

What Works

SUMMER 2013 SPECIAL ISSUE

FEATURE



BI, Analytics, and the New Continuum of Care

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Healthcare providers are finding themselves in the midst of a torrent of change driven by regulatory requirements, enactment of the Patient Protection and Affordable Care Act (PPACA), patient health and demographic shifts, and changing patient expectations. Most recognize that improving data access, flow, and analysis is critical to meeting these challenges, yet this is easier said than done. This is true in particular for provider organizations that have little history of formal business intelligence (BI), data warehousing (DW), and data management technology infrastructure.

Fortunately, technology options are maturing to provide greater agility, ease of use, and rapid deployment options, which now include cloud computing and software-as-a-service. This article will explore important BI and analytics technology trends and how organizations are capitalizing on them to realize objectives.

Healthcare Turmoil: Intelligence in Demand

The list of changes affecting healthcare providers, not to mention other players in the healthcare industry, is long. Here are three of the most significant:



Meaningful use and quality-of-care reporting have been major drivers in the adoption of BI and analytics tools.

- 1. Transition from fee-for-service to a value-based “continuum” approach.** Guided primarily by changes in reimbursement policies by the U.S. Centers for Medicare and Medicaid Services (CMS), payers and providers are taking steps to move away from strategic, operational, and financial practices that account primarily for the *quantity* of care events. The future is about quality and outcomes; payers and providers are now focused on changing metrics and practices to ensure patients get appropriate care and institutions can follow their treatment to a successful outcome. Information and analytics will be essential to integrating the contributions of healthcare services providers, payers, pharmacies, and other participants into a “continuum of care” focused on outcomes.
- 2. Reduction in readmissions.** Also driven by PPACA is an industry-wide effort to reduce avoidable readmissions to hospitals and emergency care facilities. The continuum-of-care concept will be critical to achieving reductions; primary care practices, outpatient services, and technology for self-service health monitoring will all play important roles in keeping patients from unnecessarily returning to the hospital. Quality-of-care metrics and analytics will help organizations understand and predict readmission patterns and become proactive in addressing issues, thereby avoiding penalties. Providers are using analytics to discover better ways of treating chronic illnesses, such as diabetes, through a continuum of care rather than repeated hospital and emergency care visits.
- 3. Industry consolidation.** Mergers and acquisitions are consolidating healthcare providers into a smaller number of much larger healthcare service provider networks. Driving this development are pressures to reduce costs and gain bargaining leverage for CMS reimbursements and other concerns. Consolidation, while always challenging from an information management perspective, creates new opportunities for analytics across more and bigger data sources.

Now, let’s look at four technology trends and how organizations are realizing value from them.

Trend #1: BI and analytics enable better response to dynamic and diverse user needs. Healthcare providers increasingly need more agile and flexible BI reporting and analytics tools to track quality-of-care measures, meet meaningful use requirements, and manage their growing variety of facilities and specialty operations efficiently and effectively. For many, the days when single data sources and libraries of canned reports were adequate are over; today’s users need access to multiple data sources and require

greater capabilities for drill down, slice and dice, and other forms of data interaction.

Self-service BI and analytics tools are coming of age just in time. These tools allow decision makers to access, analyze, profile, transform, and share information without having to wait for IT developers to do all the work. One key demand is for more flexible dashboards and data visualization; users need clear and comprehensive views of multiple metrics and data reports as well as the flexibility to customize dashboards to fit their roles and responsibilities. They also need the ability to go one or more layers deep into the data behind the dashboard visualizations, something that canned reports typically supplied with electronic health records (EHRs) and electronic medical records (EMRs) have not allowed.

Meaningful use and quality-of-care reporting have been major drivers in the adoption of BI and analytics tools. Healthcare providers are required to meet a set of standards defined by CMS incentive programs for meaningful use of EHRs. Providers can earn incentive payments by meeting the criteria, which include delivering complete and accurate information, better access to information, and patient empowerment. BI tools can help organizations set up meaningful use metrics, take steps to achieve the information accuracy standards required by the CMS incentive programs, and use information effectively to support other initiatives.

