Ergonomics for Safety Committees

GOSH Conference
March 11, 2009

1

Objectives

- Basic understanding of ergonomics
- Identify factors that put people at risk for injuries of the musculoskeletal system
- Tools to get started
- Define when to get help

2

Safety Committee Responsibilities

- Conduct quarterly inspections
- Recommend how to eliminate hazards
- Many committees review accident investigations

3

Requirements for Training of Safety Committees

- Hazard identification
- Principles of effective accident investigation

4

Safety Committee Advantages

- Worked at multiple jobs at workplace
- Relationship and confidence of co-workers
- Know the value of preventing these injuries

5

Safety Committee Meeting Minutes and Walk around Results

- My experience is most safety committees are not addressing soft tissue injuries
- I find very few ergo related issues in minutes or inspection hazard identification

6

How do we correct this?

- Training
- Assistance
- Practice
- Repeat all of the above

7

2007 National Statistics- BLS

235, 410 cases involving falls

444,510 strain/sprain/tears in the workplace

8

Oregon Statistics

- MSD's (musculoskeletal disorders) account for approximately 37% of all accepted disabling claims
- Although the rate of MSD's have fallen since 1990, they remain consistent relative to the percentage of all claims

9

Oregon Statistics

In a 5 year period 49,605 MSD's

- 44% BACK
- 14% WRIST
- 10% SHOULDER
- 10% TRUNK
- 10% UPPER EXTREMITIES, ex. wrists

10

Cost of Strains/Sprains/Tears in Oregon

Accounts for highest costs due to time lost and medical treatment.

Avg. back injury	$12,000
Carpal tunnel syndrome	$16,000
Shoulder injury	$20,000
Knee	$13,000
Wrist fracture	$16,000

11

Top Ten Industries Oregon

- Trucking
- Hospitals
- Millwork, veneer, plywood
- Grocery stores
- Sawmills and planing mills
- Eating & drinking establishments
- Nursing & personal care facilities
- Department stores
- Elementary & secondary schools
- Personnel supply services

12

History

- Workplace MSD's have been around a long time
- Ramazzini in the 700's described "palsies and impairments" in bakers and scribes
- In the 19th century Gray wrote about "washer woman's sprain"
- Pear packer's disease
- Fish filleter's disease

13

Historic Use of Ergonomic Principles

- US Military active in applying ergonomic principles:
- Aircraft cockpits
- Uniforms
- Used in car design and products of every kind being advertised as "ergonomic."
- Corn chips

14

Ergonomics Definition

Greek

ERGO-WORK

NOMOS- LAWS

15

Defining Ergonomics

The science of fitting the physical and cognitive demands of the job to the worker to prevent injury, human error

"Fitting the Job to the Worker"
NOT
"Fitting The Person To The Job"

16

Areas of Emphasis

- **Physical Ergonomics**- Work design, posture, MMH, repetitive movement, plant layout
- **Cognitive Ergonomics**- mental processes such as perception, memory, reasoning and motor response- human-computer interaction, decision-making, mental workload

17

What causes Musculoskeletal Disorders (MSDs)?

Acute:

A sudden or one-time traumatic event or incident, e.g., slip, trip, fall or car wreck

Chronic or Cumulative:

Injuries that occur over a period of time (months/years) & are caused by a combination of risk factors

MSDs affect ligaments, muscles, tendons, cartilage, blood vessels & nerves & spinal discs

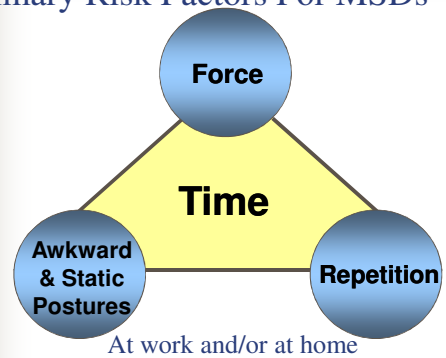
18

Terms and examples of Musculoskeletal Injuries

- Musculoskeletal Disorders (MSD)
- Cumulative Trauma Disorder (CTD)
- Soft Tissue Injury
- Repetitive Strain Injury (RSI)
- Tendinitis & Carpal Tunnel Syndrome
- Rotator Cuff Injury (shoulder)
- Muscle strain/sprain
- Bulging or Herniated Spinal Discs

