



# Putting Data to Work

Occupational Public Health Program (OPHP)

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Putting Data to Work is produced by the Occupational Public Health Program (OPHP) Oregon Department of Human Services, Public Health Division, Office of Environmental Public Health Research & Education Services

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## Work-related Musculoskeletal Disorders (MSDs)

### Introduction

Musculoskeletal disorders (MSDs) — sometimes called repetitive motion, ergonomic or overuse injuries — are a broad group of conditions affecting the connective or “soft” tissues of the body. The Bureau of Labor Statistics defines MSDs as injuries and disorders to muscles, nerves, tendons, ligaments, joints, cartilage and spinal discs.<sup>†</sup> Examples include carpal tunnel syndrome, tendonitis and rotator cuff syndrome.

Ergonomics is the study of the “fit” between an individual and his or her workplace. An ergonomic assessment might include questions about daily work activities and an individual’s work environment. The aim is to find the best fit between the individual and the job conditions.

When an individual’s work activities, workstation or work environment is not adjusted to the individual’s body, an MSD may occur. MSDs have the potential to affect a person’s productivity at work and quality of life, both on and off the job. Therefore, tracking and preventing these types of injuries in Oregon is very important to improving worker health, safety and productivity.

### Scope of the problem

According to data from the Bureau of Labor Statistics’ Survey of Occupational Injuries and Illnesses (SOII), MSDs accounted for 29 percent of all workplace injuries requiring time away from work in the United States in 2007, compared to 32 percent in Oregon.<sup>1</sup> The rate of MSDs in Oregon has declined over the years, yet continues to remain higher than the national rate (Figure 1).

The direct workers’ compensation costs of MSDs are estimated at \$20 billion annually in the United States.

*continued on next page*

<sup>†</sup> Sprains, strains, tears; back pain, hurt back; soreness, pain, hurt, except back; carpal tunnel syndrome (CTS); hernia; and musculoskeletal system and connective tissue diseases and disorders when the event or exposure leading to the case is bodily reaction (bending, climbing, crawling, reaching, twisting), overexertion, or repetitive motion.

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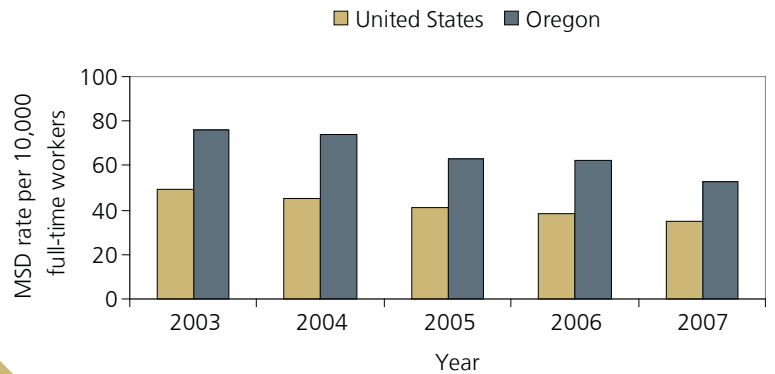
**NIOSH** National Institute for Occupational Safety and Health

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However, when indirect costs (such as loss of productivity) are factored in, the estimate jumps to as high as \$54 billion.<sup>2</sup>

## Epidemiological data

The Bureau of Labor Statistics SOII data is a valuable source of information about work-related injuries; however, it has a number of limitations. The survey data is based on a sample of employers and, as such, is subject to sampling error. Additionally, a number of employees are excluded from the survey, including public sector, self-employed, workers on farms with fewer than 11 employees, and household workers. A total of these groups is estimated to comprise nearly 21 percent of the U.S. work force.<sup>3</sup> There is also evidence that MSDs are under-recorded on the Occupational Safety and Health Administration (OSHA) logs that serve as the basis for the SOII.<sup>4,5</sup> In order to get a more complete picture of MSDs in Oregon, the Occupational Public Health Program (OPHP) incorporates other data sources, such as workers' compensation claims records.



