Construction Injury Events Leading to Disabling Fractures

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Introduction

In 1996 the construction industry

- employed 5.4% of US workforce
- accounted for
  - 7.8% non-fatal occupational injuries & illnesses
  - 9.7% cases with days away from work (DAFW)

- BLS 1997
Introduction

- Typical construction injury studies focus on injury frequency (most often univariately)  
  (Kisner & Fosbroke, 1994; Jeong, 1998)

- Fewer studies address cost and disability
  - Denver airport (Glazner et al., 1998; Lowery et al., 2000)
    - Good information on injury disability by trade, other aspects.
    - Limited to one large, single-site project.
  - More recently, active surveillance studies by Lipscomb and colleagues.

- No national study of injury-related disability duration.
Objectives

To examine:

- the most frequent construction injuries
- the most costly injuries (percent cost)
- the length of disability (LOD) of construction injuries
- antecedent events associated with the highest cost and disability injuries
- selected events in greater detail
Method

1996 workers compensation claims

- 44 of the 50 states and D.C.
- Retrieved in August 2000 (3.6 yr. minimum development)
- Construction claims identified through previously published method using manual class codes (Murphy & Courtney, 2000)
- All natures of injury and body parts
  * Published definition used for low back pain.
Method

Antecedent event categories

- Hand tool-related
- Manual materials handling
- Motor vehicle crash
- Repeated trauma
- Slips, trips, falls- elevation
- Slips, trips, falls- same level
- Struck by/againstcaught between
Method

For subsequent, more detailed event description of fractures (stage 2 analysis)

- Review of narrative text on injury event
- Classification into 3 digit OIICS event codes, 2nd event coded if indicated.
- Identification of sources
Method

Calculation of LOD

- Closed, non-lump sum cases
  » Individual indemnity payments

- Open and lump sum cases
  » Total indemnity / average weekly rate

- Adjustment made for each jurisdiction regarding waiting and retroactive periods.

- Zero cost & medical only claims included.
Results

1996 workers compensation claims

- 37,590 construction claims
- 2.2% of claims remained open
### Table 1. Most frequent construction injuries by body part & nature of injury

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Nature of Injury</th>
<th># of Claims</th>
<th>% of Claims</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Low Back</td>
<td>Low Back Pain</td>
<td>5,301</td>
<td>14.8%</td>
</tr>
<tr>
<td>2 Eye(s)</td>
<td>Foreign Body</td>
<td>3,045</td>
<td>8.5%</td>
</tr>
<tr>
<td>3 Finger(s)</td>
<td>Laceration</td>
<td>1,720</td>
<td>4.8%</td>
</tr>
<tr>
<td>4 Mult. body...</td>
<td>Misc. Inj.</td>
<td>1,123</td>
<td>3.1%</td>
</tr>
<tr>
<td>5 Hand</td>
<td>Laceration</td>
<td>1,028</td>
<td>2.9%</td>
</tr>
<tr>
<td>6 Upper Arm</td>
<td>Strain</td>
<td>933</td>
<td>2.6%</td>
</tr>
<tr>
<td>7 Knee</td>
<td>Strain</td>
<td>793</td>
<td>2.2%</td>
</tr>
<tr>
<td>8 Thumb</td>
<td>Laceration</td>
<td>787</td>
<td>2.2%</td>
</tr>
<tr>
<td>9 Ankle</td>
<td>Sprain</td>
<td>680</td>
<td>1.9%</td>
</tr>
<tr>
<td>10 Foot</td>
<td>Puncture</td>
<td>613</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

All construction claims = 35,790

Subtotal of top 10 combinations- table 1 = 16,023

Percentage of construction claims- table 1 = 44.7%
Figure 1. Injury events for all construction injuries

- Other: 14
- SBAC: 21
- STF-SL: 9
- STF-E: 9
- Rep Tra: 2
- Mot Veh: 2
- MMH: 30
- HT: 13
Results - LOD

- Mean LOD = 46 days
- Median LOD = 0 days
- Disability day count = 1,631,143

- Low Back Pain = 25.5% of disability days
Results- Highest Median LOD

- Ankle fractures = 55 days
- Foot fractures = 42 days
- Wrist fractures = 38 days
- All other comb. = 0 days

1 BP-NOI combinations representing 1% or more of disability days and at least 100 claims
Antecedent events

- **Ankle fractures (55 DAFW)**
  - 31% fall lower level
    - ladder (8), vehicle (7), scaffold (5), roof (4)
  - 19% slips and trips w/o fall (noted)
  - 17% struck by (71% falling objects)
    - trusses, rebar, I-beams, boards typical

- **Foot fractures (42 DAFW)**
  - 38% struck by (68% falling objects)
    - concrete structures, manhole components, pipes, I-beams typical
  - 31% fall lower level
    - ladder (19), roof (9), vehicle (7)
Antecedent events

- Wrist fractures (38 DAFW)
  - 41% fall lower level
    - ladder (14), roof (7), scaffold (7), vehicle (6)
  - 27% fall same level (85% with co-incident slip or trip noted)
  - 7% struck by
  - 3% slip, trip w/o fall
Discussion

- Injury Frequencies
  - Highest for back injuries and traumatic eye and hand injuries.
  - Similar to previously published data.
Discussion

- Construction workers injured in 1996 lost an average of 46 days from work.