Salinas Valley Memorial Healthcare System implemented Dimensional Insight’s “The Diver Solution” to gain visibility and detail beyond the canned reports available with its Meditech EMR system. “We would get a report from the EMR that said we had 50 orders out of 500 that were entered via our CPOE [computerized physician or provider order entry] system,” said Audrey Parks, senior administrative director in IT at Salinas Valley Memorial Hospital. More than 30 percent of medication orders entered into a CPOE is a stage-one requirement for meaningful use. “What if we were expecting that there should have been 200 orders entered? Unless we write our own SQL queries, there would be no way for us to drill down into how the EMR derived the 50 orders, or for us to verify and validate how that accounting was performed.”

The Diver Solution has enabled Salinas Valley Memorial Hospital to respond to dynamic user needs for meaningful use reporting as well as other requirements such as monitoring clinical quality measures. “Like most hospitals, we have more than one information system as part of our integrated EMR. In support of our quality initiatives, we can now reach across multiple SQL databases rather than be limited to the one Meditech EMR repository,” said Parks. “Our system empowers users to get different views of reports on

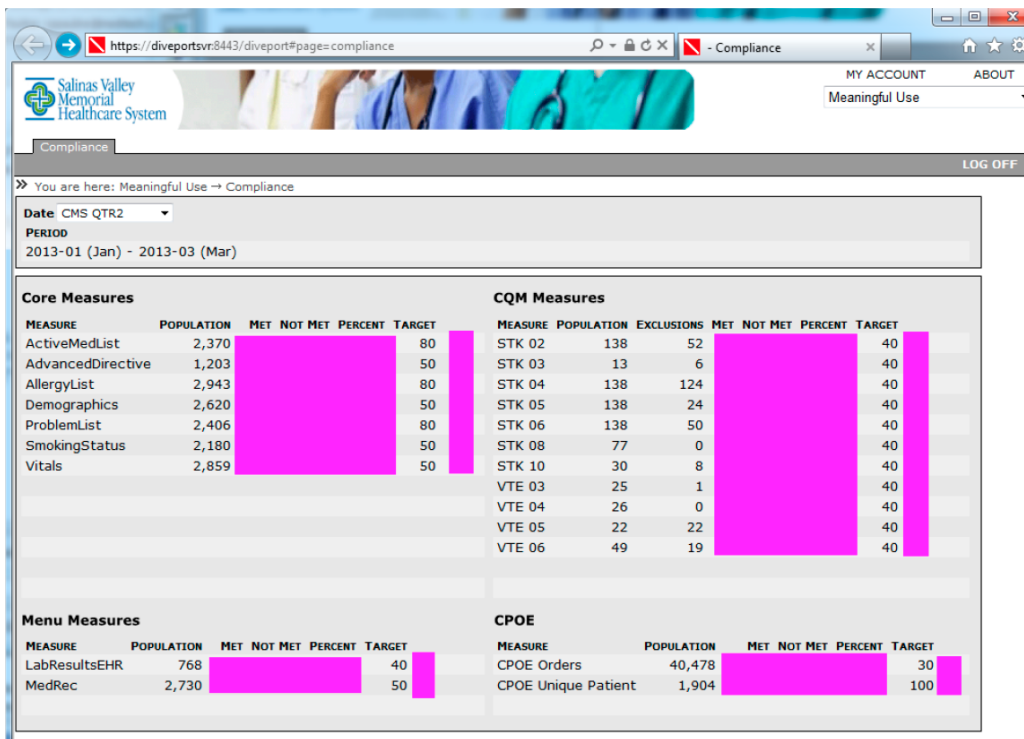


Figure 1. Example of meaningful use compliance slide from Salinas Valley Memorial Healthcare System.

their own, without having to submit requests to IT to change the sort order, change indexes, include different columns, and so on.”

Trend #2: Predictive analytics helps organizations prepare for the future of healthcare. Predictive analytics methods and technologies enable organizations to take a scientific approach to data investigation. By building models and testing multiple (and sometimes quite a large number of) variables, organizations can discover patterns, trends, affinities, correlations, anomalies, and other unexpected insights in data relationships. The growth in volume and variety of data is heating up interest in predictive analytics, which thrives on big data. The goal is to discover what the future holds based on models and the interplay of variables, then use that knowledge to reach desired outcomes by adjusting strategies, processes, and resource allocation.

Potential applications of predictive analytics across research, clinical, financial, risk, and operations are numerous. Clinical care is a natural target since healthcare providers need to apply predictive and risk-assessment thinking to diagnosis and prognosis assessments for particular types of care. Integration and consolidation of patient and care data into EHRs and EMRs offer rich sources of data for advanced analytics.

