

The Journal of Workers Compensation

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A LOOK AT THE FUTURE OF PREDICTIVE MODELING FOR WORKERS COMPENSATION CASE MANAGEMENT

BETSY ROBINSON AND BRANNON TRANSUE

What are the odds that the next card dealt will be an ace? That another hurricane will hit New Orleans next year? That a 32-year-old male with a back injury will return to work in six weeks? For businesses of all kinds, predictive modeling can help answer questions like these.

The insurance industry has long relied on predictive modeling to help manage risk and establish premiums. For the last decade or so, innovative workers compensation managed care companies have used predictive modeling to identify the claims that could benefit most from clinical case management. These early models were typically focused interventions early in the life of the claim, based upon claim attributes known at the time. Although results to date have been positive, the number of outlying cases

that sidestep such early detection, especially those that ultimately succumb to a chronic pain pattern, indicates room for improvement. The limitation of utilizing claim attributes available at the time of injury is that they cannot predict the impact of less-than-optimal care management choices subsequent to injury or the variable influence of personality on the claimant's actual rate of recovery and response to treatment.

Fortunately, the state of the art continues to evolve in the right direction. Currently, the best predictive modeling programs are those that are applied throughout the life of a claim to support prompt intervention if a claim appears to be veering off track based upon patterns and duration of care for specific diagnoses. Incorporating data from nontraditional sources, these tools are becoming sophisticated enough to identify such claims before they become "adverse surprises."

MINING PAST DATA TO PREDICT THE FUTURE

Data mining is the discipline of identifying patterns and relationships in information. It includes looking at associations or connections between events, or sequences of events, that might indicate a cause/effect relationship. Sometimes these patterns enable statisticians to make reasonable predictions about the future based on past events. The aspect of data mining associated with forecasting is known as predictive analytics. Predictive analytics uses the process of predictive modeling to create a statistical model of future behavior, probabilities, and trends. This mathematical model is based on relevant predictors within the database and is revised as the database grows larger.

For at least a decade, innovators have used predictive modeling in workers compensation to identify cases for clinical management. Before predictive modeling, case management identification processes were based on generic triggers. Often, they were ultimately left up to individual adjuster decisions, which naturally tended to be inconsistent in the nature of the claims referred as well as in the timing of the referrals. Predictive modeling systems can assess all key claims cost drivers to pinpoint the claims that will benefit most from active case management based on historical data. Such tools provide objective recommendations that take the guesswork out of the "manage/don't manage" decision to ensure that referral decisions are timely, unbiased, and consistent. The most sophisticated predictive modeling systems use multiple modeling techniques to increase overall accuracy of the prediction. However, many of the predictive models in use today are limited to the data elements captured in the claims systems.

When used in the beginning stages of a claim to support early interven-

tion, the automated tool can analyze and respond quickly, often identifying risk that an adjuster might overlook or might not respond to immediately. Systems can be integrated with managed care and claim programs, so they can pull data directly from first reports of injury and process claims within hours after they are received. The system should look at such information as the cause of the injury, the nature of the injury, the affected body part, the individual's age and gender, the individual's job class code and wage, the date of injury, and the jurisdiction. The modeling tool examines all available claim features, processes them against the predictive model to assess the expected benefit from clinical case management, and then returns a numerical score. Ideally, the tool should also provide an explanation of how it determined the score, including the factors considered most important in ranking a particular claim. This helps in understanding the model's recommendation and provides valuable insight for future decisions. The best systems generate reports regularly, every few hours, enabling virtually real-time intervention in cases where time is critical.

Each organization has a different culture, policies, and appetite for risk. Predictive modeling systems can be calibrated to the employer's thinking, setting scoring thresholds for claims to determine which cases are automatically sent to a nurse case manager for immediate attention, which cases require no case management, and which need to be reviewed by a clinician before a decision is made. As an added benefit, the organization's data can also be mined to identify the most frequent types of on-the-job accidents that the company experiences, as well as when, where, and why they occur. This information can be useful in developing prevention and mitigation strategies.

