



Much More Than Just a Number

How data analytics, the cloud and high-capacity networks are improving population health

Several years ago, Tina Esposito assembled a team like none other at Advocate Health Care, based in Downers Grove, Ill. The vice president for Advocate's Center for Health Information Services went well beyond business, medical and IT domains to find a data scientist and several statisticians and researchers. Their job: cull disparate data from dozens of different sources and formats that's continually pulled into proprietary predictive models. Their goal: find the patients most at risk for readmission – while they are still in the hospital – so mitigations were in place before they are released.

Like healthcare organizations elsewhere, reducing readmissions had become a top priority by 2011. Advocate, the state's largest healthcare provider, had just signed its first shared savings agreement with Blue Cross Blue Shield of Illinois to become one of the first commercial accountable care organizations (ACOs) in the country. This event, along with others such as signing up as a Medicare Shared Savings Provider, led to re-evaluating the care continuum throughout Advocate Health's 250 sites of care, including 13 acute-care hospitals, two children's hospitals and a growing home healthcare division.

"It's the change in reimbursements and change in the way we were looking at the care provided that necessitated our move to big data," Esposito recalled. It also led to a team jointly staffed by experts at the Cerner Corporation, with everyone focused on developing a new model to ultimately improve patient outcomes and reduce repeat hospital visits.

Healthcare organizations everywhere also are moving into big data, leveraging the mass electronic records now generated in today's digitized medical world to better serve patients. It's a major undertaking, particularly for healthcare systems with limited IT infrastructures, but as Esposito learned, tying ambitious analytic projects to population health is a worthy investment.



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Targeting the most vulnerable populations

By 2012, Esposito's nascent data analytics team was ready to launch two pilot programs that pulled information from various electronic medical record (EMR) streams to form a robust river of data poured into an algorithm that would help determine which Advocate patients were at highest risk of hospital readmissions – just hours after they'd been admitted. Esposito's team examined everything from ages, ailments and addresses to medications, lab work and physician notes.

By the end of 2013, the predictive models had been rolled out at all Advocate hospitals. Staff compliance to input data as requested now averages 75 to 80 percent per facility, and the analytics show a .76 accuracy rate for the admission model and .78 assurance for the discharge model.

Those results to date translate to a 20-percent reduction in high-risk readmissions, with a statistically significant decline in readmissions for patients with chronic obstructive pulmonary disease (COPD) and heart failure. It's also saved the equivalent of 3.5 full-time employees (FTEs) from lack of manual input now done by automated data tracking.

"I don't think the algorithm is responsible for that 20-percent reduction," Esposito noted. "The algorithm allowed us to target interventions to the right patients. That algorithm allowed us to identify who was at highest risk and how to target interventions to those patients."

Overcoming interoperability and output issues

Promising results such as those at Advocate showing cost savings and better patient outcomes are leading more healthcare organizations to consider similar analytics to target high-risk patient populations. The shift toward accountable care and value-based care is also moving big data analytics to the forefront.

"The goal is better care, preventative care and payments that are aligned to patient outcomes. And I think that big data can help enable that," said Regan Yeldell, senior director of enterprise vertical segments at Comcast Business.

Mining that data allows providers to customize individual care plans, she added, while also helping to achieve the broader goal of improving patient population health. And more information than ever is out there, not just from traditional EMR sources, but Internet-based "smart devices" and social media data now online.

A major hurdle, however, is the lack of interoperability within the healthcare industry to ensure data is accurately analyzed and based on a common vocabulary used among hospitals, practices and providers, noted Brian Klinger, account manager for strategic national healthcare accounts for Comcast Business.

Organizations such as The Center for Medical Interoperability in Nashville, Tenn., are driving healthcare innovation and standards just as CableLabs did for the cable industry, which needed to integrate technologies, according to Klinger. Comcast Business provides carrier-grade, fiber-optic Ethernet solutions built to support the network requirements of analytics-driven population health initiatives. Such high-capacity networks are crucial because they not only handle the volume, variety and velocity of new data being generated exponentially, but they can deliver real-time results.

