Safety Management Today

Ergonomics

What's Inside

In The News

CDC seeks to resume study on MSD reduction

The Centers for Disease Control and Prevention (CDC) has published a proposal to reinstate a study assessing the effectiveness and cost-benefit of occupational safety and health interventions to prevent musculoskeletal disorders (MSDs) in overhead assembly manufacturing systems.

MSDs represent a major proportion of injury/illness incidence and cost in the U.S. manufacturing sector. In 2008, 29 percent of non-fatal injuries and illnesses involving days away from work involved MSDs. The rate for the motor vehicle manufacturing sub-sector was among the highest.

In automotive manufacturing overhead conveyance of the vehicle chassis requires assembly line employees to use tools in working postures with the arms elevated. These postures are believed to be associated with symptoms of upper limb discomfort, fatigue, and impingement syndromes. Overhead working posture, independent of the force or load exerted with the hands, may play a role in the development in these conditions. Recent studies suggest a more significant role of localized shoulder muscle fatigue in contributing to these disorders. Fatigue of the shoulder muscles may result in changes in normal shoulder motion that affect risk for shoulder impingement disorders.

This study will continue to evaluate two intervention strategies for reducing musculoskeletal symptoms and pain in the shoulder attributable to overhead assembly work in automotive manufacturing as follows:

- An articulating spring-tensioned tool support device that unloads from the worker the weight of the tool that would otherwise be manually supported, and
- A targeted exercise program intended to increase individual employees' strength and endurance in the shoulder and upper arm stabilizing muscle group. ■

Preventing MSDs requires implementing an ergonomic process

Musculoskeletal disorders (MSDs) affect the muscles, nerves, and tendons. Work-related MSDs, including those of the neck, upper extremities and low back, are one of the leading causes of lost workday injury and illness. Workers in many different industries and occupations can be exposed to risk factors at work, such as lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures, and performing the same or similar tasks repetitively increasing a worker's risk of injury.

Fortunately, work-related MSDs can be prevented by implementing an ergonomics process.

Understand the impact

According to the Bureau of Labor Statistics, 33% of all worker injury and illness cases in 2011 were due to MSDs. These cases cost employers thousands of dollars each year. Direct costs include medical services and higher workers' compensation premiums. Indirect costs include increased turnover, lost work days, lower productivity, and re-training of replacement workers.

Identify the hazards

Ergonomics – fitting the worker to job tasks – helps lessen muscle fatigue, increases productivity, and reduces the number and severity of work-related MSDs. Tasks are the activities a worker performs during a particular job. Some jobs consist of a single task, but most require multiple tasks as follows:

- A warehouse worker's tasks might include stacking materials, shrink-wrapping pallets, and moving pallets with a hand cart.
- A janitor's tasks might include emptying trash, dusting, and vacuuming.
- A forklift driver's tasks might include setting dock plates, re-stacking unstable materials, and twisting around to drive in reverse.

Don't wait until an employee gets hurt before looking for hazards. Take a proactive approach by also talking to employees. Ask questions like:

- Do you have ideas about how to make your job less physically demanding and more efficient?
- Do you work in uncomfortable positions, or experience muscle fatigue and discomfort?

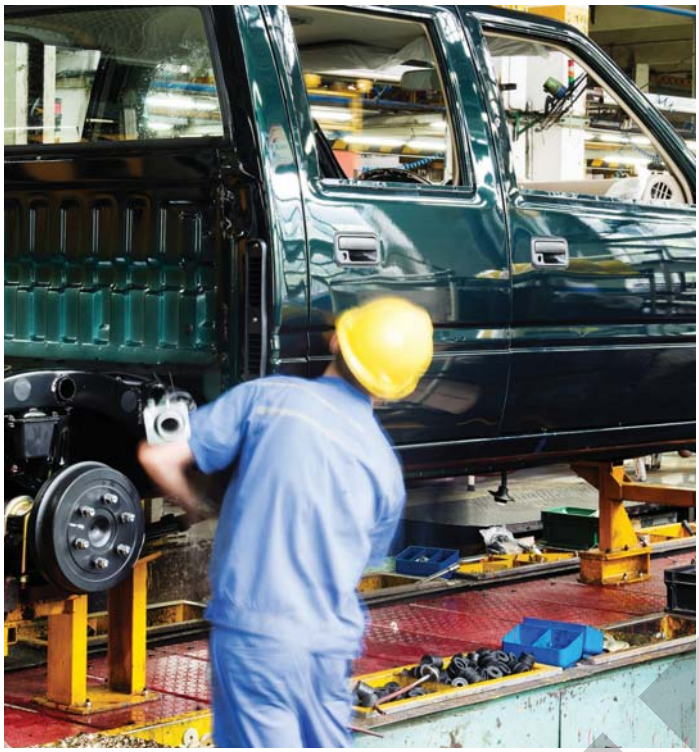
It's best to take action as soon as you identify warning signs. These signs include employee fatigue or discomfort, reports of problems, and high levels of absenteeism. Early action is important because MSDs tend to be treatable and less expensive in the early stages, but irreversible and expensive as they get worse.

