

Healthy Steps for Prevention of Carpal Tunnel Syndrome

Carpal Tunnel Syndrome (CTS) is a repetitive motion disorder. Repetitive motion and cumulative trauma disorders are disorders of the musculoskeletal and nervous systems. These disorders may be caused or aggravated by repetitive motions, forceful exertions, vibration, mechanical compression (using tools with hard and sharp edges on their handles), sustained or awkward postures, or exposure to noise over extended periods of time.

These disorders can affect nearly all tissues – the nerves, tendons, tendon sheaths, and muscles – with the upper extremities being the most frequently affected. These painful and sometimes crippling injuries develop gradually over periods of weeks, months, and years, and result from repeated actions such as twisting and bending the hands, arms, and wrists. A common risk factor for developing these disorders is the use of force combined with repetitive motion over time.

The most common occupational diseases associated with repetitive motion are tendon disorders such as tendonitis, tenosynovitis, De Quervain's disease, trigger finger, Raynaud's syndrome, and carpal tunnel syndrome.

Tendon disorders are very common and often occur at or near the joints where the tendons rub against ligaments and bones. The most frequently noted symptoms of tendon disorders are 1) a dull aching sensation over the tendon, 2) discomfort with specific movements, and 3) tenderness to touch. Recovery is usually slow, and the condition may easily become chronic if the cause is not eliminated.

Carpal tunnel syndrome (CTS) is the compression and entrapment of the median nerve where it passes through the wrist into the hand – in the carpal tunnel. The median nerve is the main nerve that extends down the arm to the hand and provides the sense of touch in the thumb, index finger, middle finger, and half of the fourth (or ring) finger. When irritated, tendons housed inside the narrow carpal tunnel swell and press against the nearby median nerve. The pressure causes tingling, numbness, or severe pain in the wrist and hand; this pain is often felt at night. Also, the internal pressure results in a lack of strength in the hand and an inability to make a fist, hold objects, or perform other manual tasks. If the pressure continues, it can damage the nerve, causing permanent loss of sensation and even partial paralysis.

CTS develops in the hands and wrists from repetitive and/or forceful manual tasks performed over a period of time. For example, the meatpacking industry is considered one of the most hazardous industries in the United States because workers can make as many as 10,000 repetitive motions per day in assembly line processes (such as deboning meats) with no variation in motion. Consequently, stress and strain are placed on the wrists and hands, which can result in CTS.

CTS affects workers in many fields. It is common among draftsmen, meatcutters, secretaries, musicians, assembly-line workers, computer users, automotive repair workers, and many others. CTS can be treated with steroids, anti-inflammatories, physical therapy, or with surgery to loosen the transverse carpal ligament. Recovery of wrist and hand function is often, but not always, complete.

CAUSES

Like many skeletomuscular disorders, CTS has a variety of causes. It is often the result of a combination of factors, such as

- **Genetic predisposition.** Certain people are more likely than others to get CTS. The amount of natural lubrication of the flexor tendons varies from person to person. The less lubrication, the more likely a person is to develop CTS. One study has related the cross-sectional shape of the wrist and the associated geometry of the carpal tunnel to CTS. Certain tunnel geometries are more susceptible to tendon irritation.
- **Health and lifestyle.** People with diabetes, gout, and rheumatoid arthritis are more prone than others to develop CTS, as are those experiencing the hormonal changes related to pregnancy, menopause, and the use of birth control pills. Job stress has also been linked to an increased likelihood of CTS. CTS seems to be more frequent among alcoholics.
- **Repetitive motion.** The most common cause of CTS that's been attributed to the workplace is repetitive motion. When you flex your hand or fingers, the flexor tendons rub against the walls of the carpal tunnel. If you allow your hand time to recover, this rubbing is not likely to lead to irritation. The amount of recovery time you need varies from fractions of a second to minutes, depending on many factors: 1) the genetic and health factors mentioned above, 2) the intensity of the flexing, 3) the weight of any objects in your hand, and 4) the extent to which you bend your wrist during flexing.
- **Trauma.** A blow to the wrist or forearm can make the tendons swell; this may cause or encourage the onset of CTS.

