Centers for Disease Control and Prevention
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Workplace Health Promotion

Work-Related Musculoskeletal Disorders & Ergonomics

Once assessment and planning have been completed, including analysis of the collected data, the next step is implementing the strategies and interventions that will comprise the workplace health program. The intervention descriptions for Work-related musculoskeletal disorders (WMSD) include the public health evidence-base for each intervention, details on designing interventions related to Work-related musculoskeletal disorders (WMSD), and links to examples and resources.

Before implementing any interventions, the evaluation plan should also be developed. Potential baseline, process, health outcomes, and organizational change measures for these programs are listed under evaluation of WMSD prevention programs.

Musculoskeletal disorders (MSD) are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs. Work-related musculoskeletal disorders (WMSD) are conditions in which:

1. The work environment and performance of work contribute significantly to the condition; and/or
2. The condition is made worse or persists longer due to work conditions[1]

In 1997, the Centers for Disease Control and Prevention's (CDC) National Institute for Occupational Safety and Health (NIOSH) released a review of evidence for work-related MSDs. Examples of work conditions that may lead to WMSD include routine lifting of heavy objects, daily exposure to whole body vibration, routine overhead work, work with the neck in chronic flexion position, or performing repetitive forceful tasks. This report identified positive evidence for relationships between work conditions and MSDs of the neck, shoulder, elbow, hand and wrist, and back.[1]

The Bureau of Labor Statistics of the Department of Labor defines MSDs as musculoskeletal system and connective tissue diseases and disorders when the event or exposure leading to the case is bodily reaction (e.g., bending, climbing, crawling, reaching, twisting), overexertion, or repetitive motion. MSDs do not include disorders caused by slips, trips, falls, or similar incidents. Examples of MSDs include:

- Sprains, strains, and tears
- Back pain
- Carpal tunnel syndrome
- Hernia[2]

Musculoskeletal disorders are associated with high costs to employers such as absenteeism, lost productivity, and increased health care, disability, and worker's compensation costs. MSD cases are more severe than the average nonfatal injury or illness.

- In 2001, MSDs involved a median of 8 days away from work compared with 6 days for all nonfatal injury and illness cases (e.g., hearing loss, occupational skin diseases such as dermatitis, eczema, or rash)[2]
  - Three age groups (25–34 year olds, 35–44 year olds, and 45–54 year olds) accounted for 79% of cases[2]
  - More male than female workers were affected, as were more white, non-Hispanic workers[2]
  - Operators, fabricators, and laborers; and persons in technical, sales, and administrative support occupations accounted for 58% of the MSD cases[3]
  - The manufacturing and services industry sectors together accounted for about half of all MSD cases[2]
- Musculoskeletal disorders account for nearly 70 million physician office visits in the United States annually, and an estimated 130 million total health care encounters including outpatient, hospital, and emergency room visits[3]
- In 1999, nearly 1 million people took time away from work to treat and recover from work-related musculoskeletal pain or impairment of function in the low back or upper extremities[3]
- The Institute in Medicine estimates the economic burden of WMSDs as measured by compensation costs, lost wages, and lost productivity, are between $45 and $54 billion annually[3]
- According to Liberty Mutual, the largest workers' compensation insurance provider in the United States, overexertion injuries—lifting, pushing, pulling, holding, carrying or throwing an object—cost employers $13.4 billion every year[3]

Examples of common WMSDs are discussed below.

Carpal tunnel syndrome (CTS)

The U.S. Department of Labor defines CTS as a disorder associated with the peripheral nervous system, which includes nerves and ganglia located outside the spinal cord and brain. Carpal tunnel syndrome is the compression of the median nerve at the wrist, which may result in numbness, tingling, weakness, or muscle atrophy in the hand and fingers.[4]

- Carpel tunnel syndrome may affect as many as 1.9 million people, and 300,000 to 500,000 surgeries are performed each year to correct this condition[4]
- The Bureau of Labor Statistics reported 26,794 CTS cases involving days away from work in 2001, representing a median of 25 days away from work compared with 6 days for all nonfatal injury and illness cases. Most cases involved workers who were aged 25–54 (84%), female, and white, non-Hispanic (75%)[4]
- Two occupational groups accounted for more than 70% of all CTS cases in 2001: operators, fabricators, and laborers; and technical, sales, and administrative support[4]

Back injury and back pain

Back symptoms are among the top ten reasons for medical visits. For 5% to 10% of patients, the back pain becomes chronic.[5-6]

- In 2001, the Bureau of Labor Statistics reported 372,683 back injury cases involving days away from work. Most cases involved workers who were aged 25–54 (79%), male (64%), and white, non-Hispanic (70%)[7]

- Two occupational groups accounted for more than 54% of back injury cases: operators, fabricators, and laborers (38%); and precision production, craft, and repair (17%)[7]

Data from scientific studies of primary and secondary interventions indicate that low back pain can be reduced by:

- Engineering controls (e.g., ergonomic workplace redesign)
- Administrative controls (specifically, adjusting work schedules and workloads)
- Programs designed to modify individual factors, such as employee exercise
- Combinations of these approaches

