REPEETITIVE MOTION DISORDERS
WHAT HEALTHCARE PROFESSIONALS NEED TO KNOW
THIS IS A 6 HOUR COURSE
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This course was developed to help expand the knowledge of healthcare professionals with respect to the subject of repetitive motion disorders. The information in this course has been derived from various professional sources.

It is the responsibility of the healthcare professional to determine which principles and theories contained herein are appropriate with respect to his/her personal limitations and scope of practice.

The information in this course has been carefully researched and is generally accepted as factual at the time of publication. The Institute for Advanced Therapeutics, Inc. disclaims responsibility for any contradictory data prior to the publication of the next revision of this course.

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HOW TO BEST PROCEED WITH THIS COURSE

Each chapter should be approached systematically in a careful and objective manner. It is important to master each chapter before going on to the next. Relax, take your time, and go at your own pace. As 6 credits of continuing education are rewarded after successfully completing this course, the reading of this manual and completion of the test questions should not take less than 6 hours. Only after you have successfully mastered all the material in the course should you proceed to the test questions. Keep in mind that each question has only one correct answer. The test consists of 40 questions. For a passing grade, you must correctly answer 28 questions.

INFORMATION FOR CERTIFICATION

In order to receive your 6 hours of continuing education credit, you must be a registered purchaser of this course. Please notify us of any address or name changes as we keep permanent records for certification and licensure.
COURSE OBJECTIVES

Upon completion of this course, you will be able to:

1. List symptoms of repetitive motion disorders.
2. Describe contributing factors to carpal tunnel syndrome.
3. Define bursitis.
4. Learn what motions increase the risk for developing medial and lateral epicondylitis.
5. Describe ways to reduce the risk of developing a repetitive motion disorder.
CHAPTER 1

WHAT ARE REPETITIVE MOTION DISORDERS?

What are Repetitive Motion Disorders?
Repetitive motion disorders are a family of muscular conditions that result from repeated motions performed in the course of normal work or daily activities. Repetitive motion disorders include carpal tunnel syndrome, bursitis, tendinitis, epicondylitis, ganglion cyst, tenosynovitis, and trigger finger. Repetitive motion disorders are caused by:

* Too many uninterrupted repetitions of an activity or motion.
* Unnatural or awkward motions such as twisting the arm or wrist.
* Overexertion.
* Incorrect posture.
* Muscle fatigue.

Repetitive motion disorders occur most commonly in the hands, wrists, elbows, and shoulders, but can also happen in the neck, back, hips, knees, feet, legs, and ankles. The disorders are characterized by:

* Pain in the affected area.
* Tingling in the affected area.
* Numbness in the affected area.
* Visible swelling or redness of the affected area.
* Loss of flexibility of the affected area.
* Loss of strength of the affected area.

For some individuals, there may be no visible sign of injury, although they may find it hard to perform easy tasks. Over time, repetitive motion disorders can cause temporary or permanent damage to the soft tissues in the body -- such as the muscles, nerves, tendons, and ligaments - and compression of nerves or tissue.

Generally, repetitive motion disorders affect individuals who perform repetitive tasks such as assembly line work, meatpacking, sewing, playing musical instruments, computer work, dental workers, and massage therapists. The disorders may also affect individuals who engage in activities such as carpentry, gardening, and tennis.
According to the Bureau of Labor Statistics of the U.S. Department of Labor many injuries or illnesses occurred as a result of repetitive motion, including typing or key entry, repetitive use of tools, and repetitive placing, grasping, or moving of objects other than tools. Of these repetitive motion injuries, 55% affected the wrist, 7% affected the shoulder, and 6% affected the back. The median time away from work was 18 days as a result of injury or illness from repetitive motion.

**How is Repetitive Motion Disorder Treated?**
Treatment for repetitive motion disorders usually includes reducing or stopping the motions that cause symptoms. Options include:

* Taking breaks to give the affected area time to rest.
* Adopting stretching and relaxation exercises.
 * Applying ice to the affected area.
 * Using medications such as pain relievers, cortisone, and anti-inflammatory drugs can reduce pain and swelling.
 * Splints may be able to relieve pressure on the muscles and nerves.
 * Physical therapy may relieve the soreness and pain in the muscles and joints.
 * In rare cases, surgery may be required to relieve symptoms and prevent permanent damage.
 * Some employers have developed ergonomic programs to help workers adjust their pace of work and arrange office equipment to minimize problems.

**What is the prognosis?**
Most individuals with repetitive motion disorders recover completely and can avoid re-injury by:

* Changing the way they perform repetitive movements.
* Changing the frequency with which they perform them.
* Changing the amount of time they rest between movements.

Without treatment, repetitive motion disorders may result in permanent injury and complete loss of function in the affected area.
CHAPTER 2

CARPAL TUNNEL SYNDROME

What is carpal tunnel syndrome?

Carpal tunnel syndrome occurs when the median nerve, which runs from the forearm into the hand, becomes pressed or squeezed at the wrist. The median nerve controls sensations to the palm side of the thumb and fingers (although not the little finger), as well as impulses to some small muscles in the hand that allow the fingers and thumb to move. The carpal tunnel - a narrow, rigid passageway of ligament and bones at the base of the hand - houses the median nerve and tendons. Sometimes, thickening from irritated tendons or other swelling narrows the tunnel and causes the median nerve to be compressed. The result may be pain, weakness, or numbness in the hand and wrist, radiating up the arm.

Although painful sensations may indicate other conditions, carpal tunnel syndrome is the most common and widely known of the entrapment neuropathies in which the body's peripheral nerves are compressed or traumatized.

What are the symptoms of carpal tunnel syndrome?

Symptoms usually start gradually, with frequent burning, tingling, or itching numbness in the palm of the hand and the fingers, especially the thumb and the index and middle fingers. Some carpal tunnel sufferers say their fingers feel useless and swollen, even though little or no swelling is apparent.

The symptoms often first appear in one or both hands during the night, since many people sleep with flexed wrists. A person with carpal tunnel syndrome may wake up feeling the need to "shake out" the hand or wrist.

As symptoms worsen, people might feel tingling during the day. Decreased grip strength may make it difficult to form a fist, grasp small objects, or perform other manual tasks. In chronic and/or untreated cases, the muscles at the base of the thumb may waste away. Some people are unable to tell between hot and cold by touch.
What are the causes of carpal tunnel syndrome?

Carpal tunnel syndrome is often the result of a combination of factors that increase pressure on the median nerve and tendons in the carpal tunnel, rather than a problem with the nerve itself. Most likely the disorder is due to a congenital predisposition - the carpal tunnel is simply smaller in some people than in others. Other contributing factors include:

* Trauma or injury to the wrist that cause swelling, such as sprain or fracture.
* Overactivity of the pituitary gland.
* Hypothyroidism.
* Rheumatoid arthritis.
* Mechanical problems in the wrist joint.
* Work stress.
* Repeated use of vibrating hand tools.
* Fluid retention during pregnancy or menopause.
* The development of a cyst or tumor in the canal. In some cases no cause can be identified.

Writer’s cramp - a condition in which a lack of fine motor skill coordination and ache and pressure in the fingers, wrist, or forearm is brought on by repetitive activity - is not a symptom of carpal tunnel syndrome.

Who is at risk of developing carpal tunnel syndrome?

Women are three times more likely than men to develop carpal tunnel syndrome, perhaps because the carpal tunnel itself may be smaller in women than in men. The dominant hand is usually affected first and produces the most severe pain. Persons with diabetes or other metabolic disorders that directly affect the body’s nerves and make them more susceptible to compression are also at high risk. Carpal tunnel syndrome usually occurs only in adults.

The risk of developing carpal tunnel syndrome is not confined to people in a single industry or job, but is especially common in those performing assembly line work - manufacturing, sewing, finishing, cleaning, and meat, poultry, or fish packing. In fact, carpal tunnel syndrome is three times more common among assemblers than among data-entry personnel. A 2001 study by the Mayo Clinic found heavy computer use (up to 7 hours a day) did not increase a person’s risk of developing carpal tunnel syndrome.

During 1998, an estimated three of every 10,000 workers lost time from work because of carpal tunnel syndrome. Half of these workers missed more than 10 days of work. The average lifetime cost of carpal tunnel syndrome, including medical bills and lost time from work, is estimated to be about $30,000 for each injured worker.
How is carpal tunnel syndrome diagnosed?

Early diagnosis and treatment are important to avoid permanent damage to the median nerve. A physical examination of the hands, arms, shoulders, and neck can help determine if the patient’s complaints are related to daily activities or to an underlying disorder, and can rule out other painful conditions that mimic carpal tunnel syndrome. The wrist is examined for tenderness, swelling, warmth, and discoloration. Each finger should be tested for sensation, and the muscles at the base of the hand should be examined for strength and signs of atrophy. Routine laboratory tests and X-rays can reveal diabetes, arthritis, and fractures.

