### MedFit Classroom Orthopedic Fitness Specialist Course

### Module: 11 Elbows, Wrists & Hands

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#### Learning Objectives Elbows, Wrists & Hands

- Identify and Define
  - Healthy Elbows
  - Healthy Wrists
  - Healthy Hands
  - **Assess and Identify Common Conditions**
- Examine Appropriate Exercises





#### Learning Objectives Elbows

#### **Elbows:**

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- Assess and Identify
  - Range of Motion Restrictions
  - Forearm Flexor and Extensor
  - Mass Restrictions/Tightness
- Identify Common Conditions
  - Epicondylitis
  - Medial "Golfer's Elbow"
  - Lateral "Tennis Elbow"
  - Osteoarthritis





# **A Healthy Elbow**

The elbow joint helps in bending and straightening of the arm to 180 degrees as well as lifting and moving objects. The humerus, or upper arm bone, forms the upper portion of the joint.

The elbow joint is made of three bones coming together:

- » the humerus (upper arm bone)
- » the ulna and the radius (the two bones that form the forearm

The cartilage in the elbow joint helps in providing protection and cushioning at the bone ends. Therefore, there is no friction or discomfort and the elbow joint can move freely.









# **Elbow: Mass Restriction/Tightness**

#### **ELBOW RESTRICTION:**

This occurs when when inelastic muscle fibers become shortened and unable to release and lengthen back to their normal relaxed state.

For example: Lifting a weight too heavy or using bad weightlifting form overstretch the triceps muscle and forearm muscles and cause these muscles to become restricted.



#### **ELBOW TIGHTNESS:**

- Injury to the right or left forearm flexor muscle gives you tight, restrictive feeling and pulls on your flexor tendon which attaches at your elbow.
- When it happens to your extensor muscles it causes stiffness and tension on your extensor tendon.
- This shows up as tightness in your elbow that interferes with your daily routine.



### Elbow: Common Conditions Epicondylitis

#### **Epicondylitis:**

This refers to the inflammation of the tendons, which are cords of tissue, that attach the forearm muscles to the elbow.

The inflammation leads to tenderness in the tendon and elbow pain.





Epicondylitis commonly occurs due to overuse of the elbow and involved tendons during sports, such as golf and tennis, or work-related activities that involve repetitive and forceful gripping and lifting.



### Elbow: Common Conditions Epicondylitis





### **Elbow Epicondylitis**



#### What are the signs and symptoms:

The signs and symptoms of epicondylitis include a painful or burning sensation at the inner or outer part of the elbow, at times accompanied by weak grip strength and difficulty picking up or holding objects.

#### An individual may also experience:

- 1. Tremors, or shaking, in their hands
- 2. Numb or tingling sensation may start at the elbow and travel to one or more fingers.
- 3. Slowly developing symptoms worsening over weeks or months
- 4. Dominant arm mostly affected



### **Elbow: Medial vs Lateral**

#### What is medial epicondylitis?

• Also known as golfer's elbow. This is the inflammation of the tendons that attach the forearm muscles to the inside, or medial aspect, of the bone at the elbow. Most commonly, the tendons connecting to the flexor carpi radialis muscle, which is located on the anterior surface (i.e., or front) of the forearm, are involved. The flexor carpi radialis is responsible for flexing the wrist (i.e., bending the hand inward so the palm faces the inside of the arm) as well as abducting the hand (i.e., moving the hand away from the body).

#### What is lateral epicondylitis?

 Lateral epicondylitis, or tennis elbow, is an inflammation of the tendons that attach the forearm muscles to the outside, or lateral aspect, of the elbow. The tendons involved are those that connect to the extensor carpi radialis brevis muscle, which sits on the lateral aspect of the forearm. These tendons are responsible for one's ability to straighten the wrist and fingers.



# **Epicondylitis Diagnosis**

#### **Diagnosis:**

During the physical exam, the clinician may ask the individual to rest their affected arm on a table, with the palm facing up, and the clinician will bend the wrist against resistance. If the individual has epicondylitis they will typically feel pain at the elbow upon bending.

-Diagnostic testing: X-rays, MRI's to rule out arthritis or herniated disks in the cervical spine, as these conditions can also involve radiating pain from the elbow.

-An electromyography (EMG) can be used to rule out nerve compression around the elbow, which could cause similar symptoms to that of epicondylitis.



