



Ergonomics Best Practices for Public Employers

The broad category of public employer encompasses 14 manual classifications. Of these, cities, schools and counties have the highest claims frequency and costs. The leading single type of injury in each classification is lumbar back strain. Disorders that result from cumulative wear and tear over relatively long periods of time, such as carpal tunnel syndrome and most back injuries, are called cumulative trauma disorders, or CTDs.

As a public employer, you can reduce these claims with good safety-process management. Commitment from the managers and elected officials is critical to providing proper safety management and preventing claims. In addition, employee involvement and accountability systems are required to ensure a safe, healthy work environment.

The ergonomics process

One effective way to reduce the risk of CTDs such as carpal tunnel syndrome and back injuries is to establish an ergonomics process. Do not regard ergonomics processes as separate from those intended to address other workplace hazards. Aspects of hazard identification, case documentation, assessment of control options and health-care management techniques that are used to address problems, use the same approaches directed toward other workplace safety issues. It is important to realize that you cannot combat cumulative disorders effectively with a quick-fix program. Rather, a long-term process which relies on continuous improvement is the preferred approach to reducing CTDs. Successful programs not only result in reduction of injuries, but they also realize quality and productivity gains.

For an ergonomics process to be successful, it is imperative that management is committed to the process, participates in the process and provides the necessary resources to ensure its success.

Include the following elements as part of effective management commitment:

1. Issue policy statements that:
 - Treat ergonomic efforts as furthering the organization's goal of maintaining and preserving a safe and healthy work environment for all employees;
 - Expect full cooperation of the total work force in working together toward realizing ergonomic improvements;

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- Assign lead roles to designated persons who are known to make things happen;
 - Give ergonomic efforts priority with other cost reduction, productivity and quality assurance activities;
 - Have the support of the local union, if applicable;
2. Hold meetings between employees and supervisors that allow full discussion of the policy and the plans for implementation;
 3. Set concrete goals that address specific operations. Goals give priority to the jobs posing the greatest risk;
 4. Commit resources to:
 - Train the work force to be more aware of ergonomic risk factors for work-related CTDs;
 - Provide detailed instruction to those expected to assume lead roles or serve on special groups to handle various tasks;
 - Bring in outside experts for consultations on start-up activities and difficult issues until you develop in-house expertise;
 - Implement ergonomic improvements as they are required;
 - Provide release time or other compensatory arrangements during the workday for employees expected to handle assigned tasks dealing with ergonomic concerns;
 - Furnish information to all those involved in or affected by the ergonomic activities to be undertaken;
 - Provide evaluative measures to track the results of the ergonomic process to indicate that progress has been made and if plans need to be revised. Reporting results of the process and publicizing notable accomplishments also emphasize the importance of the process and maintain the interest of those involved.

Employee involvement

Promoting worker involvement in efforts to improve workplace conditions is critical to successful ergonomics management. It also has several benefits, including:

- Enhanced worker motivation/job satisfaction;
- Added problem-solving capabilities;
- Greater acceptance of change;
- Greater knowledge of the work and organization.

Task force development

Ergonomic issues typically require a response that cuts across a number of organizational units. An ergonomics task force provides an excellent forum to secure input and cooperation from these units. In addition to management and the work force, secure participation from:

- Engineering personnel;
- Safety personnel;
- Health-care providers;
- Human resources personnel;
- Maintenance;
- Purchasing;
- Ergonomics specialists.

Clearly define the roles and responsibilities of each team member, and determine who will document problems and monitor project progress.

Training

Training is an essential element for any effective safety and health program. Train all employees in the following:

- Recognizing workplace risk factors for CTDs and general methods for controlling them;
- Identifying the signs and symptoms of CTDs that may result from exposure to such risk factors, and the organization's health-care procedures;
- The process the employer uses to address and control risk factors, the employee's role in the process and ways employees can actively participate.

