Management of Work-Related Musculoskeletal Disorders
Accredited Standards Committee Z365
Working Draft August 2002

1. PURPOSE AND SCOPE

1.1. Purpose and Intended Audience

This standard describes a program and processes for managing work-related musculoskeletal disorders (WMSD) of the upper extremities and neck in order to reduce their occurrence and severity. It is intended for management, particularly those who have responsibility for: medical, health and safety programs, or the design of jobs, work environments or work procedures. This program is described in general terms and professional judgment is required to apply the program to specific work situations. It is assumed that the standard will be implemented by persons appropriately trained for the task they will be performing.

1.2. Scope

This standard provides a method to reduce musculoskeletal disorders associated with work, such as manual lifting, assembly, manipulation of tools, machinery and other devices. Ergonomic considerations to be focused upon by the employer include processes for addressing risks associated with: work postures, work layout, force requirements, vibration, work rates, tool design and flexibility of workstations to accommodate individual variations. This standard does not cover musculoskeletal disorders where the mechanism of injury was a single, sudden event, such as slip, trip, fall or crush.

Note: This standard applies to the upper extremities and neck, although many of the concepts are applicable to the other parts of the body

1.3. Standard Content

The standard addresses the above scope through WMSD management program that includes employer responsibilities, training, employee involvement, surveillance, evaluation and management of WMSD cases, job analysis and job design and intervention.

2. DEFINITIONS

Cold - Exposure to low ambient temperatures in which the body's capacity to regulate the normal temperature of specific body parts is exceeded. Work involving the handling of frozen or refrigerated materials, the immersion of body parts in cold media, or the exposure to cold air exhaust may be considered exposure to this risk factor (adapted from the ACGIH Threshold Limit Values for Chemical Substances and Physical Agents).

Contact Stress – Contact Stress arises from localized pressure against the body that transmits force through the skin to underlying anatomical structures, such as tendons and

nerves. Pressure increases directly with contact force over a given area, and decreases when the contact area is proportionally increased.

Cycle - A cycle contains a sequence of one or more work elements performed in a repetitive task. Cycle time is the time from the beginning of one sequence of elements to the beginning of the next. Nonrepetitive tasks contain just one cycle, while repetitive tasks contain multiple cycles. The number of cycles in a task are sometimes related to production output, such as "units assembled," or "customers processed."

Duration - A period of time over which one is exposed to physical stress or the period of time considered as rest.

Element - Elements are basic units of work or operations that combine to make up a task. A particular sequence of elements is usually repeated every cycle. An element is often described in terms of the operation performed, such as "run machine," "pause to rest," or "input customer request."

Ergonomics - Ergonomics is a multidisciplinary science that studies human physical and psychological capabilities and limitations. This body of knowledge can be used to design or modify the workplace, equipment, products, or work procedures to improve human performance and reduce the likelihood of injury and illness.

Force - Force is the mechanical effort to accomplish a specific movement or action.

Health Care Provider (HCP) – Professional health care practitioner who are physicians, physician's assistants, registered nurses, chiropractors, or occupational and physical therapists operating within the scope of his or her license, registration, certification or legally authorized practice.

Job - A job consists of one or more tasks that are performed during the course of a workday. Usually similar sets of tasks are performed on a daily basis, although this is not always the case. Specific tasks may or may not be repeated in a workday. Jobs are sometimes described by characteristic tasks or groups of tasks, such as "computer work," "machine operation," "final assembly," "shipping," or "maintenance."

Job analysis - Job analysis is the systematic study of work and can be performed at different levels of detail depending on the specific purpose and available resources. Job analysis should identify potential exposure to work-related risk factors and evaluate their characteristic properties.

Job survey - Job surveys are cursory or preliminary review of jobs, as compared to the more detailed analysis described in job analysis. Job surveys identify specific jobs and processes that may put employees at risk of developing WMSDs.

Magnitude - The extent or degree to which each physical stress is involved. An example is the amount of force applied or the angle that a joint is flexed.

