Musculoskeletal Assessment
Upper and Lower limb
Presentation format consists of:

- Focused review of anatomy of upper & lower limbs
  - Bones
  - Muscles
  - Ligaments
  - Tendons
- Systematic approach to assessment including
  - Relevant history
  - Examination process: Look, Feel, Move
  - Pain assessment
- Checklist for limb examination
- Participant activity
- Pattern of injury
Upper Limb Assessment
Discuss the anatomy of the shoulder, +/- view the limb assessment DVD - shoulder
**Bones**

*Scapula/Acromion/ AC joint/ coracoid/Glenoid/Clavicle*

*Humerus: Head, greater tuberosity, shaft*

**Muscles**

**Rotator Cuff**

Very important in stabilising shoulder when lift arm up.

**Biceps tendon**

**Triceps (long head)**
Bones
Scapula/Acromion/AC joint/ coracoid/Glenoid/Clavicle
Humerus: Head, greater tuberosity, shaft

Muscles
Rotator Cuff -
Very important in stabilising shoulder when lift arm up.
Biceps tendon
Triceps (long head)
Atraumatic pain, is a repetitive injury, is it referred pain?
Whether you look feel move, or look move feel, it is imperative that the history and look are taken into account: Never undertake passive movement in a deformed / painful joint, never range a painful joint beyond what the patient can tolerate.

**Move and Specialised Tests**

In the acute phase - never range a painful joint beyond what the patient can tolerate
- May distract or displace the fracture even further
- Might not be able to with dislocations of the glenohumeral joint

- Drop arm test (unable to hold arm abducted at 90 degrees) – positive for rotator cuff tear
- Pain > or approaching 90 degrees = impingement syndrome

**Special tests:**

Painful arc = rotator cuff injury
Painful arc = pain 40-120 degrees abduction.
Examination: Look

• Swelling
  – Difficult to see in shoulder as deep joint
  – Look for swelling in other structures
    • AC joint
    • Clavicle

• Deformity

• Wounds

• Colour (red or mottled)
Neurovascular exam

Axillary nerve
  important in dislocation as nerve winds around neck of humerus and can be damaged
  sensation in epaulet region PLUS feel deltoid working

Brachial/radial/ulnar arteries.

Skin tenting over clavicular # (critical skin)
Active movements (ie what the patient can do) only in acute trauma
Don’t passively range an acutely painful joint
Checklist for shoulder exam

• Look/Range of motion
• Bones:
  – Scapula: spine/glenoid/coracoid/Acromion/AC joint
  – Clavicle
  – Humerus:
   • head/neck/greater tuberosity/shaft
• Neurovascular:
  – normal sensory and motor exam.
  – ALSO axillary nerve (deltoid `regimental badge sign).
  – Brachial/radial/ulnar arteries
Activity

• Review the musculoskeletal assessment of the shoulder on the DVD titled “

• Practice this assessment process on a colleague
Patterns of Injury

- Dislocation:
  - Major complication: # of glenoid rim
    - first traumatic.
    - multiple - can be atraumatic.
  - Anterior vs posterior dislocation
    - Posterior dislocation
      - 5% dislocations
      - caused by direct AP force
      - electric shock
    - Inferior/subglenoid dislocation
      - direct axial force
      - < 1% dislocations
      - hand fixed in abduction (up in the air!)
Patterns of Injury

• Rotator Cuff
  – night pain.
  – pain on reaching up or undoing bra etc.
  – NB if traumatic
    • avulsion of greater tuberosity of humerus is a possibility

• Subacromial bursitis
  – repetitive injury
Dislocated shoulder
# clavicle
Elbow Joint

- Humerus (distal)
- Radial nerve
- Brachial artery
- Ulnar nerve
- Median nerve
- Lateral epicondyle
- Capitulum
- Humeroradial joint
- Radial head
- Radius (proximal)
- Radial artery
- Medial epicondyle
- Humeroulnar joint
- Radioulnar joint
- Ulna (proximal)
- Ulnar artery
- Anterior interosseous artery and nerve
Formed by distal end of humerus articulating with head of radius and ulna.

