Ergonomics can be defined simply as “the study of work.” Specifically though, ergonomics is the science of designing the job to fit the worker, rather than physically forcing the worker’s body to fit the job. Adapting tasks, work stations, tools, and equipment to fit the worker can help reduce physical stress on a worker’s body and eliminate many potentially serious, disabling work-related musculoskeletal disorders (MSDs).

MSDs are injuries and disorders of the soft tissues (muscles, tendons, ligaments, joints, and cartilage) and nervous system. They can affect nearly all tissues, including the nerves and tendon sheaths, and most frequently involve the arms and back. Occupational safety and health professionals have called these disorders a variety of names, including cumulative trauma disorders, repeated trauma, repetitive stress injuries, and occupational overexertion syndrome.

These painful and often disabling injuries generally develop gradually over weeks, months, and years. MSDs usually result from exposure to multiple risk factors that can cause or exacerbate the disorders, and NOT from a single event or trauma such as a fall, collision, or entanglement. Frequently, workers must lose time from work to recover; some never regain full health. MSDs can cause a number of conditions, including:

- Pain
- Numbness
- Tingling
- Stiff joints
- Difficulty moving
- Muscle loss
- Paralysis

When there is a mismatch between the physical requirements of the job and the physical capacity of the worker, work-related MSDs can result. Examples of MSDs include:

- Carpal tunnel syndrome
- Tendinitis
- Rotator cuff injuries (a shoulder problem)
- Epicondylitis (an elbow problem)
- Trigger finger
- Muscle strains and low back injuries
Ergonomics is also the practice of designing equipment and work tasks to conform to the capability of the worker. It provides a means for adjusting the work environment and work practices to prevent injuries before they occur.

Healthcare facilities have been identified as an environment where ergonomic stressors exist. The particular duties of Central Sterile Supply Department put workers at risk of various injuries. The potential ergonomic hazards are MSDs and repetitive stress injuries at the shoulder, elbow, and small joints of the hands. Surgical instrument sets can be heavy, bulky and difficult to lift properly, so muscle strains are possible. Physiological hazards can occur with the repetitive motions of instrument assembly and wrapping items for sterilization. For example, these motions can cause carpal tunnel syndrome of the wrist. Extended periods of standing or bending can cause muscle fatigue and strain.

**Risk Factors**
The risk of MSD injury depends on work positions and postures, how often the task is performed, the level of required effort and how long the task lasts. Risk factors that might lead to the development of MSDs include:

- **Exerting excessive force.** Examples include lifting heavy objects or people, pushing or pulling heavy loads, manually pouring materials, or maintaining control of equipment or tools.
- **Performing the same or similar tasks repetitively.** Performing the same motion or series of motions continually or frequently for an extended period of time.
- **Working in awkward postures or being in the same posture for long periods of time.** Using positions that place stress on the body, such as prolonged or repetitive reaching above shoulder height, kneeling, squatting, leaning over a counter, using a tool with wrists bent, or twisting the torso while lifting.
- **Localized pressure into the body part.** Pressing the body or part of the body (such as the hand) against hard or sharp edges, or using the hand as a hammer.
- **Cold temperatures** in combination with any one of the above risk factors might also increase the potential for MSDs to develop.
- **Combined exposure to several risk factors** might place workers at a higher risk for MSDs than does exposure to any one risk factor.

In addition, observe whether workers are:

- Modifying their tools, equipment, or work area
- Shaking their arms and hands
- Rolling their shoulders
- Bringing products such as back belts or wrist braces into the workplace

These behaviors can mean that workers are experiencing ergonomic issues. Talk with them and review their work to see if any risk factors for MSDs are present. Workers can identify and provide important information about hazards in their workplaces. Suggestions for change also are valuable.

Once problem jobs are identified, conducting an in-depth ergonomic job analysis can help identify solutions to prevent MSDs. An ergonomic job hazard analysis is a technique that focuses
on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment.

**Possible Solutions**

OSHA's OSH Act of 1970 strives to "assure safe and healthful working conditions for working men and women..." and mandates that "each employer shall furnish to each of his/her employers employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his/her employees."