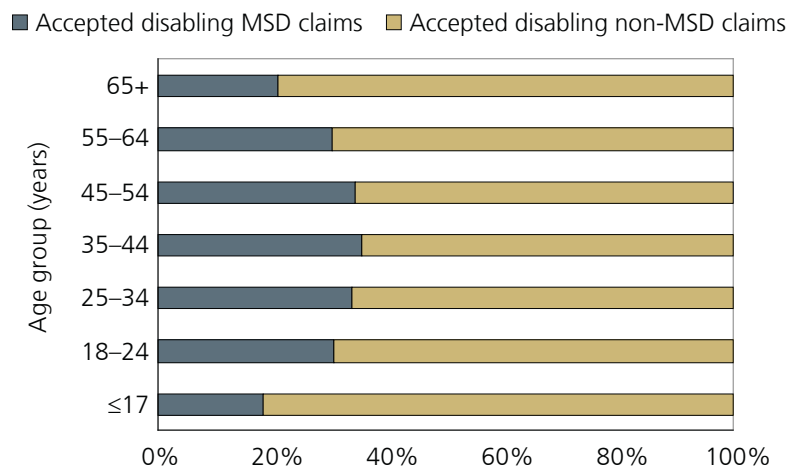
**FIGURE 1. RATE OF MUSCULOSKELETAL DISORDERS PER 10,000 FULL-TIME WORKERS, OREGON AND UNITED STATES, 2003-2007 (SOURCE: BUREAU OF LABOR STATISTICS)**

Using data from the Information Management Division of the Oregon Department of Consumer and Business Services (DCBS), OPHP analyzed occupational musculoskeletal disorders in Oregon from 2001 to 2007 to understand where and how often these injuries occur.‡

During this time period, DCBS accepted 52,312 disabling claims. Most MSDs were due to sprains, strains, and tears caused by overexertion (57 percent of all MSDs). Repetitive motion contributed to 24 percent of all MSDs, compared to 66 percent for overexertion.

The percentage of all accepted disabling claims that were MSDs decreased during the time period, from approximately 57 percent in 2001 to 43 percent in 2007. The distribution of MSDs differed by gender and age. Overall, 37 percent of claimants were female, with the greatest number of women (56 percent) in the youngest age group ( $\leq 17$  years). Overall for both men and women, claimants aged 17 years and younger (18 percent) and those age 65 years and older (21 percent) were least likely to have MSD claims, while those aged 35 to 44 years were the most likely (35 percent) (Figure 2).

**FIGURE 2. ACCEPTED DISABLING MSD CLAIMS VS. ACCEPTED DISABLING NON-MSD CLAIMS BY AGE GROUP, OREGON, 2001-2007**

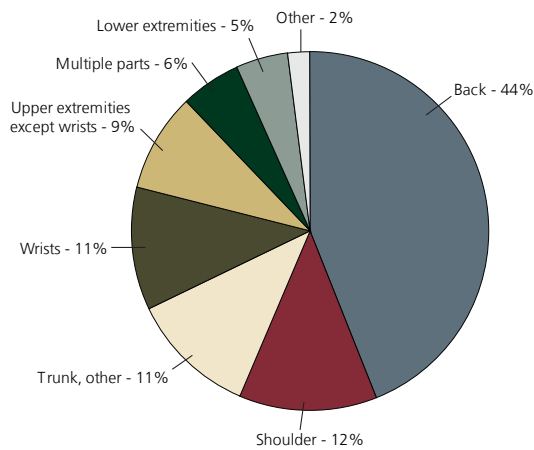


Most MSDs are sprains, strains and tears due to overexertion (Table 1). These claims accounted for 56.7 percent of all total MSD claims during this time period. DCBS estimated that sprains and strains resulted in a median paid time-loss from work of 15 days in 2007, with an average claim cost of just over \$12,000.<sup>6</sup>

