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Meaningful Detection

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Health care organizations are increasingly looking to the promise of predictive analytics and data science to improve patient outcomes.



Predicting the future of a patient’s disease state is the aspiration of any provider organization. As current health care movements continue to up the ante on “value” and performance, industry leaders are turning to the promise of unprecedented amounts of data to get out in front of avoidable problems.

Notably, some organizations are beginning to tap into the power of the data housed inside their EHR investments to trigger rapid and proactive clinical response to deteriorating patients. The fight against sepsis, a condition that has received significant regulatory attention in recent years and can dramatically impact reimbursement rates, is a prime example.

Drawing on EHR-based data, Yale New Haven Health System was able to reduce in-hospital mortality rates by 20% to 30%—with specific emphasis on sepsis—through proactive use of an acuity score algorithm.

There are plenty of other success stories related to sepsis detection, according to George Dealy, vice president of health care solutions with Dimensional Insight, who says the evolution of the sepsis detection algorithm is one of the more established protocols used for early-warning detection.

“The original protocol came largely from the traditional approach of evaluating evidence against outcomes. But it was challenging to deploy because decompensation moves so quickly, and the signs are subtle,” he says. “The EHR is the ideal platform for incorporating the protocol into the care process and automating it to increase the likelihood of early detection. This approach also yields information that can be used to further refine the protocol- and algorithm-using tools outside of the EHR.”

Gregg Malkary, managing director with Spyglass Consulting Group, notes that clinical surveillance solutions are powering many of these early detection strategies. “These solutions are being implemented across a wide variety of care settings throughout the hospital—in the operating room, intensive care, med-surge, and telemetry,” he points out, adding that health care leaders are using these analytics initiatives to increase regulatory compliance and minimize the fallout associated with hospital-acquired conditions. “Existing deployments, at least for hospitals we have surveyed, are leveraging their multimillion-dollar EHR investments. That’s a starting point—early-warning risk scoring and sepsis detection.”

Eric Perakslis, PhD, a Rubenstein Fellow at Duke University, suggests that “while there are a lot of reasons to be excited” about the evolution of predictive analytics, the industry is still in the infancy stage of realizing its potential. He points out that health care organizations must reach a level of data maturity where they can rely on the analytics.

“At the end of the day, most health care organizations today can’t even count. You have to count first,” Perakslis says. “You can’t change a system if you haven’t measured it. I think you have to get the basics right, and then measure and respond. With things like sepsis models, I hope that we’re going to see genuine quality measures and that institutions start outperforming based on lots of different criteria. For example, readmission rates after surgery to the ED go way down, the number of septic events goes way down, the number of hospital-borne infections goes way down. These are all measurable things.”

Predictive Analytics: State of the Industry

Anny Pang Yuen, RHIA, CCS, CCDS, CDIP, a consultant with AP Consulting Associates, believes the industry is scratching the surface in terms of advancement with predictive analytics, the practice of data mining to identify specific patterns and predict future outcomes.

“Vendors are promoting the use of many types of data, from clinical, demographic, geographic, medical claims, pharmacy claims, etc, to generate these predictive outcomes,” she explains, adding that uses of predictive analytics range from anticipating a patient’s care plan and care transitions after elective surgeries to solving issues such as operating room bottlenecks.

The data powering these initiatives start in EHRs, and while these infrastructures are powerful repositories of information, they have their limitations, Perakslis points out. To provide the actionable insights needed for early detection systems, they must rely on algorithms, surveillance solutions, and other applications to create insights that evolve to the level of data science.

“It’s cliché, but it’s true that the design of EHRs are based upon billing systems. Providers that use their EHR to its strength surround it with other capabilities—maps, tools, algorithms—that allow them to exploit the promise of data in the EHR without falling into the pitfalls and the difficulties of dealing with the simple structure of EHR technology,” Perakslis says.

Malkary points out that while some EHRs provide best practice alerts, decision support tools, predefined order sets, and retrospective analytical tools, they are still limited by the protracted time that it typically takes for data to get in the EHR. “It could be three to four hours. So, it’s retrospective data, while what you really need is real-time access to data,” he says. “If I can get the data right off the biomedical devices, and I have multiple sources of data, I’ll have a much better sense of the condition of the patient and whether they are going to deteriorate. But if it takes me hours, that patient might have already been identified as having sepsis, and we could have prevented that from happening.”

Malkary adds that EHRs are not “best in class” from an analytics perspective. In fact, he notes that feedback garnered in a recent Spyglass report on clinical surveillance suggests that many EHR algorithms are at least a decade old. “Now that’s going to change over time. Right now, what [EHR vendors] are doing is trying to get the academic community do the research for them and improve the algorithm, in particular around sepsis,” he notes. “The problem is that many of these organizations are running three to four different vendor algorithms in parallel. And why are they doing that? Because none of them have confidence in the data.”