Provide all ergonomic task force members with advanced training in job analysis and control measures, problem identification, and team-building and problem-solving skills.

Best practices from the BWC SafetyGRANT\$ program

The preferred approach to the prevention and control of CTDs is to design the job according to the capabilities and limitations of the work force. Design jobs to minimize CTD risk factors such as high forces, awkward postures and repetitive motions.

The BWC SafetyGRANT\$ program has provided assistance to public employers to help reduce their risk of CTDs in the workplace. As part of the program, BWC has collected samples of job designs other public employers have used to reduce the risk of CTDs in their workplaces.

Participating companies report the effectiveness of the interventions by measuring CTD incidence rates, lost days due to CTDs, restricted days due to CTDs and employee turnover. They also measure the relative risk of injury by completing risk factor assessments for affected tasks. These assessments provide a measure of the relative risk of injury for a specific task.

BWC calculated a return-on investment (ROI). Assumptions include:

- \$29,000 per incident (www.backsafe.com);
- Every dollar saved in injury reduction is available purchasing power to the employer;
- BWC normalized data to calculate the injuries and costs that would occur in an equivalent one-year follow-up period. In this way, direct comparisons could be made between the baseline and follow-up periods;
- BWC did not consider the time value of money in the calculations.

Public employer ergonomic best practices

The following are situations frequently encountered by public employers that can lead to CTDs and demonstrated solutions (best practices) to alleviate those problems.

Situation — video display terminal (VDT) workstations

One of the most common situations that public employers encounter is in the use of VDT workstations. CTD risk factors that can be present in improperly designed or adjusted VDT workstations include:

- Repetitive motion from typing;
- Awkward postures in the wrists;
- Lack of lumbar support in the spine;
- Pressure concentrations on the wrists.

Worker exposure to these risk factors can lead to CTDs, including tendonitis, tenosynovitis, carpal tunnel syndrome and back pain.

Best practice — VDT workstation design

Design and adjust workstation to reduce worker exposure to the risk factors mentioned previously; hence, the risk of work-related CTDs. Position VDT workstations so that:

- The monitor and keyboard are directly in front of the user;
- The monitor is at least 18 inches from the eyes;
- The thighs are nearly parallel with the floor;
- The top of the monitor is at or slightly below eye level;
- The wrists are in a neutral posture (in-line with the forearm);
- The feet are flat on the floor or footrest (if necessary);
- The lumbar curve of the low back is resting against, and supported by, the back of the chair.

Situation — telephone usage

Frequent and/or prolonged telephone usage can result in cradling the telephone handset between the neck and the shoulder. This situation creates neck flexion (bending), which can lead to neck pain.

Best practice — telephone headset

Using telephone headsets can reduce the neck flexion associated with traditional telephones; thus, decreasing the likelihood of neck pain.

BWC has analyzed data on injuries from organizations that received safety grants to redesign office and computer workstations. To date, 14 facilities have reported their baseline (before ergonomic intervention) and follow-up (after ergonomic intervention) data, with an average follow-up period of 270 days. Here's what we have found overall to date:

- The CTD incidence rate decreased from 12.4 to 4.4 CTDs per 200,000 hours worked, a 64-percent improvement;
- The ROI for VDT workstation redesign is 2.9 months;
- The days lost due to CTDs dropped from 45.6 to 8.1 per 200,000 hours worked, an 82-percent improvement;
- The restricted days due to CTDs declined from 16.6 to 0 per 200,000 hours worked, a 100-percent improvement;
- The average risk factor score office tasks was 26.3 before redesigning the workstations and 13.8 after the change, a 48-percent improvement.

Situation — lifting patients (or residents) in health-care settings.

Many public employers operate health-care services such as nursing homes and hospitals. One of the greatest risks to health-care workers stems from manually lifting and moving patients or residents. Manually moving patients results in very high stresses in the spine. These stresses are caused by lifting high weights in awkward postures. Nurses and nurses' aides have among the highest rates of back injuries of any occupational group. There really is no risk-free way to lift or move another person manually.

