Cumulative Trauma Disorders (CTD) of the Upper Extremities

Cumulative Trauma Disorders are a class of musculoskeletal disorders involving damage to muscles, tendons, ligaments, nerves, and circulatory system. These disorders can develop as a result of chronic exposure of a particular body part to repeated biomechanical stress (i.e., working in awkward postures), which by cumulative effect produces a debilitating physical condition. In the workplace, the upper extremities, the fingers, elbows, upper arms, shoulders, and neck are particularly susceptible to CTD.

Cumulative Trauma Disorders can result in extensive pain and disability for injured employees. The types of activities which affect the occurrence of disorders of this type can also cause inefficiency and result in decreased productivity and quality. Additionally, these disorders can result in lost work time and become a major cost, both direct and indirect, to your organization.

Stressful Job Task Characteristics
Some examples of stressful job tasks characteristics for the upper extremities are:
• working with bent wrists (forward, backward, or side to side).
• using the hand or wrist to strike or pound.
• working with bent wrists in combination with forceful grips when using hand tools, lifting, carrying.
• working in an “elbows out” position.
• resting elbows on hard or sharp surfaces.
• repeated or forceful use of pinch grips, and power grips with bent wrists.
• use of improperly fitting gloves or gloves with slippery surfaces (gloves increase the force required to perform tasks because they are slippery, thick, stiff, or fit poorly or cover more of the hand than necessary).
• repeated and forceful motions without rest, e.g., continuous computer work, or fine manipulations of tweezers, pliers, or other tools.
• excessive exposure to vibration from hand tools or equipment.

Reducing these exposures greatly reduces the chance of developing cumulative trauma disorders.

Description of Common Cumulative Trauma Disorders
There are three basic types of disorders to the upper extremities: tendon disorders, nerve compression disorders and neurovascular disorders.

I. Tendon Disorders
Tendons are “pulleys” that attach muscles to bones. Tendons transfer forces and movements from muscles to bones to help move hands, arms, and other parts of the body. Tendon disorders often occur at or near the joints where the tendons rub nearby ligaments and bones. Symptoms include a dull aching sensation over the tendon, discomfort with specific movements, and tenderness to touch.
Types
Tenosynovitis - This is a general term for a swollen or a painful tendon (synovial) sheath from repetitive overuse. With extreme repetition, the tendon sheaths are stimulated to produce excess lubricating (synovial) fluid. This excess fluid accumulates and the tendon sheath becomes swollen and painful. Eventually, the amount of lubricating fluid produced by the tendon sheath decreases to below normal levels leading to increased friction between the tendon and its sheath.

DeQuervains Disease - Named after the French physician who first described it as a stenosing tenosynovitis (progressive constriction of the tendon sheath). This disorder affects the tendons on the side of the wrist and at the base of the thumbs. It is attributed to excessive friction between two thumb tendons and their common sheath. A common cause can be overuse of the computer mouse.

Trigger finger - This occurs when the tendon sheath of a finger is sufficiently swollen so that the tendon becomes locked in the sheath. Attempts to move that finger causes a snapping and jerking movement. Using a tool that only requires one finger activation can increase the occurrence of trigger finger.

Ganglionic Cysts - This disorder is caused by a swelling of the tendon sheath from lubricating (synovial) fluid causing a bump under the skin. The bump under the skin may occur in many areas of the body but it commonly occurs on the back of the wrist. Ganglionic Cysts are associated with activities involving repetitive forceful motions with wrist extension (i.e., wrist bent up).

II. Nerve Compression Disorders
Nerve Compression Disorders occur when repeated or sustained work activities expose the nerves to pressure from hard, sharp edges of the work surface, tools, or nearby bones, ligaments, and tendons. Symptoms include numbness, tingling, and pain.

Types:
Carpal Tunnel Syndrome - Disorder of the wrist caused by entrapment or compression of the median nerve where it passes through the narrow portion (carpal tunnel) of the wrists. Numbness is a common symptom and is usually felt in the first three fingers and at the base of the thumb and is most acute while sleeping. Advanced cases include a wasting of the (thenar) muscles at the base of the thumb. High force, repetition, and awkward wrist positions are some of the occupational risk factors associated with the development of carpal tunnel syndrome.

Cubital Tunnel Syndrome - Usually occurs when a seated worker supports their arm and shoulder on a hard edge of a work bench. Numbness and tingling occur below the little finger due to compression of the ulnar nerve in the elbow (similar to the sensation produced when a person bumps their “funny bone”).

III. Neurovascular disorders
Some Cumulative Trauma Disorders involve both the nerves and adjacent blood vessels and are due to compression of these structures.

Types:
Thoracic outlet syndrome - This is a general term for compression of the nerves and blood vessels between the neck and shoulder. Symptoms include numbness and tingling in the fingers and hand. Stressful job characteristics that can increase the chances of development of this disorder are working above shoulder level, and sitting in static postures without rest breaks or movement.
Vibration syndrome - This is also referred to as “white finger” or Raynaud’s phenomenon. Closure of the hand arteries occur due to repeated or prolonged exposure to the use of vibrating tools, such as power grinders, pneumatic hammers, and chain saws. Exposure to cold may cause spasm in the fingers. Symptoms include pale or white tissue (blanching), pain, numbness, and reduced sensory, motor or autonomic function.

As this bulletin may not be sufficient to cover all your Cumulative Trauma Disorder’s concerns and information needs, contact your local Fireman’s Fund Loss Control Office which can provide further assistance.