Quality data are central to the success of early detection systems and predictive analytics, according to Dealy, who says the starting point is standardizing disparate information to establish a single source of truth. Otherwise, the information powering these programs is inaccurate or incomplete.

“The data have to be reliable. One of the things that’s helped over the last 10 years is the standardization of clinical data. Before the era of meaningful use, every EHR defined [data elements] differently,” he explains, noting that it is nearly impossible to aggregate all the necessary data with an IT standard. “So the meaningful use program required EHRs to standardize or to use available, accepted standards for clinical information, such as a SNOMED CT, RxNorm, and LOINC.”

While standardization is one component of quality data, the information has to be accurate from the get-go, Yuen says. “In my opinion, there is always a risk of the data not being reliable because they rely on the accuracy of the initial data provided. I like to say ‘garbage in, garbage out’ when it comes to the use of data analytics,” she says.

Take the example of a medical claim submitted with an incorrect ICD-10 code for a specific diagnosis. “If a patient presented to a provider office for a mole removal and to rule out melanoma in the outpatient setting, and a coder mistakenly codes rule-out melanoma as a diagnosis and incorrectly submits the claim, the patient will then have an inaccurate clinical profile based on this claim submission,” Yuen says.

Looking ahead, Malkary believes that next-generation solutions for predictive analytics should not ignore the strengths of EHRs but build on them and address the need for quality, real-time data. “We need to embrace and extend their current value because they really are helping drive workflow ... but perhaps adding analytical capabilities for these more complex data models for these specific conditions,” he suggests. “We also need to be able to access real-time clinical and nonclinical data. We have multiple disparate sources throughout an organization to draw from—claims data, data right off biomedical devices, and the data in the EHR. How do you bring that all together?”

Early Detection: The Promise

Dealy notes that there are many potential use cases, such as early detection of sepsis, where surveillance algorithms could be applied. The formula comes down to recognizing patterns between observational data and outcomes and whether data are readily available in real time.

“There are certainly other serious conditions like heart attacks and strokes where there are indications ahead of time that someone is either predisposed or at high risk at a particular point in time,” he says. “There are fairly clear and commonly understood symptoms for stroke, maybe a little bit less for a heart attack, but certainly with stroke, you can observe a person’s appearance along with physiological signs.”

While early detection of acute conditions holds promise, Dealy says that the bigger opportunity lies with population health initiatives. “The sepsis use case affects one patient at a time in a high-intensity, acute setting. There are other use cases that have a wider ranging impact, particularly in the population health arena: identifying high-risk patients and intervening proactively to alter disease paths,” he says.

Perakslis is seeing progress with diabetes when predictive analytics is applied. “I think it comes down to really understanding more of the natural history of the progression of health care, not just sick care,” he says, pointing out that less than 2% of the information about patients is actually in the health record and that stakeholders need the other 98% to treat the whole patient. This step requires bringing social determinants of health into the equation, the nonclinical factors that impact a patient’s health such as income level, access to transportation, and family situation.

“Health care is good at intervening when something’s broken. They’re not good at informatica. The next step is actually really good chronic care,” Perakslis says, recalling a recent situation in which a patient with type 2 diabetes developed gangrene in his foot and ultimately had his toe removed. The patient, who lost his job, is now partially disabled, yet if care managers had the data to identify and predict the looming exacerbation, the progression of events may have been avoided.

Opportunity vs Reality

Deploying early detection algorithms is often a balancing act for hospitals and health systems. Dealy says health care organizations must be careful about how early detection systems impact alert fatigue. In essence, the more of these algorithms that exist, the more symptoms are tracked, which can result in a considerable amount of alerts.

“There are highly sensitive situations, like sepsis. Then there are things that are important to know, but not necessarily so urgent that they should be allowed to disrupt provider workflows,” Dealy says. “In population health use cases, there’s an opportunity to manage notifications in ways that take urgency into account.”

For example, mental health issues associated with drug overdose and suicide risk are time critical. Ensuring that someone doesn’t move further into a disease progression is important but less time critical.

As with the introduction of any new workflow or protocol, one of the greatest adoption challenges is culture. Getting physicians and other clinicians onboard to proactively use predictive analytics as part of real-world care delivery requires a well-thought-out change management strategy.