**How does it move?**
- Flexion
- Extension
- Supination
- Pronation

**Distal humerus:**
Medial and lateral epicondyles.
Ulnar nerve passes behind medial epicondyle.

**Olecranon fossa**
Trochlea (medial) articulates with ulna
Capitulum (lateral) articulates with head of radius.

**Radius**
Cylindrical head articulates with capitulum.
Neck/Shaft. Rotates within annular ligament in supination and pronation

**Ulna**
Articulates with Coronoid process anteriorly.
Articulates with Olecranon posteriorly.
Shaft - subcutaneous.

**Medial Collateral Ligament**
ulnar nerve passes through middle band

**Lateral Collateral Ligament**
smaller than medial collateral ligament
Remember children are often picked up by the arms
•Pulled elbow (annular ligament subluxes off the radial head)
Examination - Look

- Swelling
- Deformity and Symmetry
- Carrying angle of arm
- Colour and Wounds
Examination- Feel

Feel: Bony landmarks
- Medial & lateral epicondyles
- Olecranon
- Radial Head
- Radius and ulna
- Tissues above and below the injury
- Feel for an effusion

Neurovascular assessment
- Nerve sensation & function (ulnar nerve)
- Pulses
  Trochlea and Capitulum not palpable
Supinate = holding a bowl of soup
Pronate = Pissed is prone
Activity

• Review the musculoskeletal assessment of the Elbow on the DVD titled “

• Practice this assessment process on a colleague
# olecranon
Dislocated elbow
Forearm, Wrist & Hand
Bones:

8 Carpal Bones

**Scaphoid lunate capitate triquetrum trapezoid trapezium hamate pisiform**

Metacarpals & Phalanges

Thumb (two bones & two joints)
- proximal & distal
- MCP - metacarpophalangeal joint
- IP - interphalangeal joint

Four fingers (index, middle, ring and little) three bones & three joints
- proximal, middle and proximal

Joints: MCP, PIP, DIP
Scaphoid
Accounts for 60% of all carpal #’s
Mechanism
fall onto outstretched hand
15-30 years age group
# Scaphoid may cause disruption to the blood supply
resulting in avascular necrosis of the proximal fragment
Blood supply is distal to proximal
incidence is 3%
Important to examine
x-ray fails to pick up 15% # (waist)
treatment is based on clinical assessment findings

Lunate
Uncommon fracture <3%
Mechanism: fall

Triquetral
Mechanism: direct blow

Pisiform

Trapezium
Mechanism: direct blow to adducted thumb

Capitate
Rare, avascular necrosis

Hamate
Mechanism: Bad golf shot
Ring & little finger painful on flexion

Radial & ulnar styloids
Examination

- **Look**: *Deformity ie dinner fork*
  - Swelling
  - Colour
  - Compare to other wrist & hand
  - Wounds

- **Feel**: Bony tenderness/sensation/pulse
  - Distal radius and ulna
  - Carpal bones especially the Scaphoid
  - Hand and digits
  - Neurovascular assessment

- **Move**: Within patient's pain limit
  - Flexion & extension,
  - Pronate and supinate,
  - Fist completion, opposition, *rotational deformity*
Activity

- Review the musculoskeletal assessment of the forearm, wrist and hand on the DVD titled “

- Practice this assessment process on a colleague
Scaphoid #
# radius and ulna
radius and ulna #

AP x-ray
# 5th MCP
Lower Limb Assessment
Bones
FEMUR
2 condyles sit on tibial plateau.

TIBIA and FIBULA
joined together at top by synovial joint and bottom by tough syndesmosis

PATELLA
articulates with femur
moves laterally during flexion.

