BIG DATA:
Applying Predictive Analytics to PEO Industry

Skip Brechtel
EVP & Chief Information Officer, CCMSI

Eric J. Lopez
Vice President, Business Intelligence and Analytics, ADP HRO

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Eric Lopez Bio

- Worked in Computer Science
- Degree in Economics
- Developed activity-based costing models and multi-dimensional analytical values
- Hybrid/FA/IT/Finance Project Manager
- Started migration of reporting tools to Tableau
- Began advancing data science and advanced analytics
- Created Analytics Center of Excellence
- Senior Director Finance ADPTS
- Began advancing data science and advanced analytics
- Vice President, Business Intelligence and Analytics

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ADP TotalSource Overview

TotalSource provides an end-to-end HCM solution to our clients

- Administration relief and economies of scale
- Administrative benefit program
- Risk mitigation and compliance support
- Industry-leading tools and technology

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Analytics as a Journey

Hierarchy of Analytics

Descriptive

Predictive

Prescriptive

What HAS happened?
What WILL happen?
How can we MAKE it happen?

Difficultly

Business Value

Who have we lost? How much?
Characteristics of losses.

What HAS happened?
Predict the probability of attrition. Are there patterns?

What WILL happen?
How do we effectively contain attrition? Next best action.

What WILL happen?
How do we effectivly contain attrition? Next best action.

Our Mission is to Maximize the current and future use of data assets to the benefit of our associates, our clients, and their employees.

Enable constituents to do what they do best

IT

Focus on driving enterprise-wide technological solutions

BI

Work with business partners to define data sets and KPIs

BU

Design, develop and deploy, with control

Build a partnership across IT, BI, and business units

Self-Serve Analytics for IT Advocacy

Fast Deployment Steps

Preach

Implement Year-End Close

Implement New Systems

Enabling Leaders, Employees

Managing Year-End

Month 1

Month 1-3

Month 3

Month 3-4

Month 6-8

Month 9-12

Month 18

Implementing sustainable solutions
Analytics Journey

- Develop a well-defined question with the answer not currently available.
- Take steps to avoid doing more data analysis than necessary.
- Start with basic analytics and work towards more complex analyses.
- Be willing to ask the tough questions such as why, so what, what about this, and what if.
- Seeing flight: we saw the need to amass and combine data assets to answer more complex questions within the business.

Applications to PEO

- Data: the scale of data available and operationalizing data from multiple sources.
- Talent: how to identify the talent you need at the right time in your journey.
- Leadership: how do we as leaders continue to educate ourselves on potential opportunities that big data and analytics can bring to the organization. Also, how might we best facilitate the merging of human and machine intelligence?

- Risk: early warning models, claim benchmarking, data-driven service models.
- Sales: identifying the proper prospect to target.
- Service: churn model.

Continue to look for opportunities to apply big data to all areas within the company.

Intelligence Solutions - Examples of Latest Solutions (1/2)

<table>
<thead>
<tr>
<th>Work Product Name</th>
<th>Purpose and Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Scorecards</td>
<td>Scorecard dedicated to improving the associate engagement experience</td>
</tr>
<tr>
<td>Worker Compensation Benchmark</td>
<td>Dashboard dedicated to providing workers comp claims per client</td>
</tr>
<tr>
<td>Sales Enhancements</td>
<td>Enhancing sales targeting with analytics</td>
</tr>
<tr>
<td>Sales Benchmark</td>
<td>Merged third party data with ADP data to allow for prospect benchmarking</td>
</tr>
</tbody>
</table>

Intelligence Solutions - Examples of Latest Solutions (2/2)

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<tr>
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<tr>
<td>Churn</td>
<td>A model to help us save clients who are at risk of leaving</td>
</tr>
<tr>
<td>MDW</td>
<td>Setting up data infrastructure providing wide customer service case view</td>
</tr>
<tr>
<td>Pricing Analytics</td>
<td>Create a data set that allows us to look at historical price changes to current</td>
</tr>
<tr>
<td>Tableau</td>
<td>Allows the organization to have hands on analytics readily available</td>
</tr>
</tbody>
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What does predictive modeling mean to you?

Simply put.....

“Early intervention is the next best thing to prevention.”
Is this new?

- Could we capture the data?
- Did we know the claim drivers?
- Did we have the data or data fields?
- Were we mining the data?

How has IT changed since 2001?