Predictive analytics can also play a key role in planning how to respond to the future direction of the healthcare provider busi-

ness model. As the continuum-of-care approach takes hold, many experts see healthcare adopting characteristics of the retail business model. Indeed, in January 2013 Walmart announced that it plans to offer “full primary care services” to go along with its strong position as a retail pharmacy. Some experts envision “shopping centers for medical services” that bring together specialties such as pediatrics, oncology, dialysis, and more in a cluster that has the same pleasing experience of modern malls.

Healthcare providers, using a “hub and spoke” model, are similarly focused on placing consolidated care facilities in the right locations to reduce the number of people choosing to go first to the “hub”—that is, the emergency room at the hospital, which is expensive and should be reserved for true emergency care. The Ohio State University Wexner Medical Center is working with Farsite, a Columbus, Ohio-based data science firm, to apply predictive analytics to discover ways to improve the patient experience and reduce the load on hub facilities, in particular by locating outpatient facilities at convenient locations within communities.

“Hospitals like to think beyond five-year increments to envision 10, 20, even 50 years down the road,” said Michael Gold, CEO and cofounder of Farsite. “The Wexner Medical Center wanted to predict what demand is going to be like given a variety of trends in patient demographics, patient preferences and projected

requirements, new technologies enabling individuals to collect their own health data, and more.”

Farsite is applying gravity models that are used widely in grocery store planning as well as multilevel regression and linear regression models. “We took all the variables together and have been able to estimate changes to existing patients’ visits based on moving facilities and consolidating the right service lines, such as pediatrics and ophthalmology, together in one location. We can also do simulations to understand future demands depending on how certain patient populations are aging, moving in and out of the workforce or school, and so on.” Working closely with the Medical Center’s business units, Farsite’s data scientists have been able to identify favorable locations that will help improve patient outcomes, reduce costs, provide the proper continuum of care, and increase the patient base.

Trend #3: Geospatial analysis offers new insights into the quality and safety of patient care. A growing number of healthcare organizations are tapping geographical information systems (GIS) to gain a new dimension on markets, customers, and resource allocation. “Micro” marketing analysis, for example, can enable healthcare services providers to fine-tune messages to specific communities based on relationships they can visualize by plotting data on maps. Providers can improve decisions about where to locate health services facilities, clinics, and emergency medical response fleets through geographic targeting analysis of location data about chronic disease rates, demographics, economics, and more. In addition, with many healthcare providers delivering charitable healthcare, it is important to use GIS to avoid overlaps with other safety net providers and fill in gaps where they exist.

Kaiser Foundation Health Plan employs mapping and geospatial analysis for a wide range of decisions, primarily through implementation of Esri’s ArcGIS platform. One key area is quality improvement, according to Michael S. Johnson, Ph.D., director of Utility for Care Data Analysis. “Once you’ve hit a certain level of quality within a healthcare delivery system for diabetes or heart disease patient care, for example, or to ensure breast cancer screening, the effort to get beyond that level grows exponentially if you keep trying to implement measures that are aimed at your entire patient base,” he said. “It becomes extremely important to understand who are the patients and members we are not reaching: that is, who is not getting the tests and screenings they need or isn’t keeping their blood sugar under control.”

Kaiser has been using geographical analysis to identify overlooked pockets in coverage areas. “We have medical service areas throughout Southern California, for example, that include hospitals and medical offices,” Johnson said. “All the areas are above the 95th percentile in our measure of diabetes management; we wanted to see how we could identify opportunities for improvement for that remaining 5 percent of members. We saw on a map that they were located on the boundaries of our medical services areas,

and that some were part of demographics groups that we were not effectively reaching because our communication materials were not in the right language. We would not have seen this if we had not been able to display the results geographically.”

Johnson said it has also been extremely valuable for Kaiser to see relationships by viewing its location data alongside information about specific communities’ resources for exercise, fresh food, and other health-critical needs. “Despite putting a lot of money into online tools, we don’t get a huge response,” Johnson said. “However, we do know where members live on the day they enroll. Analyzing trends based on location helps us engage with members early and more effectively, and helps Kaiser as an organization reach out and provide funding to help neighborhoods in ways that are meaningful and acceptable to the community.”