# EpicondylitisTreatment

#### **Treatment:**

Non-surgical:

Rest, Avoid Repetitive Motion. NSAID's, Arm Brace over the back of the forearm to prevent overextension, PT, or physical therapy may be recommended to strengthen the muscles of the forearm/ muscle-stimulation techniques to promote muscle healing or ice massages to reduce inflammation, Steroid Injections.

Surgical:

Surgery typically involves removing parts of the torn, injured muscle and reattaching the healthy parts to the bone. Depending on risk factors, such as age or past medical history, the surgeon may choose to perform an open surgery via an incision over the elbow. Another option is to perform surgery arthroscopically, using small incisions and miniature instruments. 4-12 Months recovery depending on the surgery or severity



### **Elbow Osteoarthritis**

This occurs when the cartilage surface of the elbow is worn out or is damaged. This can happen because of a previous injury such as elbow dislocation or fracture. Most commonly, this occurs as a result of a normal wearing away of the joint cartilage from age and activity.



Note: The elbow is one of the least affected joints because of its well matched joint surfaces and strong stabilizing ligaments. As a result, the elbow joint can tolerate large forces across it without becoming unstable.



### **Elbow Osteoarthritis**

The most common symptoms of elbow arthritis are:

- Pain
- Loss of range of motion

Both of these symptoms may not occur at the same time. Patients usually report a "grating" or "locking" sensation in the elbow. The "grating" is due to loss of the normal smooth joint surface. This is caused by cartilage damage or wear. The "locking" is caused by loose pieces of cartilage or bone that dislodge from the joint and become trapped between the moving joint surfaces, blocking motion.

Joint swelling may also occur, but this does not usually happen at first. Swelling occurs later, as the disease progresses.

In the later stages of osteoarthritis of the elbow, patients may notice numbness in their ring finger and small finger. This can be caused by elbow swelling or limited range of motion in the joint. The "funny bone" (ulnar nerve) is located in a tight tunnel behind the inner (medial) side of the elbow. Swelling in the elbow joint can put increased pressure on the nerve, causing tingling. If the elbow cannot be moved through its normal range of motion, it may stiffen into a position where it is bent (flexion). This can also cause pressure around the nerve to increase.





### **Elbow Osteoarthritis Treatment**

#### Nonsurgical Treatment

For the early stages of osteoarthritis of the elbow, the most common treatment is nonsurgical. This includes oral medications to reduce or alleviate pain, physical therapy, and activity modification.

Corticosteroid injections & Steroid medication works in most patients, but not everyone. Although the effects of injections are temporary, they can provide some pain relief until symptoms progress enough to need additional treatment.

An alternative to steroids has been the injection of hyaluronic acid in various forms, called viscosupplementation. Viscosupplementation involves injecting substances into the joint to improve the quality of the joint fluid.

#### **Surgical Treatment:**

By the time arthritis can be seen on x-rays, there has been significant wear or damage to the joint surfaces. Even if the wear and bone spurs are severe, arthroscopy can offer a minimally invasive surgical treatment.

Arthroscopy has been shown to provide symptom improvement and improved range of motion. It involves removing any loose bone/cartilage fragments or inflammatory/degenerative tissue in the joint. It also attempts to smooth out irregular surfaces and remove bone spurs. Multiple small incisions are used to perform the surgery. It can be done as an outpatient procedure, and recovery is reasonably rapid.

If the joint surface has worn away completely, it is unlikely that anything other than a joint replacement would bring about relief.



#### **EXERCISES FOR ELBOW HEALTH**

There are two goals of treatment for elbow stiffness – you want to:

Gain motion gradually

**Minimize inflammation** 

Another tip: Do not just focus on stretching your elbow in one direction – stretch it in both directions. A gain in elbow motion in one direction can sometimes mean a loss of elbow motion in the other direction– we do not want this!

Elbow extension stretch Elbow flexion stretch Active elbow range of motion





#### Learning Objectives Wrists & Hands

#### Wrists & Hands

- Assess and Identify
  - Anatomy of the Wrist and Hand
  - Range of Motion Restriction
  - Common Injuries
- Identify Common Conditions
  - Wrist Drop Deformity
  - Arthritis & Osteoarthritis
  - Carpal Tunnel Syndrome
  - De Quervain's Syndrome
  - Depuytren's Contracture
  - Swan-neck deformity
  - Boutonniere deformity
  - Ulner Drift
  - Trigger Finger
  - Claw Fingers



- Bishops Hand
  - Ape Hand Deformity
- Benediction Deformity



### What is a healthy wrist?







# The Anatomy of the Wrist

The Wrist:

- the joint between your hand and arm
- contains eight bones called carpal bones that are arranged in two rows.