PREVENTION

Computer keyboard users can take several steps to lower their chances of developing CTS. Some of these center around the configuration of the workplace, or "ergonomics." Others have to do with human factors.

- **Ergonomics.** Proper seating is crucial to good ergonomics. The height of your seat and the position of your backrest should be adjustable. The chair should be on wheels so you can move it easily. Arm rests on the chair, though optional, are often helpful.
- **Table height.** To adjust the chair properly, look first at the height of the table or desk surface on which your keyboard rests. On average, a height of 27-29 inches above the floor is recommended. Taller people will prefer slightly higher tables than do shorter people. If you

can adjust your table, set your **waist angle** (see bulleted list below) at 90 degrees, then adjust your table so that your elbow makes a 90 degree angle when your hands are on the keyboard.

- **Wrist angle.** If your keyboard is positioned properly, your wrists should be able to rest comfortably on the table in front of the keyboard. Some keyboards are so "thick" that they require you to bend your hands uncomfortably upward to reach the keys. If so, it will help to place a raised wrist rest on the table in front of the keyboard. A keyboard that requires you to bend your wrists is a common cause of CTS among computer users.
- **Elbow angle.** With your hands resting comfortably at the keyboard and your upper arms vertical, measure the angle between your forearm and your upper arm (the elbow angle). If it is less than 90 degrees, raise the seat of your chair. If the angle is greater than 90 degrees, lower the seat. Try to hold your elbows close to your sides to help minimize "ulnar displacement" – the sideways bending of the wrist (as when reaching for the "Z" key).
- **Waist angle.** With your elbow angle at 90 degrees, measure the angle between your upper legs and your spine (the waist angle). This too should be about 90 degrees. If it is less than 90 degrees, your chair may be too low (and your knees too high). You may need to alter the position of the backrest or adjust your own posture (nothing provides better support than sitting up straight). (Note: If making your waist angle 90 degrees changes your elbow angle, you may need to readjust the height of your chair or table.)
- **Feet.** With your elbows and waist at 90 degree angles, your feet should rest comfortably flat on the floor. If they don't, adjust your chair and table height and repeat the steps above. If your table isn't adjustable and your feet don't comfortably reach the floor, a raised footrest can help. Otherwise, you may need a different table.

WORK ROUTINE

You need very little recovery time between keystrokes to cool and lubricate the flexor tendons. If you type constantly, however, the need for recovery builds. Further, working with your hands bent upward at the wrists or frequently bending your wrists sideways heightens the friction within the carpal tunnel. It takes longer to recover from these motions. Working under stress (deadline pressure, anger, or other anxiety) can make matters even worse.

Many studies recommend a 10-15 minute break each hour to give yourself the recovery time you need. This needn't be a break from productive activities, just a break from your keyboard.

Exercises can help, too. Try the following:

- a) Make tight fists, hold for one second, then stretch your fingers out wide and hold for five seconds. Repeat several times.
- b) With arms outstretched in front of you, raise and lower your hands several times. Rotate your hands ten times (make circles in the air with the fingertips).

Variety is the key. CTS occurs most frequently in workers whose motions are not only repetitious but are kept up for hours at a time. If you use a keyboard, structure your workdays to include a mix of activities each hour. For example, instead of typing all morning and filing all afternoon, mix typing and filing throughout the day.

EARLY DETECTION

The most painful cases of CTS are those that have gone undetected or untreated over a long time. CTS can be caught easily in its early stages, however, and much of the pain and all of the disability can be avoided.

Early symptoms include a tingling in the fingers, often beginning several hours after work activity has stopped. Because of this delay in the appearance of symptoms, many CTS sufferers don't make the connection between their work activities and the pain they feel until it's too late. Over time, the tingling can lead to stiffness and numbness in the fingers and hand and then to severe wrist and hand pain.

For many individuals, the early symptoms of CTS go unnoticed. Employers and co-workers can help one another identify the onset of CTS by watching for and pointing out any unconscious shaking of the hands, rubbing of the wrists, or unusual postures or hand positions at the keyboard.

At the first sign of CTS, you should be examined by a doctor who specializes in hand and wrist disorders. The doctor can perform a number of simple tests to detect CTS and can prescribe specific steps for avoiding the problem.