Best practice — patient-lifting devices

Many powered patient-lifting devices are available that will reduce the forces and awkward postures associated with manually lifting patients. Some devices are on wheels, and employees can use them to mechanically lift and move patients. The advantage of these portable devices is that employees can use them in many locations in a facility. Keep an ample number of these devices in your facility so that they are readily available to the direct care staff.

Another type of patient-lifting device consists of a sling, which attaches to a track in the ceiling. These devices have the advantage of being easy to use and readily available when needed.

Both types of patient-transfer devices can provide increased security for the patient or resident, reduce the staff required to perform these tasks and greatly reduce the risk of musculoskeletal injuries to the staff.

BWC has analyzed data on injuries from health-care facilities that received safety grants to install floor-based patient-lifting devices. To date, 27 health-care facilities have reported their baseline (before ergonomic intervention) and follow-up (after ergonomic intervention) data, with an average follow-up period of 298 days. Here's what we have found overall to date:

- The CTD incidence rate declined from 21.3 to 11.9 CTDs per 200,000 hours worked, a 44-percent improvement;
- The ROI for patient-lifting devices is 2.5 months;
- The days lost due to CTDs dropped from 127.2 to 79 per 200,000 hours worked, a 38-percent improvement;
- The restricted days due to CTDs decreased from 96.6 to 87 per 200,000 hours worked, a 10-percent improvement;
- The employee turnover rate changed from 98.5 to 74.1 per 200,000 hours worked, a 25-percent improvement;
- The average risk factor score for patient lifting tasks was 70 before installing the floor-based patient lifting devices and 30.5 afterward, a 56-percent improvement.

Situation — awkward postures when providing patient care

Residents in public employer nursing homes sometimes sleep in beds that staff place low to the ground to minimize the risk of injury. Although this situation is beneficial to the resident, it can increase the risk of back injury to the staff when they provide care to the resident because it causes extreme trunk flexion (bending) — a risk factor for low back pain. If the bed is equipped with a manual crank adjustment, the direct care staff member must crank the bed to the desired height — a process that requires force and repetitive motion in the hands, wrists, elbows and shoulders. This process also takes time that the employee could use to provide direct care to the resident.

Best practice: hi-lo beds

Beds, which an electric motor can raise and lower, can greatly reduce trunk flexion in these situations. The direct care staff can then provide care to the resident with the trunk in an upright posture. Furthermore, risk of upper extremity CTDs is reduced because employees do not need to manually crank the bed to adjust it.

Eight facilities that put hi-lo beds into place achieved the following:

- The CTD incidence rate decreased from 21.1 to 15 CTDs per 200,000 hours worked, a 29-percent improvement;
- The ROI for the hi-lo beds is 8.5 months;

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- The days lost due to CTDs dropped from 72.7 to 20.1 per 200,000 hours worked, a 72-percent improvement;
 - The restricted days due to CTDs declined from 53.1 to 36.7 per 200,000 hours worked, a 31-percent improvement;
 - The employee turnover rate changed from 71.9 to 65.2 per 200,000 hours worked, a 9-percent improvement;
 - The average risk factor score for patient lifting tasks was 31.6 before using the hi-lo beds and 21.4 after the beds were in use, a 10-percent improvement.

Situation — laundry bins in health-care facilities

When pulling laundry out of laundry bins, health-care employees must often bend deep into the bins. This situation increases the risk of back pain by requiring extreme trunk bending coupled with heavy loads.

Best practice — spring-loaded laundry bins

Purchase bins with spring-loaded bottoms, or retrofit existing bins, to reduce the amount of trunk bending when pulling laundry from bins. As employees pull laundry from the bin, the level raises. The worker can then lift laundry from the bin with minimal trunk bending, and the risk of back injury is reduced.