Physicians can use specific tests to try to produce the symptoms of carpal tunnel syndrome. In the Tinel test, the doctor taps on or presses on the median nerve in the patient's wrist. The test is positive when tingling in the fingers or a resultant shock-like sensation occurs. The Phalen, or wrist-flexion, test involves having the patient hold his or her forearms upright by pointing the fingers down and pressing the backs of the hands together. The presence of carpal tunnel syndrome is suggested if one or more symptoms, such as tingling or increasing numbness, is felt in the fingers within 1 minute. Doctors may also ask patients to try to make a movement that brings on symptoms.

Often it is necessary to confirm the diagnosis by use of electrodiagnostic tests. In a nerve conduction study, electrodes are placed on the hand and wrist. Small electric shocks are applied and the speed with which nerves transmit impulses is measured. In electromyography, a fine needle is inserted into a muscle; electrical activity viewed on a screen can determine the severity of damage to the median nerve.

Ultrasound imaging can show impaired movement of the median nerve.

Magnetic resonance imaging (MRI) can show the anatomy of the wrist but to date has not been especially useful in diagnosing carpal tunnel syndrome.

How is carpal tunnel syndrome treated?

Treatments for carpal tunnel syndrome should begin as early as possible, under a doctor’s direction. Underlying causes such as diabetes or arthritis should be treated first. Initial treatment generally involves resting the affected hand and wrist for at least 2 weeks, avoiding activities that may worsen symptoms, and immobilizing the wrist in a splint to avoid further damage from twisting or bending. If there is inflammation, applying cool packs can help reduce swelling.

Non-surgical treatments

DRUGS
In special circumstances, various drugs can ease the pain and swelling associated with carpal tunnel syndrome. Nonsteroidal anti-inflammatory drugs, such as aspirin,
ibuprofen, and other nonprescription pain relievers, may ease symptoms that have been present for a short time or have been caused by strenuous activity. Orally administered diuretics ("water pills") can decrease swelling. Corticosteroids (such as prednisone) or the drug lidocaine can be injected directly into the wrist or taken by mouth (in the case of prednisone) to relieve pressure on the median nerve and provide immediate, temporary relief to persons with mild or intermittent symptoms. (Caution: persons with diabetes and those who may be predisposed to diabetes should note that prolonged use of corticosteroids can make it difficult to regulate insulin levels. Corticosteroids should not be taken without a doctor's prescription.) Additionally, some studies show that vitamin B6 (pyridoxine) supplements may ease the symptoms of carpal tunnel syndrome.

EXERCISE

Stretching and strengthening exercises can be helpful in people whose symptoms have abated. These exercises may be supervised by a physical therapist, who is trained to use exercises to treat physical impairments, or an occupational therapist, who is trained in evaluating people with physical impairments and helping them build skills to improve their health and well-being.

ALTERNATIVE THERAPIES

Acupuncture and chiropractic care have benefited some patients but their effectiveness remains unproved. An exception is yoga, which has been shown to reduce pain and improve grip strength among patients with carpal tunnel syndrome.

Surgery

Carpal tunnel release is one of the most common surgical procedures in the United States. Generally recommended if symptoms last for 6 months, surgery involves severing the band of tissue around the wrist to reduce pressure on the median nerve. Surgery is done under local anesthesia and does not require an overnight hospital stay. Many patients require surgery on both hands.

The following are types of carpal tunnel release surgery:

OPEN RELEASE SURGERY

This is the traditional procedure used to correct carpal tunnel syndrome, consists of making an incision up to 2 inches in the wrist and then cutting the carpal ligament to enlarge the carpal tunnel. The procedure is generally done under local anesthesia on an outpatient basis, unless there are unusual medical considerations.
ENDOSCOPIC SURGERY

This may allow faster functional recovery and less postoperative discomfort than traditional open release surgery. The surgeon makes two incisions (about ½ inch each) in the wrist and palm, inserts a camera attached to a tube, observes the tissue on a screen, and cuts the carpal ligament (the tissue that holds joints together). This two-portal endoscopic surgery, generally performed under local anesthesia, is effective and minimizes scarring and scar tenderness, if any. Single portal endoscopic surgery for carpal tunnel syndrome is also available and can result in less post-operative pain and a minimal scar. It generally allows individuals to resume some normal activities in a short period of time.

Although symptoms may be relieved immediately after surgery, full recovery from carpal tunnel surgery can take months. Some patients may have infection, nerve damage, stiffness, and pain at the scar. Occasionally the wrist loses strength because the carpal ligament is cut. Patients should undergo physical therapy after surgery to restore wrist strength. Some patients may need to adjust job duties or even change jobs after recovery from surgery.

Recurrence of carpal tunnel syndrome following treatment is rare. The majority of patients recover completely.

How can carpal tunnel syndrome be prevented on the Job?

At the workplace, workers can do:

* On-the-job conditioning.
* Perform stretching exercises.
* Take frequent rest breaks.
* Wear splints to keep wrists straight.
* Use correct posture.
* Use correct wrist position.

Wearing fingerless gloves can help keep hands warm and flexible. Workstations, tools and tool handles, and tasks can be redesigned to enable the worker's wrist to maintain a natural position during work.

Because computer work is highly repetitive and promotes static postures, it can cause discomfort over long periods of time. It is important to break up long sessions of keyboard work with frequent rest breaks or with other tasks that require movements different from those used to type or operate the mouse.

Jobs can be rotated among workers. Employers can develop programs in ergonomics, the process of adapting workplace conditions and job demands to the capabilities of workers.
CHAPTER 3

RAYNAUD'S SYNDROME

What Is Raynaud's?

Raynaud's is a rare disorder that affects the arteries. Arteries are blood vessels that carry blood from your heart to different parts of your body.

Raynaud's sometimes is called a disease, syndrome, or phenomenon. The disorder is marked by brief episodes of vasospasm (VA-so-spazm), which is a narrowing of the blood vessels.

Vasospasm of the arteries reduces blood flow to the fingers and toes. In people who have Raynaud's, the disorder usually affects the fingers. In about 40 percent of people who have Raynaud's, it affects the toes. Rarely, the disorder affects the nose, ears, nipples, and lips.

Overview

Often, the cause of Raynaud's isn't known. This type of Raynaud's is called Raynaud's disease or primary Raynaud's.

Sometimes a disease, condition, or other factor causes Raynaud's. This type of Raynaud's is called Raynaud's phenomenon or secondary Raynaud's. Primary Raynaud's is more common and tends to be less severe than secondary Raynaud's.

If you have primary or secondary Raynaud's, cold temperatures or stress can trigger "Raynaud's attacks." During an attack, little or no blood flows to affected body parts.

As a result, the skin may turn white and then blue for a short time. As blood flow returns, the affected areas may turn red and throb, tingle, burn, or feel numb.

In both types of Raynaud's, even mild or brief changes in temperature can cause Raynaud's attacks. For example, taking something out of the freezer or being exposed to temperatures below 60 degrees Fahrenheit can cause your fingers to turn blue.

Most people who have Raynaud's have no long-term tissue damage or disability. However, people who have severe Raynaud's can develop skin sores or gangrene from
prolonged or repeated Raynaud's attacks. "Gangrene" refers to the death or decay of body tissues.

Outlook

About 5 percent of the U.S. population has Raynaud's. For most people who have primary Raynaud's, the disorder is more of a bother than a serious illness. They usually can manage the condition with minor lifestyle changes.

Secondary Raynaud's may be harder to manage. However, several treatments are available to help prevent or relieve symptoms. With secondary Raynaud's, it's important to treat the underlying disease or condition that's causing it.

Researchers continue to look for better ways to diagnose and treat Raynaud's.

What Causes Raynaud's?

Often, the cause of Raynaud's isn't known. This type of Raynaud's is called Raynaud's disease or primary Raynaud's.

Sometimes a disease, condition, or other factor causes Raynaud's. This type of Raynaud's is called Raynaud's phenomenon or secondary Raynaud's.

Causes of Secondary Raynaud's

Many things can cause secondary Raynaud's. Examples include:

- Diseases and conditions that directly damage the arteries or damage the nerves that control the arteries in the hands and feet
- Repetitive actions that damage the nerves that control the arteries in the hands and feet
- Injuries to the hands and feet
- Exposure to certain chemicals
- Medicines that narrow the arteries or affect blood pressure

Diseases and Conditions

Secondary Raynaud's is linked to diseases and conditions that directly damage the arteries. The disorder also is linked to diseases and conditions that damage the nerves that control the arteries in the hands and feet.

Scleroderma (skler-o-DER-ma) and lupus are two examples of conditions that can cause Raynaud's. About 9 out of 10 people who have scleroderma have Raynaud's. About 1 out of 3 people who has lupus has Raynaud's.