MSD symptoms - MSD symptoms are persistent or recurrent sensations in the upper extremity or neck such as pain, weakness, stiffness, numbness, tingling, burning, swelling or discomfort which may be work related

Musculoskeletal disorders (MSD) –A disturbance of regular or normal functionof muscle, tendon, tendon sheath, nerve, bursa, blood vessel, bone, joint, or ligament resulting in altered structure or impaired motor or sensory function. Manifestations of MSDs may include altered structure, impaired sensory motor, or vascular function or MSD symptoms (see definition of MSD symptoms).

Non-work-related risk factors- Non-occupational factors that increase the probability of the occurrence of MSDs. These risk factors may include demographic (e.g., age, gender), medical conditions (e.g., rheumatoid arthritis, obesity, pregnancy), and non-occupational physical stresses.

Physical stress -Physical attributes of work that include force, posture and motions, vibration, and cold.

Posture and motions - Posture refers to the position of a specific articulation or body part relative to an adjacent body part, determined by the angle of the joint connecting them. Motions pertain to rotational motion of a body segment relative to another, about a common joint. Motion includes angular displacement, velocity or acceleration.

Recovery - Periods of reduced exposure to physical stress. These may be in the form of formal rest breaks, pauses in work activity, or motions and exertions that provide specific body parts the opportunity to recover.

Repetition - A force, posture and motion, vibration, or cold exposure that is repeated in the course of a task, cycle, or element.

Surveillance -The ongoing, systematic collection, analysis and interpretation of health and exposure information in the process of describing and monitoring WMSDs and evaluating the effectiveness of the program. A purpose of surveillance is to identify jobs that need further evaluation.

Task - One of the specific work objectives or procedures performed in a job. A task may consist of one or more elements. Examples of tasks are, “setup,” “operate machine,” “clean up,” etc.

Vibration - The oscillatory motion of a body. Vibration can be described in terms of its frequency, acceleration, and direction of motion.

Work organization factors - These factors broadly consider various aspects of: job content, organizational characteristics, temporal aspects of the work and task, and economic aspects.

Work-related - MSDs are work-related when work contributes to their causation, aggravation or precipitation as determined by the employer and when appropriate the opinion of the physician or health care provider who has knowledge, training, and experience in the evaluation and treatment of MSDs.

Note: In this standard, the purpose for determining work relatedness is to trigger job analysis, not determine compensability or liability. Individual state/federal workers' compensation laws control and determine compensability.

Work-related musculoskeletal disorders (WMSD) - WMSDs are musculoskeletal disorders that may be caused, aggravated, or precipitated by intense, repeated, or sustained work activities with insufficient recovery. WMSDs generally develop over periods of weeks, months and years.

Examples of WMSDs are tendonitis, carpal tunnel syndrome, epicondylitis, bursitis, and tension neck syndrome.

Work-related risk factor - Occupational physical stresses and their exposure properties that increase the probability of the occurrence of WMSDs.

3. CONFORMANCE

Standards/guidelines issued by the American National Standards Institute (ANSI) are voluntary and are established using the consensus process. For clarity, the following definitions are given in this document:

The word "shall" specifies mandatory requirements. The mandatory "shall" requirements of this document are those program elements that are recognized as essential and found fundamentally helpful in the management of WMSDs.

The word "should"specifies nonmandatory guidelines and recommendations that may be helpful depending on the particular circumstances and characteristics of each work site being evaluated. The recommendations in this document specified by "should" reflect provisions that have been found to be helpful to others who have attempted to manage work-related WMSDs.

A program for management of WMSDs is in conformance with this standard if it includes all of the "shall" provisions outlined in Section 4 "The Program." In certain circumstances, inclusion of "should" provisions as outlined in Section 4 "The Program"have been shown to enhance the overall program. The structure of a program as outlined in Section 4 may be modified so that it can be incorporated into an existing program or to accommodate the structure of the organization.