OSHA recommends that employers identify and address ergonomic stressors in their facility's safety and health plan.

**Potential Hazard**

CSSD staff can be exposed to MSD from repetitive, prolonged, reaching, when sorting sterilized packages or lifting above shoulder height to reach high shelves of equipment or when pushing and pulling heavy carts full of dirty or clean items. Static postures might occur from continuously standing in one position while sorting instruments. Contact trauma to forearm area can occur if employee rests wrists on hard sharp counter surfaces when sorting.

Possible Solutions

- Redesign workstations so packaging and equipment can be reached while maintaining the elbows in close to the body
- Use carts with large, low rolling, low resistance wheels, that can easily roll over mixed flooring as well as gaps between elevators and hallways
- Minimize prolonged overhead activity (e.g., lower stacking shelves to shoulder height)
- Use height-adjustable work surfaces or lift tables to minimize head tilt
- Rotate workers through repetitive tasks
- Pad the edge of work surfaces which come into contact with the elbow or forearm which could cause contact trauma
- Provide sit/stand stools at work stations
- Use anti-fatigue mats
- Use shoes with well-cushioned insteps and soles where floor mats cannot be used
- Provide a foot rest bar so employees can continually alter their posture by raising one foot.
Awkward Postures

Awkward postures occur with twisted, hyper-extended, or flexed back positions. They are unsafe back postures.

Potential Hazard
Increased potential for employee injury exists when awkward postures are used when handling or lifting patients/residents. Awkward postures include:

- Bending while lifting (Figure 5) forces the back to support the weight of the upper body in addition to the weight you are lifting. Bending while lifting places strain on the back even when lifting something as light as a screwdriver.
- Bending moves the load away from the body and allows leverage to significantly increase the effective load on the back. This increases the stress on the lower spine and fatigues the muscles.
- Reaching moves the load away from the back, increases the effective load, and places considerable strain on the shoulders.
- Carrying loads on one shoulder, under an arm, or in one hand, creates uneven pressure on the spine.
- Poor housekeeping limits proper access to objects being lifted, and forces awkward postures.

Possible Solutions:

- Move items close to your body and use your legs when lifting an item from a low location.
- Store and place materials that need to be manually lifted and transported at "power zone" height, about mid-thigh to mid-chest.
- Minimize bending and reaching by placing heavy objects on shelves, tables, or racks. For example, place heavy equipment on pallets to raise them into the power zone.
- Avoid twisting, especially when bending forward while lifting. Turn by moving the feet rather than twisting the torso.
- Keep your elbows close to your body and keep the load as close to your body as possible.
- Keep the vertical distance of lifts between mid-thigh and shoulder height. Do not start a lift below mid-thigh height nor end the lift above shoulder height. Lifting from below waist height puts stress on legs, knees, and back. Lifting above shoulder height puts stress on the upper back, shoulders, and arms.
Other Ergonomic Hazards

Potential Hazard
Employee exposure to ergonomic stressors in healthcare workplaces occurs **NOT** only during patient/residents handling tasks but while performing other tasks as well in the kitchen, laundry, engineering, and housekeeping areas of facilities. They might occur during:

- Transporting of equipment
- Moving food carts or other heavy carts
- Pouring liquids out of heavy pots or containers
- Reaching into deep sinks or containers
- Using hand tools
- Housekeeping tasks

Possible Solutions
Use engineering or work practice techniques to eliminate the hazard or decrease the hazard for example:

Transferring Equipment:
Strains and sprains can occur if employee is transferring equipment like IV poles, wheelchairs, oxygen canisters, respiratory equipment, dialysis equipment, x-ray machines, or multiple items at the same time. To reduce the hazards of transferring equipment:

- Place equipment on a rolling device if possible to allow for easier transport, or have wheels attached to the equipment
- Push rather than pull equipment when possible. Keep arms close to your body and push with your whole body not just your arms
- Assure that passageways are unobstructed
- Attach handles to equipment to help with the transfer process
- Get help moving heavy or bulky equipment or equipment that you can't see over
- Don't transport multiple items alone for example if moving a patient/residents in a wheelchair as well as an IV pole and/or other equipment get help, don't overexert yourself
• Reaching into deep sinks or containers: If washing dishes, laundry, or working in maintenance areas and using a deep sink, limit excessive reaching and back flexion by:
  o Placing an object such as a plastic basin in the bottom of the sink to raise the surface up while washing items in the sink
  o Remove objects to be washed into a smaller container on the counter for scrubbing or soaking and then replace back in the sink for final rinse

Handling Bags
Limit reaching or lifting hazards when lifting trash, laundry or other kinds of bags by:
• Using handling bags for laundry, garbage, and housekeeping when possible that have side openings to allow for easy disposal without reaching into and pulling bags up and out. The bags should be able to slide off the cart without lifting.
• Limiting the size and weight of these bags and provide handles to further decrease lifting hazards
• Using garbage cans that have a frame vs. a solid can to prevent plastic bags from sticking to the inside of the can or use products that stick to the inside of the garbage can that prevent the bag from sticking
• Limit the size of the container to limit the weight of the load employee must lift and dump.
• Place receptacles in unobstructed and easy to reach places
Spring Loaded Platform

- Installing chutes and dumpsters at or below grade level
- Using spring-loaded platforms to help lift items such as laundry keeping work at a comfortable uniform level
- Limit reaching and pushing hazards from moving heavy dietary, laundry, housekeeping or other carts by:
  - Keeping carts, hampers, gurneys, or other carts well maintained to minimize the amount of force exerted while using these items
  - Using carts with large, low rolling resistance wheels. These can usually roll easily over mixed flooring as well as gaps between elevators and hallways
  - Keeping handles of devices to be pushed at waist to chest height
  - Using handles to move carts rather than the side of the cart to prevent the accidental smashing of hands and fingers

Keeping floors clean and well maintained
- Pushing rather than pulling whenever possible
- Removing from use all malfunctioning carts
- Getting help with heavy or bulky loads

Using Hand Tools in maintenance areas:
Limit strains and sprains of the wrists, arms, and shoulders, of maintenance workers by choosing hand tools carefully hand tools should:

- Be properly designed, and fit to the user
- Have padded non-slip handles
- Allow the wrist to remain straight while doing finger intensive tasks. Select ergonomic tools such as ergonomic knives or bent-handled pliers

- Have minimal vibration or use vibration dampening devices and vibration-dampening gloves
- Use trigger bars rather than single finger triggers Not be used when performing highly repetitive manual motions by hand, use power tools (e.g., use power screwdrivers instead of manual screwdrivers)

**Housekeeping Tasks:**
To decrease ergonomic stressors when employees are performing cleaning tasks employees should:

- Alternate leading hand.
- Avoid tight and static grip and use padded non-slip handles.
- Clean objects at waist level if possible, rather than bending over them (e.g., push wheelchairs up a ramped platform to perform cleaning work, raise beds to waist level before cleaning).
- Use knee pads when kneeling
- Use tools with extended handles, or use step stools or ladders to avoid or limit overhead reaching
- When sweeping or dusting use flat head dusters and push with the leading edge; sweep all areas into one pile and pick up with a vacuum
- Use chemical cleaners and soaks to minimize force needed for scrubbing
- Frequently change mopping styles when mopping (e.g., push/pull, figure 8, rocking side to side) to alternate stress on muscles
- Be sure buckets, vacuums, and other cleaning tools, have wheels or are on wheeled containers with functional brakes
- Alternate tasks or rotate employees through stressful tasks
- Avoid awkward postures while cleaning (e.g. twisting, bending)
- Use carts to transport supplies rather than carrying
- Use buffers and vacuums that have lightweight construction and adjustable handle heights
- Use spray bottles and equipment that have trigger bars rather than single finger triggers

**Slips/Trips/Falls**
Statistics show that the majority (66%) of falls happen on the same level resulting from slips and trips. The remaining 34% are falls from a height.