Other examples of diseases and conditions that can cause Raynaud's include:

- Rheumatoid (RU-ma-toyd) arthritis
- Atherosclerosis (ath-er-o-skler-O-sis)
- Blood disorders such as cryoglobulinemia (KRI-o-GLOB-yu-li-NE-me-ah) and polycythemia (POL-e-si-THE-me-ah)
- Sjögren's (SHOW-gren's) syndrome, dermatomyositis (DER-ma-to-mi-o-SI-tis), and polymyositis (POL-e-mi-o-SI-tis)
- Buerger's disease

Thyroid problems and pulmonary hypertension also may cause Raynaud's.

**Repetitive Actions**

Repetitive actions that damage the arteries or the nerves that control the arteries in the hands and feet may lead to Raynaud's.

Typing, playing the piano, or doing other similar movements repeatedly over long periods may lead to secondary Raynaud's. Using vibrating tools, such as jackhammers and drills, also may raise your risk of developing Raynaud's.

**Hand or Foot Injuries**

Injuries to the hands or feet from accidents, frostbite, surgery, or other causes can lead to Raynaud's.

**Chemicals**

Exposure to certain workplace chemicals can cause a scleroderma-like illness that's linked to Raynaud's. An example of this type of chemical is vinyl chloride, which is used in the plastics industry.

The nicotine in cigarettes also can raise your risk of developing Raynaud's.

**Medicines**

Certain medicines can cause secondary Raynaud's, including:
- Migraine headache medicines that contain ergotamine. This substance causes the arteries to narrow.
- Certain cancer medicines, such as cisplatin and vinblastine.
- Some over-the-counter cold and allergy medicines and diet aids. Some of these medicines can narrow your arteries.
- Beta blockers. These medicines slow your heart rate and lower your blood pressure.
- Birth control pills. These medicines can affect blood flow.

Who Is at Risk for Raynaud's?

The risk factors for primary Raynaud's (Raynaud's disease) and secondary Raynaud's (Raynaud's phenomenon) are different.
The risk factors for primary Raynaud's include:
• Gender. Women are more likely to have primary Raynaud's than men.
• Age. Primary Raynaud's usually develops before the age of 30.
• Family history. Primary Raynaud's may occur in members of the same family.
• Living in a cold climate. Cold temperatures can trigger Raynaud's attacks.

The risk factors for secondary Raynaud's include:
• Age. Secondary Raynaud's usually develops after the age of 30.
• Certain diseases and conditions. For example, diseases that directly damage the arteries or damage the nerves that control the arteries in the hands and feet may cause secondary Raynaud's. (For more information, go to “What Causes Raynaud's?”)
• Injuries to the hands or feet.
• Exposure to certain workplace chemicals, such as vinyl chloride (used in the plastics industry).
• Repetitive actions with the hands, such as typing or using vibrating tools.
• Certain medicines, such as migraine, cancer, cold/allergy, or blood pressure medicines.
• Smoking.
• Living in a cold climate.

What Are the Signs and Symptoms of Raynaud's?

People who have primary Raynaud's (Raynaud's disease) or secondary Raynaud's (Raynaud's phenomenon) can have attacks in response to cold temperatures or emotional stress.

Raynaud's attacks usually affect the fingers and toes. Rarely, the attacks affect the nose, ears, nipples, or lips.

During a Raynaud's attack, the arteries become very narrow for a brief period. As a result, little or no blood flows to affected body parts. This may cause these areas to:
• Turn pale or white and then blue
• Feel numb, cold, or painful
• Turn red, throb, tingle, burn, or feel numb as blood flow returns to the affected areas

Raynaud's attacks can last less than a minute or as long as several hours. Attacks can occur daily or weekly.

Attacks often begin in one finger or toe and move to other fingers or toes. Sometimes only one or two fingers or toes are affected. Different areas may be affected at different times.

Severe secondary Raynaud's can cause skin sores or gangrene. "Gangrene" refers to the death or decay of body tissues. Fortunately, severe Raynaud's is rare.
How Is Raynaud's Diagnosed?

Your doctor will diagnose primary Raynaud's (Raynaud's disease) or secondary Raynaud's (Raynaud's phenomenon) based on your medical history, a physical exam, and test results.

**Specialists Involved**

Primary care doctors and internists often diagnose and treat Raynaud's.

If you have the disorder, you also may see a rheumatologist. This is a doctor who specializes in treating disorders of the joints, bones, and muscles.

Rheumatologists diagnose and treat many of the diseases that are linked to secondary Raynaud's, such as scleroderma and lupus.

**Medical History**

Your doctor may ask about your risk factors for Raynaud's. He or she also may ask about your signs and symptoms when you're exposed to cold temperatures or stress.

For example, your doctor may ask whether your fingers or toes:
- Feel numb or painful when they're exposed to cold temperatures
- Turn white or blue, or both, when they're exposed to cold temperatures

**Physical Exam**

Your doctor will look at your fingers and toes to check the health of your skin and nails and to check blood flow to these areas.

Your doctor also may do a more complete physical exam to check for signs of diseases and conditions that are linked to secondary Raynaud's.

**Diagnostic Tests and Procedures**

Your doctor may recommend the following tests to check for Raynaud's and related conditions.

**Cold Stimulation Test**

A cold stimulation test can be used to trigger Raynaud's symptoms. For this test, a small device that measures temperature is taped to your fingers. Your hands are then exposed to cold—they're usually briefly put into ice water.
Your hands are then removed from the cold, and the device measures how quickly your fingers return to their normal temperature. If you have Raynaud's, it may take more than 20 minutes for your fingers to return to their normal temperature.

**Nailfold Capillaroscopy**
You may have a test called nailfold capillaroscopy (KAP-ih-lar-OS-ko-pe). For this test, your doctor puts a drop of oil at the base of your fingernail. He or she then looks at your fingernail under a microscope.

If your doctor sees abnormal arteries, it may mean you have a disease linked to Raynaud's, such as scleroderma.

**Other Tests**
Your doctor may use other tests to look for conditions that are linked to secondary Raynaud's. Examples include antinuclear antibody (ANA), erythrocyte sedimentation rate (ESR or "sed rate"), and C-reactive protein (CRP) tests.

How Is Raynaud's Treated?

Primary Raynaud's (Raynaud's disease) and secondary Raynaud's (Raynaud's phenomenon) have no cure. However, treatments can reduce the number and severity of Raynaud's attacks. Treatments include lifestyle changes, medicines, and, rarely, surgery.

Most people who have primary Raynaud's can manage the condition with lifestyle changes. People who have secondary Raynaud's may need medicines in addition to lifestyle changes. Rarely, they may need surgery or shots.

If you have Raynaud's and develop sores on your fingers, toes, or other parts of your body, see your doctor right away. Timely treatment can help prevent permanent damage to these areas.

**Lifestyle Changes**

Lifestyle changes can help you avoid things that may trigger a Raynaud's attack. Examples of such triggers include cold temperatures, emotional stress, workplace or recreational factors, and contact with certain chemicals or medicines.

**Protect Yourself From Cold Temperatures**

To protect yourself from cold temperatures:
- Wear a hat, mittens (rather than gloves), scarf, coat with snug cuffs, and warm socks and shoes during cold weather. Layer your clothing for extra warmth.
Put hand and foot warmers in your mittens, boots, socks, or pockets. Some warmers are small heat packs, and others are battery-operated. These warmers often are available at sporting goods stores.

Turn down air conditioning or dress warmly while in an air-conditioned space.

Warm up your car before driving in cold weather.

Wear gloves or mittens when taking food out of the refrigerator or freezer (if cold temperatures severely affect you).

**Avoid Other Triggers**

Try to avoid things that make you upset or stressed. Learn ways to handle stress that you can't avoid. Physical activity helps some people cope with stress. Other people listen to music or focus on something calm or peaceful to reduce stress. Some people learn yoga, tai chi, or meditation.

Try to avoid workplace and recreational triggers. For example, limit the use of vibrating tools, such as drills. Wear proper protective gear if you work with industrial chemicals. Also, try to limit repetitive hand actions, such as typing or playing the piano.

Some medicines can trigger Raynaud's attacks. Examples include:

- Migraine headache medicines that contain ergotamine. This substance causes your arteries to narrow.
- Certain cancer medicines, such as cisplatin and vinblastine.
- Over-the-counter cold or allergy medicines or diet aids. Some of these medicines can narrow your arteries.
- Beta blockers. These medicines slow your heart rate and lower your blood pressure.
- Birth control pills. These medicines can affect blood flow.

Talk with your doctor about whether your medicines are safe for you.

**Other Lifestyle Changes**

Other lifestyle changes also can help you avoid Raynaud's attacks. For example, include physical activity as part of your healthy lifestyle. Physical activity can increase your blood flow and help keep you warm.

