Agenda

- What is OR-FACE
  - Mission
  - History
- Surveillance
  - Occupational fatality data 2003-2014
- Investigations
  - Construction cases
  - Group exercise (determining preventive actions)
- Outreach
  - Communicating recommendations
  - Toolbox talks
  - Group exercise (create toolbox talk)
- Research projects
  - Why research
  - Past and current research studies
Mission

• Prevent traumatic work-related deaths in Oregon through
  – Surveillance
  – Targeted investigation
  – Assessment
  – Outreach

History

• NIOSH surveillance research program
  – Began in 1982
  – Expanded to states in 1992
• OR-FACE
  – Joined 14 other state programs in 2002
  – 2010 only 9 states
  – Currently only 7 states
Surveillance 2014 Sources

- Google alerts: 31%
- Oregon OSHA: 42%
- Other agencies: 16%
- Vital Statistics: 11%
- Death certificates/Medical examiner
### Worker fatalities in Oregon (2003-2014)

#### Total Number of Fatal Cases

<table>
<thead>
<tr>
<th>Industry</th>
<th>Total Number of Fatal Cases</th>
</tr>
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<tbody>
<tr>
<td>Transportation and Warehousing</td>
<td>122</td>
</tr>
<tr>
<td>Forestry &amp; Logging</td>
<td>101</td>
</tr>
<tr>
<td>Construction</td>
<td>89</td>
</tr>
<tr>
<td>Agriculture</td>
<td>67</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>58</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management</td>
<td>43</td>
</tr>
<tr>
<td>Public Administration</td>
<td>36</td>
</tr>
<tr>
<td>Fishing, Hunting and Trapping</td>
<td>26</td>
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<tr>
<td>Retail Trade</td>
<td>25</td>
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<tr>
<td>Other Services (except Public Administration)</td>
<td>25</td>
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</tbody>
</table>
Worker fatalities in Oregon (2003-2014)

**Agriculture**

- 2003: 12
- 2004: 11
- 2005: 7
- 2006: 12
- 2007: 9
- 2008: 4
- 2009: 4
- 2010: 5
- 2011: 5
- 2012: 4
- 2013: 5
- 2014: 4

**Forestry and Logging**

- 2003: 13
- 2004: 7
- 2005: 12
- 2006: 9
- 2007: 14
- 2008: 9
- 2009: 5
- 2010: 5
- 2011: 5
- 2012: 4
- 2013: 5
- 2014: 4

**Transportation**

- 2003: 7
- 2004: 5
- 2005: 12
- 2006: 10
- 2007: 13
- 2008: 9
- 2009: 5
- 2010: 5
- 2011: 5
- 2012: 4
- 2013: 4
- 2014: 4

*State of Oregon Employment Department (Total nonfarm employment, annual average not seasonally adjusted)*
Worker fatalities in Oregon (2003-2014) Events

Agriculture
- Transportation incidents
- Contact with objects and...
  - Violence and other...
  - Exposure to harmful...
- Falls, slips, trips
- Fires and explosions
- Overexertion and bodily...

Transportation
- Transportation incidents
- Contact with objects...
- Violence and other...
- Exposure to harmful...
- Falls, slips, trips
- Fires and explosions

Forestry/Logging
- Transportation incidents
  - Falls, slips, trips
  - Fires and explosions
  - Exposure to harmful...
  - Violence and other...
  - Overexertion and bodily...

Construction
- Transportation incidents
  - Falls, slips, trips
  - Contact with objects and...
  - Violence and other...
  - Exposure to harmful...