19

Primary Risk Factors For MSDs



At work and/or at home

20

Awkward Posture & MSDs

Definition:
Position of the body when performing physical tasks

Awkward postures cause biomechanical stress to joints and surrounding soft tissues. Strength to the body part is decreased accelerating muscle fatigue and increasing risk of injury.

Awkward Postures include:

- Bending
- Twisting
- Reaching overhead

- Kneeling
- Squatting
- Pinch grips

21

22

23

24

Static or Fixed Postures & MSDs

Definition:
Postures or work positions that are held for a period of time

Blood supply reduced to muscles → muscle fatigue

25

Static or Fixed Postures & MSDs

Examples:

- Prolonged standing or sitting
- Standing in location to operate machinery due to foot control or sitting at a computer workstation all day

26

27

28

Force and MSDs

Definition:
Amount of physical exertion or muscular effort expended when performing a task or activity such as lifting, pushing, pulling, carrying or gripping tools or equipment

The greater the force exerted and/or sustained over time accelerates muscle fatigue and increases risk of injury

29

Force and MSDs

The amount of force exerted is influenced by the:

- Weight, shape and coupling of equipment
- Body posture used
- Number of repetitions performed
- Duration or length of time that task is performed

Examples:

- Pushing a load with poorly maintained casters or load
- shifts suddenly or unexpectedly
- Lifting a box with no hand holds with fingertips

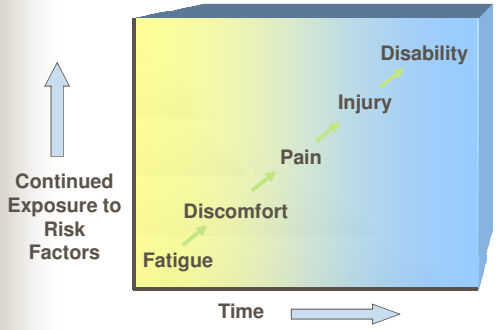
30

31

32

33

The Cumulative Effect



34

Getting Started

- Identify problem jobs
- Accident & incident history on the job
- Hazard or symptom reporting by co-workers
- High turnover
- Few women or older workers
- Production bottlenecks
- Frequent overtime worked

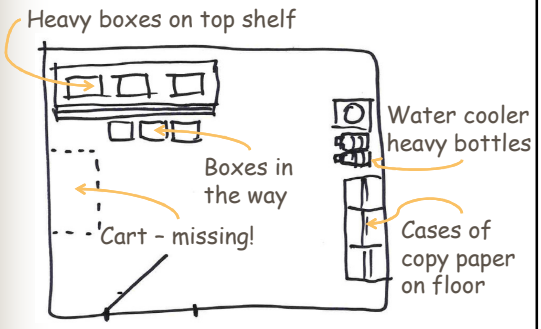
35

Define the Job Demands

- Observe the people performing the task and ask good question about it, respectfully and sincerely
- Sometimes how you ask a question is as or more important than what you ask
- Establish the production requirements & expectations
- Ask about comfort and ability to perform the job
- Ask about ways to improve the job, equipment or organization of the job