Limit your use of caffeine and alcohol. These substances can trigger Raynaud's attacks. If you smoke, quit. Smoking makes Raynaud's worse. Ask your doctor about programs and products that can help you quit. Also, try to avoid secondhand smoke.

You also can take steps to help stop Raynaud's attacks when they occur. For example:

- Move to a warmer spot, such as indoors, during cold weather.
- Warm your hands or feet. Place your hands under your armpits. Soak your feet or hands in warm water.
- Wiggle or massage your fingers and toes.
- Move your arms in circles or shake your arms or feet.
• Get out of stressful situations and try relaxation techniques.

**Medicines and Surgery**

If lifestyle changes don't control Raynaud's, you may need medicines or surgery. Medicines are used to improve blood flow to the fingers and toes.

Examples of medicines used to treat Raynaud's include calcium channel blockers, alpha blockers, prescription skin creams, and ACE inhibitors (used less often).

Rarely, people who have severe Raynaud's may develop skin sores or gangrene. "Gangrene" refers to the death or decay of body tissues. If this happens, antibiotics or surgery to cut out the damaged tissue may be needed. In very serious cases, the affected toe or finger may need to be removed.

Another treatment for severe Raynaud's is to block the nerves in the hands or feet that control the arteries. This can help prevent Raynaud's attacks. This treatment is done using surgery or shots.

The surgery often relieves symptoms, but sometimes for only a few years. Shots may need to be repeated if symptoms persist or come back.

**Living With Raynaud's**

Primary Raynaud's (Raynaud's disease) and secondary Raynaud's (Raynaud's phenomenon) can be lifelong conditions. However, you can take steps to help control Raynaud's. Lifestyle changes and ongoing care can help you manage the disorder.

Most people who have primary Raynaud's can manage the disorder with lifestyle changes. People who have secondary Raynaud's may need medicines in addition to lifestyle changes. Rarely, they may need surgery or shots.

**Lifestyle Changes**

You can take steps to avoid things that trigger Raynaud's attacks. If you have Raynaud's:

• Protect yourself from cold temperatures.
• Try to avoid emotional stress and learn ways to cope with stress that you can't avoid.
• Avoid certain medicines, substances, and activities that can trigger Raynaud's attacks. (For more information, go to "What Causes Raynaud's?")
• Include physical activity as part of your healthy lifestyle and limit your use of caffeine and alcohol. If you smoke, quit. Also, try to avoid secondhand smoke.
You also can take steps to stop a Raynaud's attack once it starts. Warm up your hands, feet, or other affected areas right away. For example, place your hands under your armpits, run warm water over your fingers and toes, or massage your hands and feet.

If you have Raynaud's, be sure to take care of your hands and feet. Protect them from cuts, bruises, and other injuries. For example, wear properly fitted shoes and don't walk barefoot. Use lotion to prevent your skin from drying and cracking. Also, avoid tight wristbands and rings.
What Is Bursitis and What Is Tendinitis?

Bursitis and tendinitis are both common conditions that involve inflammation of the soft tissue around muscles and bones, most often in the shoulder, elbow, wrist, hip, knee, or ankle.

A bursa is a small, fluid-filled sac that acts as a cushion between a bone and other moving parts: muscles, tendons, or skin. Bursae are found throughout the body. Bursitis occurs when a bursa becomes inflamed (redness and increased fluid in the bursa).

A tendon is a flexible band of fibrous tissue that connects muscles to bones. Tendinitis is inflammation of a tendon. Tendons transmit the pull of the muscle to the bone to cause movement. They are found throughout the body, including the hands, wrists, elbows, shoulders, hips, knees, ankles, and feet. Tendons can be small, like those found in the hand, or large, like the Achilles tendon in the heel.

What Causes These Conditions?

Bursitis is commonly caused by overuse or direct trauma to a joint. Bursitis may occur at the knee or elbow, from kneeling or leaning on the elbows longer than usual on a hard surface, for example. Tendinitis is most often the result of a repetitive injury or motion in the affected area. These conditions occur more often with age. Tendons become less flexible with age, and therefore, more prone to injury.

People such as carpenters, gardeners, musicians, and athletes who perform activities that require repetitive motions or place stress on joints are at higher risk for tendinitis and bursitis.

An infection, arthritis, gout, thyroid disease, and diabetes can also bring about inflammation of a bursa or tendon.
What Parts of the Body Are Affected?

Tendinitis causes pain and tenderness just outside a joint. Some common names for tendinitis identify with the sport or movement that typically increases risk for tendon inflammation. They include tennis elbow, golfer’s elbow, pitcher’s shoulder, swimmer’s shoulder, and jumper’s knee. Some common examples follow.

Structure of the Elbow

Tennis Elbow (Lateral Epicondylitis) & Golfer’s Elbow (Medial Epicondylitis)

Tennis elbow refers to an injury to the outer elbow tendon. Golfer’s elbow is an injury to the inner tendon of the elbow. These conditions can also occur with any activity that involves repetitive wrist turning or hand gripping, such as tool use, hand shaking, or twisting movements. Carpenters, gardeners, painters, musicians, manicurists, and dentists are at higher risk for these forms of tendinitis.

Pain occurs near the elbow, sometimes radiating into the upper arm or down to the forearm. Another name for tennis elbow is lateral epicondylitis. Golfer’s elbow is also called medial epicondylitis.
Shoulder Tendinitis, Bursitis, and Impingement Syndrome

Two types of tendinitis can affect the shoulder. Biceps tendinitis causes pain in the front or side of the shoulder and may travel down to the elbow and forearm. Pain may also occur when the arm is raised overhead. The biceps muscle, in the front of the upper arm, helps stabilize the upper arm bone (humerus) in the shoulder socket. It also helps accelerate and decelerate the arm during overhead movement in activities like tennis or pitching.

Rotator cuff tendinitis causes shoulder pain at the tip of the shoulder and the upper, outer arm. The pain can be aggravated by reaching, pushing, pulling, lifting, raising the arm above shoulder level, or lying on the affected side. The rotator cuff is primarily a group of four muscles that attach the arm to the shoulder joint and allow the arm to rotate and elevate.

If the rotator cuff and bursa are irritated, inflamed, and swollen, they may become compressed between the head of the humerus and the acromion, the outer edge of the shoulder blade. Repeated motion involving the arms, or the aging process involving shoulder motion over many years, may also irritate and wear down the tendons, muscles, and surrounding structures. Squeezing of the rotator cuff is called shoulder impingement syndrome.

Inflammation caused by rheumatoid arthritis may cause rotator cuff tendinitis and bursitis. Sports involving overuse of the shoulder and occupations requiring frequent overhead reaching are other potential causes of irritation to the rotator cuff or bursa, and may lead to inflammation and impingement.
Knee Tendinitis or Jumper's Knee

If a person overuses a tendon during activities such as dancing, cycling, or running, it may elongate or undergo microscopic tears and become inflamed. Trying to break a fall may also cause the quadriceps muscles to contract and tear the quadriceps tendon above the knee cap (patella) or the patellar tendon below it. This type of injury is most likely to happen in older people whose tendons tend to be weaker and less flexible. Tendinitis of the patellar tendon is sometimes called jumper’s knee because in sports that require jumping, such as basketball, the muscle contraction and force of hitting the ground after a jump strain the tendon. After repeated stress, the tendon may become inflamed or tear.

People with tendinitis of the knee may feel pain during running, hurried walking, or jumping. Knee tendinitis can increase risk for ruptures or large tears to the tendon. A complete rupture of the quadriceps or patellar tendon is not only painful, but also makes it difficult for a person to bend, extend, or lift the leg, or to bear weight on the involved leg.

Achilles Tendinitis

Achilles tendon injuries involve an irritation, stretch, or tear to the tendon connecting the calf muscle to the back of the heel. Achilles tendinitis is a common overuse injury, but can also be caused by tight or weak calf muscles or any condition that causes the tendon to become less flexible and more rigid, such as reactive arthritis or normal aging.

Achilles tendon injuries can happen to anyone who regularly participates in an activity that causes the calf muscle to contract, like climbing stairs or using a stair-stepper, but are most common in middle-aged “weekend warriors” who may not exercise regularly or
take time to warm up and stretch properly before an activity. Among professional athletes, most Achilles injuries seem to occur in quick-acceleration or jumping sports like football, tennis, and basketball, and almost always end the season’s competition for the athlete.

Lateral View of the Ankle (Representation)

Achilles tendinitis can be a chronic condition. It can also cause what appears to be a sudden injury. Tendinitis is the most common factor contributing to Achilles tendon tears. When a tendon is weakened by age or overuse, trauma can cause it to rupture. These injuries can be so sudden and agonizing that they have been known to bring down charging professional football players in shocking fashion.

How Are These Conditions Diagnosed?

Diagnosis of tendinitis and bursitis begins with a medical history and physical examination. The patient will describe the pain and circumstances in which pain occurs. The location and onset of pain, whether it varies in severity throughout the day, and the factors that relieve or aggravate the pain are all important diagnostic clues.