The following 10 questions can help you decide on what will be a good ergonomic design for your situation:

1. How will the computer be used?

- **Who will be using the computer?** If the computer will only be used by one person then the arrangement can be optimized for that person's size and shape; features such as an adjustable-height chair may be unnecessary. If the computer will be used by several people, you need to create an arrangement that most closely satisfies the needs of the extremes (that is, the smallest and tallest, thinnest and broadest persons) as well as those in between these extremes.
- **How long will people be using the computer?** If it's only a few minutes a day, then ergonomic issues may not be a high priority. If it's more than 1 hour per day, it is advisable that you create an ergonomic arrangement. If it's more than 4 hours, then you should immediately implement an ergonomic arrangement.

2. What kind of computer will be used?

- **Desktops.** Most ergonomic guidelines for computer workstation arrangements assume that you will be using a **desktop system** where the computer screen is separate from the keyboard.
- **Laptop computers** are growing in popularity and are great for short periods of computer work. Guidelines for laptop use are more difficult because laptop design inherently is problematic – when the screen is at a comfortable height and distance the keyboard isn't and vice versa. For sustained use, you should consider purchasing:

- an external monitor and an external keyboard (preferably a keyboard with a negative-tilt tray)

or

- a docking station; then arrange your workspace to create a good workstation layout.

3. **What furniture will you use?** Make sure that the computer (monitor, CPU system unit, keyboard, mouse) are placed on a stable working surface (nothing that wobbles) with adequate room for proper arrangement. If this work surface is going to be used for writing on paper as well as computer, you need a flat surface that is between 28-30 inches above the floor (suitable for most adults). You should consider attaching a **keyboard/mouse tray system** to your work surface. Choose a system that is height adjustable, that allows you to tilt the keyboard down away from you slightly for better wrist posture, and that allows you to use the mouse with your upper arms relaxed and as close to the body as possible and with your wrist in a comfortable and neutral position.

4. **What chair will be used?** Choose a comfortable chair for the user to sit in. If only one person is using it, the chair can even be at a fixed height, providing that it is comfortable to sit on and has a good backrest that provides **lumbar support**. If more than one person will be using the computer, consider buying a chair with several ergonomic features. Studies show that the best seated posture is a reclined posture of 100-110 degrees – NOT the upright 90 degree posture that is often portrayed. In the recommended posture, the chair starts to work for the body, and there are significant decreases in postural muscle activity and in intervertebral disc pressure in the lumbar spine. Erect sitting is NOT relaxed, sustainable sitting – reclined sitting is.

5. **What kind of work will the computer be used for?** Try to anticipate what type of software will be used most often.

- **Word processing** - arranging the best keyboard/mouse position is high priority.
- **Surfing the net, graphic design** - arranging the best mouse position is high priority.
- **Data entry**- arranging the best numeric keypad/keyboard is a high priority.
- **Games** - arranging the best keyboard/mouse/game pad is a high priority.

6. **What can you see?** Both your documents and the computer monitor should be positioned for easy viewing.

In positioning documents:

- Make sure that any paper documents that you are reading are placed as close to the computer monitor as possible and that these are at a similar angle - use a document holder where possible.
- Use a document holder that can be comfortably seen. There are three different ways to arrange a document holder:
 1. Use an in-line document holder that a) sits between the keyboard/keyboard tray and screen and b) is aligned with your body midline. All you have to do is look down to see the documents and raise your eyes to see the screen.
 2. Use a screen-mounted document holder; position this on the same side of your screen as your dominant eye
 3. Use a freestanding document holder. Position this next to the side of the screen and slightly angle it so that it follows a curve from the side of the screen.