36

Hazard Mapping



37

Hazard Assessment

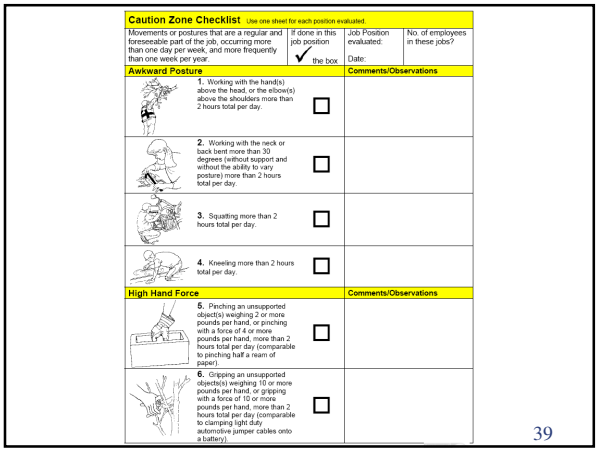
Use checklists or tools – Washington Ergonomics Group put together user-friendly tools

- Caution Zone Checklist
- Lifting Calculator

Computer Workstation Assessment:

- OR-OSHA computer workstation guidelines

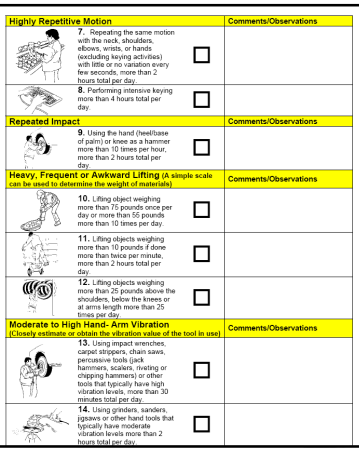
38



Caution Zone Checklist Use one sheet for each position evaluated.

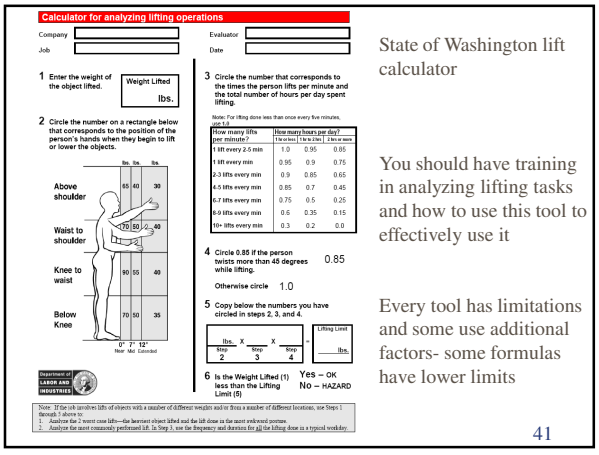
Movements or postures that are a regular and foreseeable part of the job, occurring more than one day per week, and more frequently than one week per year	If done in this job position ✓ the box	Job Position evaluated: Date:	No. of employees in these jobs?
Awkward Posture		**Comments/Observations**	
1. Working with the hand(s) above the head, or the elbow(s) above the shoulders more than 2 hours total per day.	☐		
2. Working with the neck or back bent more than 30 degrees (without support and without the ability to vary postures) more than 2 hours total per day.	☐		
3. Squatting more than 2 hours total per day.	☐		
4. Kneeling more than 2 hours total per day.	☐		
High Hand Force		**Comments/Observations**	
5. Pinching an unsupported object(s) weighing 2 or more pounds per hand, or pinching with a force of 4 or more pounds per hand, more than 2 hours total per day (comparable to pinching half a ream of paper).	☐		
6. Gripping an unsupported object(s) weighing 10 or more pounds per hand, or gripping with a force of 10 or more pounds per hand, more than 2 hours total per day (comparable to clamping light duty automotive jumper cables onto a battery).	☐		

