The Missing Link
Measuring Medical and Pharmaceutical Costs Along the Disability Continuum

Martha Garcia
Kaiser Permanente

Kevin Curry
Fraser Gaspar, PhD
Katie Zaidel, MEM
ReedGroup
SESSION OVERVIEW

• Describe new research showing how medical costs vary by day of disability.

• Explain how diagnosis and treatment are critical for understanding medical cost estimates.

• Illustrate how managing cases can save significant medical costs even when the majority of costs occur at the start of the disability episode.

• Share information about what employers can do to help control disability costs, including use of recovery estimates at the point of care.
UNDERSTANDING THE COST OF DISABILITY TO EMPLOYERS

- 889 MM illness-related absence days each year*
- $443B in illness-related absence and lost productivity costs each year*
- Half of employers total medical costs are attributable to ¼ of employees with an illness-related absence**

“The consequences of work disability vary according to which stakeholder’s perspective is being considered, but from every perspective they are enormous.”

— Bardos et al. (2015)
TRADITIONAL COST OF DISABILITY EQUATION

• Cost equation inputs typically include:
  – Wages
  – Benefits
  – Lost productivity
  – Replacement labor

• Inputs are multiplied by length of disability

• Medical cost information typically not considered, or is presented as a flat rate

Example:

Disability Cost = [Salary per day + Benefits per day + Lost productivity per day] \times [Days on disability]
The majority of disability costs are medical and costs change through time

- The majority of costs for a disability episode are from medical costs (Goetzel et al. 2003)
  - 71% of costs for physical conditions is medical costs
  - 53% of costs for mental conditions is medical costs
- Medical cost as a percentage of total costs decrease through time (Hashemi 1997, Hashemi 1998)
- IBI (2016) found ~35% of medical costs in workers' compensation claims occurred in first 6 months after injury
MISSING LINK: RESEARCH FOCUS

In order to get a full and accurate picture of disability absence costs, we need to quantify \textit{medical costs by disability episodes and understand how medical costs change through time}.

\textbf{Key Research Questions:}

1) What are the medical costs for \textit{each day} during a disability episode and how does treatment impact cost trajectories?

2) What are the potentially avoidable medical costs?
WHAT ARE THE MEDICAL COSTS FOR EACH DAY DURING A DISABILITY EPISODE?
DATA SOURCES

STD Claims
1.3 MM claims
880k employees
8.2k diagnoses
- STD Start Date
- STD RTW Date
- Diagnosis
- Age
- Gender

Outpatient Claims
219 MM records
- Service Date
- Diagnosis
- Procedure
- Medical Costs

Inpatient Claims
4.1 MM records
- Service Date
- Diagnosis
- Procedures
- Medical Costs

Drug Claims
95 MM records
- Service Date
- Drug Name
- DEA Class
- Cost

Truven Marketscan Health and Productivity Management (HPM) and Commercial Claims and Encounters (CCAE) Databases
ANALYSIS DATASET: DEFINING DISABILITY EPISODE AND COSTS

- STD first absence date range: 1/1/2007 to 12/31/2013
- Medical record date range: 1/1/2007 to 12/31/2014
- Medical records were grouped to a specific disability episode
  - 1 week before first absence date
  - 1 month after return to work (RTW) date
  - Identified procedures and diagnoses during timespan
- 886,110 STD claims with 41 million associated medical events
- Calculated disability medical costs
  - Removed medical costs not associated with primary diagnosis
  - Total gross, eligible payments
CONDITION #1
MENISCUS DISORDERS, KNEE (ICD-9-CM: 836.0, 836.1, 836.2)

- Knee injury is the second most common work-related accident.
- Two main treatment options
- Non-surgical treatment:
  - Rehabilitative exercise and activity modification.
- Surgical treatment:
  - Removal or repair of the damaged section.
  - Arthroscopy is the standard of care.
VIEWING MEDICAL EVENTS ALONG THE DISABILITY TIMELINE

CASE: 50 YEAR OLD MALE, 64 DAYS ABSENT, $9K MEDICAL COSTS
--Surgical Treatment: Arthrosopic Meniscectomy--
IT’S ABOUT TIME…
EXPOSING CASE/COST VARIATION
EXAMPLE: 50 YEAR OLD MALES