Worker fatalities in Oregon (2003-2013) Construction Events

- Falls, slips, trips 33%
- Transportation incidents 27%
- Contact with objects and equipment 22%
- Exposure to harmful substances or environments 10%
- Violence and other injuries by persons or animals 8%
Worker fatalities in Oregon Construction

Preliminary Data on Construction fatalities

- 2014: 7
  - Fell 20 ft from ladder
  - Fell off pump jack scaffold
  - Fell off scaffold
- 2015: 5
  - Fell from roof
- 2016: 4
  - Fell in hopper

Investigations

Guiding Principles

- Maintain confidentiality
- Provide facts
- Provide best practice recommendations (beyond regulatory requirements)
Investigations

Published (2015-2017)
1. Vineyard worker killed in fall from trailer
2. Contract sanitation worker killed cleaning meat blending equipment
3. Driver killed when ejected from logging truck
4. Crane operator killed by falling steel beam
5. Forestry worked killed in vehicle from timber falling activity

Workers
• Three workers fell
  • one fatal – 33 year-old carpenter foreman
  • two with neck, head and back injuries
• New crew (first job with company)
  • interviewed, selected and hired via telephone

Worksite
• Private property
• Residential shop/ garage building
• 4 Exterior 12-foot walls
• Interior wall separating shop and garage
The incident
• Four days prior 2 workers began framing, sheeting and bracing walls, framed the interior wall
• Two new workers arrived at the job site for the first time
• 20-foot Vertical truss bracing (2x4’s) nailed to north and south wall

The incident cont’d
• ~12:30 pm truck-mounted crane with a trailer loaded with trusses arrived
• Truck operator provided foreman with delivery documents (contained in Structural Building Components Association [SBCA] BCSI-B1 Summary Sheet Guide)
The incident cont’d

- Foreman assigned crew
  - 1-on trailer to connect truss to the crane rigging
  - 2-stand on top plates of framed wall
  - 1-on floor to cut lateral restraints
- Gable end truss set in place, toenailed to the plate and nailed to the 3 20-ft vertical braces
- Second truss set in place and nailed to the top plate
- Two 2x4’s lateral restraints (~2 feet long) were cut and handed to workers who nailed it to the gable truss and second truss approximately 8 feet from toe
- Process repeated with each additional truss
- Foreman worked in the center span of the trusses and installed bracing and runners then would disconnect truss from rigging
- Crane operator and rigger yelled that bracing was inadequate
- Additional lateral restraints were added.
The incident cont’d
• After the 13th truss was set in place and disconnected from the rigging, the trusses collapsed
• Two workers were knocked off the top plate and fell to concrete floor.
• Foreman fell and was struck on his head by falling truss

CAUSE OF DEATH
Lacerating and penetrating injuries of neck and chest

Contributing factors
• Training nor protective equipment were provided
• Construction experience may not have included erecting/installing trusses
• SBCA BCSI Summary Sheet Guide not reviewed
• Diagonal braces not added to task

Building Component Safety Information (BCSI)
Guide to Good Practice for Handling, Installing, Restraining and Bracing of Metal Plate Connected Roof Trusses
Key Recommendations

1. Employers and supervisors should assess the workplace hazards and **plan each stage of construction to comply with manufacturer’s recommendations or standard best practice**. In this case, the critical elements of standard practice provided in the BCSI-B1 Summary Sheet for adequate bracing prior to and during truss installation were not followed. Comply with manufacturer’s recommendations (BCSI-B1 summary sheet).

2. Employers must train supervisors and employees, communicate their expectation for following safe practices and confirm that employees fully understand the hazards and controls required for the task assigned. In this case, training and expectations were lacking and the truss installation did not include a review of standard documents, pre-job assessment, risk mitigation planning or the use of personal protective equipment. Plan each stage of the job to eliminate/mitigate hazards (Prevention through design, PtD).

Ground assembly
- Reduce collapse potential
- Pre-installed anchors and lifelines before lifting
- External and internal bracket scaffolds

Key Recommendations (cont’d)

3. Employers should develop and use a hiring process that is based on established best practices, including a process to determine candidates’ qualifications and training needs before they begin work on assigned tasks. Communicate expectations.
Forestry worker
- 55 years old
- Log quality specialist w/ 30 years’ experience incl. work around active logging operations
- Safety training up to date

Worksite
- Leased timber land, densely forested
- Multi-employer worksite
- Active logging area
- Tree falling at one end of area; cable yarding at opposite end