Cartilage
2 Menisci (cartilages)
Medial and lateral - Both C shaped
Medial larger
Fibrocartilage
Increases confluences of femoral condyles on tibial plateau
Shock absorbers
Injured with rotatory force

4 Ligaments
Medial collateral ligament (MCL)
Large band approx 12 cm. Attached to capsule & medial meniscus
Lateral collateral ligament (LCL)
ribbon like band
Anterior cruciate ligament (ACL)
Attached ‘Anterior to posterior’
Posterior cruciate ligament (PCL)
Attached ‘Posterior to anterior’

Muscles
Hamstrings
2 medial & 1 lateral
Gastronemius
medial and lateral head
Create diamond at back of knee
Adductors
Quadriceps
History

- Mechanism of injury (+/- trauma)
- Ability to weight bear post injury
- Pop/click/snap at time of injury
- Swelling - immediate/delayed + degree
- Locking/giving way
- Previous knee injuries/surgery/Hx OA/RA other spondyloarthropathies
- Systemic Sx - fever etc
Examination

• LOOK

• MOVE

• FEEL

• SPECIAL TESTS
Examination

- Remember 4 main structures to examine in knee joint:
  - Bones
  - Ligaments x 4
  - Menisci
  - Muscles - patellar tendon
Examination - Look

- Compare both sides
- Swelling
- Redness
- Deformity
- Scars
- Wounds
Examination - Feel

• BONES:
  – Distal femur
  – Medial & Lateral Joint lines
  – Proximal Fibula
  – Patella (dislocations and for tenderness)
  – Tibial tuberosity
Examination - Feel/Special Tests

- Ligaments/Tendons:
  - Patellar tendon
  - MCL/LCL/ACL/PCL
If unable to get patient to straight leg raise
- Assess kick test – same test but not against gravity
Knee Joint Exam Checklist

• Look
  – Effusion /ROM

• Bones: Feel
  – Femur/Medial & Lateral Joint lines/Proximal Fibula

• Patella & Tibial Tuberosity

• Ligaments/Tendon
  – Patellar Tendon
  – MCL/LCL/ACL/PCL

• Ottawa Knee Rule
**Ottawa Knee Rules**

An x-ray is indicated if the patient has any of the following features:

- Age > 55 years
- Inability to bear weight both immediately and in the emergency department (4 steps)**
- Isolated tenderness of the patella*
- Tenderness at head of fibula
- Inability to flex to 90°

*No bone tenderness of knee other than patella
**Unable to bear weight twice onto each limb regardless of limping

[Diagram of knee showing A patella and B head of fibula]
Patterns of Injury


- **MCL**: valgus stress. No effusion. Sore turning over in bed.

- **MENISCI**: Moderate effusion - more gradual onset. Locking. Compression + rotation.
Activity

- Review the musculoskeletal assessment of the knee joint on the DVD titled “

- Practice this assessment process on a colleague
Knee Effusion

[Image: X-ray of knee and photo showing normal and affected sides]
Ankle Joint
**Bones**
Tibia and fibula

joined together at bottom by strong syndesmosis
forms ankle Mortice

grips talus

**Talus**
thicker at front and thinner at back
“wedged in” at full dorsiflexion

**Ligaments**
Medial ligament
joins medial malleolus to talus
deltoid ligament - 2 parts

Lateral ligament (4 ligaments)

Anterior talofibular Ligament - most commonly injured
Calcaneofibular ligament
Anterior inferior tibiofibular ligament
Post talofibular ligament
7 Tarsal bones:
Talus
articulates with Tibia & Fibula/Calcaneus & Navicular
Calcaneus
heel bone
Cuboid
lateral/articulates with 5th metatarsal
Navicular
important bone for the application of the ottawa rules
Cuneiform (3)

Bones
Metatarsals
between tarsal bones and toes
base of 5th metatarsal important because peroneal tendons attaches there.
Phalanges - proximal/middle/distal.
1st toe only has proximal and distal phalanx

Ligaments and Tendon
Multiple ligaments in foot
usually small between bones
Peroneal tendon
attaches to base of the 5th metatarsal
can be avulsed.
History