Case: 64 days absent, $9K medical costs (Arthroscopic Meniscectomy)

Case: 37 days absent, $3K medical costs (Non-Surgical)

Case: 16 days absent, $4K medical costs (Arthroscopic Meniscectomy)

Case: 178 days absent, $16K medical costs (Arthroscopic Meniscectomy)
# TREATMENT DETERMINES MEDICAL COST

## Meniscus Disorders

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Count</th>
<th>25\textsuperscript{th}%ile Cost</th>
<th>Mean Cost</th>
<th>75\textsuperscript{th}%ile Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthroscopic meniscectomy</td>
<td>10,973</td>
<td>$4,085</td>
<td>$7,409</td>
<td>$8,588</td>
</tr>
<tr>
<td>No treatment</td>
<td>2,149</td>
<td>$47</td>
<td>$1,259</td>
<td>$993</td>
</tr>
<tr>
<td>Non-surgical treatment</td>
<td>1,891</td>
<td>$649</td>
<td>$3,831</td>
<td>$4,739</td>
</tr>
<tr>
<td>Meniscus repair</td>
<td>180</td>
<td>$5,938</td>
<td>$11,695</td>
<td>$14,939</td>
</tr>
<tr>
<td>Meniscus repair AND arthroscopic meniscectomy</td>
<td>145</td>
<td>$5,738</td>
<td>$11,721</td>
<td>$14,039</td>
</tr>
<tr>
<td>Total Knee Replacement</td>
<td>142</td>
<td>$8,565</td>
<td>$25,538</td>
<td>$36,482</td>
</tr>
<tr>
<td>Open AND arthroscopic meniscectomy</td>
<td>6</td>
<td>$5,729</td>
<td>$6,841</td>
<td>$7,943</td>
</tr>
<tr>
<td>Open meniscectomy</td>
<td>2</td>
<td>$8,982</td>
<td>$14,373</td>
<td>$19,764</td>
</tr>
</tbody>
</table>
## TREATMENT DETERMINES MEDICAL COST

### MENISCUS DISORDERS

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Count</th>
<th>25&lt;sup&gt;th&lt;/sup&gt;%ile Cost</th>
<th>Mean Cost</th>
<th>75&lt;sup&gt;th&lt;/sup&gt;%ile Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthroscopic meniscectomy</td>
<td>10,973</td>
<td>$4,085</td>
<td>$7,409</td>
<td>$8,588</td>
</tr>
<tr>
<td>No treatment</td>
<td>2,149</td>
<td>$47</td>
<td>$1,259</td>
<td>$993</td>
</tr>
<tr>
<td>Non-surgical treatment</td>
<td>1,891</td>
<td>$649</td>
<td>$3,831</td>
<td>$4,739</td>
</tr>
<tr>
<td>Meniscus repair</td>
<td>180</td>
<td>$5,938</td>
<td>$11,695</td>
<td>$14,939</td>
</tr>
<tr>
<td>Meniscus repair AND arthroscopic meniscectomy</td>
<td>145</td>
<td>$6,379</td>
<td>$13,731</td>
<td>$14,926</td>
</tr>
<tr>
<td>Total Knee Replacement</td>
<td>142</td>
<td>$8,565</td>
<td>$25,538</td>
<td>$36,482</td>
</tr>
<tr>
<td>Open AND arthroscopic meniscectomy</td>
<td>1</td>
<td>$8,780</td>
<td>$9,041</td>
<td>$7,942</td>
</tr>
<tr>
<td>Open meniscectomy</td>
<td>2</td>
<td>$8,982</td>
<td>$14,373</td>
<td>$19,764</td>
</tr>
</tbody>
</table>
TREATMENT DETERMINES ACCRUAL OF COST OVER TIME

ARTHROSCOPIC MENISCECTOMY (N = 10,973)
TREATMENT DETERMINES ACCRUAL OF COST OVER TIME

ARTHROSCOPIC MENISCECTOMY (N = 10,973) + NON-SURGICAL TREATMENT (N = 1,891)
TREATMENT DETERMINES ACCRUAL OF COST OVER TIME

ARTHROSCOPIC MENISCECTOMY (N = 10,973) + NON-SURGICAL TREATMENT (N = 1,891) + MENISCUS REPAIR (N = 180)
TREATMENT DETERMINES ACCRUAL OF COST OVER TIME