"Quality of service, being enabled on a network backbone, is important because segmentation and prioritization of network traffic is critical," Klinger said. "At the end of the day, data quality issues are an acute concern in healthcare because it's life or death decisions being made, depending on accurate information."

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Not all data is equal

That is, of course, one reason healthcare big data analytics is different than other industries. Not only is healthcare a heavily regulated industry, with government standards for how to manage, access and store patient data, but at its heart, these analytical projects are about improving the quality of life for all human beings.

“I don’t see a lot of industries that have the ability to make a life-changing impact on people the way the healthcare industry can,” Klinger said.

Yeldell believes the volume of data generated also sets healthcare apart from other industries. “It’s one of the only industries where the wealth of data is also compounded by the need to share and distribute that data across multiple providers and multiple organizations,” she said.

She is seeing more of her healthcare clients using predictive analytics to find patients with specific challenges within service areas. Once these patients are identified, these organizations can do outreach to help them better manage or avoid chronic conditions that lead to new or repeat hospitalizations.

Sometimes those proactive measures can boil down to giving someone a lift. Klinger told of one healthcare client that paid for a taxi cab to pick up a patient so she wouldn’t miss a critical checkup. The organization’s management realized she might need a ride after their big data analyses indicated most residents in that community did not own cars.

Looking to the cloud

Big data requires a great deal of storage and processing power, both of which may tax on-premise datacenters. That’s why providers are making use of cloud service providers to manage their EMR, research and financial data – and to help with population health initiatives.

“By centralizing and virtualizing data infrastructure in the cloud using a high-capacity connection, healthcare organizations can meet not just the need for vast storage but also the ability to shorten backup times, data recovery times and access times because it’s not just about volume, it’s about speed as well,” Yeldell said. “When you have those offsite data connections, having that high-speed connectivity is critical.”

At Advocate, Tina Esposito didn’t have the needed IT infrastructure for her population health initiative, so her team turned to their Cerner partnership to access a cloud-based version of the open source software Hadoop, widely used for big data analytics. “We didn’t have the ability to roll it out by ourselves,” she said. “We were running an SQL data warehouse that looks at operational metrics, like length of stay, but this was much, much bigger than that.”

Just getting infrastructure-ready was a major undertaking and included developing an enterprise master patient index (EMPI) to arrive at clean data originating from multiple sources (Advocate has no less than five EMR vendors, all with their own nomenclature and classifications). Esposito initially thought her team could extract data from continuity-of-care documents, but they were more like snapshots. So they went back to vendors to garner more material.

Population health initiatives require cooperation from numerous stakeholders to be effective. This means communicating thoroughly and frequently on the goal and each person’s role in it. “You need to remind them that the technology is to support something bigger, that we’re doing it to improve accountable care and specific care populations,” Esposito said. “It’s important to always stay true to that.”

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In addition, it's important to consider the impact big data initiatives have on clinical workflows. "It's not just about coming up with great algorithms but making sure they are algorithms that can be consumed and are made as easy as possible to be consumed. Otherwise we've done all this for nothing," she added.

Identifying high-risk patients and mitigating those risks while they are hospitalized is "low hanging fruit" for the Advocate team. An opportunity opened up to focus on where to place patients post-discharge to further drive down readmission rates. And to incorporate other data – such as census, environmental and trending data (such as spending habits) to reach consumers before they develop conditions that bring them to the hospital. To date, Advocate has analyzed nearly 5 million records in less than four years. That could grow exponentially.

"We want to further support our patient populations," Esposito said. "When it comes to wellness, there's a lot that goes into it, and it's much more than the treatments provided. We need to tap into that data to create a 360-degree view of the patient."

This could become a major market differentiator – for Advocate and others going big with big data.

"As our healthcare system moves to more value-based care, people are going to be looking more closely at outcomes – not just individually but across geographic populations," Yeldell said. "Big data can enable hospitals to diagnose smarter, to work smarter and to provide the right care to the right patient at the right time."

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| Regan Yeldell



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