In positioning your monitor:

- **Make sure the monitor is in front of you and facing you**, not angled to the left or right. This helps to eliminate excessive neck twisting. Also, use the screen scroll bars to ensure that whatever is being viewed most is in the center of the monitor, rather than at the top or bottom of the screen.
- **Center the monitor** so that your body and/or neck isn't twisted when looking at the screen. However, if you are working with a large monitor and spend most of your time working with software like MS Word (which defaults to creating left-aligned new pages) and you don't want to have to drag these to more central locations, try aligning yourself to a point about 1/3 of the distance across the monitor from the left side.
- **Put the monitor at a comfortable height** that doesn't make you tilt your head up to see it or bend your down to see it. When you are seated comfortably, your eyes should be in line with a point on the screen about 2-3" below the top of the monitor casing (not the screen). Sit back in your chair at an angle of around 100-110 degrees (i.e. slight recline) and hold your right arm out horizontally. Your middle finger should almost touch the center of the screen. From that starting position you can then make minor changes to screen height and angle to suit. Research shows the center of the monitor should be about 17-18 degrees below horizontal for optimal viewing, and this is where it will be if you follow the simple arm extension/finger pointing tip. You actually see more visual field below the horizon than above this (look down a corridor and you'll see more of the floor

than the ceiling), so at this position you should comfortably be able to see more of the screen. If the monitor is too low, you will crane your neck forward; if it's too high, you'll tilt your head backwards and end up with neck/shoulder pain.

- **Bifocals and progressive lens** - Even if you wear bifocals or progressive lenses, if you sit back in your chair in a reclined posture (with your back at around 110 degrees), and if you slightly tilt the monitor backwards and place it at a comfortable height, you should be able to see the screen without tilting your head back or craning your neck forward. Postural problems with bifocals can occur if you sit erect or even hunched forward. The problem with low monitors is that they cause neck flexion and suffer more from glare. Recent studies have shown that the best position for a computer monitor is for the center of the screen to be at around 17.5 degrees below eye level. Try to align your eyes with the top of the viewing area of the screen; this should put the center about right geometrically.
 - **Viewing distance** - The monitor should be at a comfortable horizontal distance for viewing, which usually is around an arm's length. Sit back in your chair and raise your arm and your fingers should touch the screen. At this distance, you should be able to see the viewing area of the monitor without making head movements. If text looks too small, then either use a larger font or magnify the screen image in the software rather than sitting closer to the monitor.
 - **Screen quality** - Use a good quality computer screen. Make sure that the text characters on your screen look sharp, and that they are a comfortable size. (You can change the screen resolution to find a comfortable and clear character size). If you can see the screen flickering out of the corner of your eye, you should try increasing the refresh rate of your monitor. (On a PC, you can change monitor resolution and refresh rates using the monitor control panel in your settings folder. On a Mac, you can use the monitor control panel). You may also consider using a good quality glass anti-glare filter or an LCD display (like a laptop screen).
 - **Eye checkup** - There are natural changes in vision that occur in most people during their early 40s. It's a good idea to periodically have your eyes checked by a qualified professional.
 - **Screen adjustments** - If any screen adjustments feel uncomfortable, change them until the arrangement feels more comfortable or seek further professional help.
7. **Posture** - Good posture is the basis of good workstation ergonomics and is the best way to avoid a computer-related injury. To ensure good posture:
- Make sure that you can reach the keyboard keys with your wrists as flat as possible (not bent up or down) and straight (not bent left or right).
 - Make sure that your elbow angle (the angle between the inner surface of the upper arm and the forearm) is at 90 degrees or greater to avoid nerve compression at the elbow.

- Make sure that your upper arm and elbow are as close to the body and as relaxed as possible for mouse use – avoid overreaching. Also make sure that your wrist is as straight as possible when the mouse is being used.
- Make sure your chair has good back support. Also check that your feet can be placed flat on the floor or on a footrest.
- Make sure your head and neck are as straight as possible.
- Make sure your posture feels relaxed.

8. **Keep it close**

- Make sure that those things you use most frequently are placed closest to you so that they can be conveniently and comfortably reached.
- Make sure that you are centered on the alphanumeric keyboard. Most modern keyboards are asymmetrical in design (the alphanumeric keyboard is to the left and a numeric keypad to the right). If the outer edges of the keyboard are used as landmarks for centering the keyboard and monitor, your hands will be deviated because the alphanumeric keys will be to the left of your midline. Move the keyboard so that the center of the alphanumeric keys (the B key) is centered on your mid-line.
- Make sure that the phone is also close to you if you frequently use it.