Therapists and physicians will use manual tests called selective tissue tension tests to determine which tendon is involved, and then will palpate (a form of touching the tendon) specific areas of the tendon to pinpoint the area of inflammation.

X rays do not show tendons or bursae, but may be helpful in ruling out problems in the bone or arthritis. In the case of a torn tendon, x rays may help show which tendon is affected. In a knee injury, for example, an x ray will show that the patella is lower than normal in a quadriceps tendon tear and higher than normal in a patellar tendon tear.
The doctor may also use magnetic resonance imaging (MRI) to confirm a partial or total tear. MRIs detect both bone and soft tissues like muscles, tendons and their coverings (sheaths), and bursae.

An anesthetic-injection test is another way to confirm a diagnosis of tendinitis. A small amount of anesthetic (lidocaine hydrochloride) is injected into the affected area. If the pain is temporarily relieved, the diagnosis is confirmed.

To rule out infection, the doctor may remove and test fluid from the inflamed area.

**What Kind of Health Care Professional Treats These Conditions?**

A primary care physician or a physical therapist can treat the common causes of tendinitis and bursitis. Complicated cases or those resistant to conservative therapies may require referral to a specialist, such as an orthopedist or rheumatologist.

**How Are Bursitis and Tendinitis Treated?**

Treatment focuses on healing the injured bursa or tendon. The first step in treating both of these conditions is to reduce pain and inflammation with:

* Rest.
* Compression.
* Elevation.
* Anti-inflammatory medicines such as aspirin, naproxen, or ibuprofen.
* Ice may also be used in acute injuries, but most cases of bursitis or tendinitis are considered chronic, and ice is not helpful. When ice is needed, an ice pack can be applied to the affected area for 15–20 minutes every 4–6 hours for 3–5 days.

Longer use of ice and a stretching program may be recommended by a health care provider.

Activity involving the affected joint is also restricted to encourage healing and prevent further injury.

In some cases (e.g., in tennis elbow), elbow bands may be used to compress the forearm muscle to provide some pain relief, limiting the pull of the tendon on the bone. Other protective devices, such as foot orthoses for the ankle and foot or splints for the knee or hand, may temporarily reduce stress to the affected tendon or bursa and facilitate quicker healing times, while allowing general activity levels to continue as usual.

The doctor or therapist may use ultrasound (gentle sound-wave vibrations) to warm deep tissues and improve blood flow. Iontophoresis may also be used. This involves using an electrical current to push a corticosteroid medication through the skin directly over the inflamed bursa or tendon. Gentle stretching and strengthening exercises are
added gradually. Massage of the soft tissue may be helpful. These may be preceded or followed by use of an ice pack. The type of exercises recommended may vary depending on the location of the affected bursa or tendon.

If there is no improvement, the doctor may inject a corticosteroid medicine into the area surrounding the inflamed bursa or tendon. While corticosteroid injections are a common treatment, they must be used with caution because they may lead to weakening or rupture of the tendon (especially weight-bearing tendons such as the Achilles [ankle], posterior tibial [arch of the foot], and patellar [knee] tendons). If there is still no improvement after 6-12 months, the doctor may perform either arthroscopic or open surgery to repair damage and relieve pressure on the tendons and bursae.

If the bursitis is caused by an infection, the doctor will prescribe antibiotics.

If a tendon is completely torn, surgery may be needed to repair the damage. After surgery on a quadriceps or patellar tendon, for example, the patient will wear a cast for 3-6 weeks and use crutches. For a partial tear, the doctor might apply a cast without performing surgery.

Rehabilitating a partial or complete tear of a tendon requires an exercise program to restore the ability to bend and straighten the knee and to strengthen the leg to prevent repeat injury. A rehabilitation program may last 6 months, although the patient can return to many activities before then.

**Can Bursitis and Tendinitis Be Prevented?**

To help prevent inflammation or reduce the severity of its recurrence:

- Warm up or stretch before physical activity.
- Strengthen muscles around the joint.
- Take breaks from repetitive tasks often.
- Cushion the affected joint. Use foam for kneeling or elbow pads. Increase the gripping surface of tools with gloves or padding. Apply grip tape or an oversized grip to golf clubs.
- Use two hands to hold heavy tools; use a two-handed backhand in tennis.
- Don’t sit still for long periods.
- Practice good posture and position the body properly when going about daily activities.
- Begin new activities or exercise regimens slowly. Gradually increase physical demands following several well-tolerated exercise sessions.
- If a history of tendinitis is present, consider seeking guidance from your doctor or therapist before engaging in new exercises and activities.
CHAPTER 5

THORACIC OUTLET SYNDROME

What is Thoracic Outlet Syndrome?

Thoracic outlet syndrome is an umbrella term that encompasses three related syndromes that involve compression of the nerves, arteries, and veins in the lower neck and upper chest area and cause pain in the arm, shoulder, and neck. Most doctors agree that thoracic outlet syndrome is caused by compression of the brachial plexus or subclavian vessels as they pass through narrow passageways leading from the base of the neck to the armpit and arm, but there is considerable disagreement about its diagnosis and treatment.

Making the diagnosis of thoracic outlet syndrome even more difficult is that a number of disorders feature symptoms similar to those of thoracic outlet syndrome, including rotator cuff injuries, cervical disc disorders, fibromyalgia, multiple sclerosis, complex regional pain syndrome, and tumors of the syrinx or spinal cord. The disorder can sometimes be diagnosed in a physical exam by tenderness in the supraclavicular area, weakness and/or a "pins and needles" feeling when elevating the hands, weakness in the fifth ("little") finger, and paleness in the palm of one or both hands when the individual raises them above the shoulders, with the fingers pointing to the ceiling. Symptoms of thoracic outlet syndrome vary depending on the type.

Neurogenic thoracic outlet syndrome has a characteristic sign, called the Gilliatt-Sumner hand, in which there is severe wasting in the fleshy base of the thumb. Other symptoms include paresthesias (pins and needles sensation or numbness) in the fingers and hand, change in hand color, hand coldness, or dull aching pain in the neck, shoulder, and armpit.

Venous thoracic outlet syndrome features pallor, a weak or absent pulse in the affected arm, which also may be cool to the touch and appear paler than the unaffected arm. Symptoms may include numbness, tingling, aching, swelling of the extremity and fingers, and weakness of the neck or arm.
Arterial thoracic outlet syndrome most prominently features change in color and cold sensitivity in the hands and fingers, swelling, heaviness, paresthesias and poor blood circulation in the arms, hands, and fingers.

There are many causes of thoracic outlet syndrome, including physical trauma, anatomical defects, tumors that press on nerves, poor posture that causes nerve compression, pregnancy, and repetitive arm and shoulder movements and activity, such as from playing certain sports.

Thoracic outlet syndrome is more common in women. The onset of symptoms usually occurs between 20 and 50 years of age. Doctors usually recommend nerve conduction studies, electromyography, or imaging studies to confirm or rule out a diagnosis of thoracic outlet syndrome.

Is there any treatment?

Treatment begins with exercise programs and physical therapy to strengthen chest muscles, restore normal posture, and relieve compression by increasing the space of the area the nerve passes through. Doctors will often prescribe non-steroidal anti-inflammatory drugs (such as naproxen or ibuprofen) for pain. Other medicines include thrombolytics to break up blood clots and anticoagulants to prevent clots. If this doesn't relieve pain, a doctor may recommend thoracic outlet decompression surgery to release or remove the structures causing compression of the nerve or artery.

What is the prognosis?

The outcome for individuals with thoracic outlet syndrome varies according to type. The majority of individuals with thoracic outlet syndrome will improve with exercise and physical therapy. Vascular thoracic outlet syndrome, and true neurogenic thoracic outlet syndrome often require surgery to relieve pressure on the affected vessel or nerve.
CHAPTER 6
TENOSYNOVITIS

What is Tenosynovitis?
Muscle and bone are connected by a cord-like structure called a tendon. When the fluid-filled lining of the sheath that protects a tendon is inflamed, it is called tenosynovitis. This condition may occur in any tendon sheath lining but tends to be more common in the hands, wrists and feet.

What Causes this Condition?
It is not always known what causes tenosynovitis but it may be a result of:

* Repetitive motions
* Overuse
* Infection
* Arthritis
* Use of vibrating hand tools

What are the Symptoms?
* Swelling around the joint in the area affected
* Joint stiffness
* Pain upon movement of the affected joint
* Redness of the skin at the affected tendon site.
* Tenderness and pain around the joint of the affected area, especially the foot, ankle, wrist or hand.

How is Tenosynovitis Diagnosed?
Your health care provider will perform a physical examination of the affected area and look for swelling over the tendon. He or she will palpate (touch) the area and try to recreate the motion that causes pain. Your health care provider may look for redness over the area and other symptoms of tenosynovitis.