The average risk factor score for laundry handling tasks in four facilities that used modified laundry bins was 34.7 before using the bins and 24 after the bins were in use, a 40-percent improvement.

Situation — opening and closing school bus doors

School bus drivers must sometimes manually open and close school bus doors. This activity usually requires bending the trunk to the side, reaching for the lever and applying force — often hundreds of times per shift. Shoulder and back injuries can result from these activities.

Best practice — automatic bus door openers

Retrofit buses with automated, pneumatic door openers. The bus driver simply pushes a button (located close to the driver) to open or close the door. These automated door openers eliminate the force and awkward trunk and shoulder postures associated with manually opening the doors. The risk of shoulder and back injuries in bus drivers is greatly reduced by mechanizing this task.

Three school districts that put automated bus doors into place achieved the following results:

- The CTD incidence rate declined from 2.8 to 0.9 CTDs per 200,000 hours worked, a 68-percent improvement;
- The ROI for school bus door openers is .4 months;
- The days lost due to CTDs dropped from 17.6 to 2.3 per 200,000 hours worked, an 87-percent improvement;

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- The restricted days due to CTDs decreased from 17 to 2.8 per 200,000 hours worked, an 84-percent improvement;
 - The average risk factor score for patient lifting tasks was 38.5 before using the automated door openers and 25.5 afterward, a 34-percent improvement.

Situation — raising and lowering basketball backboards

Staff must raise and lower basketball backboards in school gymnasiums as often as once per day. This task usually requires a school staff member to stand on a ladder and manually turn a crank. Awkward shoulder, wrist, elbow and back postures; an unstable standing surface; and high forces in the hand, wrist, elbow, shoulder and back are involved in this task. These factors increase the risk of CTDs.

Best practice — automated backboard winch

Retrofit backboards with a motor that automatically raises and lowers them. An employee can then perform the task in a neutral posture, on a stable standing surface, with minimal force. Hence, the risk of CTD from performing this task is reduced. Also, using these devices can result in a time savings, freeing the staff to perform other tasks.

At one school district, which put in automated backboards, the district maintained zero incidents, lost days and restricted days from CTDs. The risk factor score changed from 23 before getting the backboard winch to 11 afterward, a 52-percent improvement.

Situation — moving gymnasium bleachers

School staff must often push or pull gymnasium bleachers in and out. This task almost always involves extreme trunk bending and high forces, which are risk factors for low back pain.

Best practice — automated bleachers

Retrofit bleachers with motors that automatically push and pull bleachers into place with the push of a button. This eliminates the trunk bending and high forces in the spine of the school staff and greatly reduces the risk of CTD.

At two school districts where they put in automated bleachers, the districts experienced no incidents, lost days or restricted days from CTDs. The average risk factor score changed from 31.5 before automating the bleachers to 2.0 afterward, a 94-percent improvement.

Situation — moving school furniture

Moving furniture in schools often involves repetitive, heavy lifting. Furthermore, the furniture most often is moved long distances, which requires the school staff to hold heavy loads for long periods of time. These factors combine to place stress on the musculoskeletal system, increasing the risk of injury.

Best practice — desk-moving equipment

A variety of dollies can handle the types of furniture frequently found in schools. For example, you can use relatively inexpensive desk dollies to minimize forces on the back associated with lifting and holding these heavy objects.

A public school district that employed the use of desk movers achieved the following results in the custodial staff population:

- The days lost due to CTDs dropped from 27.5 to 20.3 per 200,000 hours worked, a 26-percent improvement;
- The restricted days due to CTDs declined from 23 to 12.7 per 200,000 hours worked, a 45-percent improvement.

Situation — handling equipment and objects during maintenance

Public employers are often faced with maintenance tasks in the field. These tasks could include working on roads, sewers, playgrounds or any public works project. One task that poses a high risk for back injuries is manual lifting. This lifting often involves moving equipment and supplies in and out of truck beds. Even when performed by two people, this type of lifting poses a high risk for back and shoulder injuries due to the repetitiveness, awkward postures and heavy loads.

