STRATEGY



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Infrastructure is a key technical issue. “Big data is traditionally characterized by volume, velocity and variety, but that model is not important to us because data volume has become a commodity. What’s more challenging for us is the variety of data,” he says.

## GEISINGER

HEALTH SYSTEM



Nicholas Marko, MD, Chief Data Officer, Geisinger

That variety includes relational data sourced from the EHR that includes a relatively small amount of highly-structured data, imaging data that’s much denser, free text with little structure, genomic data that’s highly structured and metadata about patients/doctor interaction.

“What we really have is a variety challenge,” says Marko. “On the technical side

we’re challenged to create a system that can handle all the variety. The real growth area is from outside our EMR, from the 20-or-so odd systems from business operations, supply chain and the like. Given that 99 percent of the time people aren’t in the hospital, we have just a small fraction of our patients’ information in the EMR.”

### Following your personal data trail

The bulk of patient information is in publicly-available data including social and transactional data sources.

“Everybody in the U.S. creates a data trail. We have to combine it with what we know about patients,” he says. Integrating data requires scale, support for disparate source systems, an ability to integrate with the EMR as merely one of many sources and an analytics migration path that will meet growing demands over the next five years.

“At the end of the day the technical challenge is very doable. Strategy is where people struggle because organizations are not used to thinking about data strategy. In the past it was not considered part of the DNA of a hospital. That’s why it’s important we have coordination at the executive level to decide how we use data,” says Marko.

Enterprise data strategy involves establishing a clear set of priorities. “Pay attention to the HR part. Health systems in general underestimate the data science and engineering expertise required to build a system. The biggest investment you’ll make is in people.

Data is really a people business, not a technical one,” he says.

### Data to direct a ship of many states

You can’t find a more challenging task of integrating data across systems of care than at Catholic Health Initiatives (CHI).

The nation’s second-largest nonprofit health system, Englewood, Colo.-based CHI operates in 19 states and comprises 103 hospitals, including four academic medical centers and major teaching hospitals as well as 30 critical-access facilities, community health services organizations, accredited nursing colleges, home-health agencies, living communities and other facilities and services that span the inpatient and outpatient continuum of care.

Perhaps then it’s not surprising that, at such a large, faith-based system, the first question about data is existential.

“You have to ask why data needs to be integrated in the first place,” says Deborah O’Dell, CHI’s VP for business intelligence. “Is integration needed for real-time data from the EMR at the point of care? For the provider to see lab results or to see the patient? Data integration is not the business problem. How you solve the business problem may require integrated data.” Integrating data may be needed to fulfill regulatory requirements such as reporting for a Medicare Shared Savings program or to analyze population-health data from ACOs.



Imagine better health. SM



Deborah O’Dell, VP, Business Intelligence, CHI

As one of the largest health systems in the country, integrating data for corporate direction setting is critical. CHI has an enterprise data warehouse to aggregate such data for analytics to compare and identify trends. “We first put data into data domains—such as acute clinical—across all CHI application platforms. Then we can start to integrate across the continuum,” she says.

### Layers of integration

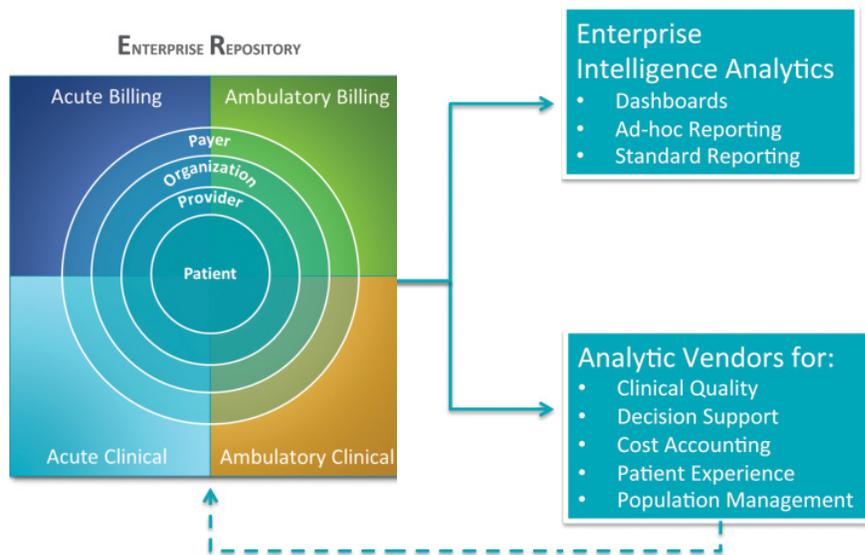
Because CHI’s diverse environment contains myriad EMR platforms—Cerner, Epic, McKesson, Meditech—those data domains help it integrate data from those sources into understandable categories such as an acute encounter or billing information from hospitals,





including details like procedures and charges. The data-domain quadrants—Acute Billing, Ambulatory Billing, Acute Clinical and Ambulatory Clinical—are all linked by circles representing patient, provider and payer. (see graphic below).

## ENTERPRISE DATA WAREHOUSE



“Each square and circle is a layer of data integration need. Our data warehouse is primarily used for analytics, so it’s not real-time. We can create dashboards in-house or send the data out to vendors to do another layer of integration,” says O’Dell.