**Slips**
Slips happen where there is too little friction or traction between the footwear and the walking surface. Common causes of slips are:
- Wet or oily surfaces
- Occasional spills
- Weather hazards
- Loose, unanchored rugs or mats
- Flooring or other walking surfaces that do not have same degree of traction in all areas

**Trips**
Trips happen when your foot collides (strikes, hits) an object causing you to lose the balance and, eventually fall. Common causes of tripping are:
- Obstructed view
- Poor lighting
- Clutter in your way
- Wrinkled carpeting
- Uncovered cables
- Bottom drawers not being closed
- Uneven (steps, thresholds) walking surfaces

**How to prevent falls due to slips and trips?**
Both slips and trips result from some a kind of unintended or unexpected change in the contact between the feet and the ground or walking surface. This shows that good housekeeping, quality of walking surfaces (flooring), selection of proper footwear, and appropriate pace of walking are critical for preventing fall accidents.

**Housekeeping**
Good housekeeping is the first and the most important (fundamental) level of preventing falls due to slips and trips. It includes:
- Cleaning all spills immediately
- Marking spills and wet areas
- Mopping or sweeping debris from floors
• Removing obstacles from walkways and always keeping them free of clutter
• Securing (tacking, taping, etc.) mats, rugs, and carpets that do not lay flat
• Always closing file cabinet or storage drawers
• Covering cables that cross walkways
• Keeping working areas and walkways well lit
• Replacing used light bulbs and faulty switches

Without good housekeeping practices, any other preventive measures such as installation of sophisticated flooring, specialty footwear or training on techniques of walking and safe falling will NEVER be fully effective.

Flooring
Changing or modifying walking surfaces is the next level of preventing slip and trips. Recoating or replacing floors, installing mats, pressure-sensitive abrasive strips or abrasive-filled paint-on coating and metal or synthetic decking can further improve safety and reduce risk of falling. However, it is critical to remember that high-tech flooring requires good housekeeping as much as any other flooring. In addition, resilient, non-slippery flooring prevents or reduces foot fatigue and contributes to slip prevention measures.

Footwear
In workplaces where floors might be oily or wet or where workers spend considerable time outdoors, prevention of fall accidents should focus on selecting proper footwear. Since there is no footwear with anti-slip properties for every condition, consultation with manufacturers’ is highly recommended. Properly fitting footwear increases comfort and prevents fatigue which, in turn, improves safety for the employee.

Encouraging and Utilizing Early Reports of Injury
Comprehensive injury reporting is important to the success of an ergonomic process. The goal of this effort is to properly assess, diagnose, and treat MSDs. Early reporting, diagnosis, and intervention can limit injury severity, improve the effectiveness of treatment, minimize the likelihood of disability or permanent damage, and reduce workers compensation claims. This then allows the employer to correctly identify work areas or specific tasks where injuries frequently occur or are most severe. This information helps direct the activities of the ergonomic team as well as to guide healthcare providers in making return-to-work and light-duty work decisions. OSHA’s injury and illness recording and reporting regulation (29 CFR Part 1904) require employers to record and report work-related fatalities, injuries and illnesses.

Encouraging and utilizing reports of symptoms of MSDs:
• Reinforces worker training on recognizing MSD symptoms
• Encourages early reporting of MSD symptoms
• Allows for prompt medical evaluations for diagnosis, treatment and follow-up care
• Reduces injury severity, the number of workers' compensation claims and associated costs and the likelihood of permanent disability
• Provides guidance on return-to-work and work placement restrictions during the healing process
• Guides job modifications
• Provides a mechanism to track and trend MSD injuries
• Enables assessment of the effectiveness of work changes

Healthcare professionals are important ergonomic team members. They help injured workers recover more quickly and return to their jobs with appropriate restrictions and less risk for re-injury. It is necessary that these professionals are knowledgeable about the operations and work practices within the specific industry. Their knowledge will allow them to assist the injured worker during the healing process and in post-injury work placement.

References