9. **A good workstation ergonomic arrangement** will allow any computer user to work in a neutral, relaxed, ideal typing posture that will minimize the risk of developing injury. Ideally, your keyboard should be placed on a height-adjustable negative-tilt tray. The mouse should be on a flat surface that's 1-2 inches above the keyboard and moveable over the numeric keypad. If you want a surface at the level of the keyboard's base, then make sure that this surface can also be angled downwards slightly to help to keep your hands and wrists in a neutral position while you are using your mouse. Also, keep your elbows as close to the body as possible while you work.

10. **Where will the computer be used?** Think about the following environmental conditions where the computer will be used:

- **Lighting** - Make sure that the lighting isn't too bright. You shouldn't see any bright light glare on the computer screen. If you do, move the screen, lower the light level, or use a good quality, glass anti-glare screen. Also, make sure that the computer monitor screen isn't backed to a bright window or facing a bright window so that the screen looks washed out (use a shade or drapes to control window brightness).
- **Ventilation** - Make sure that you use your computer somewhere that has adequate fresh-air ventilation and that has adequate heating or cooling so that you feel comfortable when you're working.

- **Noise** - Noise can cause stress; stress tenses your muscles, which can increase injury risks. Try to choose a quiet place for your workstation, and use low volume music (preferably light classical) to mask the hum of any fans or other sound sources.
- **Take a break!** All ergonomists agree that it's a good idea to take frequent, brief rest breaks.

Practice the following:

- **Eye breaks** - Looking at a computer screen for more than 15 minutes changes how the eyes work, causes you to blink less often, and exposes more of the eye surface to the air. Every 15 minutes, you should briefly look away from the screen for a minute or two to a more distant scene, preferably something more than 20 feet away. This lets the muscles inside the eye relax. Also, blink your eyes rapidly for a few seconds. This refreshes the tear film and clears dust from the eye surface.
- **Micro-breaks** - most typing is done in bursts rather than continuously. Between these bursts of activity you should rest your hands in a relaxed, flat, straight posture. During a micro-break (less than 2 minutes) you can briefly stretch, stand up, move around, or do a different work task (e.g., make a phone call). A micro-break isn't necessarily a break from work, but it's a break from the use of a particular set of muscles that's doing most of the work (e.g., the finger flexors if you're doing a lot of typing).
- **Rest breaks** - every 30 to 60 minutes you should take a brief rest break. During this break, stand up, move around, and do something else. Go and get a drink of water or coffee. This allows you to rest and exercise different muscles, and you'll feel less tired.
- **Exercise breaks** - there are many stretching and gentle exercises that you can do to help relieve muscle fatigue. You should do these exercises every 1-2 hours.
- **What about ergonomic gizmos?** - These days just about everything is labeled as being "ergonomically designed." Some of these so-called ergonomic products can actually make things worse.
 - If you're thinking about buying an "ergonomic product" ask yourself the following 4 questions:
 1. Does the product design and the manufacturer's claims make sense?
 2. What research evidence can the manufacturer provide to support its claims? (Be suspicious of products that haven't been studied by researchers.)
 3. Does it feel comfortable to use the product for a long period? Some ergonomic products may feel strange or slightly uncomfortable at first because

they often produce a change in your posture that's beneficial in the long-term. Think of these products as being like new shoes that initially may feel strange but then feel comfortable after being used for a while. If a product continues to feel uncomfortable after a reasonable trial period (say at least a week) time then stop using it.