More memory -> more power

Processors (CPUs) are now as fast as physically possible

The focus is now power-efficiency for IoT, and cramming in more processors for higher performance


Macbook Pro (2017) 32 GB RAM

Memory increase 24,800%

Faster, Bigger, Cheaper Storage

Think! HDD (2001) 60 GB, 23 mb/s $659

Samsung EVO (2016) 500 GB, 540 mb/s $149.99

Size increase 733%

Speed increase 2248%

Cost decrease 77%
Key Areas for PEO “Big Data” Analytics

**Underwriting**
- Line of Business Analysis
- Job Class / Industry
- States
- Underwriter
- Excess Retention Level

**Claims**
- Claim Severity/Modeling
- Policyholder
- Adjuster
- Attorney
- Medical Providers

Key Areas for PEO “Big Data” Analytics

**Safety/Loss Prevention**
- Cause Analysis By Book
- Job Class / Industry
- States
- Client Company
- Safety Recommendation Adherence

**Vendors**
- Carrier / TPA – ALAE Analysis
- Claim – by NCCI Job Code, Days Open, Cost/Claim
- Managed Care – Penetration, Cost
- PBM
- Attorney

Composition of Today's Workforce
Mega Trends: Co-Morbidities

- 90% of patients in outpatient P.T.
  - At least 1 medical co-morbidity
  - 40% have 2+ co-morbidities
- Older group: presence of co-morbidities higher
- Medical influence:
  - Medical
  - Therapy use
  - Diagnosis
- Entrepreneurs face additional co-morbidity in older workers

Clinically address modifications of:
- Exercise prescription
- Goals
- Treatment plan

Ref: Industrial Medicine and Acute Musculoskeletal Rehabilitation: Acute Musculoskeletal Injuries in Aging Workforce, 2007
Ref: Michelle Depres, PT, CEAS II, VP, National Product Leader, Align Networks

Aging Workforce: Trends

- Strength declines over time due to age
- Co-morbidities: HBP, obesity, type II diabetes
- Wealth of benefits:
  - Sense of personal responsibility
  - Can-do attitude
  - Experience
  - Knowledge
  - Loyalty
- Administration on Aging reports:
  - Older population (65+) = 40 Million in 2009 (12% of the U.S. population)
  - 2020, expected to grow to 72 Million (25% of our population)

Ref: U.S. and state government researchers (CDC, BLS and several state agencies), 2009

Aging Workforce: Injuries

- Body parts:
  - Ankles, Wrists, Arms, Hips
- Injury Types:
  - Fractures, strain, sprain, soft tissue injuries
- Women more likely than men to sustain fractures of wrists, forearms
- Higher incidence of multiple injuries, co-morbidities
- Sprains, strains, joint dislocation, carpal tunnel syndrome, tendinitis

Ref: U.S. and state government researchers (CDC, BLS and several state agencies), 2009
#NAPEO17

**Age Related Changes**

- Primary areas of concerns:
  - Bones & Joints
  - Eyes
  - Vascular Changes
  - Dehydration
  - Functional Abilities

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**Co-Morbidities: Obesity**

- 80% of type II diabetes related to obesity
- 70% of cardiovascular disease related to obesity
- 42% breast and colon cancer diagnosed among obese individuals
- 26% of obese people having high blood pressure
- 30% of gallbladder surgery related to obesity
- More pressure on weight bearing joints: higher incidence of arthritis
- Decrease in cardiovascular endurance

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**Predictors of Worker Outcomes (WCRI)**

- **EDUCATION**
  - Not working: No HS diploma = 20% vs College degree = 11%
  - 56% of injured workers had no education beyond high school
  - 15% of injured workers have college degrees
- **CO-MORBIDITIES**
  - Not working: 54% have co-morbid conditions (HTN, Diabetes, Heart Conditions)
  - Not working: 13% have no co-morbidities
- **ENGLISH LANGUAGE PROFICIENCY**
  - Interviewed in Spanish: difficulty navigating health care system
  - 20% "very dissatisfied" with care
  - 20% "big problems" getting desired care
- **FEARS OF BEING FIRED**
  - 27% with fear have worse outcomes
  - Worse outcomes: fear of being fired, disability status, severity of physical health, more not working, longer disability duration, earning less, "big problems" getting desired care, & higher level of dissatisfaction with care
The Impact

Drivers of Utilization (Aging)

Aging Workforce Recovery Trends

- Longer recovery times for older population
- Higher wages account for additional higher costs among older workers (indemnity)
- Extended Physical Therapy durations, above recommended clinical guidelines for a condition, may need additional therapy visits to address slow healing, additional physical deficits, balance, mobility, strength, co-morbidities and other complications