Implement an ergonomic process

Finding ways to eliminate awkward postures and repetitive motions usually involves a process of trial and error. In other words, it's not a one-time effort. Saying that a job has been "fixed" implies that it can't be improved any further, but there's always room for improvement. Consider this example:

> *At a tool repair shop, Jacob takes apart, repairs, and reassembles small power tools. He removes and replaces cover plates using a screwdriver. Jacob notices that the tool digs into his palm, and by the end of the day, his arm and wrist begin to ache.*
>
> *Jacob convinces his supervisor that he could work faster using a power drill with a screwdriver tip. The supervisor agrees and provides a drill. This allows Jacob to work faster, but he must hold the drill at an awkward angle. At the end of the day, his shoulder is sore from using the new drill.*
>
> *Jacob remembers seeing a powered, in-line screwdriver in a magazine. He shows it to his supervisor and says it should allow him to work more comfortably. The supervisor agrees and obtains one of the new drills. With the new in-line tool, Jacob's productivity increases, and at the end of the day, his arm and shoulder aren't sore.*

This illustrates the process of making improvements a little at a time, and shows the importance of re-evaluating every "solution" to make sure it solved the problem without creating new problems. The power drill solved one problem (grip and wrist



motions), but created another problem (an awkward work angle). The in-line tool provided a better fit between Jacob and his job demands, allowing him to work faster with less pain.

Always consider a few options to try before making substantial changes because the first solution may not be the best. Remember, making ergonomic improvements is a process. Begin by making a list of tasks with the highest priority.

For each task, write down several potential improvements. Sometimes a single improvement can reduce or eliminate multiple factors. Other times, several changes might be needed to address a single factor.

After listing potential improvements, evaluate each one by asking the questions listed below. Will this improvement:

- Reduce or eliminate the contributing factors and the reasons for them?
- Create new or different contributing factors?
- Reduce or eliminate other problems identified and the reasons for them?
- Increase or decrease productivity and efficiency?
- Be practical from an engineering standpoint?
- Handle the required volume and pace of work?
- Be affordable (is another option less expensive)?
- Be accepted by employees?
- Positively affect employee morale?
- Take a long time to implement?
- Affect the rate of pay or a collective bargaining agreement?
- Require substantial training (is a simpler option available)?

Finally, select a few to try out in the workplace. As part of the evaluation, set up a trial period to test new tools, equipment, or procedures. Consider the following to test the idea without making major changes:

- Prepare a mock-up of a modified workstation;
- Change a single workstation first, and others only after the effectiveness is measured;
- Create an off-line workstation or training line;
- Insert an extra workstation on a full-speed production line; or
- Set up a practice or demonstration period.

Evaluate the effectiveness

During the trial period, evaluate the improvements for effectiveness. Don't make final decisions until enough time has passed for people to adjust to the changes. Employees should have a chance to practice using the new work-station, tool, equipment, or process. Any new tool or procedure can feel awkward at first, and providing an adjustment period may prevent you from rejecting an otherwise good improvement.

Some modifications may require employees to use new muscle groups or different body parts, and they may initially feel tired or sore. Check with employees to see how they think the changes are working. The process of improving the workplace is

See **MSDs**, continued on pg. 4

MSDs, continued from pg. 3

not exact. Expect to try out changes, see how they work, and either modify them or discard them for alternatives.

After an appropriate adjustment period, evaluate each improvement separately by considering the following questions. Has this improvement:

- Had enough time to work (are employees used to the changes)?
- Reduced or eliminated fatigue, discomfort, symptoms, or injuries?
- Reduced or eliminated the contributing factors or other problems?
- Added any new contributing factors or other problems?
- Worked from a financial standpoint?
- Had a positive effect on productivity and efficiency?
- Matched the production requirements of the job?
- Been accepted by employees?
- Been fully implemented in a reasonable amount of time?
- Had a positive effect on absenteeism and turnover rates?
- Been supported with the training needed to make it effective?

