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Mr. Walling is a frequent industry speaker on predictive modeling, commercial lines ratemaking, captive insurance, and medical malpractice topics.

In the area of predictive modeling, Mr. Walling has been involved in:

- △ Ratemaking analyses including implementation of innovative risk classification plans and underwriting scorecards
- △ Claims studies and utilization reviews
- △ Agency management analyses
- △ Evaluations of experience and schedule rating plans
- △ Analyses of closed claim databases
- △ Territory refinement analyses

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Improving Commercial Casualty Claims Handling with Predictive Analytics

By Robert J. Walling, III, FCAS, MAAA

Insurance companies are constantly seeking competitive advantages that will result in superior underwriting results. Over the last decade and more, many insurers have looked to predictive analytics to develop sophisticated pricing tools. As predictive modeling moves from an underwriting best practice to an industry standard, claims data mining applications are becoming a fertile new way to improve commercial casualty insurance underwriting results. When predictive analytics are applied to workers compensation and medical professional liability insurance claims data, the data provides powerful business intelligence. Some companies are outperforming their peers by using predictive analytics applications such as case reserving systems, proactive claims protocols based on scoring claims data, and fraud monitoring tools. Applications such as these are reducing claim frequencies and severities, cutting claims defense costs and improving efforts to identify and combat fraud.

For the purposes of this monograph, predictive analytics are defined as any statistical technique used to analyze how a group of characteristics, such as rating or demographic factors, estimate a target variable, like claim frequency or severity. The claims arena offers many new target

variables such as the likelihood of fraud, attorney involvement, or a verdict for the plaintiff.

Target variables related to loss severity are particularly interesting and include useful measures to triage newly reported claims such as the:

- Likelihood of severity more than twice the average for a given injury type
- Likelihood of a claim exceeding a self-insured retention
- Non-economic damages greater than X% of total losses
- Defense costs greater than Y% of total losses

Predictive analytics focusing on claims applications go beyond the traditional modeling techniques currently popular for pricing applications. Decision trees and neural networks, for example, are analytic techniques that replicate intuitive aspects of the claims process, but are not well suited for pricing applications.

Challenges and opportunities for predictive analytics depend greatly on the type of coverage. Both health and personal lines insurance have the advantage of large volumes of claims with low average claim sizes that tend to settle quickly.

“...companies are outperforming their peers through predictive analytics applications...”

Figure 1 – Claim Counts and Average Severities by Coverage



predicted severity for claims based on a model including factors such as legal jurisdiction, severity of injury, and attorney involvement. The analysis identifies and isolates a number of useful differences in claims severity. For example, the results indicate that attorney involvement has a larger percentage impact on claims in the “Emotional Only” category than the other injury types. Such a model could be used for improving workers compensation and professional liability reserve estimates by quantifying the expected effect of regional differences in attorney involvement.

This type of claims model has also proven effective in measuring territorial severity differences for the medical component of workers compensation claims, where differences in medical costs and managed care fee schedules impact severities. Analyzing medical professional liability claims by region can also provide insights into regional differences in court behaviors.

“...analyzing medical professional liability claims by region can provide insights into regional differences in court behaviors...”

In contrast, medical professional liability and workers compensation insurance, offer fewer claims, higher average severity, longer settlement lags, higher legal defense costs and larger insureds. (See Figure 1)

Therefore, since commercial casualty lines lack the scores of variables available to personal lines, their models must focus on fewer characteristics. On the other hand, the larger average claim severity and individual insureds with more claims present greater opportunities for models to improve claims handling procedures and identify “problem” claims sooner.

PART 1 - CLAIMS RESERVING APPLICATIONS

The largest risks the commercial casualty insurer faces are adverse development of loss reserves and underwriting/pricing decisions based on underestimated reserves. Predictive analytics are commonly used in casualty claims to refine claims reserving estimates. Many insurers use predictive analytics to quantify claims adjusters’ qualitative expectations of differences in ultimate claims severities. This approach also provides new insights into the characteristics that influence claims severities.