The term "include" refers to a minimum list. The term "may include" refers to a list containing discretionary elements.

4. THE PROGRAM

General background information regarding WMSDs is provided below to justify the program components and organization that follow.

4.1. Background

The conclusions of the background section are based on the scientific literature, the professional experience of the committee, and the committee's discussions during the last decade. The conclusions are similar to those of the independent reviews by the National Institute for Occupational Safety and Health in 1997 and the National Research Council (NRC) in 1999 and 2001.

The NRC report (1999) concluded that:

· "There is a higher incidence of reported pain, injury, loss of work, and disability among individuals who are employed in occupations where there is a high level of exposure to physical loading than for those employed in occupations with lower levels of exposure."

· "There is a strong biological plausibility to the relationship between the incidence of musculoskeletal disorders and the causative exposure factors in high-exposure occupational settings."

· "Research clearly demonstrates that specific interventions can reduce the reported rate of musculoskeletal disorders for workers who perform high-risk tasks. No known single intervention is universally effective. Successful interventions require attention to individual, organizational, and job characteristics, tailoring the corrective actions to those characteristics."

The conclusions of the 2001 NRC report include:

· "The basic biology and biomechanics literatures provide evidence of plausible mechanisms for the association between musculoskeletal disorders and workplace physical exposures."

· "There is strong support across these bodies of work that high force and repetition are associated with musculoskeletal disorders of the upper extremities; basic biology data provide evidence of alteration in tissue structure."

· "A number of characteristics of the individual appear to affect vulnerability to work-related musculoskeletal disorders, including increasing age, gender, body mass index, and a number of individual psychosocial factors. These factors are important as contributing to and modifying influences in the development of pain and disability and in the transition from acute to chronic pain."

· “The intervention literature supports the efficacy of tool and workstation design changes, job rotation, and other interventions that directly address these risk factors with regard to upper extremity symptomology.”

· “The weight of the evidence justifies the introduction of appropriate and selected interventions to reduce the risk of musculoskeletal disorders of the low back and upper extremities. These include, but are not confined to, the application of ergonomic principles to reduce physical as well as psychosocial stressors. To be effective, intervention programs should include employee involvement, employer commitment, and the development of integrated programs that address equipment design, work procedures, and organizational characteristics.”

The Z365 Standard is based on the following conclusions of the Accredited Standards Committee Z365

· WMSDs are associated with one or more work-related risk factors (force, posture and motion, vibration, and cold), their exposure properties (magnitude, repetition, duration and recovery), and work organization.

· There are nonwork-related risk factors for some MSD disorders such as age, gender, and exposure to nonwork physical factors. Symptoms and physical signs of nonwork-related MSDs and WMSDs are often similar. Work and nonwork-related risk factors may coexist.

· Work-related risk factors may be associated with: use of tools, equipment, tasks, work methods, work processes, the work environment, and other aspects of work organization.

It is often possible to identify and measure exposures to WMSD risk factors

· It is possible to identify many work situations in which the risk of WMSDs is elevated.

· It is often possible to develop and implement control measures for suspected or established work-related risk factors for MSDs, although quantitative exposure-disorder relationships (e.g., dose-response) may not be available in the technical or scientific literature for all work-related risk factors or all disorders.

· It is possible to identify broad principles of design to reduce exposure to one or more WMSD risk factors for many high risk jobs. These principles can be used in the design of work or for modifying existing operations, and in the design of new equipment and processes.

· WMSDs may go unrecognized and unreported.

· Current data do not support the validity of any single medical screening test to accurately predict the future development of a WMSD.

· It is possible to reduce WMSD severity and duration with early reporting and evaluation and appropriate treatment of employee symptoms by a HCP.

· The disability associated with WMSDs is likely reduced with a program that includes medical management, modifying jobs, and/or accommodating employees who have work restrictions.