The scaphoid, lunate, triquetral and pisiform bones move with the arm bones, and the trapezium, trapezoid, capitate, and hamate bones are connected to the bones of the palm. The carpal bones are connected by ligaments.

Many tendons connecting the forearm muscles to the fingers and thumb run through the wrist. Extensor tendons on the back of the wrist straighten your fingers, while flexor tendons on the front of the wrist bend them. Nerves and blood vessels also pass through the wrist. Together all of these structures work in a coordinated way to provide your wrist with exceptional range of motion.



# Range of Motion Restriction & Common Injuries

#### **Normal Range of Motion:**

- Wrist extension: 60 degrees
- Wrist flexion: 60 degrees
- Wrist adduction (ulnar deviation): 30 degrees
- Wrist abduction (radial deviation): 20 degrees
- A joint that cannot move to its full potential has limited ROM.

- This condition may have a variety of causes, from pain and swelling to neurological disorders.

#### **Common Injuries:**

- Arthritis
- Bone dislocation
- Broken wrist
- Carpal tunnel syndrome, compression of the median nerve in the wrist
- Ganglion cyst, fluid-filled lumps along tendons or joints
- Pseudogout, a type of arthritis
- Sprains and strains
- Tendonitis



#### Wrist Drop Deformity



A disorder caused by radial nerve palsy. Because of the radial nerve's innervation of the extensor muscles of the wrist and digits, those whose radial nerve function has been compromised cannot actively extend them. As such, the hand hangs flaccidly in a position of flexion when the patient attempts to bring the arm to a horizontal position. Causes of wrist drop can range for penetrative trauma to external compression (Saturday night palsy) to systemic nutritional deficiencies. Treatment can range from none to surgery, depending on the nature and extent of the injury to the radial nerve.



# The Anatomy of the Hand

#### The Hand:



- Phalanges. The 14 bones that are found in the fingers of each hand and also in the toes of each foot. Each finger has 3 phalanges (the distal, middle, and proximal); the thumb only has 2.
- Metacarpal bones. The 5 bones that compose the middle part of the hand.
- Carpal bones. The 8 bones that create the wrist. The 2 rows of carpal bones are connected to 2 bones of the arm--the ulna bone and the radius bone.

Numerous muscles, ligaments, tendons, and sheaths can be found within the hand. The muscles are the structures that can contract, allowing movement of the bones in the hand. The ligaments are fibrous tissues that help bind together the joints in the hand. The sheaths are tubular structures that surround part of the fingers. The tendons connect muscles in the arm or hand to the bone to allow movement.



### Arthritis/Osteoarthritis

Although there are over 100 types of arthritis, rheumatoid arthritis and osteoarthritis are the most common in the hand and wrist. Rheumatoid arthritis is an autoimmune disorder that causes joints on both sides of the body (for example, both wrists) to develop chronic redness, swelling, and pain.

Osteoarthritis is the most common form of arthritis, and the hand and wrist joints are among the most commonly affected. A joint is a part of the body where two or more bones meet. The ends of the bones are covered in a smooth and slippery surface, known as cartilage. This allows the bones to move smoothly against each other and protects the joint from stress.

Osteoarthritis causes the cartilage in your joints to thin and the surfaces of the joint to become rougher, which means that the joints may not move as smoothly as they should, and they might feel painful and stiff.

You may have firm, knobbly swellings at the finger joints.

These are known as Heberden's nodes or Bouchard's nodes depending on which joints are affected. They're caused by the growth of bony spurs called osteophytes.





### Arthritis: Joint Damage and Swelling









### Common Conditions & Carpal Tunnel Syndrome

#### **Carpal Tunnel Syndrome:**

Carpal tunnel syndrome is a compression of the median nerve that causes tingling, numbness, pain and/or weakness in the arm and upper extremities. The median nerve supplies sensation to the thumb, index, middle and, occasionally, the ring fingers, and also supports motor function in a muscle in the thumb. The carpal tunnel is a channel in the wrist through which the nerve passes from the arm through to the hand.

#### **Causes:**

It occurs when there is increased pressure on the median nerve at the carpal tunnel. This pressure is frequently caused when the wrist is bent upward or downward for prolonged periods of time, such as while using a keyboard, mouse or other device. Symptoms get worse when there is increased pressure in the carpal tunnel.