Constructing a severity model with even a few claims characteristics can lead to improvements in estimating ultimate claims values. For example, Figure 2 shows the

Figure 2 – Severity Differences for Minor Claims Due to Attorney Involvement

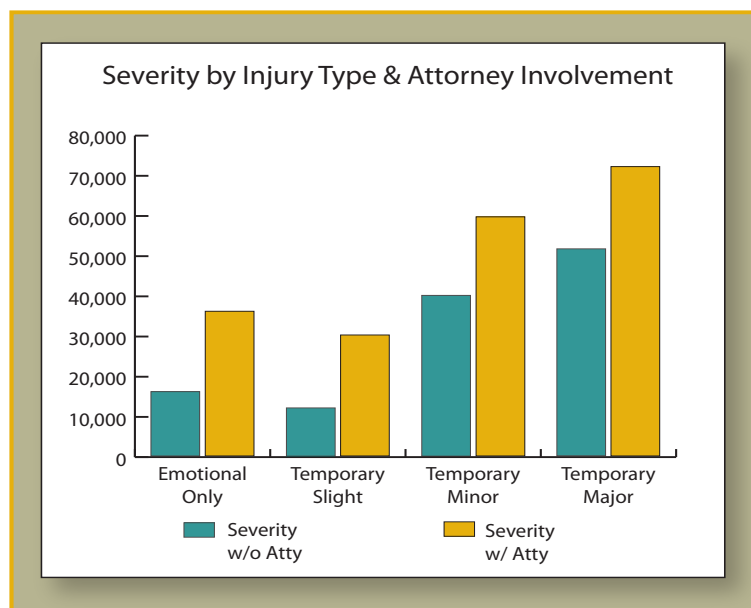


Figure 3 – Examples of Predictive Model Explanatory Variables for Medical Professional Liability

Characteristic Category	Examples
Providers	Prior Incidents Specialty Years of Experience Medical Education
Practice	Average Prescriptions per Patient Number of Employees Number of Procedures or Patients Treatment Characteristics <ul style="list-style-type: none"> - % Medicare - % Elective - % Informed Consent
Claims	Attorney Involvement Reporting Lags Settlement Lag Severity of Injury Stage of Suit at Settlement Use of Specific Attorneys and Expert Witnesses
Patient/Claimant	Age Sex Profession Marital Status Parental Status
Geographic	State County of Injury County of Lawsuit

Many claims characteristics, or explanatory variables, are effective in identifying differences in expected medical professional liability claims severity. **Figure 3** provides illustrations of broad categories of these explanatory variables along with examples.

A medical professional liability predictive model that includes even a subset of these characteristics can be used for a multitude of potential underwriting and claims applications.

PART 2 - CLAIMS PROCESS APPLICATIONS

Claims predictive modeling applications can offer increased accuracy of claims estimates and reductions in overall claims costs. One critical claim handling decision is whether to fight or settle a claim. [In some cases, quick settlements can have lower overall claims with claim costs, including defense costs, than drawn out and costly defenses.] This may be true even with favorable decisions with little or no loss payments. Predictive models that include factors such as the nature (e.g., misdiagnosis) or severity of injury (e.g., minor permanent), patient age and lawsuit venue/court can determine which claims merit defense

and which will typically have lower overall costs using an early offer approach.

Risk managers responsible for large self-insured retentions often use this type of predictive analytics as an early warning system to alert them of problem claims as quickly as practical, which triggers corresponding changes in claims handling procedures. The risk manager’s goal is to identify claims characteristics which have a high likelihood of resulting in materially higher-than-average severity for that type of injury. Early identification of higher-than-average severity claims allows risk managers and claims staff to select the best claims handling tactics (e.g., fight vs. settle), involve different experts (e.g., lawyers or case managers), and take other proactive steps to handle these claims in the most effective manner.

Other factors such as venue of lawsuit, specific attorneys and expert involvements, and the type of procedure performed (e.g., not current best practices treatment protocol) can indicate a greater likelihood of a problem claim and the need for a higher level of claims handling diligence.