4.2. WMSD Management Program

A WMSD management program shall have the following components:

· Employer Responsibilities

· Training

· Employee Involvement

· Surveillance

· Evaluation and Management of WMSD Cases

· Job Analysis

· Job Design and Intervention

Figure 4.1 illustrates the essential components and functions of the WMSD management program and how they work together. The depth and breadth of the program should be tailored to meet the needs of each employer and can be incorporated into existing programs. In addition, it is important for employers to stay abreast of the best available information (literature, trade data, etc.) relating to industry specific WMSD hazards.

Effective implementation of the Z365 WMSD management program for most employers will require establishing priorities for prevention and control activities. The choice of priorities will depend on the progress an employer already has made in addressing workplace factors and on the extent of problems already present in the workplace. Some employers will focus first on management of diagnosed WMSD cases and evaluation and intervention of the corresponding jobs. Others, in worksites with few or no cases or high employee turnover, may move straight to implementing proactive job surveys (e.g., employee interviews, checklists) so that potential problems associated with particular jobs can be identified and addressed before new WMSD cases appear.

The level and breadth of training and employee involvement may directly depend on how the program is initiated and progresses over time. As Figure 4.1 shows, there are three surveillance outcomes that could lead to job analysis. An employer may focus first on

the employee reports. In doing so the employer may provide the appropriate training and employee involvement to accomplish this goal. As an employer moves to surveillance using existing records and job surveys participants may change or expand and so may the corresponding level and breadth of training and employee involvement.

The program should be evaluated on a regular basis to determine if specified tasks are completed, objectives are being met and whether modifications are necessary.

Figure 4.1: The program for management of WMSDs Flowchart illustrating program elements. The chart does not include all components of the standard.

4.2.1 Management Employer Responsibilities

Management is responsible for the safety and health of its employees while on the job or at the worksite. This responsibility shall include the management of WMSDs. It entails establishing, monitoring, and supporting procedures to identify and reduce recognized work-related risk factors. These efforts should be directed toward reducing exposure to work-related risk factors from both existing operations and in the design and purchase of new equipment and processes.

Documenting the program and program activities in writing will help communicate to persons within the organization and to provide a basis by which the organization can evaluate its goals and accomplishments.

The program may include:

- objectives (e.g., identify high risk jobs, identify affected employees, etc.)
- tasks necessary for attaining the stated objectives
- a listing of persons who are responsible for tasks and objectives and for oversight of the program
- specification of necessary training for all members of the organization
- specification of necessary resources
- a schedule for implementation
- a periodic program evaluation.

4.2.2 Training

Periodic training is necessary so that employees and managers can facilitate surveillance, job analysis, job design and medical management.

Employers shall provide training to appropriate management representatives and employees, which may include:

· recognition and reporting of the signs and symptoms and signs of MSDs that may be work-related

· record keeping processes for reporting WMSDs

· whom to contact for further assistance

· roles and responsibilities in the surveillance procedures

· recognition and management of WMSD risk factors

· job analysis and design procedures

· proper use, adjustment, and maintenance of tools, work equipment and work stations

· job interventions and best work procedures and practices for minimizing risk of WMSDs.

4.2.3 Employee Involvement

Employees shall be given the opportunity to participate in the program for management of WMSDs.

The following are examples of employee involvement that should be considered :

· submitting suggestions or concerns

· participating in discussions related to their workplace and work methods

· participating in employee surveys

· participating in formal team meetings

· using and operating tools and work equipment in the prescribed manner

· participating in the design of work, equipment and procedures

· participating in the employer's WMSD problem solving process

· participating in WMSD education and training

· notifying the employer of related MSD symptoms and risk factors early.

Note: Federal law (the National Labor Relations Act) may restrict the extent and manner of involving employees in decision-making programs that affect the "terms and conditions" of work. Employers may wish to consult legal counsel for guidance in how to involve employees in committees that design and implement ergonomics programs.