The incident
- Log quality specialist participated in a field training exercise about 1 ½ hours from timber sale area (site of fatal incident). She then drove along a winding road that ran diagonally from NW to SE along the length of the timber sale area.
- Yarding activity was underway at SE end; tree falling was underway at NW end.
The incident (cont’d)

- Single flagger/watchman was assigned to control approaching traffic at the SE end (cable yarding).
  - Equipped with radio that did not work; not equipped with required high-vis vest or “stop/slow” paddle signs.
  - Unaware of tree falling work at NW end.
- No warning signs or flaggers were positioned between this entry point and the NW end (tree falling activity).
- Log quality specialist was driving SE-NW and encountered the watchman at the SE entry to the area.
- Watchman allowed her to pass under cable then saw her pull over a short distance away, presumably to allow two oncoming vehicles to pass.
- Driver of the first vehicle was owner of sub-contracted logging company; two hunters were in the second vehicle.

The incident (cont’d)

- Brief conversation took place between log quality specialist and logging company owner; owner reportedly told her wait reports of what was said were limited and ambiguous.
- Logging company owner and hunters then continued on toward the SE.
- Log quality specialist waited at least 20 minutes before proceeding toward the NW (20 min. is normal limit for temporary road closures by logging contractors).
- Not likely she could see or hear cutting activity occurring > ¼ mile down the road to the NW. And remember, no flagging or signage in place to warn of tree falling operations ahead.
The incident (cont’d)
• Tree measuring between 140-160 ft. tall, 36 in. in diameter was being felled above road, located about 145 ft. from the road (requirement is minimum two tree lengths from road).
• Ground below stump sloped downward approx. 30% grade.
• Intended lay of the tree was parallel to road; however, it fell downward toward road.
• Unsafe cutting practices noted during investigation (on this and other trees in area) included:
  o insufficient holding wood;
  o low backcuts; and
  o improper cleaning of the face cut.

Proper backcut placement

The incident cont’d
• Tree struck log quality specialist’s vehicle as she was driving, crushing the cab of her vehicle.

CAUSE OF DEATH
Traumatic head and neck injury

Contributing factors
• Tree height and ground slope are important factors when evaluating timber falling activity for potential hazards.
  • In this case tree < minimum safe distance of two lengths from road, with no protective provisions in place.
  • Unsafe cutting practices observed that allowed tree to fall 135° away from intended lay and into the road.
  • Inadequate communications channels in place.
Key Recommendations

1. Employers responsible for active logging operations should assure that entry into hazardous logging areas is controlled, including correct placement of flagging, road closures, and adequate and proper signage and warnings.

2. Employers should assess tree fallers skills and require that novice or inadequately performing workers are directly supervised by a qualified person until the faller demonstrates the ability to safely perform these tasks independently, including trees of different types & sizes, and under different ground conditions.
   ◦ Assess subcontractor safety during contract review.

Key Recommendations (cont’d)

3. Employers with employees who work in and around forests who may be exposed to production logging operations should train employees in hazard recognition and reporting, and assure hazards are tracked, documented, and resolved, and their resolution communicated.

4. Incident investigations should be utilized to identify action items to be addressed, and responsibilities assigned to assure their completion.

5. On multi-employer worksites, all employers on site share the responsibility for protecting workers from known hazards, and thus should establish inter-employer safety communication practices involving all employers at a given site.
Hierarchy of Controls

- Elimination: Physically remove the hazard
- Substitution: Replace the hazard
- Engineering controls: Isolate worker from hazard; modify equipment
- Work practice/admin. controls: Training; modify the process
- PPE: Personal protective equipment

Recommendations Exercise: Your Turn (Part 1)

- Form teams
- Review investigation report summaries/factors sheets
- Develop recommendations
Outreach

• Website
• Publications
• Interventions
• Presentations

Resources

• Oregon Institute of Occupational Health Sciences
  – Education
  – Outreach
  – Publications
  – Newsletter
  – Blog
  – Symposia
  – Online videos
OR-FACE Website

Google OR-FACE

Publications

Annual Reports (since 2003)