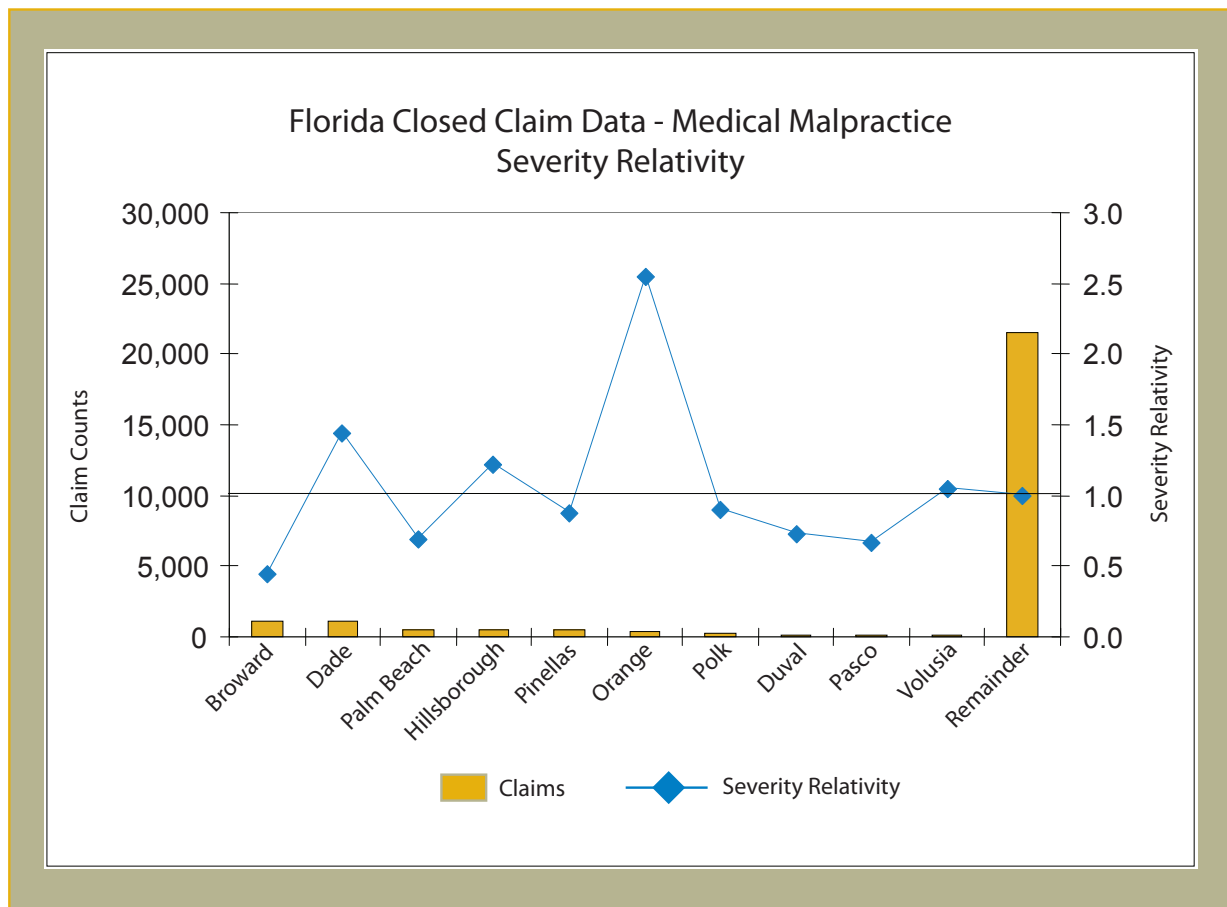
For example, using a predictive model based on the Florida closed claim database¹, **Figure 4** shows substantially higher average claim severity in lawsuits brought in Dade and Orange County Courts than other areas of the state. This information may warrant closer scrutiny of claims handling protocols based on location.

Predictive analytics have also proven important in assessing the benefits of innovative claims resolution techniques, such as proactive physician apology and early offer proposals. In the early days of the most recent medical professional liability crisis, innovative programs began investigating physician apology as a part of a claims handling strategy. These visionaries included the Lexington VA Medical Center, the University of Michigan Health System, and Johns Hopkins Hospital. All of these institutions had success reducing defense costs and improving patient satisfaction with these techniques. However, would a rigorous assessment of the data support a fundamental change in claims handling?

