

How to prevail over a crisis using data analytics

Anne Paxton

September 2021—The pandemic has pelted hospitals and laboratories with wild cards and sometimes thrown wrenches into the works. But the jolts it has delivered to normal institutional operations, forcing new solutions to business and clinical care dilemmas, have also positioned laboratories to help produce stunning new capabilities.

The clinical analytics program at NorthShore University HealthSystem in suburban Chicago provides a model for how laboratory data can help institutions redeploy clinical care resources, adeptly adjust staffing and supplies, preempt negative impacts on patient care, and recover operational capacity and financial stability during a crisis.

Though NorthShore is a large integrated system consisting of six hospitals, its methods to develop its own analytic solutions can be used by community care and academic health care providers to create their own in-house or vendor-based solutions, says Chad Konchak, MBA, assistant vice president of clinical analytics. He wants to help other institutions and laboratories discover for themselves something he asserts with confidence: “There’s incredible untapped value in your data.”



Konchak

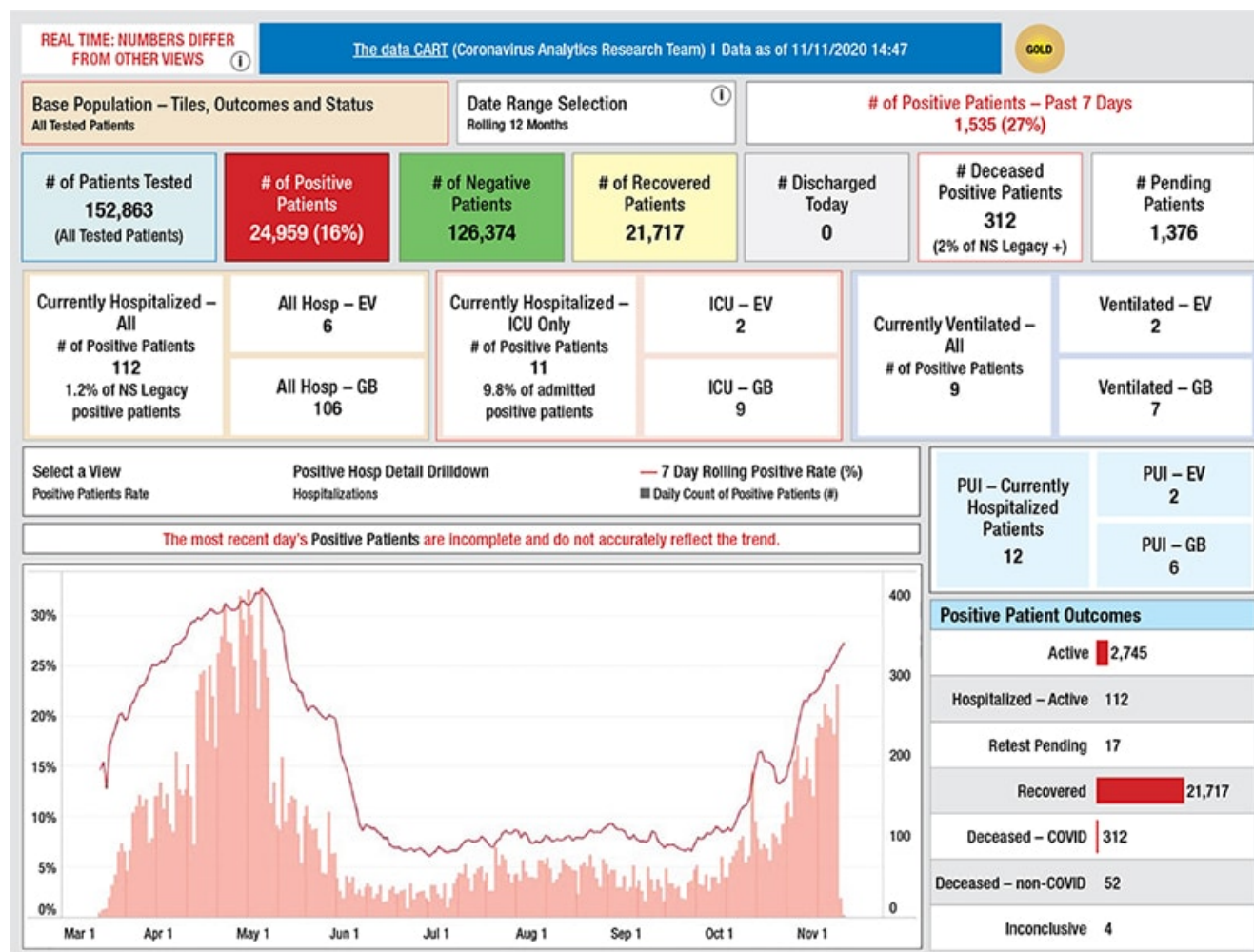
NorthShore clinical analytics, which began 11 years ago as a two-person unit, has grown to a staff of 25 and was not caught flat-footed when the pandemic hit. As in any crisis, there was a deluge of requests and requirements, Konchak says. But his unit launched its Data CART (Coronavirus Analytics Research Team) governance group around the same week in March 2020 that NorthShore admitted its first COVID-19 patient and shut down elective surgeries.

