OSC | 11
Ohio Safety Congress & Expo

#425 Lean-ergonomic methods to reduce workers' compensation costs, Part 2 of 2

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Thursday, March 31, 2011
2:30 to 3:30 p.m.

Ohio | Bureau of Workers' Compensation

Lean-Ergonomic methods to reduce workers' compensation costs (Part 2 of 2)

What is CTD?

Cumulative = Repeated stress to a specific part of the body

Trauma = Mechanical stress causing intermittent aches and pains

Disorders = Continuous pain, severely affecting specific body function

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Cumulative trauma disorders can be classified as:

1) Tendon disorders

2) Neurovascular disorders

3) Nerve disorders

Tendon Disorders

They occur at or near joints where tendons rub against ligaments and bones

Symptoms : Pain at the joints

Type of tendon disorders

Tendinitis	Trigger finger
Tenosynovitis	DeQuervain's disease
Ganglionic cyst	Epcondylitis

Tennis, Pitcher & Bowler's elbow

Root causes of tendon disorders

Type of disorder	Employee complaints	Root causes
Wrist tendonitis	Pain in the wrist joint	• Bending the wrist
Rotator cuff tendonitis	Pain the shoulder joint	• Working above shoulder level • Raised elbows • Excessive reach
Epicondylitis (Tennis Elbow)	Pain at the elbow joint	• Rotation of the forearm while bending the wrist
DeQuervain's disease	Pain at the base of the thumb	• Bending the wrist while using thumb for form grip
Ganglionic cyst	Bump under the skin	• Constantly bending the wrist
Trigger finger	Uneven and jerky motion of the fingers	• One finger trigger action • Pinch grip with bent wrist
Bursitis	Excessive pain while moving the shoulder	• Excessive overhead motion

Cumulative trauma disorders can be classified as:

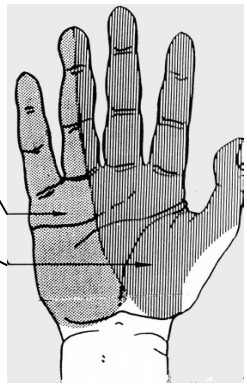
1) Tendon disorders

2) Neurovascular disorders

3) Nerve disorders

Ulnar nerve
(Numbness & tingling in the little finger & part of ring finger)

Median nerve
(Numbness & tingling in the little thumb, next 2 fingers & part of the ring finger)



Nerve disorders

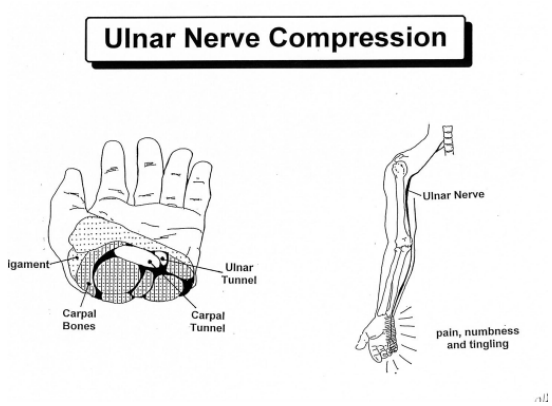
Results from the pressure on the nerves

Symptoms

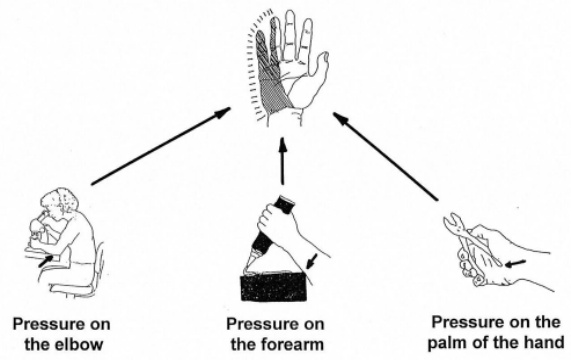
1) Pain, numbness and tingling sensation in the fingers.
2) These symptoms may occur hours after the activity is done

Common nerve disorders

1) Ulnar nerve compression
2) Carpal tunnel syndrome



Examples Of Ulnar Nerve Compression

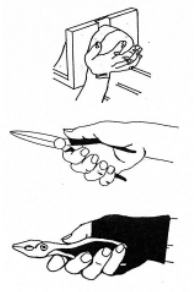


To neutralize musculoskeletal stresses due to pressure at the palm of the hand

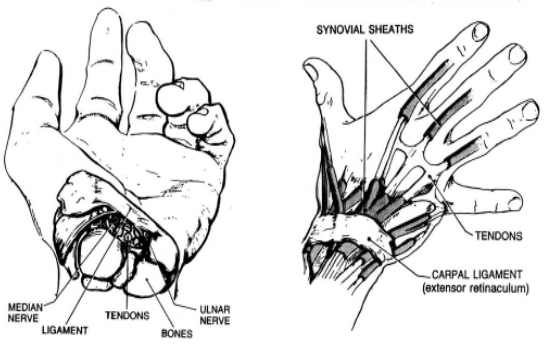
1) Avoid pressing at the palm of the hand

2) Buy tools with long handles that will not compress the palm of the hand

3) Use gloves with open-fingers and padding at the palm of the hand



What is Carpal Tunnel Syndrome?