- Published 18 months
- Case abstracts, based on document review
  - OSHA investigation
  - Police investigation
  - Medical examiner
    - Pathology
    - Toxicology
  - National Transportation Safety Board
  - US Coast Guard
Publications

Interactive Maps (2003-2013)

Event

Occupation

Publications

Hazard Alerts

- One page
- Bulleted recommendations
- Abstracts of similar cases
Tips for Better Safety Communication

- End information overload, increase comprehension
- Increase actual use of info
- Better recall (remember more of it)
- Perform better (improve problem-solving)

Ref: Larkin & Larkin, 2007  www.Larkin.biz

Safety Communication Essentials

- Use pictures
  - Simpler the better (use several if subject complex)
  - Keep it simple (text)
  - Then get technical… (optional)

Ref: Larkin & Larkin, 2007  www.Larkin.biz
“Few things in communication research are known with certainty, here is one of them: Adding crude drawing to text brings huge increases in comprehension.”

Ref: Larkin & Larkin, 2007  www.Larkin.biz
Toolbox Talk Exercise: Your Turn (Part 2)

- Form teams
  - Some members do a stick drawing
  - Some members write text to describe

OR-FACE Research

- Why research?
- New/current projects underway
- Previous field studies
Why Research

• Workplace fatalities: preventable, yet unacceptably common events
  – Globally ~ 350,000 workers killed on the job each year, with nearly 5,000 deaths occurring in US
  – Oregon occupational fatality rate currently 2.6 deaths per 100,000 workers (national US average = 3.5)

• **Targeted research**: important arm of OR-FACE
  – Use knowledge gained through surveillance and investigation, e.g. identify high hazard industries, prevalent injuries, needs for prevention
  – Develop and conduct field studies
  – Ultimate aim: create evidence-based, practical intervention tools & methods

New Projects

• Social network analysis
• Preventing falls in residential construction
• Mobile toolbox talks
Field Study #1 – Social Network Analysis

1° Aim: Conduct *social network analysis research to further target communications in high risk industries*

- Significant # of fatalities occur in agriculture
  - Fatality rate 800% higher than all US workers
  - Leading cause on farms: mobile machinery (tractors)
  - Oregon home to more than 37,000 family farms
- How does SNA work?
  - Identifies pathways of information and influence flow
  - Who are the Influencers / opinion leaders in the industry
  - How are they connected to followers who look to them for technical and safety information

Field Study #2 – Fall Prevention

The challenge:

- Falls: most common cause of construction fatalities
- At greatest risk: workers in small-to-medium sized residential construction
- Notoriously difficult to engage in research
- We know little about their fall prevention knowledge and practice in Oregon and effective ways to influence adoption of new protective work practices
<table>
<thead>
<tr>
<th>Field Study #2 – Fall Prevention (cont’d)</th>
</tr>
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<tbody>
<tr>
<td><strong>Aim:</strong> Test novel targeting strategy to engage small residential construction firms in fall prevention surveillance research, and establish fall prevention equipment and training grants</td>
</tr>
<tr>
<td>• “Triggering event” hypothesis: serious (non-fatal) fall injury will increase employer readiness to participate in fall prevention research and adopt specific prevention practices</td>
</tr>
<tr>
<td>• Two-year surveillance/fall prevention survey to compare trigger event contractors and control contractors</td>
</tr>
<tr>
<td>• Small grants pilot to supply equipment and training</td>
</tr>
<tr>
<td>• Partnering with SAIF and OHBA to identify participants</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Field Study #3 – Mobile Toolbox Talks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aim:</strong> Establish and evaluate a mobile marketing system to promote fatality prevention toolbox talks in construction</td>
</tr>
<tr>
<td>• Partners (subscribers)</td>
</tr>
<tr>
<td>– Oregon Home Builders Association</td>
</tr>
<tr>
<td>– Associated General Contractors</td>
</tr>
<tr>
<td>• Text messaging/pdf/YouTube videos</td>
</tr>
<tr>
<td>• Emails</td>
</tr>
<tr>
<td>• Hypothesis: Mobile alert system will increase proportion of supervisors who meet/exceed Oregon OSHA required frequency for safety talks</td>
</tr>
</tbody>
</table>
Preventing Construction Fatalities: The Toolbox Guide Initiative

