Six Steps to Safety: The Hierarchy of Control in the Prevention of Agricultural Injury

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This presentation is based on findings from the Saskatchewan Farm Injury Cohort Study, supported by the Canadian Institutes of Health Research

Back row: Will Pickett (PI), Candace Seaby, Josh Lawson, Rob Brison, Don Voaklander, Leslie Day, Barbara Marlenga

Front row: Catherine Trask, Louise Hagel (manager), James Dosman (Co-PI), Nathan King

Missing: Niels Koehncke, Valerie Elliot
AGRICULTURE: MULTIPLE INJURY EXPOSURES...

- Animal care
- Large moving objects
- Grain production
- Heights
- Maintenance
- Machine repair
- Machine operation
- Working alone
- Long hours
- Multi-tasks
- Deadlines
- Weather
...RESULTING IN MULTIPLE TYPES OF INJURIES

425 Injuries among 5,292 Farmers in One Year (2006) - SFIC

- Struck by/against object
- Animal related
- Fall from height
- Pinned/caught between objects
- Overexertion
- Fall on the same level
- Repetitive strain injury
- Entanglement
- Exposure to fire
- Jumped to lower level
- Runover by machine

Percentage of Total

- Struck by/against object: 16%
- Animal related: 15%
- Fall from height: 14%
- Pinned/caught between objects: 13%
- Overexertion: 11%
- Fall on the same level: 10%
- Repetitive strain injury: 5%
- Entanglement: 4%
- Exposure to fire: 2%
- Jumped to lower level: 2%
- Runover by machine: 0%
Hierarchy of Control:
1. Hazard description
2. Risk assessment
3. Elimination of the hazard
4. Engineering controls
5. Administrative and procedural systems and controls
6. Use of personal protective equipment

SIX STEPS TO SAFETY:
A MODIFIED HIERARCHY OF CONTROL

1. Hazard description
Recognizing hazards in the workplace is the first step in the planning of the control of risk of injury or illness.

2. Risk assessment
Determining the risk involved in each hazard is necessary in order to identify the elements that require control or management.
3. Elimination of the hazard

Removing the hazard by changing how the work is done is the best means to reduce risk. For example, replacing grain auger with grain vacuum.

4. Engineering controls

Reduce or eliminate the hazard by initial design specifications, or by applying methods of substitution, isolation, enclosure or ventilation. For example, safety shields over drive belts.
SIX STEPS TO SAFETY: A MODIFIED HIERARCHY OF CONTROL (3)

5. Administrative and procedural systems and controls
Practices and procedures. For example, education, work protocols, and training.

6. Personal protective equipment
Provides a buffer between the worker and the work environment. For example, masks, boots, hats, safety glasses, fall protection, hearing protection.
## Testing the Modified Hierarchy of Control

### Saskatchewan Farm Injury Cohort Study – Phase 2

Winter 2013: Mail Survey

<table>
<thead>
<tr>
<th></th>
<th>Owner – Operators n (%)</th>
<th>All Individuals n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people</td>
<td>1,108 (100%)</td>
<td>2,635 (100%)</td>
</tr>
<tr>
<td>Hours of farm work:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part-time</td>
<td>213 (20.0%)</td>
<td>1226 (48.4%)</td>
</tr>
<tr>
<td>Full-time</td>
<td>853 (80.0%)</td>
<td>1307 (51.6%)</td>
</tr>
<tr>
<td>Any farm injury, yes</td>
<td>142 (12.8%)</td>
<td>205 (7.9%)</td>
</tr>
<tr>
<td>Serious farm injury, yes</td>
<td>78 (7.0%)</td>
<td>107 (4.1%)</td>
</tr>
</tbody>
</table>
# TESTING THE MODIFIED HIERARCHY OF CONTROL