39



Highly Repetitive Motion		**Comments/Observations**
7. Repeating the same motion with the neck, shoulders, elbows, wrists, or hands (excluding keying activities) with little or no variation every few seconds, more than 2 hours total per day.	☐	
8. Performing intensive keying more than 4 hours total per day.	☐	
Repeated Impact		**Comments/Observations**
9. Using the hand (heel/base of palm) or knee as a hammer more than 10 times per hour, more than 2 hours total per day.	☐	
Heavy, Frequent or Awkward Lifting (A simple scale can be used to determine the weight of materials)		**Comments/Observations**
10. Lifting object weighing more than 75 pounds once per day or more than 55 pounds more than 10 times per day.	☐	
11. Lifting objects weighing more than 10 pounds if done more than twice per minute, more than 2 hours total per day.	☐	
12. Lifting objects weighing more than 25 pounds above the shoulders, below the knees or at arms length more than 25 times per day.	☐	
Moderate to High Hand- Arm Vibration (Closely estimate or obtain the vibration value of the tool in use)		**Comments/Observations**
13. Using impact wrenches, carpet strippers, chain saws, percussive tools (jack hammers, scalers, riveting or chipping hammers) or other tools that typically have high vibration levels, more than 30 minutes total per day.	☐	
14. Using grinders, sanders, jigsaws or other hand tools that typically have moderate vibration levels more than 2 hours total per day.	☐	

40



Calculator for analyzing lifting operations

Company ____ Evaluator ____

Job ____ Date ____

1 Enter the weight of the object lifted. Weight Lifted ____ lbs.

2 Circle the number on a rectangle below that corresponds to the position of the person's hands when they begin to lift or lower the objects.

	lbs.	lbs.	lbs.
Above shoulder	85	40	30
Waist to shoulder	170	50	40
Knee to waist	90	55	40
Below Knee	70	50	35

0° 7° 12° Near Mid Extended

3 Circle the number that corresponds to the times the person lifts per minute and the total number of hours per day spent lifting.

Note: For lifting done less than once every five minutes, use 1.0

How many lifts per minute?	How many hours per day? 1 hr or less	1 hr to 2 hrs	2 hrs or more
1 lift every 2.5 min	1.0	0.95	0.85
1 lift every min	0.95	0.9	0.75
2-3 lifts every min	0.9	0.85	0.65
4-5 lifts every min	0.85	0.7	0.45
6-7 lifts every min	0.75	0.5	0.25
8-9 lifts every min	0.6	0.35	0.15
10+ lifts every min	0.3	0.2	0.0

4 Circle 0.85 if the person twists more than 45 degrees while lifting. 0.85

Otherwise circle 1.0

5 Copy below the numbers you have circled in steps 2, 3, and 4.

lbs. (Step 2) × (Step 3) × (Step 4) = Lifting Limit ____ lbs.

6 Is the Weight Lifted (1) less than the Lifting Limit (5) Yes – OK No – HAZARD

Note: If the job involves lifts of objects with a number of different weights and/or from a number of different locations, use Steps 1 through 5 above to:
1. Analyze the 2 worst case lifts—the heaviest object lifted and the lift done is the most awkward posture.
2. Analyze the most commonly performed lift. In Step 3, use the frequency and duration for all the lifting done in a typical workday.

State of Washington lift calculator

You should have training in analyzing lifting tasks and how to use this tool to effectively use it

Every tool has limitations and some use additional factors- some formulas have lower limits

41

Calculator for analyzing lifting operations

7 SOLUTIONS PRINCIPLES

To find the most appropriate solution for this job, look for the lowest number you used to do the calculations (2, 3, 4)

HANDS POSITION (2)	FREQUENCY (3)
• Reduce the horizontal distance from the body • Remove barriers, obstacles • Reduce weight of load • Reduce capacity of the container • Team lift the object with two or more workers • Design workstation with the adjustable heights to eliminate trunk bent forward • Provide handholds • Store objects at 30 inches off the floor	• Increase weight of a load so it requires mechanical assist • Improve layout to minimize manual material handling • Use mobile storage racks
DURATION (3)	**TWISTING (4)**
• Use mechanical assist such as overhead hoist, manipulator, vacuum lift, pneumatic balancer, forklift • Eliminate the use of deep shelves • Job rotation to other jobs where no lifting is required	• Redesign workstation layout to eliminate trunk twisting • Locate lifting operations in front of the body • Use slides, gravity, chutes to eliminate lifting/twisting