OR-FACE
PSU Occupational Health Psychology
Hoffman Construction
Fortis Construction
SAIF Corporation

Tool Box Talk Guides: Evidence-Based Structure

**FRONT:** Scripted Story

**BACK:** Line Drawing

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**Toolbox Talk Guides OR-FACE www.orface.org/toolboxtalk**

**INSTRUCTIONS:** Hold the guide with this side facing you and the other side facing your crew. Then read the story.

**Scripted Story**

Our safety talk today is about fall hazards. Workers from a number of companies have been involved in the development of strategies to prevent falls. Let's look at a common fall hazard and discuss what you can do to prevent it.

A worker scale a ladder while wearing a tool belt. The worker is wearing high-visibility clothing and hard hat. The ladder is extended to the second floor of a building.

**Line Drawing**

**FATAL HAZARD**

- Never exceed load or extension limits of a lift or crane
- Use a spotter and communication system to prevent lifts over workers
- Never work directly under a load

---

**ASK: “Does anyone have more ideas or comments to share?”**

Pause for discussion. Then see if there are any ways to take action.

**END WITH ACTION PLAN** (ideas for what to do or ask)

- Are there any operations we do that might cause us to push too far or too close to the edge?
- “We have some ideas for improving our communication systems”
- What do you all do to make sure people are not under loads being moved?
- Discuss a recent situation at your current site.
- Express your commitment to training people for each machine they operate.
- Closely follow-up at the next safety talk.
Tool Box Talk Guides: Evidence-Based Structure

**FRONT: Scripted Story**

Tool Box Talk Guide
Load of Lumber Shifts and Falls on Construction Worker

**INSTRUCTIONS:** Hold the guide with this side facing you and the other side facing your crew. Read this story.

Our safety talk today is about 20-year-old Robert Jones from another company. He died when a load of lumber fell on him. He was on a ladder to access a skid of lumber on top of a lift, but he fell off the lift and was caught on a bundle of lumber in the same area. The lumber was loaded on the lift and he was over the maximum allowable. The load shifted and caught on the worker.

So here are some ways we can prevent something like this from happening where you work.

- Never work directly under a load, or under the swinging motions of a lift or crane, unless you are required to be there as a regular employee.
- Use a spotters and communication system to make sure everyone knows what is in advance, and to prevent injuries from passing over workers.

**ASK:** These are very important ideas or concepts to share.

END WITH ACTION PLAN (ideas for what to talk about).
- Remind your employees to do the right thing and do not lift loads above their heads.
- Discuss any new ideas for improving your communication.
- Ask, “Do you all do what the people under the load are doing?”
- Help employees get trained in new equipment.
- Evaluate your employees’ ability to perform the work.
- Commend those who stand out on the next safety talk.

**BACK: Line Drawing**

**FRONT: Scripted Story**

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- Commend those who stand out on the next safety talk.
3 Field Studies (sample findings)

• Study 1: Current Pre-Shift Practices (n=28)

- My company conducts pre-shift talks/briefings

*Frequency:
  - 28% weekly
  - 32% daily

- Number of responses:
  - Job plan: 16
  - Time/productivity: 9
  - News/updates: 6
  - General safety: 20
  - Safety stories: 10

3 Field Studies (sample findings)

• Study 2: Image Viewing Distances (n=30)

- 1 to 3 M greater viewing distance

- NIOSH: Spiralizer Blade Falling from Top Shroud
  - Item which killed 1 worker
  - Item that caused 1 injury
Study 3: Field Test (n=119)

**Supervisors**
- Talk with FACE report

**Workers**
- Reactions
- Behavioral intentions
- Preference

VS.

**Supervisors**
- Talk with Tool Box Guide

Preferred 3:1

Similar positive ratings

Peer-reviewed Publication