- Mechanism of Injury:
  - Inversion, eversion, plantarflexion, dorsiflexion
- Fall
- Ability to weight bear post injury
- Site of pain
- Previous ankle injuries/surgery
- History of RA/OA/other spondyloarthropathies
- Systemic illness
**Examination- Look**

- Swelling/deformity/bruising/redness
- Ability to weight bear (4 steps)
- Scars from previous surgery
- Colour
- Wounds
Neurovascular assessment

• Pulses:
  – dorsalis pedis and posterior tibial
• Nerves:
  – Checked for altered sensation to the foot

Deep peroneal
  1st web space

Superficial peroneal
  top of foot

Saphenous nerve
  medial side of foot to base 1st metatarsal

Sural nerve
  lateral side of foot.
**Examination - Move**

- Dorsiflexion (0 - 20 degrees)
- Plantarflexion (0 - 60 degrees)
- Inversion
- Eversion

*Note ankle movements are dorsiflexion and plantarflexion **ONLY**.*

*Inversion/Eversion occur at subtalar joint.*
Examination - Feel

- Bony Tenderness – refer to the Ottawa Ankle Rules
- Proximal fibula
- Ligaments: Deltoid and ATFL
- Subtalar Movement
- Anterior drawer
**Ankle films:** A series of ankle x-ray films is required only if there is any \textbf{pain in malleolar zone} and any of these findings:

- Bone tenderness at A;
- Bone tenderness at B;
- **Inability to bear weight** both immediately and in the emergency department.

**Foot films:** A series of foot x-ray films is required only if there is any \textbf{pain in mid-foot zone} and any of these findings:

- Bone tenderness at C;
- Bone tenderness at D;
- **Inability to bear weight** both immediately and in the emergency department.

Limitations of Ottawa Ankle Rules

• Don’t use for patients under 18!!!
• Use your clinical judgement if patient is intoxicated or uncooperative
• Has other distracting injuries
• Has diminished lower limb sensation e.g. diabetes.
Ankle/Foot Exam Checklist

• Look
  – Deformity, swelling, ROM, Wt Bearing ability

• Palpate bones
  – Proximal Fibula, Medial & Lateral malleoli, Navicular, Base 5th metatarsal (Ottawa Rule Spots)

• Palpate tarsal bones/metatarsals/other obvious sites of injury.

• Assess ligaments
  – ATFL and Deltoid ligament

• Assess neurovascular status
  – DP/PT Pulses. Foot sensation
Activity

• Review the musculoskeletal assessment of the foot / ankle joint on the DVD titled “

• Practice this assessment process on a colleague
Gout also presents as medial ankle or big toe pain with poor mobility, pain swelling and or erythema.
Ankle Fracture
Base of 5\textsuperscript{th} Metatarsal Fracture
Using Crutches

Adapted from LifeTec™ – Measuring and Using Crutches
Sizing

Fitting Forearm Crutches
- Plant crutch end in front of foot by 6 inches
- Keep elbow slightly flexed - 15 to 30 degrees
- Place cuff at proximal forearm just distal to elbow

Fitting Axilla Crutches
- Measure from 5cm under the user’s armpit to a point on the ground about 15cm out from the side of the heel.
- This is the overall height and where the axilla pad should be set.
- Adjust the overall height by moving the centre post at the bottom up or down and securing in the right position.
- Take the measurement from the wrist crease to the same point on the ground as the first.
- This is the height for the hand grips to be set.
Using Crutches

- The weight should be taken through the hands on the hand pads
- The axilla pads should be pressed against the chest wall, not high under the armpits
- The crutches should be positioned slightly to the side and forward to maintain a stable base.
Non weight bearing

- If the user is not to bear any weight through the affected leg, then both crutches should be put forward and the user should hop towards the space between them, to just behind the crutches.

- The affected leg should be held in front of the body clear of the ground.
**Weight Bearing**

- If the affected leg is to be partial weight bearing, then the user should place the crutches forward, then the affected leg, then share the load between the crutches and that leg while the unaffected leg is brought forward.
“Good feet go to Heaven; Bad feet go to Hell”
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