ARTHROSCOPIC MENISCETOMY (N = 10,973) + NON-SURGICAL TREATMENT (N = 1,891) + MENISCUS REPAIR (N = 180)

~20% of costs occur after median durations
CONDITION #2

CARPAL TUNNEL SYNDROME (ICD-9-CM: 354.0)

• 5% of the US population is affected by carpal tunnel syndrome (Hooker 2007)
• Non-surgical treatments, examples:
  – Nonsteroidal anti-inflammatory drugs
  – Corticosteroid injections
• Surgical treatment is open carpal tunnel release
• During the period from 1981 to 2005, the average annual incidence of carpal tunnel release surgery was 109 per 100,000 (Gelfman 2009)
# TREATMENT DETERMINES MEDICAL COST

## CARPAL TUNNEL SYNDROME

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Count</th>
<th>25&lt;sup&gt;th&lt;/sup&gt;%ile Cost</th>
<th>Mean Cost</th>
<th>75&lt;sup&gt;th&lt;/sup&gt;%ile Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Surgical Treatment</td>
<td>8,828</td>
<td>$1,436</td>
<td>$4,505</td>
<td>$5,710</td>
</tr>
<tr>
<td>Carpal Tunnel Release</td>
<td>1,261</td>
<td>$3,921</td>
<td>$8,923</td>
<td>$9,091</td>
</tr>
<tr>
<td>No Treatment</td>
<td>895</td>
<td>$17</td>
<td>$626</td>
<td>$420</td>
</tr>
</tbody>
</table>
TREATMENT DETERMINES ACCRUAL OF COST OVER TIME

CARPAL TUNNEL SYNDROME

26% of costs occur after median duration

18% of costs occur after median duration
WHAT ARE THE POTENTIALLY AVOIDABLE MEDICAL COSTS?
IDENTIFYING POTENTIALLY AVOIDABLE COSTS USING THE OPTIMUM RECOVERY DURATIONS

Optimum Duration = recommended disability durations that represent the physiological recovery time, absent of psychosocial factors

- Developed by ReedGroup using a multi-step process including data analysis, clinical peer-review, and Medical Advisory Board approval
- Matched to disability episode by diagnosis and procedure

Potentially Avoidable Costs (PAC) are the difference in costs if all employees returned at the optimum RTW date, as opposed to observed RTW date

Days from First Absence Date
CALCULATING POTENTIALLY AVOIDABLE COSTS (PAC)

• Typical calculation: PAC = $13,000 - $7,400 = $5,600

• PAC must account for:
  − Medical costs after RTW
  − Case characteristics

Case 1:
  Duration = 100 days
  Younger
  No comorbidities
  Not hospitalized

Case 2:
  Duration = 100 days
  Older
  Depression + hypertension
  Hospitalized

Total Medical Costs = $13,000
Potentially Avoidable Costs = $5,600
CALCULATING POTENTIALLY AVOIDABLE COSTS (PAC)

• Typical calculation: PAC = $13,000 - $7,400 = $5,600

• PAC must account for:
  - Medical costs after RTW
  - Case characteristics

Case 1:
Duration = 100 days
Younger
No comorbidities
Not hospitalized

Case 2:
Duration = 100 days
Older
Depression + hypertension
Hospitalized

Total Medical Costs = $13,000
Potentially Avoidable Costs = $5,600

2017 IBI Annual Forum
INVERSE PROBABILITY WEIGHTING (IPW) TO ACCOUNT FOR PROBABILITY OF RTW AT OPTIMUM DURATION

• Developed inverse probability weights for each subject using a log-linear regression model, outcome = Disability Days

• High inverse probability weights mean under/over prediction

• Potential predictors: age, gender, recurrence, salaried/union, # of unique ICDs/procs, hospitalized, surgical procedure, comorbidities, location (median household income, % college graduates, population density), opioid use, health plan, industry.
CALCULATING POTENTIALLY AVOIDABLE COSTS USING INVERSE PROBABILITY WEIGHTING

- Developed log-linear regression model predicting medical costs by full duty days and covariates
- Includes costs 30 days after RTW
- Weighted by inverse probability weights
- For individuals who had a duration above optimum, calculated PAC as the difference in predicted medical costs at:
  - Observed duration
  - Optimum duration
- Summed all PACs