Best practice — material-handling aids

Equip trucks used during field maintenance tasks with material-handling equipment. Attach hoists that can move equipment and supplies in and out of the beds of trucks mechanically; thus, eliminating the need for workers to lift these items. You also can use the hoists to move heavy sewer grates, which require extreme trunk bending when moved manually.

Twenty locations that put the lifting aids into place achieved the following results:

- The CTD incidence rate dropped from 4 to 1.3 CTDs per 200,000 hours worked, a 67-percent improvement;
- The ROI for lift aids is 2.6 years;
- The days lost due to CTDs plunged from 13.5 to 5.3 per 200,000 hours worked, a 61-percent improvement;
- The restricted days due to CTDs decreased from 15.6 to 14 per 200,000 hours worked, a 10-percent improvement;
- The average risk factor score for lifting tasks was 37.6 before using the lifting aids and 23.5 after the openers were in use, a 37-percent improvement.

Best practice — lift gates

Add lift gates to trucks to eliminate manual lifting of equipment and supplies from the beds. Employees can roll items to the lift gate, and then lower the lift gate to the ground. These devices reduce the spinal forces and the associated risk of injury associated with manually moving equipment.

Two locations that put truck lift gates into place (the average follow-up period was 290 days), saw the following:

- The CTD incidence rate dropped from 20 to 0 CTDs per 200,000 hours worked, a 100-percent improvement;
- The ROI for truck lift gates is five months;
- The days lost due to CTDs plunged from 80.3 to 0 per 200,000 hours worked, a 100-percent improvement;
- The turnover rate due to CTDs decreased from 622 to 73.4 per 200,000 hours worked, an 88-percent improvement;
- The average risk factor score for lifting tasks was 35 before using the lift gates and 28 after using the lift gates, 20-percent improvement).

Situation — jackhammer design

Using jackhammers can expose the user to heavy loads and vibration. Vibration to the hands and arms increases the risk of upper extremity CTDs. In addition, jackhammers are often heavy and create force in the spine during use.

Best practice — jackhammer design

Jackhammers are commercially available that are lighter in weight and designed to reduce the amount of harmful vibration transmitted into the hands and arms. The lower levels of vibration and lighter weights reduce the risk of CTDs in the hand, wrist, arm, shoulder and back.

One public employer that replaced its existing jackhammer with a low-vibration jackhammer reported a reduction in risk factor scores from 67 to 35, a 48-percent improvement.

BWC SafetyGRANT\$ case studies

Can public employers reduce injuries in their workplaces? Yes. Through BWC's SafetyGRANT\$ program, the bureau has collected data on the effectiveness of installing ergonomic interventions in public employers' workplaces. An analysis of data from participating public employers showed that by incorporating ergonomic design into their workplaces, they reduced the CTD lost-days rate by 19 percent after just 200 days (from 36 to 29 days lost per 200,000 employee hours worked).

The following case studies demonstrate that by incorporating ergonomic best practices into the design of tasks and by using good safety management processes, you can reduce the risk of CTDs and other injuries. Ergonomic best practices worked for these employers, and they can work for you, too.

The best practices described above are just a few of the ergonomic interventions that public employers can incorporate. For more information about safety in the workplace or for assistance with your operation, please contact the BWC Division of Safety and Hygiene at 1-800-OHIOBWC, and listen to the options, or visit our Web site at ohiobwc.com.

Champaign County Nursing Home, Urbana

Situation

Champaign County Nursing Home is an employment and training center for adults with mental retardation and developmental disabilities. The employer is concerned with the stresses and strains placed on workers while turning, positioning and giving daily care to the residents. Risk factors include repetitive motion, since the employees perform numerous lifts and transfers throughout the day; awkward postures, since the old Hoyer lifts they use are not very stable or compact; and transferring the residents involves lifting and twisting by the worker.