Description of farms (n=1,108) reporting information on the hierarchy of control

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Did not report ‘Always’ for any of the steps</td>
<td>116</td>
<td>(14.6)</td>
</tr>
<tr>
<td>1</td>
<td>Reported ‘Always’ for one of the six steps</td>
<td>191</td>
<td>(24.0)</td>
</tr>
<tr>
<td>2</td>
<td>Reported ‘Always’ for any two steps</td>
<td>182</td>
<td>(22.8)</td>
</tr>
<tr>
<td>3</td>
<td>Reported ‘Always’ for any three steps</td>
<td>160</td>
<td>(20.1)</td>
</tr>
<tr>
<td>4</td>
<td>Reported ‘Always’ for any four steps</td>
<td>101</td>
<td>(12.7)</td>
</tr>
<tr>
<td>5</td>
<td>Reported ‘Always’ for any five steps</td>
<td>42</td>
<td>(5.3 )</td>
</tr>
<tr>
<td>6</td>
<td>Reported ‘Always’ for all six steps</td>
<td>5</td>
<td>(0.6 )</td>
</tr>
<tr>
<td>-</td>
<td>Missing</td>
<td>311</td>
<td></td>
</tr>
</tbody>
</table>
ADHERENCE TO THE HIERARCHY OF CONTROL

Total cumulative number of hierarchy steps reported
All Individuals (n = 2,635)

| Adherence | Any Injury | | Serious Injury | |
|-----------|------------|----------------|----------------|----------------|----------------|
|           | n          | % injury       | OR             | (95% CI)       | % injury       | OR             | (95% CI)       |
| 0 (low)   | 252        | 10.3           | 1.00           | -              | 4.4            | 1.00           | -              |
| 1         | 461        | 8.9            | 0.87           | (0.49-1.54)    | 5.4            | 1.32           | (0.62-2.80)    |
| 2         | 431        | 10.4           | 1.09           | (0.62-1.90)    | 5.3            | 1.34           | (0.62-2.86)    |
| 3         | 378        | 8.2            | 0.80           | (0.44-1.45)    | 4.8            | 1.15           | (0.52-2.55)    |
| 4         | 263        | 3.4            | **0.32**       | **(0.14-0.74)**| **1.1**        | **0.27**       | **(0.07-0.99)**|
| 5 or 6 (high) | 120       | 5.8            | 0.56           | (0.22-1.42)    | 4.2            | 1.01           | (0.33-3.07)    |

Note: all models adjusted for age, sex, and hours of farm work

A three-fold reduction in injuries among those always using four steps
ADHERENCE TO THE HIERARCHY OF CONTROL

Total cumulative number of hierarchy steps reported
(Farm owner-operators) (n = 1,108)

<table>
<thead>
<tr>
<th>Adherence</th>
<th>n</th>
<th>% injury</th>
<th>OR</th>
<th>(95% CI)</th>
<th>% injury</th>
<th>OR</th>
<th>(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (low)</td>
<td>113</td>
<td>15.9</td>
<td>1.00</td>
<td>-</td>
<td>6.2</td>
<td>1.00</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>185</td>
<td>14.1</td>
<td>0.85</td>
<td>(0.44-1.64)</td>
<td>8.7</td>
<td>1.44</td>
<td>(0.57-3.65)</td>
</tr>
<tr>
<td>2</td>
<td>176</td>
<td>17.6</td>
<td>1.13</td>
<td>(0.60-2.16)</td>
<td>8.5</td>
<td>1.42</td>
<td>(0.56-3.62)</td>
</tr>
<tr>
<td>3</td>
<td>156</td>
<td>14.7</td>
<td>0.91</td>
<td>(0.46-1.80)</td>
<td>9.0</td>
<td>1.48</td>
<td>(0.57-3.82)</td>
</tr>
<tr>
<td>4</td>
<td>95</td>
<td>5.3</td>
<td>0.30</td>
<td>(0.11-0.83)</td>
<td>2.1</td>
<td>0.33</td>
<td>(0.07-1.62)</td>
</tr>
<tr>
<td>5 or 6 (high)</td>
<td>45</td>
<td>13.3</td>
<td>0.81</td>
<td>(0.30-2.22)</td>
<td>11.1</td>
<td>1.90</td>
<td>(0.56-6.40)</td>
</tr>
</tbody>
</table>

Note: all models adjusted for age, sex, and hours of farm work

A three-fold reduction in injuries among farmers always using four steps
1) This was a secondary analysis.

2) Not all questions used to assess Hierarchy of Control may have been really good questions, especially for “Hazard Identification” and “Risk Assessment”

3) None-the-less, we were interested that the more steps in the HOC always followed, the lower the apparent injury risk.

4) The HOC may not so much be a hierarchy, but rather a set of options used differently in different risk situations.
Summary

The Six Steps to Safety may be a useful framework for innovative research and programming to effect a significant reduction in farm injury.
Thank you and have a great meeting!