4.2.4 Surveillance Procedures

The results of surveillance are used to determine when and where job analysis (Section 4.2.6) is needed, and where ergonomic interventions may be warranted. Each organization may want to establish criteria for when a job survey result or health surveillance data indicates the need for a job analysis. This information may be further used to assist in establishing job analysis and intervention priorities and assessing the program.

Surveillance includes:

1. Review of existing records of work-related illnesses and injuries (See Figure 4.1).

Review of existing records of WMSDs (e.g., OSHA log and workers' compensation records)shall be conducted initially and at the start of surveillance and periodically thereafter. This analysis helps determine where WMSDs are occurring and prioritize jobs to be further analyzed using job analysis. (Job Analysis, Section 4.2.6).

2. Employee Reports (See Figure 4.1).

There are two kinds of employee reports that should be reviewed.

· Employee reports of MSD symptoms.

· Reports of employee concerns about WMSD risk factors.

3. Job surveys (See Figure 4.1).

The aim of job surveys is to identify specific jobs and processes that may put employees at risk of developing WMSDs. Job surveys are considered a cursory or preliminary review of jobs, as compared to the more detailed job analyses described in Section 4.2.6. Job surveys may include any of the following methods: facility walkthroughs, employee and supervisor interviews/questionnaires, work-related risk factor checklists, or team problem solving approaches. The job risk factors for WMSDs are listed in Section 4.2.6.

Job surveys can be incorporated into existing programs, such as regular safety, health, team problem solving, or quality inspections, expanding their scope to include identification of WMSD risk factors. Results of job surveys may be applied to similar jobs within one or more departments or locations.

Job surveys should be performed:

· when new WMSD cases are reported, to determine if risk factors exist across similar jobs that use similar tasks, equipment, tools, or processes. This might include a sampling of representative jobs.

· when employees report new MSD symptoms.

· when employees report WMSD risk factors.

· when there is an unexplained high rate of turnover or absenteeism for a specific job. There may be many reasons for turnover or absenteeism not related to WMSDs.

· when surveillance activities are begun, as a baseline assessment of job risk factors.

· when a job, equipment, or process substantially changes, to identify risk factors that may result from making these changes.

· new tools, equipment or work processes are planned, purchased or installed.

When health data are insufficient or unavailable, such as when health records are not required by federal or state laws, job surveys shall be performed.

4.2.5 Evaluation and Management of WMSD Cases

Early assessment or establishing a diagnosis and initiating treatment, may limit the severity, improve the effectiveness of the treatment and allow for sufficient and timely recovery of the condition. Early identification of WMSDs can alert the employer to the need for job analysis of that employee's job, or the need for further analysis if the job has already been evaluated.

Employers shall:

· examine existing policies, practices and programs to ensure that they encourage prompt reporting of MSD symptoms or potential WMSD risk factors without reprisals.

· once notified of recurrent or persistent MSD symptoms, facilitate a prompt evaluation of the symptomatic employee by an appropriate health care provider (HCP) consistent with state laws.

· provide the HCP with a contact familiar with the job tasks.

· provide HCPs the opportunity to become familiar with jobs and job tasks (e.g. , site walk-throughs, review of job surveys, analysis reports, detailed job descriptions, job safety analyses, photographs or videotapes).

· ensure employee privacy and confidentiality regarding medical conditions identified during the assessment as permitted by law.

Employers should:

· select or recommend HCPs with knowledge, experience and training in workplace exposures and the evaluation and treatment of WMSDs.

· whenever feasible, modify jobs, redesign the job, and/or accommodate employees with work restrictions as determined by a HCP.

Note: Refer to the Americans with Disabilities Act for guidance relevant to employees with disabilities.

The health care provider should:

· evaluate the symptomatic employee

· seek information and review materials regarding employee job activities

· be familiar with the management of WMSD cases or refer the employee to a HCP who is familiar with such management.