**TABLE 1. ACCEPTED DISABLING MSD CLAIMS BY NATURE AND EVENT OF INJURY, OREGON, 2001-2007**

Nature of injury	Event			All	
	Bodily reaction	Overexertion	Repetitive motion	Total	Percent
Sprains, strains, tears	4,943	29,649	4,694	39,286	75.1
Musculoskeletal system and connective tissue diseases and disorders	179	1,751	3,852	5,782	11.1
Hernias	74	3,204	407	3,685	7.0
Carpal tunnel syndrome	2	36	3,334	3,372	6.4
Back pain, hurt back	17	65	12	94	0.2
Pain, except the back	6	38	49	93	0.2
<b>All natures</b>	<b>5,221</b>	<b>34,743</b>	<b>12,348</b>	<b>52,312</b>	<b>100.0</b>

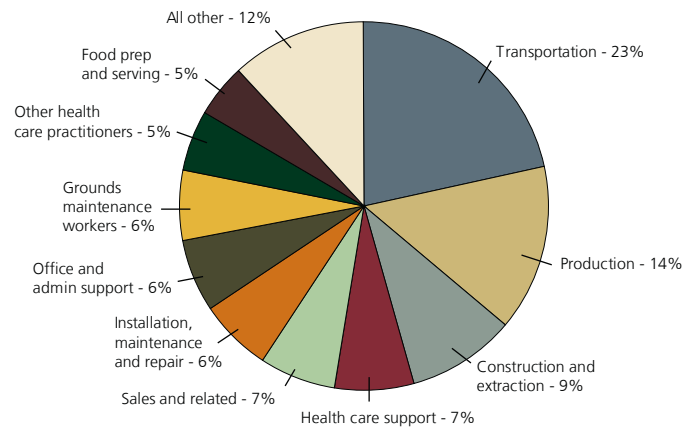
**FIGURE 3. ACCEPTED DISABLING MSD CLAIMS BY PART OF BODY, OREGON, 2001-2007**



Of the MSD claims accepted during this time period, the back was the most commonly injured body part (44 percent), followed by the shoulder (12 percent) (Figure 3).

As might be expected, the distribution of accepted MSD claims varies by occupation and industry. Transportation and material moving occupations were most commonly reported (23 percent), followed by production occupations (14 percent) and construction and extraction occupations (9 percent).

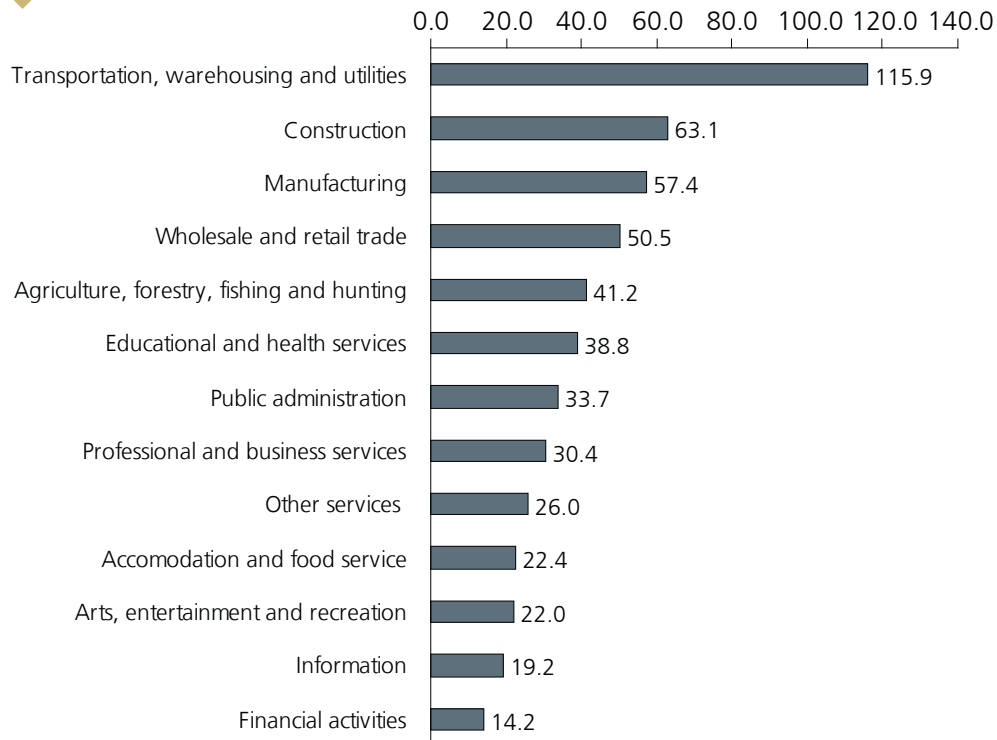
Figure 5 shows the MSD claims rate by industry for the years 2005 to 2007. Overall, the transportation, warehousing and utilities sector had the highest rate of MSDs (115.9 per 10,000 employed persons). Construction ranked second at 63.1 per 10,000 employed persons.