DIGGING DEEPER

Most companies that are using predictive modeling today apply it at the front end of a case to project what is expected to happen. This approach can be valuable, but it has inherent limits due to the nature of the information that is initially available. Things change. Sometimes treatment is not as successful as anticipated. Predictive modeling applied at the outset cannot account for the fact that two individuals of the same age, with the same injury and the same job, for example, may have significantly different outcomes. In many cases, it makes sense to dig deeper and look at the additional data that become available as the claim matures. Doing so makes it possible to identify areas where case management or even clinical interventions that did not initially appear necessary might now be useful.

Most predictive modeling today looks only at claim demographics. In

recent years, some systems have begun to incorporate ongoing medical utilization data as well. This enables the model to consider clinical attributes in order to identify the trends that may indicate that the claim is not reaching a positive resolution. Mid-case triggers might include diagnostic testing that continues after 90 days or after changes in providers. In a study of chronic pain conducted by Roper Starch Worldwide in 1999, one in four chronic pain patients made at least three changes in doctors, primarily because he or she still had pain after treatment.¹ Another mid-case trigger might be increasing doses of strong pain relief medications, perhaps indicating that the treatment is not working as expected.

Some claims will call for closer involvement on the part of a nurse case manager. Others might call for a physician advisor or peer-to-peer consultation. Similar to early application of predictive modeling, mid-case modeling provides a tool for helping keep a claim on track, before expenses escalate unnecessarily, and for helping the injured worker achieve an optimal outcome.

TAKING THE NEXT LOGICAL STEPS

To date, predictive modeling tools have not been truly effective in preventing the subset of claims that become outliers, such as cases in which the pain from the injury does not resolve. These are the cases with unanticipated care and costs. According to the Workers Compensation Research Institute (WCRI), these so-called “adverse surprise” cases probably represent 1 percent or less of cases with more than one week of lost time, but account for as much as 12 percent of total medical costs.² According to WCRI, these types of cases appear to be trending upward, most notably in California. In that state, claims with significant adverse surprises increased steadily, year over year, from 2.2 percent of claims with more than one week of lost time in 1996 to 6 percent in 2000.³

Very often, adverse surprise cases do not present as clinically catastrophic — they are most often lower back injuries or similar diagnoses with no attributes that differentiate them statistically — but they can be financially catastrophic over time. In fact, when WCRI analyzed data from claims with an average of three years’ experience in 14 states, it found that nonspecific back pain accounted for one in seven cases and 11 percent of medical payments in those states.⁴ What’s more, adverse surprise claims seem to be responsible for driving an increasing share of medical costs. In California, the share of costs associated with these claims rose from 20 percent in 1996 to 31 percent in 2000.⁵

It could be of great benefit to be able to predict which claims were most

likely to fall into this undesirable subset. Specialized resources might be applied earlier in the life of the claim in order to keep the claim on track and support a more positive outcome. To be effective, a solution must address an understanding of the nature of pain that has evolved considerably in recent years. Where chronic pain was once defined as any pain that lasted six months or more, it is now defined as “pain that persists longer than the temporal course of the natural healing that is associated with a given injury or disease process.”⁶ This new definition recognizes the complex and subjective nature of the pain experience and the role of the mind in processing and interpreting pain signals. It also recognizes that if initial clinical management of the injury is not effective, there is an increased risk that the associated pain may linger long after the tissue damage has resolved.

Applying predictive modeling tools and techniques as a claim ages is a strong step forward. It can help support effective, consistent application of resources in order to promote the best possible outcome, and to do so as soon as the risk increases. For example, drug use trends can be analyzed to identify those who could be at risk for substance abuse down the road. If the model identified prescriptions for narcotics and other controlled substances from multiple physicians, prescriptions filled at multiple pharmacies, or high prescription fill quantities of a prescribed narcotic, these cases are identified as being at risk, and an appropriate intervention can be determined. The case can then be triaged and the risk confirmed. Appropriate interventions could include case management, provider outreach, pharmacy reviews, patient education, or, if the claim is mature, complex case management.

