The Potential of Big Data in Healthcare
Today, there’s more data than ever—and more that can be done with it. Predictive analysis offers benefits to clinicians, patients, healthcare systems and insurers.

Nine years ago, M. Narendra Kini, MD, MHA, the President and CEO of Nicklaus Children’s Hospital in Miami, realized that his clinicians had more patient information at their fingertips than ever before—and that concerned him.

“Imagine a patient in the ICU; they are very sick. Some 140 variables are coming at the clinician,” says Kini. He lists data sources: the lab, imaging, the monitor, multiple IV pumps and other equipment. “The sheer amount of data are beyond human capacity to analyze—whether a clinician is experienced or inexperienced. That realization is still driving us.”

The magnitude of healthcare data is expanding at a jaw-dropping rate. In 2013, the industry produced 153 exabytes (one exabyte is equal to 1 billion gigabytes), and researchers estimate the 2020 total output will be 2,314 exabytes. That’s a 48 percent annual rate of increase.

According to Anil Jain, MD, fellow of the American College of Physicians and Chief Health Informatics Officer for IBM Watson Health, clinicians have abundant information but not enough time to assess and use it.

“They don’t know if they’re making the right decisions. That’s what keeps doctors awake at night.”

Jain says clinicians typically ask themselves a series of questions when trying to make use of all the data out there.

“If I had a patient that fits this particular pattern, based on everything that you know about other people like this person, based on everything you know about experts at linear institutions, or what’s in the journals or in textbooks, what are the things that I should be considering?” Jain has observed that physicians then assess the data in light of their own training, experience and critical thinking to make the best decisions for the specific case.
The Benefits of Big Data

Enter Big Data. It can form the foundation for predictive analysis and drive artificial intelligence.

Kini and his analytical team at Nicklaus are developing an artificial intelligence algorithm that could, by late 2018, combine data, analyze variables and accurately predict medical events. Kini describes an example of the algorithm at work. After recognizing patterns in critically ill children, the algorithm would “provide very powerful early-warning alerts to the clinician that something is going to happen to that child in the next six to eight hours.” Kini anticipates that the algorithm could help eliminate much of the quality difference between clinicians and ultimately save lives.

Analytics experts are convinced that machine learning—also referred to as cognitive computing, deep learning or artificial intelligence—can predict the chances of a patient’s hospitalization, the length of the stay and whether patient health is eroding despite treatment.

Artificial intelligence can draw on electronic health records and claims data, patient-generated health data, imaging data, genomic sequencing and even information on social determinants. It can provide enormous advantages in a value-based setting and also affords dramatic benefits to a health system’s bottom line.

“If I’m going to get paid for value instead of volume, I need to know if I can bring clinical data together with claims and other forms of administrative data to figure out the true cost of care,” Jain notes. “I can get an accurate answer only if I access and analyze large and disparate forms of data to account for important differences among seemingly similar patients.”

Healthcare in the US is in the midst of an unprecedented push for quality, safety and performance-based payment, coupled with a volcanic upsurge in comparison shopping by patients. Today, there’s an urgent need for healthcare systems to achieve a granular understanding of their patients’ data.

In early 2015, Chicago’s Rush University Medical Center (RUMC) employed data analytics to examine the quality indices used by US News & World Report (USNWR). The Rush study illustrated that pre-existing conditions were not being captured, leading to an inaccurate safety score. USNWR made appropriate changes to correct its methods.

“Over the last three years, we’ve made huge strides in understanding our data and highlighting areas that are true quality problems, not statistical problems,” emphasizes Omar Lateef, DO, RUMC’s Chief Medical Officer and Senior Vice President of Hospital Affairs. Lateef likens the organization of information to flipping on a light switch in a dark room. “You’re not guessing, and your plans are focused. Your resources are directed to where they need to be, and you know where the problems are.”

On an industry level, that means that the proper use of hospital or health system data can have enormous effects on quality ratings, which can directly influence reputation, marketing and financial incentives from the Centers for Medicare and Medicaid Services (CMS).

In a local performance-based payment environment, analyses of Big Data can trigger the redesign of emergency room or cath lab service lines to cut costs. Healthcare systems with multiple hospitals could, for example, use Big Data to benchmark one cath lab against others and identify areas of inefficiency.

Data analysis can even play a powerful role in workforce allotment and location of new facilities. Kini says, “Healthcare is not very good at using analytics to assess their markets or determine where to put the next location or what services need to be there. That’s standard in other industries. So we started to deploy detailed analytics by ZIP code.”

Kini also has applied predictive indices and analytic data to reduce first-year employee turnover, adapting the indices as a sophisticated pre-interview screening tool.
BIG DATA FOR BIG INSURERS

Targeted number crunching has impacted the healthcare policies of major employers as well. JPMorgan Chase & Co., which self-insures 300,000 employees, spouses, domestic partners and dependents, spends $1.5 billion annually on healthcare.