The Data CART would track and manage activities across NorthShore that were affected by SARS-CoV-2. “With analytics, the technology is the easiest part. It’s the soft-governance stuff that can be complicated, especially in a pandemic when all the timelines accelerated. It usually takes months just to define things.”

The NorthShore clinical analytics program, however, was exceptionally well prepared. NorthShore is one of only six health care organizations worldwide at the highest level of digital transformation maturity, as evaluated by the Healthcare Information and Management Systems Society, based on electronic medical record adoption, outpatient EMR adoption, and data analytics.

Before the pandemic, NorthShore had used its clinical modeling capability for disease surveillance, cardiovascular risk assessment, and diabetes care. So NorthShore was well positioned to develop comprehensive COVID-19 tracking, data visualization, and analytical dashboards to support clinicians. The analytics program’s performance during the past 18 months continued to bear out the known concept, Konchak says, that “business intelligence maturity enables hospital agility.”

NorthShore developed its own SARS-CoV-2 PCR test early on. That gave NorthShore “a relatively straightforward understanding of who’s positive, who’s negative, and who’s putative,” he says, “whereas other organizations had to draw a lot of inferences from symptoms.”



Data CART dashboard landing page. Numbers updated in real time (hourly refresh). The overall testing metrics on the first row are uploaded to a corporatewide employee website, increasing transparency of information. Hospitalization, intensive care unit, and ventilation censuses allow operations to understand available capacity in real time. Trending data at the bottom are aggregated over rolling seven-day periods to account for weekday/weekend variation. Data were collected from the internal Epic electronic health record system and visualized in Tableau 2019.2.

Konchak CW, Krive J, Au L, et al. From Testing to Decision-Making: A Data-Driven Analytics COVID-19 Response. *Academic Pathology*. January 2021. doi:10.1177/23742895211010257. Reused under license [CC BY-NC-ND 4.0](#)

Data like these became key indicators in the Data CART dashboard. “Our system needed to understand so many different things like our volumes on our different units and historical data,” Konchak says, in order to maintain care of the stroke and heart attack patients whom NorthShore would continue to admit as well as the COVID patients. Paired with predictive analytics on the spread of the disease, the indicators allowed the system to plan critical care nurse and physician staffing and detect areas in the community where jumps in disease spread were occurring or inequities in testing were developing.

The dashboards blend real-time reporting, updated hourly, and analytical and predictive capabilities in a single format that can be accessed on demand. Originating in SoftLab, the laboratory data flows into the Epic EHR and to a COVID data mart in the enterprise data warehouse, which feeds the primary analytics tools. The process employs the statistical programming language “R” to provide advanced analytics while data manipulation for the dashboard is carried out by the visualization software Tableau, which “is what’s making the magic happen,” Konchak says.

As the pandemic continued, the data and analytics helped keep tabs on multiple parameters of the disease and the hospitals’ operations while also supporting NorthShore’s return to normal, because restoring elective surgery volumes was one of the most important goals not only for patient care but also for NorthShore’s financial stability. “The data actually predicted the pandemic waves and breaks,” Konchak says, “so we were able to hit the ground

running and start to turn things back on.” With the dashboard updated hourly, “we were able to monitor the data in close to real time, which allowed us to make close to real-time adjustments.”

Just as job numbers affect predicted patterns in the stock market, the predictive model assumes that factors such as the current spread of the disease, how quickly it is happening, how many patients are hospitalized, or the ratio of people hospitalized to those in the ICU or on a ventilator all affect demands on the hospital, he says. “It’s not just how many people have COVID but how sick they are that taxes the system. And this model was able to predict those effects up to a week or two weeks ahead of time.” This capability let data analytics help drive clinical care decisions during the pandemic.