#### Signs and Symptoms:

The most common effects are numbness, tingling and pain in wrist, hand and/or fingers. There may also be a feeling of weakness along the median nerve.





### **Carpal Tunnel Syndrome**





# **Carpal Tunnel Syndrome**

Is there any way to prevent carpal tunnel syndrome?

Most cases of carpal tunnel syndrome can be prevented by stopping or reducing an activity that stresses your fingers, hand, or wrist, or by changing the way in which you do that activity.

How is carpal tunnel syndrome treated?

Conservative treatments include avoiding certain activities, splinting the wrists to keep them in a straight position, taking anti-inflammatory medications or injecting corticosteroids into the carpal tunnel. The surgery for this condition is to release the transverse carpal ligament (the roof of the carpal tunnel) to allow more room for the inflamed median nerve.



### De Quervain's Tenosynovitis

Painful condition where the tendons on the thumb side of the wrist are affected.

This causes difficulty in turning the wrist, hold any object and fold the thumb.





### **Dupuytren's Contracture**

### Dupuytren's Contracture (Do-pa-trins)

A condition in which one or more fingers bend in towards the palm due to the development of fibrous connective tissue between the tendons of the finger.

- Common (More than 200,000 cases per year in US)
- Treatable by a medical professional
- Doesn't require lab test or imaging
- Can last several years or be lifelong
- Common for ages 50 and older
- More common in males
- Family history may increase likelihood

**Common Symptoms Include:** 

- Development of digital cords that limit finger movement
- Flexion contracture
- Nodules on the skin





# Swan-Neck Deformity



# **Boutonniere Deformity**

**Boutonnière Deformity:** a condition that affects your ability to straighten the middle joint of a finger or – less commonly – a toe. Your joint is stuck in a bent position and won't straighten. At the same time, the joint toward the tip of your finger or toe (extremity) is flexed upward.

If you've injured a tendon in your hand called the central slip extensor, you might develop a boutonnière deformity.

Causes, symptoms and signs of boutonnière deformity

- An injury where you jam your finger
- Swelling and pain at the middle joint of the finger or toe.
- You can't straighten out your finger and the tip is flexed up.
- Your joints are stiff, which gets worse over time.



\*\*\*It's called a boutonnière deformity because the slit in the tendon looks like a buttonhole with the bone showing. Boutonnière means buttonhole in French.



# **Ulnar Drift**

Ulnar deviation, or ulnar drift, is a medical condition that causes the joints in the wrist and hand to shift so that the fingers bend toward the ulna bone on the outside of the forearm.



Note: The pointer finger is curving towards the middle finger in beginning stages of ulnar drift.





# **Swan-Neck Deformity**

Swan neck deformity develops when one of the tendons or ligaments that control the movement in the fingers is jammed or injured. Any condition that tightens or limits the movement of the fingers by damaging the tiny fibers in the fingers that allow them to move can lead to the deformity.

The deformity can happen from a single injury or a combination of injuries, including:

- If the thick ligament that connects the bones in your fingers (volar plate) becomes weak or tears. Volar plate injuries can occur when a finger is jammed (also known as a sprain)
- If the tendon that flexes the middle finger joint (flexor digitorum superficialis) is torn or damaged. A common name for this injury is Jersey finger.
- If the tendon that straightens the end joint of your finger (extensor digitorum communis) is injured. This injury is sometimes called mallet finger or baseball edFit finger.

# **Trigger Finger**

Trigger finger, also known as stenosing tenosynovitis (stuh-NO-sing ten-o-sin-o-VIE-tis), is a condition in which one of your fingers gets stuck in a bent position. Your finger may bend or straighten with a snap — like a trigger being pulled and released .lt occurs when inflammation narrows the space within the sheath that surrounds the tendon in the affected finger. If trigger finger is severe, your finger may become locked in a bent position.

People whose work or hobbies require repetitive gripping actions are at higher risk of developing trigger finger. The condition is also more common in women and in anyone with diabetes. Treatment of trigger finger varies depending on the severity.

- Finger stiffness, particularly in the morning
- A popping or clicking sensation as you move your finger
- Tenderness or a bump (nodule) in the palm at the base of the affected finger
- Finger catching or locking in a bent position, which suddenly pops straight
- Finger locked in a bent position, which you are unable to straighten

Trigger finger can affect any finger and occurs more frequently in the morning.