**FIGURE 4. PERCENT OF MUSCULOSKELETAL CLAIMS BY OCCUPATION,\* OREGON, 2005-2007**

\*Standard Occupation Coding

**FIGURE 5. CLAIMS RATE OF ACCEPTED DISABLING MSDS PER 10,000 EMPLOYED PERSONS BY INDUSTRY SECTOR (NAICS),\* OREGON, 2005-2007**



\*North American Industry Classification System

‡ Data are from the Information Management Division of the Oregon Department of Consumer and Business Services (DCBS), which collects workers' compensation claims from Oregon insurers. This represents accepted disabling claims for MSDs occurring between Jan. 1, 2001 and Dec. 31, 2007. A claim is accepted when the insurance company agrees to pay for the claim. Disabling status is defined by missing three or more days of regularly scheduled work, hospitalization, or the possibility of permanent disability.

## About OPHP

The Occupational Public Health Program (OPHP) in the Oregon Department of Human Services Public Health Division has been identifying and preventing work-related illnesses, injuries and deaths for nearly 20 years. Through funding from the Centers for Disease Control and Prevention National Institute of Occupational Safety and Health, the program conducts surveillance to identify patterns of illness or injury. OPHP also works with partners to address concerns related to priority conditions, populations, occupations and industries.

OPHP focuses on burn injuries, acute pesticide poisonings, work-related asthma, musculoskeletal disorders and other illnesses and injuries. The program is currently collecting data on 19 occupational health indicators, which are measures of work-related illnesses, injuries or factors associated with worker health. Examples include counting the number of work-related deaths and work-related pesticide poisonings. OPHP is also conducting work-related burn injury surveillance and working with partners to reduce the number of burn injuries in the workplace.

## Case summaries

### **CASE 1: DELIVERY DRIVER INJURED FROM HEAVY LIFTING**

A 45-year-old delivery driver was unloading appliances by himself at a condominium complex. The appliances were double-stacked in his truck so he had to unstack them. Unfortunately, because the dolly didn't have brakes, appliances weighing over 400 pounds slid down the trailer ramp. Additionally, because there was no ramp or wheelchair access at the receiving site, the driver had to lift heavy appliances over the curb. Part way through his 12-hour day, he felt a snap and burning ache in his left arm. Also, his knees began to hurt while going up and down the stairs and trailer ramp. When he finally went to the doctor, he was diagnosed with strains to his elbow, back and right knee. He lost nine days of work time.<sup>8</sup>



### **CASE 2: HEALTH CARE WORKER INJURED WHILE LIFTING PATIENT**



A female health care worker was injured while transferring a patient from a wheelchair to a toilet. During the transfer the patient lost her balance and started to fall. The health care worker attempted to catch the patient and, in the process, injured her lower back. The incident investigation revealed that the patient had not been assessed before the transfer and was unable to bear her own weight during the transfer. The restricted work environment of the bathroom aggravated this incident and forced the workers to use awkward postures while attempting to steady and support patients.<sup>9</sup>

## Description and diagnosis

There are many different types of MSDs with a variety of different symptoms. MSDs are associated with specific work patterns, such as the following:

- » Fixed body positions;
- » Continual repetition;
- » Force concentrated on small parts of the body (e.g., hand); or
- » Work that does not allow for rest and recovery between movements.