How is Tenosynovitis Treated?
The main objective of treatment is to decrease inflammation and pain. Immobilization of the affected area and rest are advised to aid in healing. To immobilize the tendon area, splints and removable braces are often utilized. The application of ice packs to the affected area may help decrease inflammation and relieve pain.
Medications such as nonsteroidal anti-inflammatory medications (NSAIDs) such as ibuprofen can be utilized to decrease inflammation and relieve pain as well. In some instances, your health care provider may recommend treatment with corticosteroid injections into the affected area. In rare cases, surgery may be advised if all other treatment options fail.

Sometimes, a local infection may be the etiology of tenosynovitis. In such cases, antibiotics would be prescribed. If this treatment fails, a surgical procedure can be performed to clean out the area surrounding the tendon.

How Can Recurrence of Tenosynovitis be Prevented?

To help reduce the chance of tenosynovitis recurring, it is important to perform exercises to strengthen the muscles surrounding the affected tendon following recovery of the episode. If the tenosynovitis was the result of overuse or repetitive motions, frequent breaks will be necessary to prevent the condition from returning. If the tenosynovitis was the result of the use of vibrating hand tools, switching to manual hand tools or hand tools that vibrate less intensely should be considered. If the tenosynovitis was the result of an infection, seek immediate attention from your health care provider if you suspect any local infection so appropriate treatment can be started promptly.

What is the Prognosis?

Most individuals can expect a full recovery of tenosynovitis with appropriate treatment by a health care provider. If the condition becomes chronic, damage to the tendon may result and it may take a long time to heal. In some instances, complete healing may not occur.

What are the Potential Complications of Tenosynovitis?

Without appropriate treatment, stiffness of the tendon may occur or the tendon may even rupture. This would result in a joint that remains stiff. If the tenosynovitis is caused by infection, it is possible the infection may spread to other areas of the body or damage the affected limb.

How Can You Help Prevent Tenosynovitis?

* Keep wounds clean and seek medical attention for suspected infection.

* Avoid repetitive motions of the hands, wrists, feet and ankles.

* Avoid overuse of the hands, wrists, feet and ankles.

* Avoid frequent use of vibrating hand tools.
Chapter 7
Sprains and Strains

What Is the Difference Between a Sprain and a Strain?

A sprain is a stretch and/or tear of a ligament (a band of fibrous tissue that connects two or more bones at a joint). One or more ligaments can be injured at the same time. The severity of the injury will depend on the extent of injury (whether a tear is partial or complete) and the number of ligaments involved.

A strain is an injury to either a muscle or a tendon (fibrous cords of tissue that connect muscle to bone). Depending on the severity of the injury, a strain may be a simple overstretch of the muscle or tendon, or it can result from a partial or complete tear.

What causes a sprain?

A sprain can result from a fall, a sudden twist, or a blow to the body that forces a joint out of its normal position and stretches or tears the ligament supporting that joint. Typically, sprains occur when people fall and land on an outstretched arm, slide into a baseball base, land on the side of their foot, or twist a knee with the foot planted firmly on the ground.

Where Do Sprains Usually Occur?

Although sprains can occur in both the upper and lower parts of the body, the most common site is the ankle. More than 25,000 individuals sprain an ankle each day in the United States.

The ankle joint is supported by several lateral (outside) ligaments and medial (inside) ligaments (see fig. 1). Most ankle sprains happen when the foot turns inward as a person runs, turns, falls, or lands on the ankle after a jump. This type of sprain is called an inversion injury. The knee is another common site for a sprain. A blow to the knee or a fall is often the cause; sudden twisting can also result in a sprain (see fig. 2).
Sprains frequently occur at the wrist, typically when people fall and land on an outstretched hand. A sprain to the thumb is common in skiing and other sports. This injury often occurs when a ligament near the base of the thumb (the ulnar collateral ligament of the metacarpophalangeal joint) is torn (see fig. 3).

What Are the Signs and Symptoms of a Sprain?

The usual signs and symptoms include pain, swelling, bruising, instability, and loss of the ability to move and use the joint (called functional ability). However, these signs and
symptoms can vary in intensity, depending on the severity of the sprain. Sometimes people feel a pop or tear when the injury happens.

Doctors closely observe an injured site and ask questions to obtain information to diagnose the severity of a sprain. In general, a grade I or mild sprain is caused by overstretching or slight tearing of the ligaments with no joint instability. A person with a mild sprain usually experiences minimal pain, swelling, and little or no loss of functional ability. Bruising is absent or slight, and the person is usually able to put weight on the affected joint.

When to See a Health Care Provider for a Sprain

- You have severe pain and cannot put any weight on the injured joint.
- The injured area looks crooked or has lumps and bumps (other than swelling) that you do not see on the uninjured joint.
- You cannot move the injured joint.
- You cannot walk more than four steps without significant pain.
- Your limb buckles or gives way when you try to use the joint.
- You have numbness in any part of the injured area.
- You see redness or red streaks spreading out from the injury.
- You injure an area that has been injured several times before.
- You have pain, swelling, or redness over a bony part of your foot.
- You are in doubt about the seriousness of the injury or how to care for it.

A grade II or moderate sprain is caused by further, but still incomplete, tearing of the ligament and is characterized by bruising, moderate pain, and swelling. A person with a moderate sprain usually has more difficulty putting weight on the affected joint and experiences some loss of function. An x ray may be needed to help the health care provider determine if a fracture is causing the pain and swelling. Magnetic resonance imaging is occasionally used to help differentiate between a significant partial injury and a complete tear in a ligament, or can be recommended to rule out other injuries.

People who sustain a grade III or severe sprain completely tear or rupture a ligament. Pain, swelling, and bruising are usually severe, and the patient is unable to put weight on the joint. An x ray is usually taken to rule out a broken bone. When diagnosing any sprain, the health care provider will ask the patient to explain how the injury happened. He or she will examine the affected area and check its stability and its ability to move and bear weight.

What Causes a Strain?

A strain is caused by twisting or pulling a muscle or tendon. Strains can be acute or chronic. An acute strain is associated with a recent trauma or injury; it also can occur after improperly lifting heavy objects or overstressing the muscles. Chronic strains are usually the result of overuse: prolonged, repetitive movement of the muscles and tendons.
Where Do Strains Usually Occur?

Two common sites for a strain are the back and the hamstring muscle (located in the back of the thigh). Contact sports such as soccer, football, hockey, boxing, and wrestling put people at risk for strains. Gymnastics, tennis, rowing, golf, and other sports that require extensive gripping can increase the risk of hand and forearm strains. Elbow strains sometimes occur in people who participate in racquet sports, throwing, and contact sports.

What Are the Signs and Symptoms of a Strain?

Typically, people with a strain experience pain, limited motion, muscle spasms, and possibly muscle weakness. They also can have localized swelling, cramping, or inflammation and, with a minor or moderate strain, usually some loss of muscle function. Patients typically have pain in the injured area and general weakness of the muscle when they attempt to move it. Severe strains that partially or completely tear the muscle or tendon are often very painful and disabling.

How Are Sprains and Strains Treated?

Reduce Swelling and Pain

Treatments for sprains and strains are similar and can be thought of as having two stages. The goal during the first stage is to reduce swelling and pain. At this stage, health care providers usually advise patients to follow a formula of rest, ice, compression, and elevation (RICE) for the first 24 to 48 hours after the injury (see the box below). The health care provider also may recommend an over-the-counter or prescription nonsteroidal anti-inflammatory drug (NSAID), such as aspirin or ibuprofen, to help decrease pain and inflammation.

For people with a moderate or severe sprain, particularly of the ankle, a hard cast may be applied. This often occurs after the initial swelling has subsided. Severe sprains and strains may require surgery to repair the torn ligaments, muscle, or tendons. Surgery is usually performed by an orthopaedic surgeon.

It is important that moderate and severe sprains and strains be evaluated by a health care provider to allow prompt, appropriate treatment to begin. This box lists some signs that should alert people to consult their health care provider. However, a person who has any concerns about the seriousness of a sprain or strain should always contact a health care provider for advice.

RICE Therapy

- **Rest**
  Reduce regular exercise or activities of daily living as needed. Your health care provider may advise you to put no weight on an injured area for 48 hours.
If you cannot put weight on an ankle or knee, crutches may help. If you use a cane or one crutch for an ankle injury, use it on the uninjured side to help you lean away and relieve weight on the injured ankle.

- **Ice**
  Apply an ice pack to the injured area for 20 minutes at a time, four to eight times a day. A cold pack, ice bag, or plastic bag filled with crushed ice and wrapped in a towel can be used. To avoid cold injury and frostbite, do not apply the ice for more than 20 minutes.

- **Compression**
  Compression of an injured ankle, knee, or wrist may help reduce swelling. Examples of compression bandages are elastic wraps, special boots, air casts, and splints. Ask your health care provider for advice on which one to use and how tight to apply the bandage safely.