A good way to determine if you reduced or eliminated contributing factors is to go back and observe the workstation as you did during the initial evaluation. If necessary, you can try a new improvement option, or begin the process again to make further improvements. If the situation has improved, and the risk is lower, move on to the next job in your priority list.

The process of making ergonomic improvements involves looking at equipment and job tasks, trying out improvements, looking again to see if they work, making further changes, and so on. The goal is to remove conditions that could lead to injuries. More often than not this process reduces injuries, increases productivity, saves money, and improves product quality and job satisfaction. ■

Q&A

How can an employer determine if an MSD is work-related?

Not all musculoskeletal disorders (MSDs) are work-related. MSDs can and do develop outside the workplace. As such, the determination of whether any particular MSD is work-related may require the use of different approaches tailored to specific workplace conditions and exposures.

Even though there are no special criteria for determining if an MSD case is work-related, establishing the work-relatedness of a specific case may include:

- Taking a careful history of the patient and the illness,
- Conducting a thorough medical examination,
- Reviewing the job requirements for any musculoskeletal hazards, and
- Characterizing factors on and off the job that may have caused or contributed to the MSD. ■

Ergonomic training: A helping hand to prevent MSDs

Training ensures that workers are aware of ergonomics and its benefits.

Awareness begins by sharing the information you gathered when analyzing work tasks and considering improvements. Inform them about:

- Factors that may contribute to injuries and how to identify them,
- Changes that have already been made to address any hazards, and
- How to report problems and request improvements.

When ergonomic training is effective, workers will benefit by:

- Learning about the proper use of equipment, tools, and machine controls.
- Using good work practices, including proper lifting techniques.
- Becoming more aware of work tasks that may lead to pain or injury.
- Recognizing early symptoms of MSDs.

- Understanding the importance of reporting and addressing early indications of MSDs before serious injury develops.
- Understanding procedures for reporting work-related injuries and illnesses, as required by OSHA's injury and illness recording and reporting regulation at 29 CFR Part 1904. ■

Push, pull, bend, grasp, reach, and twist: How much is too much?

Most job tasks involve movement and physical effort. The key is identifying when they could lead to injuries. To find out which tasks may cause problems and what to do about them, it's critical to identify contributing factors in the workplace.

Contributing factors

Contributing factors include:

- Awkward postures,
- Repetitive motions,
- Forceful exertions,
- Pressure points (local contact stress),
- Vibration, and
- Environmental factors.

When identifying contributing factors, keep in mind that no one knows exactly:

- How many repetitions are too many,

See **Push**, continued on pg. 6

Push, continued from pg. 5

- What degree of awkward posture is harmful,
- What duration of a task is too long,
- How much force is too much, or
- What the effects are from combinations of these factors.

Since each person has different physical capabilities, the "safe" exposure level may be different for each worker. What is known is that the more time spent performing physically demanding or repetitive tasks, the more likely an injury will occur.

Both the total time per shift and the duration of each period can be factors. A solid 20 minutes of exposure to vibration might be worse than a series of one minute exposures which are spread throughout the shift, even if the total time per shift exceeds 20 minutes.

As repetitive motions, forceful exertions, and other factors increase, so does the recovery time (the length and frequency of muscle relaxation breaks) needed to help reduce fatigue and prevent injury.

The more contributing factors present, the more likely an injury will occur. Contributing factors should be minimized as much as possible. Identifying them requires evaluating each job.

Job analysis

There are many ways to analyze jobs and identify contributing factors. Some methods are relatively simple, and others require detailed analysis and sophisticated equipment. A simple method might involve using checklists, while a more comprehensive method breaks each job down into specific movements like reach and grasp.

Job analysis methods also vary according to the type of work they address. Some focus on workstation design, while others are specific to types of work, like materials handling. Still others focus on the work environment, like lighting and temperature extremes.

Whatever method is used, identifying potential problems is essential to coming up with improvements. Identifying contributing factors can be done in three simple steps:

1. **Look for clues.** Try to identify jobs that may be causing problems by looking around the workplace, talking to employees, and looking for early warning signs.
2. **Prioritize the tasks in each job.** Ask workers how hard the task is, and how often the task is done. This allows you to compare different tasks and prioritize those with the highest risk. Tasks with higher risk should be addressed before looking at tasks with lower risk.
3. **Observe the work.** Each job task may have contributing factors, and injuries can be caused by a combination of factors in multiple tasks. Also, talking to employees who actually perform the work can provide valuable information about how the job might be improved.