The claims handling process of COPIC Insurance Company (COPIC), the largest medical malpractice carrier in Colorado, has been widely regarded as a best practices model. COPIC sought to test whether it was practical and cost effective to replace the “conventional wisdom” approach of strongly defending all claims with a claim handling philosophy of 1) compensating negligently injured patients, 2) minimizing legal costs, and 3) defending physicians whose efforts were appropriate. COPIC’s goal was “to prevent medical injuries from entering the ineffective, inefficient, and adversarial legal system.”

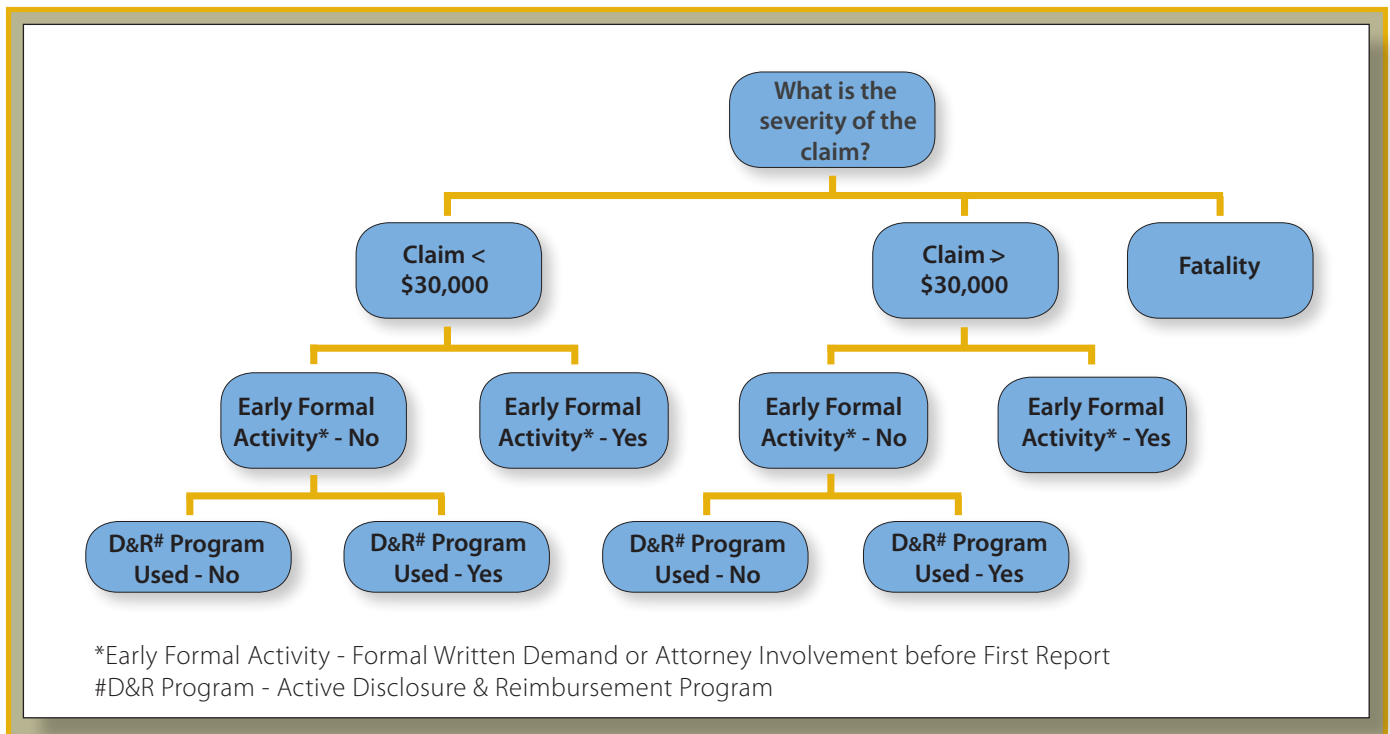
COPIC’s program started out as a pilot that only applied to incidents that were estimated to have total costs of less than \$30,000. Claims administrators had discretion to pay up to \$25,000 for patients’ out of pocket expenses (childcare, pet or senior relative care, house cleaning, etc.) and another \$5,000 for their loss of time.