Effect of bending the wrist

BLOOD FLOW is very critical to the Muscles and Synovial fluid in the hand

It affects : **a) the efficiency of the Synovial fluid**
b) the efficiency of the Muscles

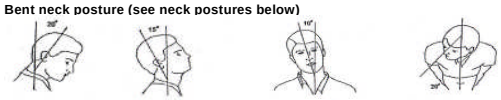
Result : **Stage 1: reduction of blood flow**
Stage 2: inflammation of tendons
Stage 3: pain in the wrist (Tendinitis)
Stage 4: Carpal Tunnel Syndrome

Ergonomic Guidelines for Posture

Flexion < 15° Extension < 15° Ulnar deviation < 5° Radial deviation < 15°
Bending the wrist (see hand postures above)

Twisting the wrist < 90°
Raised elbow < 30°
Working below shoulder level
Forward reach < 20 inches for standing posture
Forward reach < 15 inches for seated posture

Bent neck posture (see neck postures below)



Flexion < 20° Extension < 15° Sideways < 10° Twisting < 20°

Methods to improve metabolic balance and eliminate static loads

1) Engineering solutions

2) Administrative solutions

Engineering solutions to neutralize static posture

Reduce inches and/or degrees

by improving:

- **the workstation**
- **the handtool**
- **workspace organization**
- **the method of operation**
- **the angle of the part**
- **material handling**
- **the equipment**

Methods to improve metabolic balance and eliminate static loads

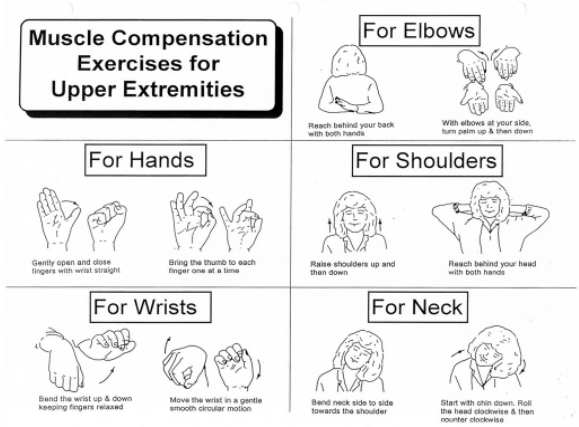
1) Engineering solutions

2) Administrative solutions

Physiological Techniques (Administrative Controls)

A) Muscle Compensation & Respiration Exercises

B) Muscle Rotation Technique



Demonstration of muscle stretching exercises and deep breathing exercises

Muscle Rotation Techniques

- **Use muscle rotation to reduce static loads on the muscles.**
- **Change tasks using different muscles, which will help muscles recover from static loads.**
- **This can also be achieved by doing different jobs which use different muscles.**

Lean-Ergonomics Analysis

1. **Push-Pull analysis**
2. **Manual Lifting analysis**
3. ☞ **CTD analysis**

CTD Analysis

Cellular approach

Ergonomics intervention approach

Cellular Approach

Step 1: Identify CTD risk factors in each operation and place corresponding colored dots.

Step 2: For each risk factor (colored dot), check to see if it is repeated every thirty seconds or less.

Step 3: Remove the colored dot if it does not satisfy the condition in step 2.

Step 4: Use engineering solution to neutralize as many risk factors (colored dots) as possible.

Step 5: Use administrative solutions to neutralize the balance of the risk factors (colored dots)

Ergonomics Intervention Approach

1. Analysis sheet #1: CTD symptom survey
2. Analysis sheet #2: Root causes of CTD
3. Analysis sheet #3: Static postures causing CTD
4. Analysis sheet #4: Other CTD risk factors
5. Analysis sheet #5: Ergonomics recommendations

CTD Analysis sheet # 1

CTD symptom survey sheet

What were the symptoms which required medical intervention?		Identify location Left or right side
1) **Pain, numbness and tingling**	☐	_____
a) in the little finger (Ulnar nerve compression)	☐	_____
b) in the thumb & next two fingers + wrist pain (Carpal tunnel syndrome)	☐	_____
c) in thumb & next two fingers + arm fatigue (Thoracic outlet syndrome)	☐	_____
2) Shoulder pain (Rotator cuff tendinitis)	☐	_____
3) Elbow pain (Epicondylitis)	☐	_____
4) Wrist pain (Tendinitis)	☐	_____
5) Pain at the base of the thumb (DeQuervain's disease)	☐	_____
6) Bump under the skin at the wrist (Ganglionic cyst)	☐	_____
7) Uneven and jerky motion of the fingers (Trigger finger)	☐	_____
8) Fingertips becoming cold or pale or white (Raynaud's syndrome)	☐	_____
9) Neck pain	☐	_____