“The big issue in the hospitals is that we have various levels of understanding about what clinical surveillance analytics is, and that’s actually very problematic. We have a researcher, but how do we get everybody else on board? We have these next-generation tools, but how do you deploy them when we know challenges that exist with change management?” Malkary asks, adding that many vendors in the industry are making overinflated claims about what early detection can accomplish, which creates suspicion within the clinician community. “What we really need to have is greater validation through peer-reviewed articles that demonstrate the clinical efficacy on an algorithm-by-algorithm basis based on real data.”

Perakslis suggests that some organizations are too unwilling to try new care models. “There are organizations that are biased toward action and biased toward value, and there are other organizations that would approach those same opportunities very carefully,” he says. “My personal judgment sense is that you want to be in the middle somewhere. I totally respect organizations that don’t want to jump into something first, but I actually don’t necessarily respect organizations that are willing to wait until everybody else has done it. You know, people have to try.”

Regardless of the challenges, Perakslis believes that large organizations don’t have justifiable excuses not to leverage advances in clinical surveillance and predictive analytics. Pointing to the notable per-patient costs of EHR investments, he suggests that the business case for spending the extra dollars is an easy one to make.

“Don’t get me wrong, I don’t think every small community hospital needs to have a data science guru there but I expect the big academic medical centers to be doing it,” Perakslis says, pointing out that the cost savings are well worth the extra investment. “I look at the unnecessary procedures; I look at the

amount of times that [health care organizations] don't get paid for something. When you consider all the data going into hospitals, having a director of data science is really a small amount of money."

Malkary agrees, noting that as the industry heads toward value-based care, the name of the game is quality outcomes and cost containment. Consequently, he believes that use of early detection systems will continue to mature.

"Who wouldn't want to be able to detect sepsis?" Malkary asks. "Now that everyone is focused on it, the algorithms are actually getting more accurate, so there is more willingness to deploy them. There are areas of opportunity, but they have to be deployed in a thoughtful manner."

— *Selena Chavis is a Florida-based freelance journalist whose writing appears regularly in various trade and consumer publications, covering everything from corporate and managerial topics to health care and travel.*

Novant Health, Predictive Analytics Startup to Tackle Heart Failure Outcomes

Jvion, which specializes in artificial intelligence (AI)-enabled prescriptive analytics for preventable harm, announces a partnership with Novant Health as part of the newly launched Novant Health Institute of Innovation & Artificial Intelligence. Working together, the partners aim to reduce readmissions for congestive heart failure (CHF) patients, which can be as high as 35% in the first year and can double with each subsequent hospitalization. By integrating clinical and socioeconomic data and leveraging Jvion's AI technology, the companies aim to identify the most relevant interventions for the patients most likely to respond to them.

The partnership supports the institute's focus on identifying advanced technologies to provide highly personalized care and accelerated solutions with actionable data and insights for preventive prediction, diagnosis, and treatment to Novant Health's patients.

"We are excited to continue implementing AI-based treatment modalities for our patients and bringing these transformational technologies to Novant Health and the communities we serve," says Eric Eskioğlu, MD, Novant Health executive vice president and chief medical officer. "Partnering with innovators in analytics such as Jvion allows us to anticipate risk factors and effectively intervene through personalized treatment plans for our patients, saving time and money. The implementation of this technology will transform the way we deliver care for our patients with CHF across the Carolinas and Virginia, thereby improving their quality of life and preventing unnecessary readmissions."

"Heart failure is one of the leading causes of hospitalization for older adults," says Gordon Reeves, MD, Novant Health director for advanced heart failure. "Patients hospitalized for heart failure are inherently a high-risk population and are more likely to have a diminished quality of life after hospitalization. Jvion may allow us to focus our resources on helping them have a successful transition out of the hospital and recover to a better quality of life."

"AI-enabled prescriptive analytics represent a new, innovative approach to using clinical and socioeconomic data to pinpoint the most impactful interventions for individuals suffering from diseases, such as CHF, that can be managed or prevented," says Shantanu Nigam, Jvion CEO. "We are excited to partner with Novant Health, a leader committed to leveraging new technologies to save lives, improve quality of care, and impact key quality measures."

Jvion has successfully reduced CHF readmissions by 13% on average, preventing 130 readmissions per 1,000 discharges for a potential savings of approximately \$1 million. Jvion's Machine identifies individual patients at risk, from rising risk to high risk, of avoidable harmful events, the clinical and socioeconomic determinants causing this risk, and personalized interventions that change a patient's trajectory.

"With AI-based technologies like Jvion, our care teams can move faster and with more precision to address some of the community's most serious health concerns—in this case, reducing readmissions for patients with congestive heart failure," says Angela Yochem, Novant Health executive vice president and chief digital and technology officer. "This partnership with Jvion expands our AI portfolio and builds on our commitment to use leading-edge technology to connect with and care for our patients."

— *Source: Jvion*