42

Analytical Tools

RULA -Rapid Upper Limb Assessment
REBA- Rapid Entire Body Assessment
Liberty Mutual Manual Material Handling Tables
Rodgers Muscle Fatigue Assessment
Utah Back Compressive Force
Shoulder Force formula
NIOSH Lifting Equation
Hand-arm Vibration
Push-pull formula- Liberty Mutual
Work Safe BC Guidelines
Ohio Lift Formula

43

For Each Risk Factor Ask Why Until a Dead End is Reached

Important to determine the *hazard* before problem-solving

Important to determine *why* before problem-solving

Important to get feedback from several workers because people can vary how they accomplish the job

44

Choose Solution

Goal is to find the solution that will **substantially reduce the problem** and be **within affordable cost guidelines** for the plant or organization

The **simpler and more effective interventions** can be found by finding the **root causes** for the **risk factors instead of looking for a piece of equipment that will address each risk factor**

45 45

Solutions to Prevent MSD's

First Choice (or Method): Engineering Controls

Eliminate or reduce primary risk factors:

- Use a conveyor or lift truck to lift and transfer
- Change height, reach or orientation of work
- Use fixtures /clamps to hold materials
- Suspend tools
- Reduce the weight of objects handled
- Provide better grips with handles

46

Solutions to Prevent MSD's

Second Choice: **Work Practice Controls**

Reduce employee exposure to primary risk factors by using best work methods:

- Plan work organization
- Eliminate unnecessary movements
- Use adjustments on equipment

47

Develop Strategies for Root Causes/Develop Solutions

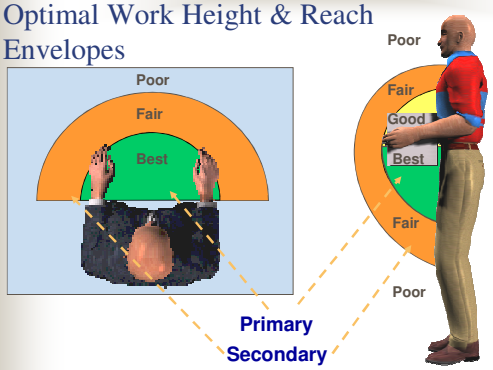
Root Cause- Design of Equipment

Strategy- Reduce reach distance

Solution- Bring material closer to point of operation

48

Optimal Work Height & Reach Envelopes



49

Solutions to Prevent MSD's

Engineering
+
Work Practice
+
Administrative Controls
=
Reduce the Risk of Injury

Remember - back belts are ineffective in preventing back injuries

50

Roadblocks to Problem-Solving

- Deciding what the solution is before going through the process
- Assumptions and inadequate information
- Inadequate buy-in from top management
- Inadequate buy-in from workers
- Mechanizing and job elimination- people are afraid their job will be eliminated so sometimes they won't give good information

51

When to ask for help

- When you are beginning to focus on ergonomics
- Redesign of a work area
- Shifting from reactive to proactive ergonomics program
- You've tried fixes and they aren't working

52

Hot Topics

Back Belts- NIOSH Research results

Balls as Chairs- They aren't

53

Resources

www.lni.wa.gov/Safety/Topics/ReduceHazards/ErgoBank/default.asp

www.cornell.edu/ErgoProjects

www.orosha.org

www.office-ergo.com

www.ag-ergo.ucdavis.edu

www.osha.gov

www.niosh.gov

www.worksafebc.com

54

Credits for training material

- Oregon Nurses Association- Lynda Enos
- Washington State Dept. of Labor & Industries Ergonomics Group
- Labor Education Research Center
- NIOSH
- Federal OSHA
- WorkSafe BC

55

Thank you

Annette Blake-Swindler
Ergonomic Consultant
OR-OSHA Consultative Services Section
541-687-7368

annette.m.blake-swindler@state.or.us

56