Workers Comp Claims Predictive Modeling - How to Reduce Medical Costs

CAS Ratemaking and Product Management Seminar

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OUTLINE

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- Product Description(s) and Examples
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- Predictive Model
  - Approach
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- Practical Applications and Recommendations

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Background and Conceptual Framework

- Client spends approximately $100 million in annual WC premium
- Average WC medical cost per claim (severity) increasing by approximately 8% to 9% per annum
- Claim frequencies starting to increase
- In-house self-administered Property/Casualty claims unit
- Complex claim-related situations (injury, job, medical, demographic, socio-economic, etc.)
- Limited claims adjuster resources
- Lots of claims and medical data – need to leverage its use

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Insurer's New Predictive Model Targets High Cost Workers' Comp Claims

- *Workers' compensation giant Liberty Mutual has developed a new predictive model that lets it **more quickly identify and manage high cost workers' compensation claims** that typically make up about 20 percent of all workers' compensation claims.*
- *The new model is designed to help Liberty's claims professionals identify claims that are potentially going to cost a lot and then **bring the right resources** to one of these claims at the right time. The company should then be able to close these claims faster, thereby **lowering overall claim costs**.*
- *The predictive model will be used to look at claims monthly and **pick up changes in each claim's profile** that can negatively impact that claim's development, such as **emerging medical and non-medical factors**.*

http://www.insurancejournal.com/news/national/2011/08/18/211516.htm

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Conceptual Framework

- Develop a predictive model that identifies cost drivers not readily apparent to adjusters
  - A supplement to existing claims administration process
- Help lower workers compensation costs by:
  - Triaging claims earlier and more effectively by identifying claims likely to turn into high-cost claims
  - Predicting cost drivers of claims
  - Intervening with improved medical management to prevent losses from developing adversely

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Product Description(s) and Examples

- Reporting tool
- Predictive models
  - Ranking of predictive variables
  - Marginal $ impact
- Risk driver reports
- Claim/medical management business rules

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Project Overview

- Step 1
  - Prepare and Review Data
  - Create Population-Level Medical Metrics
  - Summarize Findings at Population Level
- Step 2
  - Develop Claims Predictive Models
- Step 3
  - Create Customized Risk Driver Reports
  - Conduct Claims Workshop
- Step 4
  - Assist with Claims Operational/Process Impact
  - High-Level Model Vision and Implementation Plan

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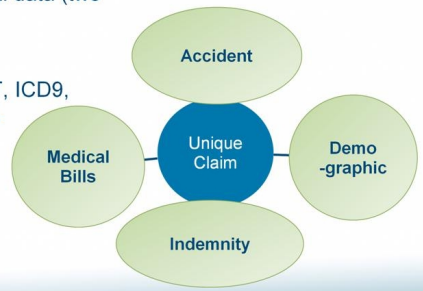
Data

- Utilized all WC lost-time (LT) claims (over 20,000) and 8 years of medical bills/lines (millions)
- Merged claim file and medical data (two vendors' data sets)
- Other data challenges
- Collapsed medical data (CPT, ICD9, NDC) into meaningful groups



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Step 1 - High-Level Review of Findings

- Older claims (not new reports) drive medical severity trend
- Price of medical services a bigger driver than utilization
  - Hospital services are highest
- High-potency narcotic analgesics account for 2% of bills but 10% of costs
- In-network severities higher than out-of-network
- Slip/fall claims show the highest per claim severity trends
- Payments on older claims for older workers (>= age 55) trending over 10%

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Step 1 Reporting Summary – Example

Percentages by Category

Category	Medical Payments	Amounts Billed	Number of Claims with Payments	Number of Bills Paid	Number of Lines Billed
State 1	17.8%	17.3%	26.5%	24.9%	25.2%
State 2	15.9%	17.7%	20.2%	19.1%	17.0%
State 3	14.8%	12.1%	13.1%	12.2%	10.9%
State 4	8.4%	6.5%	6.0%	6.2%	5.7%
State 5	11.1%	11.6%	4.1%	4.4%	4.7%
All Other	32.1%	34.9%	30.0%	33.2%	36.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Statistics by Category

Category	Average Paid per Claim	Number of Bills per Claim	Average Paid per Bill	Average Paid per Line Billed	Number of Lines per Bill	Savings Percentage
State 1	1,951	9.5	205	59	3.5	54.3%
State 2	2,284	9.6	239	78	3.1	60.2%
State 3	3,291	9.5	348	113	3.1	45.4%
State 4	4,082	10.4	392	123	3.2	42.5%
State 5	7,922	10.8	732	199	3.7	57.2%
All Other	3,120	11.2	278	74	3.8	59.1%
Total	2,917	10.1	288	84	3.4	55.5%

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Step 2 – Modeling Technique

- Organize medical data using algorithms from Milliman's Health discipline
- Models developed on closed claims and applied to open claims
- Models created at various points in the early life of a claim
- Considered multi-dimensional characteristics (e.g., older female, back strain, multiple procedures)
- Used multi-variate linear and non-linear regression models, and selected the best fit model
- Balanced relative simplicity of model with need to control influence of multiple factors (e.g., demographic, socio-economic, medical, accident) to predict outcomes

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Step 2 - Modeling Approach – Stratify and Identify

