Correlations between Outcome Scores
“Firefighter Hearing Health”

Dal Lae Chin, RN, PhD1
Karen A. Monsen, RN, PhD, FAAN2,3
Madeleine J. Kerr, RN, PhD2,3
OiSaeng Hong, RN, PhD, FAAN1

1 University of California San Francisco, School of Nursing, San Francisco, CA
2 University of Minnesota, School of Nursing, Minneapolis, MN
3 University of Minnesota, Institute for Health Informatics, Minneapolis, MN

Acknowledgements

• Participants from fire departments in CA, IL, & IN
• Omaha System Partnership for Knowledge Discovery and Health Care Quality

Introduction

• Noise-induced Hearing Loss (NIHL): One of most prevalent occupational injuries among firefighters in the U.S.
• Need in measurement of outcomes of hearing loss prevention programs
• “Omaha System Problem Rating Scale for Outcomes”: Standardized language represent health outcomes relative to hearing problem
Modeling Relationships

- It is difficult to understand relationships between educational interventions, behavior changes, and health outcomes.

- Omaha System Knowledge, Behavior and Status framework enables investigation of associations between hearing health outcomes.

Purpose

- "Correlations" between standardized hearing health variables:
  - KBS variables by definitions of Omaha System rating

Method

- Secondary analysis from
  - Internet-based survey
  - Hearing assessment

(*) S.I.R.E.N. (Safety Instruction to Reduce Exposure to Noise and Hearing Loss)
Participants

- 346 firefighters from CA, IL, and IN

**Characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Years)</td>
<td>45</td>
</tr>
<tr>
<td>Years of work in fire service</td>
<td>17</td>
</tr>
</tbody>
</table>

**Characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity (Caucasian or White)</td>
<td>81</td>
</tr>
<tr>
<td>Gender (Male)</td>
<td>94</td>
</tr>
<tr>
<td>Loud noise exposure at job site (daily/weekly)</td>
<td>84</td>
</tr>
</tbody>
</table>

**Standardized Outcomes**

<table>
<thead>
<tr>
<th>Standardized Outcomes</th>
<th>Omaha System Rating</th>
<th>SIREN Data</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KNOWLEDGE</strong></td>
<td>Ability of the client to remember &amp; interpret information</td>
<td>Four questionnaire items on Noise-induced hearing loss and its prevention 1= no knowledge 5=superior knowledge</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>Observations, actions, or activities of the client fitting the occasion or purpose</td>
<td>% of time of Use of hearing protection device (HPD) 1= 0 to 20% 5=81 to 100%</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>BEHAVIOR</strong></td>
<td>Condition of the client in relation to objective and subjective defining characteristics</td>
<td>Objective hearing status 1=above 80dB 5=less than 25dB</td>
<td>4.4</td>
</tr>
</tbody>
</table>

**Data Analysis**

- SPSS 18.0
- Descriptive statistics
- Nonparametric analysis
  - “KBS” variables are categorical variables with skewed distributions
  - Spearman’s rho correlations
Correlations between “KBS”
The level of statistical significance: $p < .05$

<table>
<thead>
<tr>
<th>SCALE</th>
<th>Knowledge</th>
<th>Behavior</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Behavior</td>
<td>0.13</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Status</td>
<td>-0.07</td>
<td>0.12</td>
<td>1</td>
</tr>
</tbody>
</table>

* Significant correlation: knowledge-Behavior & Behavior-Status

Conclusion

- Firefighters having higher-level knowledge on NIHL used HPDs more frequently.
- Firefighters frequently used HPDs showed better hearing status.
- Future studies
  - Comparison between the baseline and the current hearing assessments of firefighters
  - Compare between the “KBS” scores to other populations of interest for the hearing problem

(* NIHL: Noise-induced hearing loss. HPD: hearing protection device)

Implications

- Standardizing health data will create opportunities
  - further analysis of the way in which knowledge-behavior-status changes occur.
  - enable data exchange across occupational health and other care settings.
- Data exchange will support population-based hearing health assessments and outcomes.
Thank you! & Questions!

Dal Lae Chin, RN, PhD (Dal.Chin@ucsf.edu)