Kaiser and other healthcare providers are also implementing geospatial analysis to improve tracking of infections inside medical care facilities. Providers are drawing data from sensors placed over sinks and monitors in spaces where patient-caregiver contact is common. “It is helping providers hold people accountable and drive down the spread of infection,” said Christina Bivona-Tellez, Esri’s health and human services manager.

Providers are beginning to use GIS for more effective disease tracking in communities and to improve understanding of how disease patterns relate to members’ environments. For example, researchers have found that cases of pediatric asthma are highest among those who live in close proximity to freeways, Johnson said. Providers, governments, and other organizations are able to use this information to improve collaboration on reducing incidence of chronic respiratory illnesses in children.

Trend #4: New data warehousing and integration options will speed access and analysis. Data integration will be critical to successful consolidation, not to mention other objectives. However, it can also be the source of challenging and expensive problems. Organizations are evaluating the range of options, including data federation and virtualization. This means users can work iteratively with IT to create comprehensive views of data without having to physically extract and move it into an application, data mart, or specialized data store. An added benefit of data federation and virtualization technologies is that they can give organizations a common data access layer; various BI tools can then access data, but the users of these tools are insulated from changes to the underlying data sources.

The sidebar “HealthNow Applies Data Virtualization to Increase User Satisfaction and Ease Governance” offers a case study of how a major healthcare company implemented data virtualization to overcome data access and integration problems.

Smarter Care for More Patients

Experts estimate that PPACA enactment will bring more than 30 million new individuals into healthcare services networks. The only way organizations can address this challenge, among others discussed in this article, is through improved data access, integration, analysis, and sharing. Healthcare must and shall always be a human-centered endeavor, but it is no exaggeration to say that lives depend on successful information management and analysis practices and technology deployment.

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HealthNow Applies Data Virtualization to Increase User Satisfaction and Ease Governance

Healthcare organizations are under pressure to increase their information prowess for both business management and patient care. HealthNow New York, one of the state's top healthcare companies (with 815,000 members, 13,000 client companies, and 2,100 employees) had to solve its data access and integration problems so that it could use information effectively to improve health outcomes, increase operational efficiency and profitability, comply with new regulations, and safeguard information privacy and security.

HealthNow's rapid growth had created a data environment that was a "hodgepodge of legacy stores built on top of each other, with no true enterprise view," said George Yuhasz, the firm's director of Data Process and Governance. With data spread across numerous departmental and personal databases, HealthNow had conflicting definitions of attributes and data entities. Operational repository updates and data integration had to be done manually with custom scripts; the data warehousing team had to respond to reporting and data access requests piece by piece. Building persistent data extracts and other development was taking too long. Frustrated users' "shadow IT" projects threatened to create even more confusion.

HealthNow made it a goal to develop a single, common enterprise framework and data integration architecture. Rather than focus solely on building an enterprise data warehouse, HealthNow chose to make data virtualization, implemented with Informatica Data Services, a key part of its solution for enabling a reporting view of disparate data sources. "We have been able to set up virtualized access pretty quickly to give users an ability to at least ask questions and see what the data looks like, with

caveats in place that this mode would not necessarily perform at an industrial-strength level," said Yuhasz. "It gained traction pretty quickly from the standpoint of enabling quick prototypes of reporting layers for analytics and for doing application updates for Web services."

Yuhasz described a second advantage of virtualization: "We could say to the users, 'Okay, since we keep coming up with the need to create enterprise repositories for you to query yet finding that when we need to add fields it is taking too long, what we're going to do is start to enable you to have some heavily managed yet open environments in sandbox facilities.'" Yuhasz's group implemented sandboxes to provide access to carefully governed source data and monitor what users did with it. The sandboxes let his team put essential controls in place so that they did not become phantom enterprise data stores or the basis for shadow IT organizations.

"We did this together with users as a partnership rather than through a more typical order-taking IT service delivery model," Yuhasz explained. "It required trust between the technology and analytical teams." Yuhasz said that virtualization has enabled HealthNow to "do agile, first-pass development prototypes of what we could ultimately make persistent data repositories look like, including all the necessary security, quality, and governance measures in place."

This was excerpted from the TDWI Best Practices Report, Achieving Greater Agility with Business Intelligence. Read the full report at tdwi.org/bpreports.



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