4. What do ergonomics experts say about the product? (If they don't recommend it, don't use it.)
- There are many computer-related "ergonomic" products, the most common ones being:
 - **"Ergonomic" keyboards** - Most of these are keyboards where the alphanumeric keys are split at an angle. For a non-touch typist, this design can be a disaster! The split design only addresses issues of hand ulnar deviation, and research studies show that vertical hand posture (wrist extension) is more important. There is no consistent research evidence that most of the split-keyboard designs currently available really produce any substantial postural benefits. For most people, a regular keyboard design works just fine if it's put in the proper neutral position.
 - **"Ergonomic" mice** - Many of these mice designs or alternative input device designs can work well to improve your hand/wrist posture. However, it's important to check that you can use these with your upper arm relaxed and as close to your body as possible. Remember that overreaching to an "ergonomic mouse" defeats any benefits of this design.
 - **Wrist rests** - These were very popular a few years ago, but research studies haven't demonstrated any substantial benefits for wrist rests. In fact, a wrist rest can actually increase pressure inside the carpal tunnel by compressing the undersurface of the wrist. (Take a look at your wrist and you'll probably see blood vessels that shouldn't be compressed!) If you choose to use a wrist rest, using one with a broad, flat, firm surface design works best. Rest the heel of your palm on the surface, NOT your wrist. Try not to rest while you're actually typing, but rest in between bursts of typing movements. Avoid soft and squishy wrist rests because these will contour to your wrist, restrict the freedom of movement of your hands, and encourage more lateral deviation during typing. The surface of a typical wrist rest that's been used often erodes away, which means that the user has been sliding his or her wrists over the surface, compressing the blood vessels often visible at the wrist. Remember, your hands should be able to glide above the surface of a wrist rest during typing. Don't lock them in place on the rest while you type.
 - **Support braces/gloves** - There is no consistent research evidence that wearing wrist supports during computer use actually helps reduce the risk of injury. If you do like wearing a wrist support, make sure that it keeps your

hand flat and straight, not bent upwards. There is some evidence that wearing wrist supports at night in bed can help relieve symptoms for those with carpal tunnel syndrome.

- **Height adjustable, split work surfaces** - With respect to wrist posture, the issues are the same for height-adjustable, split work surfaces and sit-stand work surfaces:
 - If the surface is too low, the hand will be in greater extension.
 - If the surface is too high, the elbow will be in sustained flexion.
 - If it's a flat surface, then it's just the same argument as is used above for a negative-slope keyboard tray arrangement.

You can't set a flat work surface at an appropriate height for all five main tasks of office work – keyboarding, using a mouse, writing, viewing documents and viewing the screen. These each require different heights for an optimal arrangement. A negative-slope keyboard tray system serves as the height and angle adjustment mechanism for the keyboard. Also, the mouse platform serves as the height and angle adjustment for the mouse when attached to a work surface that is set for writing height. Monitor height is best adjusted by a separate monitor pedestal rather than by trying to move a whole work surface.

Five Tips for Using a Laptop Computer

1. **Un-ergonomic laptops** - The design of laptops violates a basic ergonomic requirement for a computer: namely that the keyboard and screen should be separated. In the early days of personal computing, desktop devices integrated the screen and keyboard into a single unit, and this resulted in widespread complaints of musculoskeletal discomfort. By the late 1970s a number of ergonomics design guidelines were written and all called for the separation of screen and keyboard. The reason is simple: with a fixed design, if the keyboard is in an optimal position for the user, the screen isn't; if the screen is optimal, the keyboard isn't. Consequently, laptops are excluded from current ergonomic design requirements because none of the designs satisfy this basic need. This means that you need to pay special attention to how you use your laptop because it can cause you problems.
2. **Laptop user type** - how do you use your laptop? Are you an occasional user who works on your laptop for short periods of time, or are you a full-time user with the laptop as your main computer? Occasional users will have less risk of problems than full-time users. All users should pay some attention to how they use their laptop, but full-time users may have more problems.
3. **Laptop posture** - As indicated above, laptops violate basic ergonomic design requirements, so using a laptop is a tradeoff between poor neck/head posture and poor hand/wrist posture.