- **Elevation**
  If possible, keep the injured ankle, knee, elbow, or wrist elevated on a pillow, above the level of the heart, to help decrease swelling.

### Begin Rehabilitation

The second stage of treating a sprain or strain is rehabilitation, with the overall goal of improving the condition of the injured area and restoring its function. The health care provider will prescribe an exercise program designed to prevent stiffness, improve range of motion, and restore the joint's normal flexibility and strength. Some patients may need physical therapy during this stage. When the acute pain and swelling have diminished, the health care provider will instruct the patient to do a series of exercises several times a day. These are very important because they help reduce swelling, prevent stiffness, and restore normal, pain-free range of motion. The health care provider can recommend many different types of exercises, depending on the injury. A patient with an injured knee or foot will work on weight-bearing and balancing exercises. The duration of the program depends on the extent of the injury, but the regimen commonly lasts for several weeks.

Another goal of rehabilitation is to increase strength and regain flexibility. Depending on the patient’s rate of recovery, this process begins about the second week after the injury. The health care provider will instruct the patient to do a series of exercises designed to meet these goals. During this phase of rehabilitation, patients progress to more demanding exercises as pain decreases and function improves.

The final goal is the return to full daily activities, including sports when appropriate. Patients must work closely with their health care health care provider or physical therapist to determine their readiness to return to full activity. Sometimes people are tempted to resume full activity or play sports despite pain or muscle soreness. Returning to full activity before regaining normal range of motion, flexibility, and strength increases the chance of reinjury and may lead to a chronic problem.
The amount of rehabilitation and the time needed for full recovery after a sprain or strain depend on the severity of the injury and individual rates of healing. For example, a mild ankle sprain may require 3 to 6 weeks of rehabilitation; a moderate sprain could require 2 to 3 months. With a severe sprain, it can take 8 to 12 months to return to full activities. Extra care should be taken to avoid reinjury.

Can Sprains and Strains Be Prevented?

People can do many things to help lower their risk of sprains and strains:

- Avoid exercising or playing sports when tired or in pain.
- Maintain a healthy, well-balanced diet to keep muscles strong.
- Maintain a healthy weight.
- Practice safety measures to help prevent falls. For example, keep stairways, walkways, yards, and driveways free of clutter; anchor scatter rugs; and salt or sand icy sidewalks and driveways in the winter.
- Wear shoes that fit properly.
- Replace athletic shoes as soon as the tread wears out or the heel wears down on one side.
- Do stretching exercises daily.
- Be in proper physical condition to play a sport.
- Warm up and stretch before participating in any sport or exercise.
- Wear protective equipment when playing.
- Run on even surfaces.

NOTES:
CHAPTER 8
REDUCING HEALTHCARE WORKER RISK

Ergonomics focuses on the interactions between work demands and worker capabilities. The goal is to achieve those interactions between the work and the worker that will optimize productivity and, at the same time, preserve the safety and health of the workforce. Ergonomics is simply “fitting the task to the worker” rather than forcing the worker to fit the task. Applying ergonomic principles to work stations can help prevent a variety of conditions, such as back pain and carpal tunnel syndrome. Small adjustments to the position of a chair, keyboard, or monitor can lead to big improvements in employee comfort and productivity.

Design Principles for Repetitive Hand and Wrist Tasks:

1. Reduce the number of repetitions per shift. Where possible, substitute full or semi-automated systems.
2. Maintain neutral (handshake) wrist positions:
   - Design jobs and select tools to reduce extreme flexion or deviation of the wrist.
   - Avoid inward and outward rotation of the forearm when the wrist is bent to minimize elbow disorders (i.e., tennis elbow).
3. Reduce the force or pressure on the wrists and hands:
   - Wherever possible, reduce the weight and size of objects that must be handled repeatedly.
   - Avoid tools that create pressure on the base of the palm which can obstruct blood flow and nerve function.
   - Avoid repeated pounding with the base of the palm.
   - Avoid repetitive, forceful pressing with the finger tips.
4. Design tasks so that a power grip rather than a finger pinch grip can be used to grasp materials. Note that a pinch grip is five times more stressful than a power grip.
5. Avoid reaching more than 15 in. in front of the body for materials:
   - Avoid reaching above shoulder height, below waist level, or behind the body to minimize shoulder disorders.
   - Avoid repetitive work that requires full arm extension (i.e., the elbow held straight and the arm extended).
6. Provide support devices where awkward body postures (elevated hands or elbows and extended arms) must be maintained. Use fixtures to relieve stressful hand/arm positions.
7. Select power tools and equipment with features designed to control or limit vibration transmissions to the hands, or alternatively design work methods to reduce time or need to hold vibrating tools.
8. Provide for protection of the hands if working in a cold environment. Furnish a selection of glove sizes and sensitize users to problems of forceful overgripping when worn.
9. Select and use properly designed hand tools (e.g., grip size of tool handles should accommodate majority of workers).

*Adapted from design checklists developed by Dave Ridyard, CPE, CIH, CSP. Applied Ergonomics Technology, 270 Mather Road, Jenkintown, PA 19046–3129.

**ERGONOMICS AT THE WORKPLACE**

**AT THE COMPUTER**

**Monitor Placement**

With regard to the monitor, one must take into consideration how the placement and maintenance of the monitor can affect both the eyes and the musculoskeletal system. The following suggestions can help prevent the development of eye strain, neck pain and shoulder fatigue while using your computer workstation:

*Make sure the surface of the viewing screen is clean.*
*Adjust brightness and contrast to optimum comfort.*
*Position the monitor directly in front of user to avoid excessive twisting of the neck.*
*Position the monitor approx. 20-26 inches (arm's length) from user.*
*Tilt top of the monitor back 10 to 20 degrees.*
*Position monitors at right angles from windows to reduce glare.*
*Position monitors away from direct lighting which creates excessive glare or use a glare filter over the monitor to reduce glare.*
*The top of the viewing screen should be at eye level when the user is sitting in an upright position (NOTE: Bifocal wearers may need to lower monitor a couple of inches).*

**Ergonomic Chair**

What do you need to look for in Ergonomic Seating? In order to help make sure you choose a chair with all the necessary adjustments, we will break the chair down into its components.

**I. Casters & Base**

Use a chair with casters and a 5-point base to ease movement and minimize possible tipping. Generally, nylon carpet casters are standard, but soft wheel casters are...
available for hard surfaces such as linoleum. Rubber locking casters are useful on stools to prevent tipping.

II. Seat Pan

The seat pan is the component of the chair that supports the majority of the user’s weight. It is important to purchase a chair which uses dense, small-cell foam padding or spring coils to retain its support and cushioning (this usually involves purchasing a chair over $250.00). The front part of the seat should slope down slightly (waterfall design) and allow a fist size gap between the back of the knees and the front edge of the seat pan to reduce pressure at the back of the thighs. Tilt adjustments are preferred to allow a forward working posture to be attained or a reclined posture. A seat pan with a sliding mechanism is also a beneficial feature. This allows small and tall users to adjust the distance from the back rest.

III. Backrest

Adequate lumbar support is the most crucial element of a backrest. The backrest should either be small enough to fit into the small of the back, clearing the pelvis and back of the rib cage, or curved to provide adequate support. Many chairs come with a built-in lumbar adjustment which can be adjusted by turning a knob on the side of the chair. Inadequate lumbar support places excess pressure on the spine. Remember, a lumbar support cushion properly placed behind the small of the back can help to accentuate lumbar support. The backrest should also have angle, in-out, and height adjustments to achieve proper spinal alignment. The angle adjustment allows the user to adjust the angle of the back rest relative to the seat pan, as apposed to the tilt mechanism, which moves the seat pan with the backrest. When you change the tilt, the angle between the seat pan and the backrest stays the same.

IV. Armrests

Adjustable height and width are absolutely necessary when purchasing a chair with armrests. The armrest should be made of a soft material and should be at least 2” wide to provide adequate surface area.

V. Seat Height

Almost all task chairs come with a hydraulic seat height adjustment. This is probably the single most import adjustment mechanism on a chair. It allows the user to adjust the chair so their feet can rest properly on the floor or footrest and the upper body is properly aligned with the computer monitor and input devices such as the keyboard and mouse.
VI. Chair Recline or Tilt

The chair recline or tilt adjustment changes the angle of the entire seat relative to the floor. As with backrest angle adjustability, a reclined chair transfers some of the upper body weight to the backrest of the chair. It is also important that the user change body positioning throughout the day.

Adjusting Your Chair

Contrary to popular belief, sitting, which most people believe is relaxing, is hard on the back. Sitting for long periods of time can cause increased pressure on the intervertebral discs— the springy, shock-absorbing part of the spine. Sitting is also hard on the feet and legs. Gravity tends to pool blood in the legs and feet and create a sluggish return to the heart.