- Predict outstanding medical cost (dependent variable) at the claim level early in the life of the claim by age cohort
  - Day 1, 30, 60, 90, 120, 180, and 360 days after reported injury
- Key process - collapse diagnosis, procedure and drug (if available) codes into meaningful groups
- Identify drivers of future medical cost
  - Identify non-obvious (and obvious) cost drivers
  - Validate the findings from Step 1 (one-way data analyses)
  - Distinguish unit price vs. utilization components of cost

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Step 3 Findings - Top Risk Drivers by Category

Day 30 Model		Day 360 Model	
Claim Characteristics		**Claim Characteristics**	
Rank	*Variable*	*Rank*	*Variable*
1	State/Year Indicator	1	State/Year Indicator
2	Returned to Work = No	4	Injury Group - Sprains & Strains
5	Injury Group - Sprains & Strains	6	Full Time Employee = Yes
9	Full Time Employee = Yes	12	Returned to Work = No
11	Occupation_Light		
Medical Conditions		**Medical Conditions**	
Rank	*Variable*	*Rank*	*Variable*
6	Visit Counts; Cerebro-Vascular	7	Visit Counts; Cerebro-Vascular
14	Visit Counts; Musculoskeletal	9	Number of Medical Conditions; Male < 45; Contusions
28	Visit Counts; Screening and History of Diseases	24	Number of Medical Conditions; Male 46-55; Fractures
32	Visit Counts; Heart	27	Number of Medical Conditions; Female 46-55; Sprains & Strains
		34	Visit Counts; Musculoskeletal
Medical Utilization		**Medical Utilization**	
Rank	*Variable*	*Rank*	*Variable*
3	High Savings Ratio (Low Paid/Billed Ratio)	2	High Savings Ratio (Low Paid/Billed Ratio)
4	Paid $; Male < 45; Fractures	3	Paid $; Female > 56; Other Injuries
7	Paid $; Female 46-55; Other Injuries	8	Counts; Other Imaging Tests
8	PT counts; Female > 56; Fractures	10	Imaging Scan Counts; Female < 45; Contusions
10	Counts of Procedures	14	Hospital bills; Female < 45; Sprains & Strains
Prescription Drug Classes		**Prescription Drug Classes**	
Rank	*Variable*	*Rank*	*Variable*
13	Prescription Count; Anticoagulants (warfarin)	5	Prescription count; Male < 45; Other Injuries
16	Counts of Drug Categories	11	Prescription count; Female < 45; Sprains & Strains
24	Prescription Count; GastroIntenstinal	13	Specialty drug count; Male < 45; Other Injuries
		21	Prescription count; Female >55; Other Injuries
		22	Prescription Count; Neurological Agents (Mental Health/Substance Abuse)

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Step 3 Findings - Sample Risk Driver Report

- Snapshot of claimant and medical risk characteristics
- Run on 1,800+ open claims with medical data transactions as of January 1, 2011
- Categories
  - Claim characteristics
  - Medical conditions
  - Medical utilization
  - Prescription drug classes
- Used for conducting sample claims workshop with multi-disciplined team of experts
  - Compared model predictions vs. actual results in hindsight

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Sample Risk Driver Report (p. 1)

Date of Injury	8-Aug-10	Adjuster Code	85
Division	One	Store Number	6
State	Pennsylvania	Department	Five

Claimant Name	Jane Doe	Occupation	Clerk
Gender	Female	Full-Time	No
Age at Date of Injury	46	Tenure (Years)	0.5
Cause of Injury	Electrical Current	Marital Status	Married
Nature of Injury	Sprain/Strain	# of Prior Claims	0
Part of Body	Shoulders	Returned to Work	No

	Actual	Predicted	$ Diff	% Diff
Paid Medical to-Date	4,631	4,631	0	0%
Medical Case Reserves	2,696	25,099	22,403	831%
Incurred Medical	7,327	29,730	22,403	306%

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Sample Risk Driver Report (p. 2)

Risk Driver Category	Incremental Cost	Data Element	Estimated Future Costs
Claimant Characteristics			
Sprains/Strains of the Back	$2,358	Category = Yes	$2,358
Medical Conditions			
Musculoskeletal and Connective Tissue	$447	6 Diagnoses	$2,682
Medical Utilization			
Office Visits	$101	34 Counts	$3,434
Medical Paid to Date	20.5%	$4,631 Prior Paid	$949
Subtotal			$4,383
Prescription Drug Classes			
Neurological Agents	$3,688	3 Counts	$11,064
Number of Prescriptions	$576	1 Count	$576
Subtotal			$11,640
All Other			$4,036
Grand Total			**$25,099**

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Step 4 Recommendations

- Improve data collection and compilation process at first report of injury
- Perform annual update of predictive model
- Produce quarterly risk driver reports on open claims
- Develop business rules for:
  - Frequency of contact/follow-up by adjuster
  - Assignment to claims adjuster level, special claims teams, nurse case manager, physician, special investigative unit, etc.
- Store results and integrate within data warehouse reporting tool

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Other Potential Practical Applications

- Compensability of medical only claims
- Claim fraud detection
- Claims process reviews/file audits
- Integration with actuarial analysis
- Medical management efforts
  - Reporting/performance assessment process
  - Objectively evaluate provider, network, etc. performance

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