- **Occasional users** - Because the neck/head position is determined by the actions of large muscles, you are better off sacrificing neck posture rather than wrist posture. For occasional use:
 - Find a chair that is comfortable and that you can sit back in
 - Position your laptop in your lap for the most neutral wrist posture that you can achieve
 - Angle the laptop screen so that you can see this with the least amount of neck deviation
 - **Full-time users** - if you use your laptop at work as your main computer you should:
 - Position it on your desk/work surface in front of you so that you can see the screen without bending your neck. This may require that you elevate the laptop off the desk surface using a stable support surface, such as a computer monitor pedestal.
 - Use a separate keyboard and mouse. You should be able to connect a keyboard and mouse directly to the back of the laptop or to a docking station.
 - Use the keyboard on a negative-tilt keyboard tray to ensure a neutral wrist posture.
 - Use the mouse on an adjustable position mouse platform.
 - Follow the posture guidelines for working at a computer workstation.
4. **Laptop dimensions** - Many laptops offer large screens (15" plus) and can work as desktop replacements (giving the viewing area of a 17" monitor). However, think about where you will most use your laptop to help you choose the best size. The larger the screen, the more difficult it will be to use this in mobile locations (e.g. airplane, car, train). There are a number of smaller notebook and ultra portable laptops on the market. Consider issues of screen size and screen resolution. A small screen (such as 12.1 inches) will be useful in mobile settings, but if the resolution is high (like XGA – 1024 x 768) make sure that you can read the screen characters and can easily use the input device to point to areas on the screen. The smaller the laptop, the smaller the keyboard, so make sure that you can comfortably type on a keyboard that may be only 75% the size of a regular keyboard.
5. **Laptop weight** - If you are a mobile professional who will be frequently transporting your laptop, think about the weight of the system. The word “system” here means the weight of the laptop plus the required accessories (power supply, spare battery, external disk drive, zip drive, CD RW, etc.). Many lightweight portables can become as heavy as regular laptops when you add the weight of all of the components together. If your laptop plus components weighs 10 lbs. or more, then you should certainly consider using a carry-on bag that has rollers on it.

Tendonitis

Tendonitis is a form of tendon inflammation that occurs when a muscle or tendon is repeatedly tensed from overuse of unaccustomed usage of the wrist and shoulder. With further exertion, some of the fibers that make up the tendon can actually fray or tear apart. The tendon becomes thickened, bumpy, and irregular in certain areas of the body (like the shoulder), and the injured area may calcify. Without rest and sufficient time for the tissues to heal, the tendon may be permanently weakened. Tendonitis is common among power press operators, welders, painters, and assembly line workers (like automobile, appliance, electronic production).

Tenosynovitis

Tenosynovitis is an inflammation or injury to the synovial sheath surrounding the tendon. These sheaths secrete synovial fluid, which acts as a lubricant to reduce friction during movement. Repetitive motion using the hands and wrists may provoke an excessive secretion of synovial fluid, with the sheath becoming swollen and painful. Repetitions exceeding 1,500 to 2,000 per hour produce symptoms associated with tendon sheath irritation in the hands. Tenosynovitis affects workers in jobs such as core making, poultry processing, and meatpacking.

Trigger Finger

Trigger finger, another tendon disorder, is attributed to the creation of a groove in the flexing tendon of the finger. If the tendon becomes locked in the sheath, attempts to move the finger will cause snapping and jerking movements. The palm side of the fingers is the usual site for trigger finger. This disorder is often associated with using tools that have handles with hard or sharp edges. Meatpackers, poultry workers, electronic assemblers, and carpenters are at risk of developing trigger finger.

Raynaud's Syndrome

Raynaud's syndrome, or white finger, occurs when the blood vessels of the hand are damaged as a result of repeated exposure to vibration for long periods of time. The skin and muscles are unable to get the necessary oxygen from the blood and eventually die. Common symptoms include intermittent numbness and tingling in the fingers; skin that turns pale, ashen, and cold; and eventual loss of sensation and control in the fingers and hands. This condition is also intensified when the hands are exposed to extremely cold temperatures. This illness is associated with the use of vibrating tools over time like pneumatic hammers, electric chain saws, and gasoline powered tools. After long-term exposure – perhaps 10 to 15 years working 6 to 7 hours a day with vibrating tools – the blood vessels in the fingers may become permanently damaged. There is no medical remedy for white finger. If the fingers are fairly healthy, the condition may improve if exposure to vibration stops or is reduced.

Other types of vibration may affect the entire body, producing overall fatigue and potential permanent damage. Vibration in conjunction with prolonged sitting may also result in degenerative changes in the spine. For example, drivers of tractors, trucks, buses, construction machines, and other heavy equipment may suffer from low back pain, and permanent abdominal, spinal, and bone damage.

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