Ref: U.S. and state government researchers (CDC, BLS and several state agencies, 2009-2013)

Ref: National Institute for Occupational Safety and Health, Morbidity & Mortality Weekly Report
Obesity Costs

- Obesity Today: $200 billion a year (>10% of healthcare costs)
- Morbidly Obese (BMI 40+)
  - 45% higher claim volume
  - 5x more missed work days
  - 5x higher medical costs
  - 6x greater indemnity costs

Ref: Cawley, Meyerhoefer. The Medical Care Costs of Obesity: An Instrumental Variables Approach.

Claim Influence

- Small percentage of claims = disproportionately high costs
- Not just the "big" cases (lumbar fusion) that turn costly
- Includes those that seem innocent at first but analytics help flag
- Extended medical treatment
  - Diagnostic tests
  - Physical therapy
  - Pharmaceutical products
  - Indemnity
  - Surgery
  - Permanent Disability

Data Drives Outcomes

- Many data points are captured but is this info then utilized?
- What data can be collected?
- Many intervention options
- Early identification and action are key

Predictive Modeling Reduces WC Costs

- According to a Towers Watson survey in 2011:
  - 5% reduction (Liberty Mutual Vantage Comp)
  - 15% reduction (Aon’s Early Claim Intervention model from Business Insurance magazine)
  - 4-8% reduction in annual loss and expense ratios (Deloitte Consulting article in Insurance & Technology)

- Sedgwick: avg. incurred costs decreased 6-8% (2014)

- CCMSI: 5-10% reduction (2016)

Let’s Look at a Successful Program

The science behind the crystal ball.
GENERAL INFORMATION

• Developed by CCMSI management team based on extensive data review of ten year closed claim and pilot study of two large national accounts

• The CRA module is integrated in our indemnity claims best practices and completed within the 10 – 15 days of receipt of the indemnity claim

• Currently the CRA is a static form developed by CCMSI Corporate Claims Committee that does not allow for any form changes

• Future development will be based on industry trends and include additions or deletions of specific questions to the CRA

• CRA form is built into our adjuster recorded statement process for indemnity claims and major medical only claims where adjuster/supervisor is concerned because of key claim factors

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CRA – Key Injury/Data Sections Captured During Recorded Statements

• Basic background information (6 questions for profile scoring)
• Accident /injury information (3 questions for profile scoring)
• Employer history information (6 questions for profile scoring)
• Health history/lifestyle information (13 questions for profile scoring)
• Injury history information (4 questions for profile scoring)
• Medical information (3 questions for profile scoring)
A few questions included in the CRA form are:

**Basic Background Information**
- Medicare Eligibility
- Height
- Weight
- BMI (Body Mass Index: auto-calculated)
- Highest Level of School Completed
- Do you believe you will return to work on a scale of 0-1 (0 being the highest to return)?
- How far do you travel to work? (in minutes)
- Are you employed anywhere else?

**Accident/Injury Information**
- Is this a repetitive trauma injury?
- Reporting lag time
- Legal - Petitioner/Attorney

**Injury History Information**
- Any prior injuries to the body part in the past?
- Prior surgeries to this body part
- Any prior Workers’ Compensation claims?

**Medical Information**
- How far do you travel to see your treating physician? (in minutes)
- Where do you rate your pain on a scale of 1-10 (10 being the highest)?

**Health/Lifestyle Information**
- High blood pressure/hypertension?
- Have you ever been treated for any illness such as depression, bipolar, schizophrenia, etc.
- Diabetes?
- Thyroid?
- Arthritis?
- Cancer?
- Heart Problems?
- Stroke?
- Alcohol Consumption

**Employer History Information**
- Is claimant a good, marginal, or poor employee?
- Rate the employer’s probability of returning to work (10 being the most probable to return)
- Employer unable/unwilling to accommodate light duty or RTW?
- Any anticipated layoffs, furloughs or pending relocations?
CRA Initial Claim Note