This three-step system may not be the best method for evaluating your particular workplace, but it is simple and inexpensive. Different approaches are designed to address specific jobs, tasks, or workstations. If problems seem complicated or widespread, you may need to contact an ergonomics consultant or other expert. ■

Is it *really* an "ergonomic" tool?

As a manager, you are undoubtedly involved with selecting the tools and equipment used by workers. As such, you've probably noticed that some tools are advertised as "ergonomic" or are designed with ergonomic features. That sounds great, but you need to remember that a tool becomes "ergonomic" only when it fits the task workers are performing, and it fits workers without causing awkward postures, harmful contact pressures, or other safety and health risks.

The best tool is one that:

- Fits the job being done,
- Fits the work space available,
- Reduces the force needed to be applied,
- Fits the hand, and
- Can be used in a comfortable work position.

Make sure to evaluate tools and equipment thoroughly before purchasing or allowing workers to use them. Once in use, continue to evaluate the tool and the worker for any ergonomic issues. Use the following checklist to help:

Checklist

Handtools Checklist

General

Yes	No	N/A	
☐	☐	☐	Are heavy tools suspended or counterbalanced in ways to facilitate use?
			Comments:
☐	☐	☐	Are tools powered when necessary and feasible?
			Comments:

Design and selection

Yes	No	N/A	
☐	☐	☐	Does the tool allow adequate visibility of the work?
			Comments:
☐	☐	☐	Does the tool grip/handle prevent slipping during use?
			Comments:
☐	☐	☐	Is the tool equipped with handles of textured, non-conductive material?
			Comments:
☐	☐	☐	Is the tool equipped with large switches that can be operated with all four fingers?
			Comments:
☐	☐	☐	Are different handle sizes available to fit a wide range of hand sizes?
			Comments:
☐	☐	☐	Is the tool handle designed not to dig into the palm of the hand?
			Comments:
☐	☐	☐	Can the tool be used by either hand?
			Comments:
☐	☐	☐	Can the tool be used safely with gloves?
			Comments:
☐	☐	☐	Can the tool be used by either hand?
			Comments:

See **Checklist**, continued on pg. 8

Checklist, continued from pg. 7

Use

Yes	No	N/A	
☐	☐	☐	Is the correct tool being used for the job?
			Comments:
☐	☐	☐	Has the tool been altered by the employee?
			Comments:
☐	☐	☐	Does the tool properly fit the employee's hand?
			Comments:
☐	☐	☐	Is the tool evenly balanced in the employee's hand?
			Comments:
☐	☐	☐	Is the employee using excessive force?
			Comments:
☐	☐	☐	Is the employee repeatedly bending or twisting the wrist?
			Comments:
☐	☐	☐	Is the employee repeatedly exerting pressure on the base of the palm?
			Comments:
☐	☐	☐	Is the employee repeatedly pounding with the base of the palm?
			Comments:
☐	☐	☐	Is the employee using a finger pinch grip?
			Comments:
☐	☐	☐	Does the tool vibrate excessively?
			Comments:
☐	☐	☐	Does the tool cause excessive kickback?
			Comments:
☐	☐	☐	Does the tool become too hot or too cold?
			Comments:
☐	☐	☐	Does the exhaust air blow onto the hands/arms?
			Comments:

Maintenance

Yes	No	N/A	
☐	☐	☐	Is there a preventive maintenance program to keep tools operating as designed?
			Comments:

Training

Yes	No	N/A	
☐	☐	☐	Have employees been trained in the proper use of tools?
			Comments:
☐	☐	☐	Have employees been trained in when and how to report problems with tools?
			Comments:
☐	☐	☐	Have employees been trained in proper tool maintenance?
			Comments:
☐	☐	☐	Have employees been provided with basic information about common musculoskeletal disorders (MSDs) and their signs and symptoms?
			Comments:
☐	☐	☐	Have employees been provided basic information about the kinds of risk factors, jobs, and work activities associated with MSD hazards?
			Comments:
☐	☐	☐	Have employees been provided basic information about how to report MSDs and their signs and symptoms in your workplace?
			Comments:

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ISSN 1090-3445 GST R123-317687 (43005)

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