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicted Medical Costs at Observed Duration</th>
<th>Predicted Medical Costs at Optimum Duration</th>
<th>PAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$5,000</td>
<td>$4,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>2</td>
<td>$10,000</td>
<td>$4,500</td>
<td>$5,500</td>
</tr>
<tr>
<td>3</td>
<td>$20,000</td>
<td>$5,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>Total PAC</td>
<td></td>
<td></td>
<td>$21,500</td>
</tr>
</tbody>
</table>
POTENTIALLY AVOIDABLE COSTS (PAC) FOR MENISCUS DISORDERS AND CARPAL TUNNEL

Meniscus Disorder:
- Non-surgical treatment (n=1,734) = ~$900K or $529 per case
- Arthroscopic meniscectomy (n = 10,257) = ~$9.5MM or $928 per case
- Meniscus repair (n=160) = $0

Total PAC savings = ~$10.4 million or $868 per case

Carpal Tunnel:
- Non-surgical treatment (n=8,719) = ~$2.4MM or $277 per case
- Carpal tunnel release (n=1,256) = ~$1.2MM or $957 per case

Total PAC savings = ~$3.6 million or $361 per case
# POTENTIALLY AVOIDABLE COSTS FOR COMMON DIAGNOSES AFFECTING U.S. WORKERS

## POTENTIALLY AVOIDABLE COSTS (PAC) BY DIAGNOSIS

<table>
<thead>
<tr>
<th>DIAGNOSIS</th>
<th>N</th>
<th>MEDIAN (OPTIMUM)</th>
<th>25th %ile</th>
<th>Mean</th>
<th>75th %ile</th>
<th>PAC/Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressive Disorder (311)</td>
<td>15,609</td>
<td>43 (28)</td>
<td>$338</td>
<td>$3,405</td>
<td>$2,775</td>
<td>$830</td>
</tr>
<tr>
<td>Lumbago; low back pain (724.2)</td>
<td>15,143</td>
<td>39 (14)</td>
<td>$491</td>
<td>$6,023</td>
<td>$4,406</td>
<td>$1,573</td>
</tr>
<tr>
<td>Dislocation of Knee; meniscus tear (836.0)</td>
<td>12,874</td>
<td>45 (31.5)</td>
<td>$2,866</td>
<td>$6,452</td>
<td>$7,893</td>
<td>$303</td>
</tr>
<tr>
<td>Anxiety (300.00)</td>
<td>12,659</td>
<td>40 (7)</td>
<td>$279</td>
<td>$2,336</td>
<td>$1,762</td>
<td>$851</td>
</tr>
<tr>
<td>Lumbar Disc Displacement (722.10)</td>
<td>11,437</td>
<td>63 (32)</td>
<td>$2,259</td>
<td>$16,174</td>
<td>$17,682</td>
<td>$3,250</td>
</tr>
<tr>
<td>Major Depressive Disorder, single (296.20)</td>
<td>11,059</td>
<td>57 (28)</td>
<td>$513</td>
<td>$4,173</td>
<td>$4,256</td>
<td>$1,168</td>
</tr>
<tr>
<td>Uterine Leiomyoma, unspecified (218.9)</td>
<td>10,334</td>
<td>44 (28)</td>
<td>$6,742</td>
<td>$12,912</td>
<td>$16,217</td>
<td>$1,927</td>
</tr>
<tr>
<td>Obesity, morbid (278.01)</td>
<td>8,992</td>
<td>31 (35)</td>
<td>$15,740</td>
<td>$26,403</td>
<td>$30,409</td>
<td>$770</td>
</tr>
<tr>
<td>Inguinal Hernia, unilateral (550.90)</td>
<td>7,896</td>
<td>35 (25)</td>
<td>$3,450</td>
<td>$6,884</td>
<td>$8,504</td>
<td>$135</td>
</tr>
<tr>
<td>Major Depressive Disorder, recurrent (296.33)</td>
<td>7,483</td>
<td>68 (28)</td>
<td>$785</td>
<td>$6,204</td>
<td>$7,003</td>
<td>$1,874</td>
</tr>
</tbody>
</table>
POTENTIALLY AVOIDABLE MEDICAL COSTS ACROSS THE ENTIRE U.S. WORKFORCE
POPULATION OF 55 MILLION U.S. WORKERS WITH STD BENEFITS