- At least half of injured construction workers did not lose enough time to receive wage replacement benefits (median = 0).
  - BLS DAFW median for 1996 = 7 days.
  - Difference - BLS accrues from day after event compared to WC waiting periods (typically 3-7 days).

- Total of disability days ≈ loss of 6,500 FTE workers for one year
Discussion

- Construction LBP LOD mean (79 days) higher than Hashemi et al. (1999) for Private Industry (61 days)
  - Return to work challenges in construction, differential cost development periods.

- Wrist fracture mean highest (245 days), median = 38
  - More than half of construction workers with a wrist fracture missed more than a month of productive work.
Ankle, foot and wrist fractures
  - Importance of fall prevention
    ◆ Typical areas such as roofs and scaffolds
    ◆ More challenging areas such as ladders and vehicles
  - Struck by falling objects
    ◆ Need for examination of construction footwear design.
    ◆ Need for improved mechanical material handling procedures.

Findings consistent with those reported for severe construction injuries.
  ◆ Carpenters (Lipscomb et al., 2003)
  ◆ Drivers (Glazner et al., 2003)
**Limitations**

- LOD likely underestimated due to effect of waiting periods. (Hashemi et al., 1997, 1998)

- Misclassification of antecedents and injuries. (Murphy and Courtney, 2000)

- Administrative data system limitations
  - Limited exposure assessment sensitivity
  - Presence of filtering effects: under-reporting
  - Varying outcome sensitivity

  (Murphy et al., 1996)
Strengths

- Examined construction injury LOD and antecedents.
- Used a larger, more nationally distributed source of data than prior construction LOD studies.
- Data source benchmarked against other national-scale surveillance systems. \((\text{Murphy et al., 1996})\)
- Estimate of LOD not substantially right-censored (as is the case with the BLS). \((\text{Courtney and Webster, 1999})\)
Future plans

Complete evaluation of all fractures (est. >1800)

- Conduct additional case identification and validation using all injury narratives.
- Assess impact of multiple outcome claims.
- Assess potential for further improvement of classification (e.g., Lombardi et al., 2003)
- Examine LOD differences at more detailed levels.
Conclusions

- LBP was the largest contributor to construction disability.
- Disability duration varied substantially with wrist, foot and ankle fractures being particularly severe.
- The majority of the most disabling injuries were due to STF & MMH.

Applications
- Basis for further studies into STF and MMH in construction.
- Can be used as an industry benchmark for organizations within construction.
- Can be used as part of justification for intervention.
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Method

Calculation of Cost

– Closed cases
  » All medical, indemnity, and other payments

– Open cases
  » Estimated medical, indemnity, and other payments (including amounts paid to date)

– Zero cost & medical only claims included
Table 2. Most costly and disabling construction injuries by body part & nature of injury

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Nature of Injury</th>
<th>% Claims Cost</th>
<th>% Disability Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Low Back</td>
<td>Low Back Pain</td>
<td>21.3</td>
<td>25.5</td>
</tr>
<tr>
<td>2 Mult. body...</td>
<td>Misc. Inj.</td>
<td>8.1</td>
<td>5.1</td>
</tr>
<tr>
<td>3 Knee</td>
<td>Strain</td>
<td>3.4</td>
<td>4.4</td>
</tr>
<tr>
<td>4 Upper Arm</td>
<td>Strain</td>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td>5 Wrist</td>
<td>Fracture</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td>6 Mult. body...</td>
<td>Contusion</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>7 Low back (tr)</td>
<td>Misc. Inj.</td>
<td>1.4</td>
<td>1.6</td>
</tr>
<tr>
<td>8 Knee</td>
<td>Contusion</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td>9 Ankle</td>
<td>Fracture</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>10 Foot</td>
<td>Fracture</td>
<td>1.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>

All construction claims = 100.0
Claims - table 2 = 44.2
Figure 2. Percentage of LBP and Wrist Fracture attributable to antecedent events

Low Back Pain

- Other: 8
- SBAC: 5
- STF-SL: 8
- STF-E: 9
- Rep Tra: 2
- Mbt Veh: 2
- MMH: 61
- HT: 5

Wrist Fracture

- Other: 1
- SBAC: 8
- STF-SL: 32
- STF-E: 33
- Rep Tra: 0
- Mbt Veh: 2
- MMH: 18
- HT: 6

Highest LOD count = 416,444
Highest LOD mean = 245
Discussion- Antecedents

- **MMH**
  - 61% of LBP, 59% upper arm strains

- **STF**
  - 65% wrist fractures, 56% knee strains, 17% LBP
  - Across industry, STF responsible for 46% of disabling fractures, 48% of disabling strains
    (Courtney et al., 2001)
  - Prior studies show that STF-origin LBP can be more severe
    (Murphy and Courtney, 2000)

- **Repeated trauma**
  - 6% of knee strains and multiple body part injuries