“Is that a good spend? Is that a mediocre spend? Are there opportunities to cut waste?” wondered Bernadette Branosky, JPMorgan Chase’s Global Benefits Manager. “Are we overspending? Are our employees overspending their own hard-earned dollars? How can we change people’s behavior to direct that spend in a different way?”

Beginning in 2012, Branosky and her team saw an uptick in the percentage of out-of-network healthcare claims, which are at least 50 percent more costly than in-network claims. Working with its two healthcare insurance partners, JPMorgan Chase strengthened the incentives for its members to choose in-network providers and, using aggregated, de-identified data, tracked the policy’s effect.

“Now we’re going in the right direction,” Branosky says, citing an increase in network utilization.

JPMorgan Chase also is successfully using financial incentives to encourage biometric screening and health risk assessments. Mining that de-identified analytic data has enabled the company to identify categories of employees least likely to participate in the incentive programs, and tailor policies to encourage their participation. That helps the employees learn about their own health risks, while giving direction to the company’s program offerings. Branosky’s office also found that the incentives are positively affecting healthcare decision-making for all covered employees, regardless of business line or income level.
Building a Big Data Capability

The evidence shows that an investment in predictive analytics and the manipulation of Big Data can lead to more efficient and effective healthcare within a value-based paradigm. But a recent survey indicates that limited resources at many hospitals can prevent the installation of comprehensive, enterprise-wide information governance plans.

For those healthcare systems with the funds to make Big Data an actionable priority, there are three options for ramping up the power of predictive analytics:

• Contract with outside vendors
• Collaborate with other systems. Leveraging Big Data analytics requires an advanced talent base in high demand, and collaborative efforts collect more data, leading to more accurate predictive capabilities
• Develop in-house talent

RUMC chose the in-house approach. “Two things have to happen,” says Rush’s Lateef. “First, you have to have accurate data to identify where your real problems are. We ‘clean’ the data so that we know, for example, if the indicated infections are real or not.”

The cleaning step used to take 80 percent of a data scientist’s time, but, in what IBM Watson Health’s Jain calls “the real story in Big Data,” recent advances have flipped the balance so that sophisticated model-building now fills 80 percent of a data scientist’s workday.

“Once we know what’s real, then we know how to fix it,” Lateef says. “If your data unearth a problem, then step two is letting the right people know so that they can fix the problem. We have 42-inch monitors in each of the six C-suite offices. They track key quality and safety standards for all the execs to see. That drives change.”

“Quality is data-driven.”

-Omar Lateef, DO, Chief Medical Officer, Rush University Medical Center, Chicago
Winning Physician Buy-In

One of the biggest obstacles to acceptance of predictive analytics is convincing physicians to support and use the tools Big Data provides. Nicklaus Children’s Hospital’s Kini, one of the country’s earliest supporters of Big Data in medical care, has been on the front lines of that battle. “I will tell you very honestly...there’s a tremendous amount of resistance,” Kini says. “Doctors are indoctrinated to be independent practitioners. They have long resisted the concept of guidelines. They may see forms of analytics or artificial intelligence as cookbook medicine.”

IBM Watson’s Jain believes that Big Data is a tool for physicians, not the other way around. “We don’t want to create clinicians who are basically doing what the computer tells them to do. The right answer is to have humans plus machines be better than machines alone or humans alone.”

“Artificial intelligence will change and elevate the standard of care. The day will come when, regardless of where you live, the patient will receive extremely appropriate care.”

-M. Narendra Kini, MD, President and CEO, Nicklaus Children’s Hospital, Miami

The Penalty for Ignoring ‘Big Data’ Adoption

A significant downside may await healthcare systems that decide to delay the use of predictive analytics and machine learning, as seen in the following examples:

• Successful management of risk-based contracts with insurers is contingent on knowledge of the system’s patient treatment costs by illness.
• Without predictive analytics and machine learning, systems may be less able to adapt nimbly to healthcare policy shifts.
• CMS is expected to increase reimbursement incentives for quality care, forcing more reliance on the rapid identification of current quality problems and accurate predictions of upcoming issues.
• Absent the visibility created through Big Data, system competitors may cherry-pick the most profitable components of healthcare delivery, leaving the remaining systems with the highest acuity patients.
• Educated consumers, perhaps the most important driver in the push toward data analytics and artificial intelligence, are likely to select their providers based on increasingly available quality data scores and abandon those healthcare systems that lag behind their competitors.

From outside and inside the medical industry, the pressure of Big Data will force changes that improve care and cut expenses. Those who harness the power of Big Data and artificial intelligence will reap the rewards.