A combination of several factors often cause or exacerbate MSDs. Heat, cold and vibration can also contribute.<sup>7</sup> Table 2 lists occupational risk factors and symptoms for some common upper-body MSDs.

**TABLE 2. OCCUPATIONAL RISK FACTORS AND SYMPTOMS OF SIX COMMON MSDS**

<b>Disorder</b>	<b>Occupational risk factors</b>	<b>Symptoms</b>
<b>Carpal tunnel syndrome (CTS)</b>	Repetition, force, contact stress, awkward posture <i>Examples: Repetitive wrist motions, typing with wrists at an upward angle</i>	Pain, numbness, tingling, burning sensation in the thumb, index and middle finger, wasting of muscles at base of thumb, dry palm
<b>DeQuervain's disease</b>	Repetition, force, contact stress <i>Examples: Repetitive hand twisting and forceful gripping</i>	Pain at the base of the thumb
<b>Epicondylitis (elbow tendonitis)</b>	Repetition, force, awkward posture <i>Examples: Repeated or forceful rotation of the forearm and bending of the wrist at the same time</i>	Pain, weakness, swelling, burning sensation, dull ache over affected area
<b>Low back injury</b>	Repetition, awkward posture, static loading, force <i>Examples: Improper lifting techniques, awkward posture, transporting patients, heavy lifting, twisting and bending</i>	Pain, swelling, fatigue, stiffness and immobility
<b>Tendonitis/tenosynovitis</b>	Repetition, awkward posture, force <i>Examples: Repetitive wrist motions, repetitive shoulder motions, sustained hyper-extension of arms, prolonged load on shoulders</i>	Pain, swelling, fatigue, stiffness and immobility
<b>Thoracic outlet syndrome</b>	Repetition, awkward posture, force <i>Examples: Prolonged shoulder flexion, extending arms above shoulder height, carrying loads on the shoulder</i>	Pain, numbness, swelling of the hands

(Data adapted from the Canadian Centre for Occupational Health and Safety.)

MSDs progress at different rates, ranging from a sudden, severe back strain due to heavy lifting to a case of carpal tunnel syndrome that develops from repetitive movements over time. It is important to recognize and treat milder symptoms as soon as they occur. If an MSD goes untreated for a long time, it may become a long-standing or even permanent condition.

Workers suspecting that they might have an MSD should promptly see their physicians to avoid developing a more serious condition. MSDs are diagnosed by examining the types of tasks performed in a typical workday, including the intensity and duration of each task. The diagnosis may then be confirmed with laboratory tests such as electroneuromyography (ENMG) or magnetic resonance imaging (MRI).<sup>7</sup>

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## Prevention and treatment recommendations

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### **PREVENTION**

Often, soft tissue injuries are caused or exacerbated by a combination of several risk factors. Any one of the risk factors in Figure 6 can cause injury; however, cumulative effects of combined risk factors are often more severe.

Although MSDs are often treatable, it is better to prevent them before they start. Prevention depends upon supportive collaboration between employers and employees. Employers and employees must be able to recognize and avoid risk factors that may cause or exacerbate musculoskeletal injury. Table 3 provides a general description and examples of the main risk factors leading to MSDs.

Employers should also assess the workplace for hazards to reduce risks with strategies such as the following:

#### **Engineering controls**

- » Automation. The best way to prevent an injury is to eliminate the hazard. If a machine can do the job, humans are not at risk. Using mechanical lifting devices is an example of automation.
- » Tool and equipment design. Tools should be well designed and maintained to decrease the force required to complete the task. Ensure that workers are using the proper tool for the task, and that it is the proper size. An example is using a ratchet with a longer handle, which will increase the amount of leverage and reduce force.
- » Workplace adjustments. Ideally, each worker should be able to customize a workstation to his or her body size, shape, and sitting or standing position. Adjustable workstations and lift tables are examples of this concept.

