Fracture Management

General Advice
This guide gives brief advice about the management of common fractures presenting to ED. Where there is uncertainty, discuss cases with senior medical staff or consult the variety of orthopaedic and emergency medicine textbooks available in ED. There is a fracture clinic held Monday-Friday at RAH and IRH.

Emergency referral of all orthopaedic cases should be made to the orthopaedic FY2 at RAH and the on call orthopaedic registrar at IRH.

Paediatric fractures requiring emergency orthopaedic discussion and assessment should be discussed with senior doctors. Sometimes it is appropriate to refer directly to the ortho registrar at RHC if requiring manipulation / operative treatment. Generally we do not sedate children for fracture manipulation in ED. Non-operative cases can be referred to the local orthopaedic receiving team.

In general terms, fractures can be categorised in four ways:

<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Features</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCHARGABLE</td>
<td>Some fractures can be discharged from ED with appropriate advice.</td>
<td>Little metacarpal #</td>
</tr>
<tr>
<td></td>
<td>Advice leaflets are available on CEM website for these cases</td>
<td>5th Metatarsal #</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Radial head #</td>
</tr>
<tr>
<td>VFC REFERRAL</td>
<td>Fractures requiring POP cast or specific orthopaedic review. Patients</td>
<td>Colles #</td>
</tr>
<tr>
<td></td>
<td>should be given follow-up advice for the VIRTUAL FRACTURE CLINIC</td>
<td>Lateral maeollus #</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fibula neck #</td>
</tr>
<tr>
<td>EMERGENCY REFERRAL</td>
<td>Fractures requiring discussion with and advice from the receiving</td>
<td>Neck of femur #</td>
</tr>
<tr>
<td></td>
<td>orthopaedic service to determine on-going management</td>
<td>Ankle # with talar shift</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tibial plateau #</td>
</tr>
<tr>
<td>SOCIAL REFERRAL</td>
<td>Fractures which result in significant functional impairment for the patient</td>
<td>Pubic ramus #</td>
</tr>
<tr>
<td></td>
<td>sufficient to preclude them from managing at home</td>
<td>Neck of humerus #</td>
</tr>
</tbody>
</table>

Virtual Fracture Clinic (VFC)
Patients requiring referral to the virtual fracture clinic should be provided with a VFC advice leaflet and they should then make an appointment at reception prior to leaving.

Virtual fracture clinic discharge checklist
1. Patient has adequate analgesia prescribed
2. Appropriate initial treatment (splintage/cast/sling) has been given
3. Patient has telephone contact details
4. Patient provided with VFC leaflet (on CEM)
5. Patient makes a VFC appointment at reception
6. Patient understands that they will be contacted the following working day
Examination Tips
There are some key points to remember during the clinical examination of all patients presenting with a fracture.

**LOOK**
- Comment on obvious deformity
- Assess for adequate local skin perfusion/discolouration

**FEEL**
- Assess distal circulation
- Assess for distal sensory function
- Feel for local crepitus

**MOVE**
- Move the joint above and below the injury
- Comment on both active and passive movement

**ADDITIONAL**
- Upper Limb Injuries- Ask about HAND DOMINANCE and occupation
- Lower Limb Injuries- Document weight bearing ability

**X-rays**
- NEVER request an x-ray prior to examining the patient
- Request the CORRECT x-rays- it is unfair to assume the radiographer will know which x-rays are required- they have not examined the patient
- Certain injuries require SPECIFIC VEIWS- these are discussed during the description of the relevant injury- in the event of uncertainty- ask before sending the patient to x-ray
- In most cases- TWO views are required. Where a single view is acceptable- this is described in the context of the relevant injury.
  As a guide:
  TWO VIEWS- AP and Lateral
  TWO JOINTS- Above and below the injury in long bone fractures

**Open Fractures**
Management of open fractures is as follows:
- Irrigate wound with saline
- Saline soak dressing
- IV Antibiotics- 1.5g IV Cefuroxime
- Assess tetanus status
- Appropriate fracture management (POP/Splint)
- Refer to on-call orthopaedics
Upper Limb Injuries

Sterno-Clavicular Joint Dislocation
Diagnosis made on CHEST X-RAY. Assess for joint asymmetry. Clinical examination used to differentiate type of dislocation.

Anterior Dislocation
Clavicle is more prominent on palpation over the anterior chest wall
Manage with a broad arm sling and fracture clinic follow-up

Posterior Dislocation
There is a palpable depression on the anterior chest wall
Perform ECG
Refer to on-call orthopaedics.