EXPANDING THE DATA POOL

Even using the mid-case triggers that are available now won't identify every recalcitrant case, because — as with early use of predictive models — many additional factors can affect the outcome of the claim. Medical utilization and claim demographic data do not provide all of the answers. The medical community understands that, when it comes to pain, the mind/body dichotomy is a gross oversimplification at best. Ultimately, the paradigm shift benefits injured patients — but it poses some challenges for predictive modeling, because the nonphysical attributes that affect resolution are more difficult to identify and quantify. The challenge to the industry is to identify the other attributes that affect the progress of a case and to identify them early enough in a claim to avoid progression to chronic pain, if possible.

The industry is beginning to recognize that certain behavioral attributes may indicate an issue that basic clinical data and claim demographics alone wouldn't identify. Some companies are beginning the work necessary to identify these issues. One large national employer with an integrated benefits program looked at data from health insurance, workers compensation medical and indemnity, short- and long-term disability, and sick leave for more than 58,000 individual employees. The analysis identified that less than 1 percent of the population was responsible for most of the company's health-care spending. In some cases, the costs were driven by catastrophic injury or illness; however, analysis revealed some interesting trends. For example, of the employees in the high-cost driver groups, about half had repeated motor vehicle claims and transportation rules violations, and many used both occupational and nonoccupational benefits simultaneously.

Not all companies have access to this level of combined data. Further, some of the attributes that might indicate a problem aren't the kinds of data that would ordinarily appear as a field in a database. Instead they are included in clinical notes or adjuster notes. Today's data mining tools have the capability to focus on information within these "notes" to identify keywords or phrases that might be indicators of potential changes in expected claim outcomes.

Another area to look at is clinical care. Provider profiling can offer insights into which providers don't overtreat or overutilize diagnostics, as well as those who have historically had a higher-than-average percentage of worse-than-expected outcomes. By appropriately adjusting for the case mix, providers who treat more severe or complex cases are not penalized in the scoring. By comparing providers within a specialty who treat similar cases or injuries, it is possible to analyze patterns in medical costs, number of office visits, number of services provided, and duration of treatment. This information makes it possible to alert the claims adjuster when a claim involves a provider who has demonstrated patterns of overutilization in past claims.

FOCUS ON TODAY AND A SYSTEM THAT MEETS YOUR NEEDS

At any stage in its evolution, predictive modeling can be a useful tool for workers compensation case management. With this type of tool, it is important to remember that a single decision model won't meet everyone's needs. However, modeling tools can be customized to focus on specific attributes or specific areas. For example, if a company finds that back injuries in a certain state seem to be problematic, the company needs to use a model that is flexible enough to support such specific variations across

groups. Much of the system set-up will depend on the customer's appetite for being aggressive with clinical case management — a determination that can be made according to the organization's specific risks based on work force demographics and claims experience. There might be different triggers within different populations or job categories. The model can be continually refined as insight grows with additional experience and ongoing application of the tool throughout the life of the claim.

ENDNOTES

1. "Chronic Pain in America: Roadblocks to Relief" (a study conducted by Roper Starch Worldwide for American Academy of Pain Medicine, American Pain Society, and Janssen Pharmaceutica, 1999).
2. *Adverse Surprises in Workers' Compensation: Cases with Significant Unanticipated Medical Care and Costs* (Cambridge, Mass.: Workers Compensation Research Institute, June 2005).
3. Ibid.
4. *Flash Report* (Cambridge Mass.: Workers Compensation Research Institute, August 2007).
5. *Adverse Surprises in Workers' Compensation*. Op cit.
6. Shipton, E.A., and B. Tate, "Flagging the pain: preventing the burden of chronic pain by identifying and treating the risk factors in acute pain," *European Journal of Anaesthesiology* 22, no. 6 (2005): 405-412.

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