### **Claw Fingers**

- Claw hand is a condition in which your fingers are noticeably curved or bent. This condition can affect one or more of your fingers, on one or both hands.
- The condition gets its name from the curvature of the fingers, which makes the hands resemble a bear's claw.
- Claw hand can be a congenital defect (a defect present at birth) or it may be due to certain disorders or injuries.
- Depending on the severity of the condition, you may have difficulty using your hands to pick up and grasp items.





### **Bishops Deformity** (Also known as Ulnar Claw)

**Bishops deformity** (also known as ulnar claw) is a condition that causes the joints of the 4th and 5th fingers (ring and pinky fingers) to become What causes a hand to claw? Claw hand deformity is a condition where your fingers are bent into a position that looks like a claw. It may affect all of your

fingers or only some of them



#### CAUSE:

In the hand, the ulnar nerve innervates medial two lumbricals supplying the fourth and fifth fingers, the interossei muscles, and the hypothenar muscles. When relating the injury to the ulnar nerve, the benediction sign would present if a person tries to open their hand and extend the fingers.

#### **Ape Hand Deformity**



Ape Hand Deformity, also known as Simian hand, is a deformity in humans who cannot move the thumb away from the rest of the hand.



# **Benediction Deformity**

The hand of benediction, also known as benediction sign or preacher's hand, occurs as a result of prolonged compression or injury of the median nerve at the forearm or elbow.





Grandpa was devastated when the test results came back showing his "miracle" was actually a median nerve lesion and not the blessing of "Jesus Hand."



### Hand/Wrist Exercises

**Purpose:** 

- Improve Flexibility
- Gain Strength
- Increase Grip Strength (Improve independence and reduce fall risk)

Before starting any exercises, be sure to have clearance from a medical professional. Hand/wrist exercise aims, among other things, to lessen the pain. It is expected that after the exercises, the area is sore for a while, but if it doesn't go away or it becomes worse, the patient should contact their doctor.

Alphabet Writing: Hold the forearm with the opposite hand. Start writing the capital letters of the alphabet in the air with loose fingers. When it becomes too easy, make the letters smaller and the movements more precise. People who need extra support can rest their elbows on a table

Wrist Extension and Flexion: Put your wrist on a folded towel on a table and leave your hand handing on the edge. Start with your palm facing down and move your hand up and down at the wrist. Repeat it with the palm facing up



# Hand/Wrist Exercises

#### Wrist Ulnar/Radial Deviation

Support your forearm on a table on a rolled-up towel for padding on your knee, with your thumb facing upward Move the wrist up and down through its full range of motion

#### **Wrist Supination and Pronation**

Stand or sit with your arm at your side and the elbow bent to 90 degrees, with palm facing down Rotate your forearm so that your palm faces up and then down<sup>7</sup>

#### Wrist Flexor Stretch

Hold the arm out and keep the palm of your hand facing down

Using the other hand, hold the fingers and stretch the wrist backward until a stretch is felt on the inside of the forearm

Repeat the movements 10 times and repeat the exercise with the other arm

How to Strengthen Your Wrists



### **Finger Exercises**

#### Hand/Finger Tendon Glide

Start with all your fingers straight and make a hook fist Make your hand straight again and make a full fist Make a straight fist; return to a straight hand (Repeat 10x each hand)

#### Make An O

Start with your hand straight and slightly bend your thumb toward the other fingers Move your index finger until it touches your thumb and makes and O shape Hold it for 30 seconds & repeat the movement with each finger (10x in each hand)

#### **Claw Stretch**

Hold the palm of your hand in your direction with the fingers straight Bend the fingers towards the base of each finger until your hand resembles a claw Keep this position for 60 seconds and repeat four times in each hand

#### **Thumb Flexion**

Start with the thumb positioned outward & move it across the palm and back.

# **Exercises for Hand/Grip Strength**

**Grip Exercises:** Some diseases, such as arthritis, can affect your grip strength. Simple daily exercises can help with movements and also re-establish the strength in your hands.

**Grip Strengthening** 

Squeeze a grip-strengthening ball as tightly as you can for a few seconds Repeat the movements 10 times in each hand You can also use a tennis or stress ball

**Pinch Grip** 

Hold a ball between your thumb and another finger Squeeze it for five seconds Repeat the movement 10 times in each hand





### Please complete the Elbows, Wrists & Hands Quiz





### Resources

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### Resources



### Resources