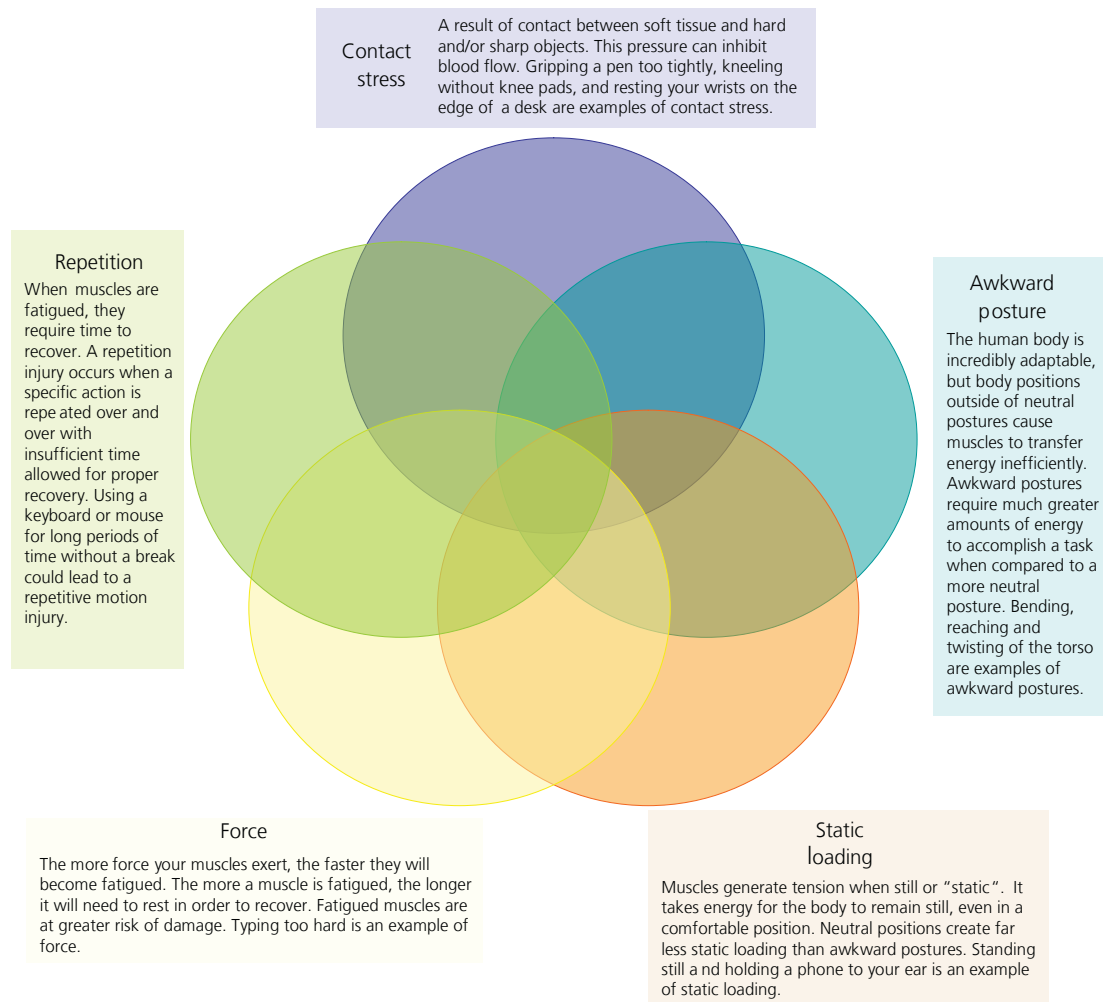
#### **Administrative controls**

- » Early reporting. Encouraging employees to report at the first sign of discomfort can often prevent minor issues from developing into costly injuries.
- » Safety culture. Creating a culture supportive of safe work practices is essential to preventing injuries.
- » Job rotation. Allow workers to vary tasks so different muscle groups are used. This strategy can be effective when the job cannot be modified to reduce risks.
- » Job enlargement. Reduce repetitive motion by increasing the variety of tasks each worker performs.
- » Training. Workers should be trained and encouraged to perform safe work practices, including specific exercises, proper rest periods, and adjusting workstations and equipment to reduce muscle strain.