$6 Billion per Year
Potentially Avoidable Medical Costs

Calculation:

- Total US Employees Eligible for STD Absence:
  - 55MM (40% of Total US Workers have STD benefits)

- STD Claim Rate per Diagnosis:
  - # of STD cases for each diagnosis / Total employees eligible for STD absence

- Potentially Avoidable Costs per Diagnosis:
  - Average medical costs from Optimum to RTW Date for each diagnosis

Total US Workers from the IBI Full Cost Estimator
% of US Workers with STD benefits from BLS
Claim Rate per diagnosis calculated from Marketscan HPM database

2017 IBI Annual Forum
RESEARCH SUMMARY

• Medical costs vary by day of disability with most costs incurred at the beginning of a disability episode.

• Managing cases towards the optimum durations can save medical costs after a disability starts.

• Diagnosis, treatment, and other case information are important for quantifying accurate absence durations and medical costs.

• Cost trajectory models could be used to estimate medical costs when employers don’t have access to the employee’s medical data.
KP VALUE PROPOSITION

Deliver on the promise of integrated health & productivity management, by aligning products & services that improve workforce health & productivity.

• Less fragmentation = less costs and better clinical outcomes, earlier RTW

• Program elements integrated and complementary = synergized and compounded impacts to workforce health

• Less administrative costs for employers

• KP Integrated Care System provides KP members best health and wellness

Integration of service and program component data provides a unique opportunity to measure and report the impact on total health and productivity.
WHAT IS KAISER PERMANENTE DOING?

DISABILITY STRATEGY

KP will support customers in reducing the duration and total costs of employee disability through efficient administrative processes, responsive service and best in class clinical tools and reporting.

Key Tactics:

• Active provider role in workforce management as part of treatment plan.
• Tools in HealthConnect, including Disability Duration Guidelines and an integrated tool (Activity Rx) for consistent documentation and link to MDGuidelines
• Training and support for all providers lead by integrated disability management MDs
• Expand ReedGroup’s MDGuidelines in Occ Health, Non-Occ Health & FMLA
ACTIONABLE ITEMS FOR HEALTH PLANS

CONSIDERATIONS FOR EMPLOYERS

• Include medical costs in analysis of disability benefits programs
  – Can’t manage what you can’t measure
  – Wage replacement, benefits, lost productivity, AND disability-related medical costs

• Include disability-related outcomes in analysis of wellness programs

• Ensure cases are managed using evidence-based guidelines and durations
  – Delivers appropriate care in a timely fashion

• Design medical / disability benefit plans to work together
  – Encourages desired behaviors
  – Ensure costs and time-off for preventive care are well covered

• Ensure right balance between high-deductible health plans and care utilization

• Review return-to-work policies
  – Encourage modified duty and workplace accommodations
CONTACT INFORMATION

Kevin Curry  
SVP, National Practice Leader  
ReedGroup  
kcurry@reedgroup.com  
303-407-0690

Martha Garcia  
Senior Program Manager  
Kaiser Permanente  
martha.f.garcia@kp.org  
818-557-6093  
CA License od84548

Fraser Gaspar, PhD, MPH  
Epidemiologist  
ReedGroup  
fraser.gaspar@reedgroup.com  
720-456-4413

Katie Zaidel, MEM  
Data Research Scientist  
ReedGroup  
kzaidel@reedgroup.com  
720-440-6960
RESEARCH STRENGTHS AND LIMITATIONS

Strengths:

• Large, integrated dataset
• Multiple components (outpatient, inpatient, pharmaceuticals)
• Multiple employers and regions
• Ability to tie to physiological optimum durations

Limitations:

• Inherent noise in medical data
  – Coding to high level
  – Missing data
• Per day costs do not control for severity or other confounding factors that may affect both duration and medical costs
FUTURE RESEARCH

- Evaluate how the adherence to ACOEM’s treatment guidelines affects disability durations and medical costs.

- Refine evaluation of chronic conditions by linking multiple disability episodes.

- Operationalize cost model to make it available to a wider audience (web-based tools).