The following recommendations can help increase comfort for computer users:

♦ "Dynamic sitting", don't stay in one static position for extended periods of time.
♦ When performing daily tasks, alternate between sitting and standing.
♦ Adjust height of backrest to support the natural inward curvature of the lower back.
♦ It may be useful to use a rolled towel or lumbar pad to support the low back.
♦ The backrest angle is set so that your hip-torso angle is 90 degrees or greater.
♦ Adjust height of chair so feet rest flat on floor (use footrest if necessary).
♦ Sit upright in the chair with the low back against the backrest and the shoulders touching the backrest.
♦ Thighs should be parallel to the floor and knees at about the same level as the hips.
♦ Back of knees should not come in direct contact with the edge of the seat pan (there should be 2-3 inches between the edge of the seat and the back of the knee).
♦ Don't use armrests to slouch.
♦ Adjust height and/or width of armrests so they allow the user to rest arms at their sides and relax/drop their shoulders while keyboarding.
♦ Where armrests are used, elbows and lower arms should rest lightly so as not to cause circulatory or nerve problems.
**Desktop Placement**

If you are like many computer users, your computer, keyboard, and mouse are resting on your desk or a portable computer workstation. There is no specific height recommended for your desktop; however, the working height of your desk should be approximately elbow height for light duty desk work.

To allow for proper alignment of your arms your keyboard should be approximately 1 inch to 2 inches above your thighs (see Keyboard and Mouse Placement). Most times this requires a desk which is 25 inches to 29 inches in height (depending upon size of individual) or the use of an articulating keyboard tray. The area underneath the desk should always be clean to accommodate the user’s legs and allow for stretching.

The desktop should be organized so frequently used objects are close to the user to avoid excessive extended reaching. If a document holder is used, it should be placed at approximately the same height as the monitor and at the same distance from the eyes to prevent frequent eye shifts between the screen and reference materials.

**Keyboard and Mouse Placement**

Many ergonomic problems associated with computer workstations occur in the forearm, wrist, and hand. Continuous work on the computer exposes soft tissues in these areas to repetition, awkward postures, and forceful exertions.

The following adjustments should be made to your workstation to help prevent the development of an ergonomic problem in the upper extremities:

♦ Adjust keyboard height so shoulders can relax and allow arms to rest at sides (an articulating keyboard tray is often necessary to accommodate proper height and distance).

♦ Keyboard should be close to the user to avoid excessive extended reaching.

♦ Forearms parallel to the floor (approximately 90 degree angle at elbow).

♦ Mouse should be placed adjacent to keyboard and at the same height as the keyboard (use articulating keyboard tray if necessary).

♦ Avoid extended and elevated reaching for keyboard and mouse. Wrist should be in neutral position (not excessively flexed or extended).

♦ Do not rest the hand on the mouse when you are not using it. Rest hands in your lap when not entering data.

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**Lighting**

Lighting not suited to working with a Video Display Terminal is a major contributing factor in visual discomforts including eyestrain, burning or itching eyes, and blurred or double vision. Typical office environments have illumination levels of 75 to 100 foot-candles, but according to the American National Standards Institute (ANSI), computer workstations require only 18 to 46 foot-candles.

Use the following recommendations to reduce eyestrain and eye fatigue:

- Close drapes/blinds to reduce glare. Adjust lighting to avoid glare on screen (light source should come at a 90 degree angle, with low watt lights rather than high.) Place monitor at 90 degree angle to windows (where possible). Reduce overhead lighting (where possible). Use indirect or shielded lighting where possible. Walls should be painted medium or dark color and not have reflective finish.

- Use a glare screen to reduce glare (alternatively, place a large manila folder on top of the monitor and let it hang over the monitor 2 inches -3 inches to reduce glare from overhead lighting).

**Eye Exercises**

**Eye Comfort Exercises**

- A. Blinking (produces tears to help moisten and lubricate the eyes)
- B. Yawning (produces tears to help moisten and lubricate the eyes)
- C. Expose eyes to natural light

**Palming**

- A. while seated, brace elbows on the desk and close to the desk edge
- B. let weight fall forward
- C. cup hands over eyes
- D. close eyes
- E. inhale slowly through nose and hold for 4 seconds
- F. continue slowly through nose and hold for 15-30 seconds

**Eye Movements**

- A. close eyes
- B. slowly and gently move eyes up to the ceiling, then slowly down to the floor
- C. repeat 3 times
- D. close eyes
- E. slowly and gently move eyes to the left, then slowly to the right
- F. repeat 3 times
Focus Change

A. hold one finger a few inches away from the eye
B. focus on the finger
C. slowly move the finger away
D. focus far into the distance and then back to the finger
E. slowly bring the finger back to within a few inches of the eye
F. focus on something more than 8 feet away
G. repeat 3 times

Musculoskeletal Exercises

Deep Breathing

A. while standing, or in an otherwise relaxed position
B. place one hand on the abdomen and one on the chest
C. inhale slowly through the nose
D. hold for 4 seconds
E. exhale slowly through the mouth
F. repeat

Cable Stretch

A. while sitting with chin in, stomach in shoulders relaxed, hands relaxed in lap, and feet flat on the floor, imagine a cable pulling the head upward
B. hold for 3 seconds and relax
C. repeat 3 times

Side Bend: Neck Stretch

A. tilt head to one side (ear towards shoulder)
B. hold for 15 seconds
C. relax
D. repeat 3 times on each side

Diagonal Neck Stretch

A. turn head slightly and then look down as if looking in your pocket
B. hold for 15 seconds
C. relax
D. repeat 3 times on each side

Shoulder Shrug

A. slowly bring shoulders up to the ears and hold for approx. 3 seconds
B. rotate shoulders back and down
C. repeat 10 times
### Executive Stretch

A. while sitting, lock hands behind head  
B. bring elbows back as far as possible  
C. inhale deeply while leaning back and stretching  
D. hold for 20 seconds  
E. exhale and relax  
F. repeat 1 time

### Foot Rotation

A. while sitting, slowly rotate each foot from the ankle  
B. rotate 3 times in one direction, then 3 times in the opposite direction  
C. relax  
D. repeat 1 time

### Hand Shake

A. while sitting, drop arms to the side  
B. shake hands downward gently  
C. repeat frequently

### Hand Massage (Note: Perform very gently!)

A. massage the inside and outside of the hand using the thumb and fingers  
B. repeat frequently (including before beginning work)

### Finger Massage (Note: Perform very gently!)

A. massage fingers of each hand individually, slowly, and gently  
B. move toward nail gently  
C. massage space between fingers  
D. perform daily

### Wrist Stretch

A. hold arm straight out in front of you  
B. pull the hand backwards with the other hand, then pull downward  
C. hold for 20 seconds  
D. relax  
E. repeat 3 times each
Patient Care

Assisting another individual in a change of position requires proper body mechanics on your part. Proper body mechanics (positioning) will make your job easier to perform and reduce the risk of injury. Proper body mechanics requires that the natural curves of the spine are maintained in proper alignment. So, let's look at the natural curves of the back and how to successfully maintain these curves:

Maintain Your Curves

To do this successfully........

1. Bend your knees to get up and down.
2. Keep the object close to the body in order to minimize forces on your body.
3. Pivot don't twist.
4. Don't try to do more than you can handle. Respect your limits.

Biosafety Cabinets and Laboratory Workbenches

The following are recommended for control of ergonomic hazards associated with biosafety cabinets and laboratory workbenches:
♦ Use an ergonomically designed chair that provides adequate back support, adjustable seat angle, and height adjustability between 28 inches to 33 inches.

♦ Use footrests for individuals whose feet do not rest comfortably on the floor.

♦ Apply closed-cell foam padding to the front edge of the biosafety cabinet (away from the downdraft) or workbench. This reduces contact forces by increasing the surface area that comes into contact with the forearm and therefore reduces the chances of impinging nerves, tendons, or blood vessels. If applying closed-cell padding to front edge of biosafety cabinet, make sure the material can be properly decontaminated.

♦ Remove drawers, supplies, refrigerators, etc. from under the workbenches and cabinet doors from under biosafety cabinets (provides leg room).

♦ Use a turntable to store equipment near the worker. This reduces excessive reaching and twisting, which places an increased load on the low back.

♦ Use anti-fatigue matting for laboratory personnel who must stand for extended periods of time.

♦ Take frequent micro-breaks to perform stretching exercises.

Biosafety cabinets may be purchased that incorporate the features below. Desirable features for the new biosafety cabinets include:

♦ A perforated front grill reduced by 1 inch to 2 inches to bring the work platform closer to the laboratory worker-adjustable height (hand-crank or hydraulic lift). Non-glare glass on the sash window and/or adjustable Plexiglas barriers.

♦ A platform configuration with "wells" for placement of tall containers.
REFERENCE LIST