## Personal protective measures

- » Personal protective equipment (PPE). Requiring significant effort on behalf of employees, PPE measures to protect workers have proven less effective than other types of controls. Some OSHA standards require that an employer provide personal protective equipment at no cost to employees. Lifting belts, stabilizing mats and gloves to dissipate the energy from hand tool vibration are examples of PPE designed to prevent MSDs.
- » Note on lifting: Because lifting is one of the primary causes of MSDs, it is imperative to create a workplace environment that minimizes manual lifting. Engineering and administrative controls are considered the most effective measures for preventing injuries caused or exacerbated by lifting.

**FIGURE 6. COMMON MSD RISK FACTORS**



## Treatment

MSDs can be treated with medication, surgery and alternative treatments that are not dependant on medications. The first stage of dealing with an MSD includes rest, heat or cold, light exercise and stretching, and anti-inflammatory medications. Modalities that are not dependant upon medication include stretching, acupuncture, massage, spinal manipulation, splinting, or physical therapy. The next stage is to prevent recurrence or exacerbation of the injury by increasing rest periods at work, changing workplace layout and tool design, and altering job tasks to decrease repetitive movement and fixed body positions.<sup>7</sup>



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## Conclusions

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The burden of work-related MSDs is significant, with serious consequences for worker health, productivity and economic loss both on and off the job. Employers and employees should work together in proactive planning to prevent the development of MSDs specific to job function, occupation and industry, and those with the multiple risk factors. Occupational risk factors include contact stress, awkward posture, static loading, force and repetition. MSD prevention should aim at eliminating risk factors. If this is not possible, employers should consider automation, job rotation, job enlargement, workplace adjustments, tool and equipment design, training, modification of work practices and support of early reporting. Because MSDs can progress at different rates, it is imperative to recognize and treat these disorders early. This may prevent future, costly and potentially permanent conditions. Successful prevention requires collaboration and participation by workers, union representatives and management.

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## Resources

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### **Canadian Centre for Occupational Health and Safety (CCOHS)**

This Web site provides a wealth of information about MSDs and many other occupational conditions. Available at [www.ccohs.ca/oshanswers/diseases/rmirsi.html](http://www.ccohs.ca/oshanswers/diseases/rmirsi.html).

### **Ergonomics Ideas Bank**

This is a searchable collection of ideas to reduce risk factors for WMSDs provided by the Washington State Department of Labor & Industries.

Available at [www.lni.wa.gov/Safety/Topics/ReduceHazards/ErgoBank/default.asp](http://www.lni.wa.gov/Safety/Topics/ReduceHazards/ErgoBank/default.asp).

### **MedlinePlus: Ergonomics**

MedlinePlus is a searchable database that compiles information from the National Library of Medicine, the National Institutes of Health, and other government agencies and health-related organizations.

Available at [www.nlm.nih.gov/medlineplus/ergonomics.html](http://www.nlm.nih.gov/medlineplus/ergonomics.html).

### **NIOSH: Ergonomics and Musculoskeletal Disorders**

The National Institute for Occupational Safety and Health (NIOSH) Web site provides information about WMSDs, including ergonomics programs, evaluation of risk factors, back belts and back injuries, computer keyboards, vibration, and many other topics.

Available at [www.cdc.gov/niosh/topics/ergonomics/](http://www.cdc.gov/niosh/topics/ergonomics/).

### **Safety and Health Topics: Ergonomics**

This Web site describes OSHA's approach to address MSDs in the workplace, as well as a strategy to reduce these injuries and illnesses.

Available at [www.osha.gov/SLTC/ergonomics/](http://www.osha.gov/SLTC/ergonomics/).

### **Oregon OSHA**

The Oregon Occupational Safety and Health Division has numerous publications on ergonomics available on its Web site.

Available at [www.orosha.org/publications/ergopubs.html](http://www.orosha.org/publications/ergopubs.html).

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