By October 2020, the CART data made it possible for NorthShore to restore 89 percent of its historical surgery volumes a month ahead of schedule and, in addition, to demonstrate that the accelerated recovery period had no negative impact on iatrogenic COVID-19 infection and did not result in increased deep vein thrombosis, pulmonary embolisms, or cerebrovascular accident. This is an example of “how a coordinated and transparent data-driven effort that was built upon a robust laboratory testing capability was essential to the operational response and recovery from the COVID-19 crisis,” write Konchak and coauthors in an article published April 20 in *Academic Pathology* (doi.org/10.1177/23742895211010257).

The success of NorthShore’s clinical analytics programs also illustrates that health care is making headway in catching up to data companies like Amazon and Facebook in using data and information not only as an artifact of a business but also as a strategic asset to gain an advantage over the competition, in Konchak’s view.

In reality, actionable data is somewhat unusual, he says. “A lot of people build predictive models that predict outcomes, but the vast majority of U.S. predictive models don’t make it into a decision-making process, meaning they are not actionable. It goes into a research publication, which is great, but it’s not actually leading to improved decision-making.”

A former software engineer early in his career, Konchak was later drawn to health care because “there were so many gaps. Even today we have a bloated, overly expensive system with lower outcomes” than other countries experience. “And just from a technology standpoint, there are a lot of opportunities there.” He has found that conceiving of health care systems as complex manufacturing operations has helped him use his business background to good effect in this particular health care crisis.

“Obviously, all the medical science is so critical to health care, but being able to understand the fundamental economics of health care is also critical,” especially when the subject is a \$3 billion hospital corporation like NorthShore. So he thinks about the throughput of patients in a health care system and how to optimize it. “It’s similar to a complex factory where you have inputs and outputs, except the inputs are complicated human bodies. And optimizing the process while being safe and minimizing other downstream outcomes like readmissions—that’s an industrial engineering problem more than it is a medical science problem.”

He hopes the *Academic Pathology* article will be a blueprint of sorts for other laboratories and hospitals that may want to emulate the data analytics run at NorthShore and to maximize their own data’s usefulness. He compares data to a raw material such as iron ore. “Iron ore is pretty useless sitting in a rock, but taking it through the right supply chain and the right kind of enrichment process, you can turn iron ore into steel and build bridges that get people from one community to another. It’s incredibly valuable,” he says. “Similarly, using the ones and zeros of digital data, once you enrich the data with positive tests, with comorbidities, the locations of patients’ homes, and other information, you start to paint a picture that becomes actionable and advances your ability to deliver better health care.”

One limitation of the consulting analytic tools outlined in the article, Konchak says, is that they are restricted by the populations tested by NorthShore, which has an extensive testing capacity but still tests only a sample of the region’s population. A fuller interoperable, intersystem data infrastructure would dramatically improve the analytic tools, he adds.

That's not all that's required, however. "A company can come in and plug in an analytics program, but that's only one-third of the problem that needs to be solved. Establishing a culture of data is critical for the success of analytics," Konchak says. "You need to have an analytics leader or an executive leader within your institutions who is championing this to really help drive that data-driven culture." In addition, health care institutions need to partner with engaged physician leaders. "Physicians are the real decision-makers. Predictive analytics and descriptive analytics like the Data CART are just tools to help them make data-supported decisions." On this basis he distinguishes analytics from artificial intelligence. "Analytics is more like augmented intelligence."

How can smaller institutions tap into the insight that data analytics can provide? He advises beginning modestly. "I'm in favor of the way we approached it, by finding small 'use cases' where you can show the value of the data. Sometimes people jump too far ahead and try to deploy complicated analytics. And those can become less and less transparent to the decision-makers."

"Start small. Start simple," he recommends. "A simple algorithm that indicates interventions for someone who has a lot of prior admissions or a lot of comorbidities is going to be more effective than a fancy predictive model that hasn't been well thought through." NorthShore's clinical analytics program that began with a two-person team was helped in its expansion by partnering with the organization's research institute. Universities are a resource that smaller institutions can similarly draw upon through partnerships, he says.

But whether through in-house or vendor partnership-based solutions, Konchak believes many small community hospitals can up their game beyond Excel spreadsheets and benefit from better analytics. "You don't have to have a 25-person team with PhD mathematicians to be successful," he says. With buy-in from an institution's executives, and with clinical and business leaders on the front lines who trust the process and use it, "really, anybody can do this."□

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