SAMPLE CLAIMS

SAMPLE CLAIM #1
Current Age 46
Marital Status Married
Height: Feet 5
Inches 11
Weight 350
BMI Score 49
Do you have any children under the age of 18 years old? True
Ages of Children 17
Highest Level of School Completed High School Diploma or GED
Do you believe you will return to work on a scale of 10 to 10 (10 being the highest to return) 0
Employer Custodian
How far do you travel to work? (i.e. in minutes) 25
Describe the effects of the injury (pain, stabbing, ache, pop, leg pain, buttocks) Painful
Witnesses No
Any injuries to this body part in the past? No
Prior surgeries to this body part No
Any prior Workers' Compensation claims? Yes
Diagnosis Fractured shoulder and dislocation
Tests X rays and Cat Scan
Have you returned to work since the date of incident? False
How far do you travel to see your treating physician? (i.e., in minutes) 8
Where do you rate your pain on a scale of 1 – 10 (10 being the highest)? 1
High Blood Pressure/Hypertension? Yes
Have you ever been treated for any illness such as depression, bi-polar, schizophrenia, etc.? Yes
Diabetes? Yes
Arthritis? Yes
Heart Problems? Yes
Tobacco use now or in the past? Yes
Is claimant a good, marginal or poor employee? Good
Rate the employee's probability of return to work (10 being most probable to return) 10
Employer unable/unwilling to accommodate light duty or RTW? Yes
# NAPEO17

**Claim Risk Assessment – Sample Claim #3: Key CRA Information and Potential Cost Drivers**

- **Current Age**: 52
- **Marital Status**: Married
- **Height**: Feet 5, Inches 8
- **Weight**: 370 lbs
- **BMI Score**: 56
- **Do you have any children under the age of 18 years old?**: False
- **Highest Level of School Completed**: High School Diploma or GED
- **Do you believe you will return to work on a scale of 10 to 10 (10 being the highest to return)**: 10
- **Employer**: Roll off driver with trailer
- **Describe the specific duties you perform on a daily basis**: Drop off empty dumpsters, pick up full ones
- **How far do you travel to work? (i.e. in minutes)**: 60
- **Describe the effects of the injury (pain, stabbing, ache, pop, leg pain, buttocks pain)**: Pain – extreme
- **Any prior injuries to this body part in the past?**: Yes
- **Any prior Worker’s Compensation claims?**: Yes
- **Diagnosis**: Fractured tibia L
- **First Appointment**: Still in the hospital
- **Recommended Treatment**: Not weight bearing, referral to inpatient rehab
- **Last Appointment**: Still in the hospital
- **Current Treatment**: Transfer to rehab
- **Have you returned to work since the date of the incident?**: False
- **How far do you travel to see your treating physician? (i.e. in minutes)**: 90
- **Where do you rate your pain on a scale of 1 – 10 (10 being the highest)?**: 8
- **Alcohol consumption?**: Yes
- **Tobacco use now or in the past?**: Yes
- **Do you have a working spouse?**: Yes
- **Is claimant a good, marginal or poor employee?**: Good
- **Rate the employee’s probability of returning to work (10 being most probable to return)**: 0
- **Employer unable/unwilling to accommodate light duty or RTW?**: No

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**Process after Identification**

Once a claim has been identified as a high risk claim, CCMSI’s adjuster and supervisor should work closely with our client to develop a proactive strategy to manage and mitigate ultimate claim cost if possible. Some of the items listed below should be included in their analysis:

- Nurse care management
- Utilization review
- Tighter supervisor diary to monitor file and assist adjuster
- Guidance to best panel physician based on state of jurisdiction handling requirements
- Aggressive pursuit of early RTW opportunities
- Early independent medical examinations/2nd opinions
- Surveillance
- Pre-litigation attorney intervention
- Early settlement
- Frequent reserve analysis to ensure reserve adequacy
Implementation
You have the data, now what?

Stakeholder Solutions
• More experienced adjuster
• Increased level of managerial review
• Direct to nurse case manager
• Retain expert legal counsel
• Engage appropriate medical professionals
• Use a team approach

Integrating Claims Management Process
• Predictive modeling must integrate with operations
• Establish feedback loop
• Monthly review between predictive analytics team and claims examiners (round table)
• Claims handlers must explore innovative ways to drive resolution
Exceptional Outcomes

- Minimize risk of exploding claims
- Control costs
- Maximum medical recovery
- Return to work
- Claim settlement/closure

Key Takeaways

- Data is an asset – we collect it and we need to use it
- Data can be a tool to guide and assist in decision making
  - Past
    - What happened?
    - Why and how didn’t it happen?
  - Present
    - What is happening now?
  - Future
    - What has the potential to happen?
    - What are the best or worst outcomes?
    - How do we plan?
- Make better decisions
  - More accurately
  - More consistently
  - More timely

Questions?