Solution

Champaign County Nursing Home purchased 32 electric beds. The staff can raise these beds to reduce the need for awkward lifting and make transfers easier. Nurses can lift from a comfortable level, while also keeping the resident safe and comfortable. The employer also purchased an Arjo patient lift with slings and attachments. The lift is battery-powered and is stable and compact so that it can fit into tight places.

Results

- Champaign County Nursing Home was awarded \$40,000 from BWC SafetyGRANT\$ for the Arjo lift and electric beds. The project cost approximately \$59,000.
- Champaign Nursing Home believes it has reduced many of the risk factors related to transferring patients from their beds because staff can position the beds to reduce bending and allow the patient to always be lowered.
- CTDs rates have fallen from 16 CTDs per 200,000 hours worked (before the interventions) to 0 CTDs in seven months since the intervention.
- The lost days rate due to CTDs fell from 289 per 200,000 hours worked (before the interventions) to 0 lost days in seven months since the intervention.
- Champaign Nursing Home believes the reduction in time spent cranking beds has led to greater productivity.

Crestwood Local School District, Mantua

Situation

Crestwood Local School has bleachers that are self-supporting only when pulled out. When pushed in, they can easily bend. When bent, they become very difficult to push in and out. To fix the bleachers requires that a custodian crawl underneath them in an awkward position and work on them. The nine-year-old bleachers are in disrepair. Pulling and pushing the bleachers requires trunk flexion and high forces. These factors are associated with an increased risk of shoulder and back injuries. The school district has had one acute injury, a custodian suffered a contusion when repairing the bleachers from underneath.

Solution

Crestwood Local School repaired, braced and motorized the bleachers at the high school and middle school. These motorized bleachers eliminate the risk factors associated with pushing and pulling the bleachers.

Results

- Total cost of intervention: \$41,080 (BWC contribution was \$32,864.32).
- Risk factor score fell from 29 (before motorizing bleachers) to four (after motorizing bleachers), indicating a reduction in the risk of injury.
- The employer maintained zero CTDs, lost days and restricted days.
- The following is the text of a letter sent to a Crestwood administrator:

9-28-00

Dear Terri:

We would like to thank you on behalf of all of us at the middle school for all your hard work in making our motorized bleachers a reality. You and your committee are lifesavers. You will never know how much we appreciate it. Our backs, knees and other body parts are forever in your debt. Please feel free to come visit us anytime. We will be happy to offer you a free demonstration.

Our heartfelt thanks,

The middle school custodians
Rick, Jerry, Linda and Jackie

City of Mansfield

Situation

The city of Mansfield's public works division is made up of several departments, many of which have tasks requiring heavy, manual labor, such as lifting, turning large valves, operating jackhammers, and manipulating cumbersome objects and equipment. CTD risk factors that workers were exposed to included vibration, forces in the spine, awkward postures and repetitive motion.

Solution

The city of Mansfield purchased equipment to reduce CTD risk factors, such as cranes, low-vibration jackhammers, lift gates for trucks and winches.

The large cranes prevent employees from having to lift and maneuver large awkward objects like sewer grates. The small cranes assist with the lifting of smaller items. The cable winch is attached to large items in unreachable places, so that they may be moved onto the tailgate lift for loading. The jackhammers purchased are lighter weight and result in less exposure to vibration.

Results

- The cost of all interventions was \$58,024 (BWC contributed \$40,000).
- Jobs that often required two or more people because of heavy lifting now only take one person, freeing workers to perform other tasks.
- Worker exposure to risk factors was reduced in every intervention case.
- After six months, the CTD injury rate for repair personnel dropped from 49.8 CTDs per 200,000 hours to 0.
- After six months, the CTD injury rate for the maintenance personnel plunged from 461.9 CTDs per 200,000 hours to 0.