CARE INTERVENTIONS EDITION

Care Analytics
NEWS

AI and Predictive Analytics Reduce Payer Costs Through Early ID of Patients Considering Elective Surgeries

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John Smith (pseudonym), 33, had been morbidly obese most of his life. After failing multiple attempts to lose weight, using various diet and exercise programs, he decided his best option was bariatric surgery. John didn't fully understand the procedure, other options, or what to expect. He simply thought it was his last hope.

A scenario like this is both common and costly for the nation's health plans and employers. John's bariatric surgery cost his plan about $25K. Unfortunately, soon after his surgery, he came down with sepsis, leading to additional costs and procedures, which ultimately cost his plan well over $50,000.00.

John's story is representative of many patients today. It is also one reason a growing number of health plans, providers and payers are exploring how artificial intelligence (AI) and predictive analytics can be used to identify patients like John earlier in the surgery decision-making process. Their goal is to provide patients and employees with education, information, and support to make more informed decisions about surgery.

Readmission Prediction Models

Most current readmission prediction models only incorporate clinical and demographic variables obtained from administrative databases.[2-5] Usually, these risk predictions are not available until months after discharge. One more timely model incorporates clinical data stored in the electronic health records (e.g., potassium levels) from the patient's current hospital stay to predict 30-day readmissions at discharge.[6]

The promise of incorporating social determinants of health into inpatient readmission predictive models largely remains unfulfilled. Most models that incorporate socioeconomic factors actually use community-level factors as proxies for unmeasured individual-level measures of social health.[7,8] For example, to measure a patient's financial vulnerability, researchers might use the poverty rate for neighborhood in which the patient lives as a prediction model factor. Other readmission prediction models use stand-in factors of individual-level social care need, such as "lives alone," "a health care visit with a social worker," and "missed clinical appointments."[9,10]

In other words, readmission prediction models usually lack individual-level social determinants of health. And yet, substantial research exists that healthcare organizations systematically collect information on social care needs. Could this data be used for readmission prediction models?

Social Determinants of Health Data in the Electronic Health Record

As described above, most readmission prediction models incorporate clinical administrative data from electronic health records (EHRs), but the data on social health is lacking. However, a recent development may transform the usefulness of the EHR data in readmission prediction models. The American Medical Association (AMA) and United Healthcare have proposed more than 20 new ICD-10 codes for social determinants of health that add details to existing code categories Z55-Z65.[11] For example, Z59.62 would indicate that the patient was "unable to pay for utilities." While not approved or finalized, these codes could go into effect as early as October 1, 2020.

Until such a time official ICD-10 codes are developed for social determinants of health, researchers may be able to use clinical notes in the text fields in the EHR. Natural language processing is a technology that enables automated extraction of information from the notes of physicians and other providers. Navathe and colleagues used this technique and found that lack of peer support and housing instability were statistically associated with inpatient readmissions.[12]

Social Health Surveillance

Aside from the EHR data, healthcare organizations collect social health data for planning, implementation, and evaluation of the integration of social and medical care. Public health calls this data collection function "surveillance."

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In public health, active surveillance involves the health department directly conducting research or reaching out to providers and laboratories for data. Passive public health surveillance involves collecting information when health providers or laboratories voluntarily report cases of disease.

As with public health surveillance, social health surveillance allows healthcare organization to monitor the social conditions in a systematic way in order to guide interventions or measure progress towards goals. In our research on medical care and social care integration, we describe two types of social surveillance approaches that can be used in readmission prediction models: active and passive.

Using Predictive Data to Reduce Unnecessary Procedures

Using technology to improve the decision process for consumers is a necessary undertaking. One of the critical challenges facing the healthcare industry today is how to eliminate and reduce unnecessary medical tests and treatments that cost an estimated $200 billion annually and cause an estimated 30,000 deaths a year.

Elective surgeries make up a large percentage of those performed in the U.S. Each year, more than 2.3 million people undergo one of the following procedures:

- 1,000,000 hip and knee replacements
- 500,000 low back surgeries
- 600,000 hysterectomies
- 228,000 bariatric surgeries

These surgeries are costly. Knee surgeries alone can cost up to $50,000.00. Lower back surgeries range on average from $50,000 to $100,000. While cost is a reason to examine the factors influencing elective surgeries, a more critical issue is that it is often choice and not expert advice or counsel from physicians driving patients' decisions. An analysis of government data that says upwards of 20 percent of surgeries performed are unnecessary.

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The number of potentially unnecessary surgeries performed is one reason why it is important for plan sponsors to look for ways to educate consumers so they make better decisions.

Educating consumers begins with identifying those employees or plan members considering surgery.   While programs to connect with patients considering surgery do exist, especially among larger employers, engagement at the right time in the decision-making process can be problematic.

For example, an individual may undergo a medical test or start treatment for a condition like lower back pain, but by the time claims data is available, the decision to proceed with the surgery is already made. Often such decisions are finalized without clinical advice or a second opinion.

Enter AI and Predictive Analytics

Here's where and why AI and predictive analytics can begin to play a critical role in the early identification of patients considering elective surgeries. Predictive outreach models use actuarial analysis and a range of data - such as claims (medical and Rx), social determinants of health (SDoH), demographics and environmental factors - to predict a future event, and subsequently seek to avoid that event through intervention.