Arthritis

The term arthritis is used to describe more than 100 rheumatic diseases and conditions that affect joints, the tissues which surround the joint and other connective tissue. The pattern, severity and location of symptoms can vary depending on the specific form of the disease. Forty-six million Americans report that a doctor told them they have arthritis or other rheumatic conditions. Arthritis is the most common cause of disability in the United States.[8] Arthritis limits the activities of nearly 19 million adults.[9] Two thirds of individuals with arthritis are under age 65.[10]

The National Arthritis Data Working Group estimates that 27 million adults have osteoarthritis. Nine million adults report symptomatic knee osteoarthritis, and 13 million report symptomatic hand osteoarthritis. Persons are considered to have symptomatic osteoarthritis if they have frequent pain in a joint (e.g., pain in a joint on most days of a recent month) and radiographic (e.g., x-ray) evidence of osteoarthritis in that joint, although sometimes this pain may not actually emanate from the arthritis seen on the radiograph. Other forms of arthritis include rheumatoid arthritis and gout. Arthritis is a concern in the workplace both because it may develop from work-related conditions and because it may require worksite adaptations for employees with limitations or disabilities.[11-12]

Certain occupations are associated with increased prevalence of arthritis, specifically osteoarthritis, most often of the knee and/or hip. These occupations include mining, construction, agriculture, and sectors of the service industry.[12-13] Common features of these occupations are physically demanding/heavy labor tasks, lifting or carrying heavy loads, exposure to vibration, high risk of joint or tissue injury, and prolonged periods of working in awkward or unnatural postures such as kneeling and crawling.

- In 2003, the total cost for arthritis conditions was $128 billion—$81 billion in direct costs and $47 billion in indirect costs[14]
- Persons who are limited in their work by arthritis are said to have Arthritis-attributable work limitations (AAWL). AAWL affects one in 20 working-age adults (aged 18-64) in the United States and one in three working-age adults with self-reported, doctor-diagnosed arthritis[15]
- The National Business Group on Health recommends that employers address arthritis by encouraging workers to avoid obesity and providing ergonomically appropriate workplace design[16]

Early diagnosis and appropriate management of arthritis can help people with arthritis decrease pain, improve function, stay productive, and lower health care costs. Appropriate management includes consulting with a doctor and self management education programs to help teach people with arthritis techniques to manage arthritis on a day-to-day basis. Physical activity and weight management programs are also important self-management activities for persons with arthritis.

Developing and Implementing Workplace Controls

Engineering controls, administrative controls and use of personal protective

A three-tier hierarchy of controls is widely accepted as an intervention strategy for reducing, eliminating, or controlling workplace hazards, including ergonomic hazards. The three tiers are:

- Use of engineering controls
  - The preferred approach to prevent and control WMSDs is to design the job to take account of the capabilities and limitations of the workforce using engineering controls. Some examples include:
    - Changing the way materials, parts, and products can be transported. For example, using mechanical assist devices to relieve heavy load lifting and carrying tasks or using handles or slotted hand holes in packages requiring manual handling
    - Changing workstation layout, which might include using height-adjustable workbenches or locating tools and materials within short reaching distances
- Use of administrative controls (changes in work practices and management policies)
  - Administrative control strategies are policies and practices that reduce WMSD risk but they do not eliminate workplace hazards. Although engineering controls are preferred, administrative controls can be helpful as temporary measures until engineering controls can be implemented or when engineering controls are not technically feasible. Some examples include:
    - Reducing shift length or limiting the amount of overtime
    - Changes in job rules and procedures such as scheduling more breaks to allow for rest and recovery
    - Rotating workers through jobs that are physically tiring
    - Training in the recognition of risk factors for WMSDs and instructions in work practices and techniques that can ease the task demands or burden (e.g., stress and strain)
- Use of personal protective equipment (PPE)
  - PPE generally provides a barrier between the worker and hazard source. Respirators, ear plugs, safety goggles, chemical aprons, safety shoes, and hard hats are all examples of PPE
  - Whether braces, wrist splints, back belts, and similar devices can be regarded as offering personal protection against ergonomic hazards remains an open question. Although these devices may, in some situations, reduce the duration, frequency or intensity of exposure, evidence of their effectiveness in injury reduction is inconclusive. In some instances, these devices may decrease one exposure but increase another because the worker has to “fight” the device to perform the work. An example is the use of wrist splints while engaging in work that requires wrist bending

Ergonomics

Ergonomics is the science of fitting workplace conditions and job demands to the capability of the working population.[1] The goal of ergonomics is to reduce stress and eliminate injuries and disorders associated with the overuse of muscles, bad posture, and repeated tasks. A workplace ergonomics program can aim to prevent or control injuries and illnesses by eliminating or reducing worker exposure to WMSD risk factors using engineering and administrative controls. PPE is also used in some instances but it is the least effective workplace control to address ergonomic hazards. Risk factors include awkward postures, repetition, material handling, force, mechanical compression, vibration, temperature extremes, glare, inadequate lighting, and duration of exposure.[17] For example, employees who spend many hours at a workstation may develop ergonomic-related problems resulting in musculoskeletal disorders (MSDs).

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