Components of the health care provider evaluation should include:

· a medical history (occupational and non-occupational) which includes a complete description of symptoms

· a description of work activities as reported by the employee and the employer

· a review of exposure information relevant to the clinical findings

· a physical examination appropriate to the presenting symptoms and history

· an initial assessment or diagnosis, and an appropriate treatment plan

· work restrictions or work modifications if appropriate

· an opinion on the work-relatedness of the disorder based on professional guidelines (e.g. “A Guide to the Work-Relatedness of Disease”).

Employees with WMSDs should:

·provide input to and follow the treatment plan recommended by the HCP, including work restrictions.

The health care provider should follow-up with symptomatic employees to document symptom improvement or resolution, or reevaluate the employee who may not have

improved. The time frame for this follow-up depends on the type, duration and severity of the employee symptoms. If symptoms do not improve within the expected time frame the employee should be referred to an appropriate medical specialist and/or the job should be analyzed again.

In this standard, the purpose for determining work-relatedness is to trigger job analysis, not determine compensability. Individual state/federal workers' compensation laws control and determine compensability.

When the employer has determined, based on the medical evaluation and exposure information (job description, walk through, etc.) that an employee has a WMSD, the employer shall perform a job analysis of the employee's job, or a sample of representative jobs, as soon as possible. The job analysis should include input from the symptomatic employee.

4.2.6 Job Analysis

Job analyses are more detailed studies of the work than job surveys, concentrating on the risk factor exposures at the task, elemental or micro level. Job analyses identify potential exposures to work-related risk factors and evaluate their characteristic properties.

Job analysis shall be performed:

· when it is suspected that an MSD is work-related (see Section 4.2.5)

· when a problem job is identified from a records review, a trend of WMSDs, or job surveys (see Section 4.2.4)

· when a problem persists after changes have been implemented

· during the design or acquisition phase of equipment, processes, or jobs.

When a job analysis already exists for that job or a similar job, it shall be reviewed if a new job analysis is not performed. When analyzing multi-task and highly variable jobs (e.g. job shop, maintenance, repair, jobs of short duration), similar tasks should be grouped to simplify the job analysis process. A job analysis is not necessary if an obvious solution is evident, is implemented, and it leads to a resolution of the problem.

When multiple job analyses are required, the following information should be considered in setting priorities:

· jobs where WMSDs have been identified by an individual case

· jobs where the incidence or severity of WMSDs is higher compared to other departments, facilities or other groupings

· those jobs where proactive job surveys have suggested further job analysis and possible intervention.

Work-related risk factors are present at varying levels for different jobs and tasks. The mere presence of a risk factor does not necessarily mean that an employee performing a job is at undue risk of injury. Generally, the greater the exposure is to a single risk factor or combination of risk factors, the greater the probability of a WMSD. For example, the risk associated with the first three risk factors may be increased in the presence of cold temperature.

Job analyses shall consider all of the following work-related risk factors:

· force and contact stress

· posture and motions

· vibration

· cold temperature

Job analyses for WMSD risk factors shall evaluate each of the following exposure properties of the physical stresses listed above by qualitative or quantitative approaches:

· magnitude

· repetition

· duration

· recovery

Job analysis should consider job and work organization factors that can alter the characteristic properties or effects of physical stress exposure.

4.2.7 Job Design and Intervention

Work-related risk factors may pose minimal risk of injury if sufficient exposure is not present or if sufficient recovery time is provided. However, if there is sufficient exposure and insufficient recovery time there will be a risk of injury. Reducing exposure to risk factors will result in reduced probability or severity of WMSDs. When work-related risk factors and their corresponding exposure properties are identified and prioritized from a job survey or analysis, then job design or redesign, including feasible engineering or administrative changes, shall be used for eliminating or reducing exposure to work-related risk factors. The decision regarding which specific risk factor to reduce in job design or redesign is based on the scientific evidence, professional judgment, technical feasibility and input from employees and management.

The job design and interventionprocess ends when:

· exposures to work-related risk factors are reduced or eliminated as much as practical or surveillance indicates (see Section 4.2.4) that the problem is under control; or

· appropriate exposure limits have been identified and met.

4.3 Literature Cited

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