These data elements, when combined with machine learning (ML) and AI predictive models, can spot very complex patterns in patients' behaviors that typically lead to surgery. These patterns are not easily uncovered by conventional means. This technique is extremely valuable, as future events can be predicted prior to all of the claims data being available. In contrast, while a standard disease management model identifies a population with a particular diagnosis or prior expenditures, it's usually too late to make a difference.

Predictive technology for surgery examines two basic issues: 1) who is at risk and 2) at what point in the care process is there the opportunity to engage and educate. To find these insights, organizations can use claims data including medical, pharmacy, physical therapy and even behavioral health.

The data analyzed indicates patterns and trends useful in identifying patients considering surgery. Consider an employee who is taking OTC NSAIDs for knee pain. She then progresses to a prescription NSAID, increasingly stronger, then opioids. That pattern can indicate that within a few months – that employee will be considering surgery. Reaching her early on provides an opportunity for intervention and education.

Additionally, it is helpful to analyze robust database warehouses that mirror a specific population to identify trends. For example, Medicare Advantage data for older patients considering knee surgery; commercial health plan data for younger populations. Combined with organization-specific data, use of information from a warehouse can provide important insights that can feed into the predictive model.

There are other valuable insights to be found through predictive modeling. Data analysis allows organizations to think about what has been done in the past to engage patients considering surgeries and consider the strategies that will provide better outcomes in the future. One of the most beneficial features of AI is that it enables us to continually learn.

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If past programs targeted at educating patients used postcards or letters and produced less than desired results, consider programs that use nurse allies to call targeted patients. Each type of program implemented will provide a wealth of data to be analyzed and incorporated (or not) into future programs.

Steps to Create Effective Programs

Developing a predictive modeling approach to surgery decision education, support and intervention requires a number of steps, including:

1. Understand the intervention and its economics to identify those members at risk of surgery before the member has the surgery. There is usually a small window of opportunity. Make sure the technology used provides the opportunity for rapid interventions.

2. Develop a Model specifically for the intervention. This is done by analyzing billions of rows of historical patient behavior data to find common trends and patterns that typically lead to a specified future outcome, such as surgery. For example, trends related to certain diagnoses, procedures, prescription purchases, demographics and disease comorbidities can be very accurate in predicting a future surgery, often months before it occurs.

3. Test the Model by employing vigorous internal and external validation techniques. For example, overlaying the predicted scores on an un-touched data sample such as a separate time frame, to analyze the model's accuracy. The goal is to determine how accurate the model is at applying the same patterns/trends seen in one timeframe to a separate timeframe and getting the same outcomes. Champion / Challenger testing can also be used to understand the efficacy of new modeling algorithms in a timely fashion.

4. Consider the operating environment and process and develop it further where necessary. For example, when a model predicts a surgery is imminent, how quickly can an outreach be triggered? Are there channel considerations for how one can communicate to that member, either by email, phone or direct mail? If an outreach has already been tried for a specific member, for example an email has been sent without engagement, what is the next best action to take that will maximize the likeliness of engagement of the subsequent outreach?

5. Monitor the results against reasonably-defined key performance indicators (KPI) and iteratively improve the process. For example, call backs within a specified attribution time frame.

6. Identify industry or organizational standard KPIs. A few to consider include:
    - Measure the percentage of increase in engagement of educational programs;
    - Quantify the number of surgeries prevented before they occur
    - Analyze the reduction in claims costs against resources invested and deployed to run the program (in other words, to generate a positive, marginal ROI).

7. Analyze the organization's ability to internally or externally develop a surgery support program. While it is possible to build programs internally, it can be costly, especially initially. Partners with proven experience and a solid track record can assist in development and implementation.

What does the introduction of AI and predictive modeling for surgical procedures mean to payers? What lessons can be learned?

AI models have significantly improved over the years as a result of improved data collection and the introduction of ML. They will continue to improve in the coming years. However, the value of surgery decision support programs goes beyond early identification of patients. The educational opportunities provided by such programs lead to better engagements and participant satisfaction that lead to better outcomes and lower costs.

Our organization is pioneering surgery decision support programs for employers and health plans. Organizations that implemented our model over an 18-month period saw engagement rates and cost savings more than double than the rate experienced by companies not using this model.

Specifically, employers that had predictive outreach in place for a pre-surgery initiative saw an engagement rate (number of people enrolling relative to number of actual eligible surgeries) that was more than twice as high as employers that did not have predictive outreach in place — 31.3% versus 14.3%. Additionally, claims savings for these individuals was more than double the savings from employees who were not identified so quickly — $7.33 per employee per month, versus $3.05 per employee per month.

AI and Predictive Tech – A Strategy Worth Considering

Targeted outreach models that leverage ML techniques and predictive modeling can benefit disease and demand management programs by increasing enrollment and optimizing outreach efforts and resources. They provide an approach aimed at education, engagement and support, providing long-term benefits for participants. In an era of ongoing benefit uncertainty, health plans and payers would be well served to look for innovative ways to reach patients in the surgery-decision-making process. AI and predictive analytics are well worth consideration.

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