Figure 4 – Florida Medical Professional Liability Claim Severity Relativities by County



¹ Starting in 1974, the Florida Department of Financial Services - Office of Insurance Regulation, has maintained a comprehensive Medical Professional Liability Closed Claim database containing all closed claims in the state. Today it contains over 70,000 closed claims.

Figure 5 – Medical Professional Liability Claims Decision Tree



One way to evaluate a program like COPIC's would be the use of a predictive modeling technique known as decision tree analysis, such as depicted in **Figure 5**.

The data from the program was dramatic from the onset and continues to impress. During the first five and a quarter years of the program, a total of 2,174 incidents met the COPIC program criteria. Although 52 of the incidents did result in claims, only two patients have sued while in the program. None of the incidents required a trial verdict. Average amounts paid per incident of \$5,680 were dramatically lower than COPIC's average claim severity. Interestingly, the COPIC program also appears to be impacting the severity of claims that require traditional claims handling techniques. Between 2003 and 2005, average severity of closed claims dropped from \$88,056 to \$77,936 (-11.5%).

PART 3 – FRAUD INVESTIGATION APPLICATIONS

A final area of tremendous opportunity in commercial casualty predictive analytics is the identification of potentially fraudulent claims. In some ways, this is simply a specific example of predictive analytics developed to improve claims handling procedures. Early identification of claims with a higher-than-average potential for claimant or provider fraud presents the opportunity to intervene quickly with additional claims handling approaches and special investigation units.

For example, consider a workers compensation insurance claims model that includes one or more of the characteristics listed below. These characteristics would typically be available

within the first two weeks to one month following the first report of a workers compensation claim:

Employee Characteristics

- Hired in the past thirty days
- Currently on probation at work
- Took extensive time off prior to claim
- Recently reprimanded
- Had no health coverage

Claim Characteristics

- No witnesses
- Occurred on Monday or late on Friday, outside normal work hours, or date, time and place of accident is unknown
- Reported after several days by worker
- Occurred immediately prior to strike, layoff, plant closing, job termination or job completion
- Seeks benefits in a state other than principal work location

Claimant Behavioral Characteristics

- Avoids using U.S. Mail for claim related correspondence
- Cancels or fails to keep appointment(s), or refuses a diagnostic procedure to confirm an injury
- Protests a modified or light duty plan for returning to work
- Seeks a second opinion when released back to work
- Is difficult or uncooperative during rehabilitation
- Cannot be reached at home or is frequently reported sleeping and cannot be disturbed

Many of these characteristics are quite intuitive and have been discussed in claims and risk management literature for some time. The real advantage of adding predictive analytics is quantifying the increased likelihood of fraud that has to date only been a qualitative matter. Decision trees and logistic regression can prove to be tremendous

tools for fraud models. One frequent challenge with fraud models is that many of the characteristics frequently used, such as the previous list, often reside in text fields of claim department databases, not more easily manipulated data fields. This introduces the need to use text mining techniques as a precursor to predictive analytics.

Conclusion

The battlefield for superior underwriting results using predictive analytics is shifting from sole underwriting to now include claims as well. Companies are discovering that predictive modeling has tremendous potential in workers compensation, medical professional liability insurance and other commercial casualty insurance coverages.

Claims models offer the benefits of increased accuracy of claims estimates. They can also provide early warning systems to claims adjusters identifying claims with higher likelihood of above average claims severity and higher-than-average fraud potential. This information can lead to improved claims processes, reduced overall claims costs and lower defense costs. In addition, expanding predictive analytics to claims applications creates more communication and collaboration between underwriting and claims, which can improve insurance company operations and create a data driven culture throughout the company.

This monograph is Part 3 in a 3-Part Series on Commercial Lines Predictive Modeling.

Please visit our Knowledge Center for the complete series.

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