“You have to approach data integration in steps,” she says. “People thought an HIE would integrate all this data. While that was the intent of an HIE, it doesn’t do that for data reporting, analytics or quality improvement. HIEs are more about the point of care. A physician goes into to see basic information about a particular patient such as what medication she was on. But how do we perform? How do we compare on a quality level? Data integration at the HIE level doesn’t do that kind of analytics.”

Integrating data for retrospective analysis has advantages that real-time integration at the point of care can’t afford.

“When providing information at the point of care the data must be perfect. However, if you’re doing retrospective analysis for directional information you don’t have to be exact. Data is a living thing. The older data gets the more stable it is. Because

of CHI’s size that directional information is essential for operational improvement.”

## Population health is public health

“The U.S. is undoubtedly headed toward population-health management. It’s the right

thing to do for patients, and economically it’s the only option for the country,” says Dale Sanders, executive VP for product development at Health Catalyst. “The rest of the developed world caught onto this years ago and that’s why we are dead-last in cost versus outcome. We’re calling it population health, but what’s really happening is we’re becoming public health organizations, and that’s the right thing to do.”

What public health is to infectious disease, population health is to chronic disease. “We need to move from reactive disease management to proactive disease prevention and, to achieve that mission, we must expand the current ecosystem of data beyond the four walls of traditional healthcare delivery. We have to get our hands on socio-economic data at the community and patient level, and patient-reported outcomes data,” he says.

Sanders is working on a data-warehouse project in Alberta, Canada to combine socioeconomic, genomic, law-enforcement and social-network data into a single and very large data repository.

“Alberta and other Canadian provinces function as public health systems. Hospitals and clinics are important anchor points, but their vision of healthcare is much broader than that.” he says. “Where there’s no clear method or standard for collecting socio-economic data, for example, they are developing a roadmap to get that data. They are already collecting patient reported outcomes data. It’s more than just collecting the data that exists. It’s acknowledging the data you need but does not exist, and then building a strategic roadmap to fill the gaps.”





## The Tesla model

Such data includes factors like income, language, patient-activation measures, and all the lifestyle behaviors that have an impact on a person's health such as air and water quality, sexual behaviors, diet, alcohol use, smoking, diet, housing and access to transportation.

"You can summarize it as the digitization or instrumentation of a human being. I use the metaphor of the automobile to describe what we need to do in healthcare," says Sanders. "Twenty years ago, cars had almost no onboard sensors to collect performance data. Today, digital sensors are everywhere in a car including the tires, seats,

fuel system, suspension, oil and cooling. When you take your car into the mechanic, the first thing they do is plug into the car's on-board 'data warehouse' and analyze the data. They can diagnose in seconds what previously took hours or days. Tesla automobiles are blanketed with sensors. All of that data is collected in the car's data warehouse, and also uploaded to the Tesla cloud where Tesla aggregates it and manages the 'population health' of their product lines. Their cars were specifically designed to support digital predictive maintenance, as well product and design enhancements."

Tesla analyzes that data with machine learning in the aggregate and then applies that insight to your profile and car, which is the equivalent of precision medicine. Using millions of data points over time these algorithms get smarter and smarter, more fine-grained in their accuracy.

"What's interesting," he says, "is that these algorithms and data techniques haven't changed in decades, but now we have the volumes of data that never existed before to precisely train these algorithms. Unfortunately, we're only collecting a few hundred megabytes of data per year on a patient, and those are mostly sick patients, which is a long way from a comprehensive, 24x7 view. We haven't instrumented the patient the way the car industry has with cars."



Dale Sanders, EVP,  
Product Development,  
Health Catalyst

## You know you're an integrated health system when...

The Alberta population-health project, for example, estimates that only 10 percent of the data required for that project will come from today's EMRs. "We don't even know what a healthy patient looks like from a data perspective," says Sanders, who frames healthcare data and decision support within the "Three P's:"

- » Population;
- » Protocol (subsets of patients like me); and
- » Patient.

"From a technology standpoint, I agree that the mass accumulation of data has become a commodity. The challenge today is at the data calculation level, to calculate the cost of care, for example. The challenge with data isn't the technology anymore. It's the governance of data and how you decide to apply that data to improve outcomes and lower costs."

Sanders asserts that most C-suite executives have little appreciation for how data-driven healthcare is becoming. "There's a generation gap. I can say that because I'm an old guy now. Older executives don't generally understand a really basic, new business concept: You can't have an integrated system until you integrate your data. Executives with dreamy M&A aspirations focus all their attention on integrating cultures and acquiring people and buildings. They are overlooking the data integration and acquisition strategy for the new enterprise. That's evident when CIOs aren't invited to participate in the deal-making. The CEOs, COOs and CFOs participating in M&A's don't yet appreciate that you can't have an integrated health system until you have integrated data."

## Conclusion

Integrating data across systems of care is one of healthcare's generational challenges. Not surprisingly, it's a complex mix of technological, process and cultural challenges that will require the best minds in healthcare to solve. As veteran CIO and healthcare executive John Glaser said, "Let's settle in for the long haul."



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