Employee name _____ Date _____ Dept _____

Comments _____

CTD Analysis sheet # 2

Root causes for CTD symptom survey sheet

CTD symptom		Check Mark area of investigation
1)	Pain, numbness and tingling	
	a) in the little finger (Ulnar nerve compression)	__ Pressure at elbow or __ Pressure at forearm or __ Pressure at palm of hand
	b) in the thumb & next two fingers + wrist pain (Carpal tunnel syndrome)	__ Bent wrist
	c) in thumb & next two fingers + arm fatigue (Thoracic outlet syndrome)	__ Working above shoulder level (with bent neck)
2)	Shoulder pain (Rotator cuff tendinitis)	__ Excessive reach or __ Raised elbow or __ Working above shoulder level
3)	Elbow pain (Epicondylitis)	__ Bent wrist (and twisting the wrist)
4)	Wrist pain (Tendinitis)	__ Bent wrist
5)	Pain at the base of the thumb (DeQuervain's disease)	__ Bent wrist (and thumb pressure)
6)	Bump under the skin at the wrist (Ganglionic cyst)	__ Bent wrist
7)	Uneven and jerky motion of the fingers (Trigger finger)	__ Bent wrist (with pinch grip) or __ Tool with 1 finger trigger action
8)	Fingertips becoming cold or pale or white (Raynaud's syndrome)	__ Using vibration tool or __ Working in cold environment
9)	Neck pain	__ Bending the neck or __ Twisting the neck
Employee name _____ Date _____ Dept _____		
Comments _____		

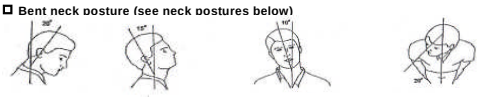
CTD Analysis sheet # 3

Following are the static postures which can cause CTD

Flexion > 15° Extension > 15° Ulnar deviation > 5° Radial deviation > 15°
☐ Bending the wrist (see hand postures above)

☐ Twisting the wrist > 90°
☐ Raised elbow > 30°
☐ Working above shoulder level
☐ Forward reach > 20 inches for standing posture
☐ Forward reach > 15 inches for seated posture

☐ Bent neck posture (see neck postures below)



Flexion > 20° Extension > 15° Sideways > 10° Twisting > 20°

Please note: Ergonomic guideline is the opposite of static posture

CTD Analysis sheet # 4

Worksheet for Independent CTD risk factors

For every "YES" check-marked, transfer the solution code in Sheet # 5

	Independent CTD risk factors	**NO**	**YES**	**Recommended solutions**
a)	Is something pressing the elbow or lower arm?	☐	☐	Use padding at contact point of elbow or lower arm
b)	Is something pressing at the palm of the hand?	☐	☐	Use padded gloves or tools with longer handles
c)	Does the operation require vibration tools?	☐	☐	Use anti-vibration gloves or sleeve for tool handle
d)	Are there sharp edges or pinch points on the tool handle?	☐	☐	Replace with ergonomic tools
e)	Does the handtool require one finger trigger action?	☐	☐	Replace with handtool which has multi-finger trigger action
f)	Are the operator's hands exposed to cold temperature?	☐	☐	Rotate job or redirect exhaust air from air-tool (Pneumatic handtool)
g)	Is the operator applying force while using gloves?	☐	☐	Use correct size gloves and avoid bulky gloves

CTD Analysis sheet # 5

Worksheet for Ergonomic Solutions for Upper Extremities

Ergonomic Data

Employee name: _____
Operation: _____
CTD symptoms from Sheet #1: _____
Root cause from Sheet #2: _____
Static posture from Sheet #3: _____
Solution from Sheet #4: _____
Weight lifted (lbs.) _____

Goal: Ergonomic guideline _____

Lean-Ergonomic Recommendations

Practical examples of CTD Analysis

Lean-Ergonomics Training Sessions

ER-1: Ergonomics application to Lean Manufacturing (8 hours)

ER-2: Ergonomics training for Managers and Supervisors (4 hours)

ER-3: Ergonomics training for Hourly Production Employees (2 hours)

ER-4: Ergonomics training for Engineers & Technicians (4 hours)

ER-7: Office ergonomics (2 hours)

ER-9: Lean-Ergonomics Kaizen Event (classroom + hands-on analysis on the production floor)

For more information,
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Any Questions?

Good Luck in your Journey of Lean-Ergonomics Excellence