Clavicle Fracture
In suspected clavicle fractures, request a CLAVICLE X-RAY. One view is adequate
Typically, the fracture is found in the middle third

DISCHARGE CHECKLIST
✓ Assess for skin tenting (if present refer to orthopaedics)
✓ Assess upper limb neurovascular status
✓ Broad arm sling
✓ Ensure appropriate analgesia
✓ Ensure safety for discharge
✓ VFC

Acromio-Clavicular (AC) Joint
If AC joint injury is suspected, X-rays of BOTH AC joints are required for comparison.

<table>
<thead>
<tr>
<th>GRADE</th>
<th>FEATURES</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>No asymmetry on x-ray. Clinical diagnosis</td>
<td>Broad-Arm sling for 2-3 days Adequate analgesia EARLY MOBILISATION Discharge to GP</td>
</tr>
<tr>
<td>II</td>
<td>Subluxation on x-ray Joint capsule remains intact</td>
<td>Broad-Arm sling for 2-3 days Adequate analgesia EARLY MOBILISATION Discharge to GP</td>
</tr>
<tr>
<td>III</td>
<td>AC and coracoclavicular ligaments torn Joint capsule disrupted</td>
<td>May require weight bearing views Broad-arm sling Refer to fracture clinic</td>
</tr>
</tbody>
</table>
**Scapula Fractures**
Request SCAPULA X-RAY
Common injury in frail elderly patients
An isolated fracture of the scapula is uncommon and is often associated with chest wall injury and underlying pulmonary trauma

Assess and document WINGING of the scapula- This is caused by an injury to serratus anterior and requires out-patient orthopaedic follow-up

**DISCHARGE CHECKLIST**
✓ Satisfactory respiratory observations and examination
✓ Broad arm sling
✓ Ensure adequate analgesia
✓ VFC

**Anterior Shoulder Dislocation**
One view (AP) is satisfactory to diagnose anterior shoulder dislocation

Management of suspected shoulder dislocation:
IV Access
• IV Morphine
• Assess and Document Axillary Nerve Function (badge patch)

Request x-ray

Dislocation?

**YES**
- Transfer to Resus
- Adequate monitoring
- Two doctors present
- Sedate
- Attempt reduction

**NO**
- Alternative diagnosis
- Broad arm sling
- Adequate analgesia
- Discharge

Post-attempt x-ray
Assess and document post attempt axillary nerve function

**YES**
- Polysling
- Axillary Pad
- Ensure adequate analgesia
- Ensure safe for discharge
- Post sedation advice
- VFC follow-up

**NO**
- Ensure adequate analgesia
- Polylysing for comfort
- Refer on-call orthopaedics
Anterior Shoulder Dislocation with associated fracture
Anterior shoulder dislocation often associated with a fracture of the greater tuberosity of the humerus

<table>
<thead>
<tr>
<th>Fracture Site</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undisplaced greater tuberosity fracture</td>
<td>Attempt reduction</td>
</tr>
<tr>
<td>Greater tuberosity fracture displaced &gt;1cm</td>
<td>Refer to on-call orthopaedics</td>
</tr>
<tr>
<td>Fracture neck of humerus</td>
<td>Refer to on-call orthopaedics</td>
</tr>
</tbody>
</table>

Posterior Shoulder Dislocation
Uncommon diagnosis- 1:20 of shoulder dislocations
Associated with seizure and electrocution
Clinical features
• Arm held in internal rotation
• Reduced active external rotation
• Assess and document axillary nerve function
X-ray findings
• AP View is often normal
• Assess for “light-bulb” sign on AP view
• Easier to diagnose on “Y”-View
Management
• Attempt reduction in ED
• If successfully reduced- give polysling and ensure adequate analgesia.
• VFC
If reduction unsuccessful- refer to on-call orthopaedics

Neck of Humerus Fracture
Common injury in elderly patients with underlying degenerative bone disease
Request a HUMERUS X-RAY

DISCHARGE CHECKLIST
✓ Assess and document upper limb neurovascular status
✓ Ensure adequate analgesia
✓ Ensure suitable for discharge
✓ Collar and cuff
✓ VFC

Shaft of Humerus Fracture
Usually associated with a rotational injury (such as arm-wrestling)
Common in metastatic bone disease
Request a HUMERUS x-ray

Examination
Significant deformity
Assess and document radial nerve function (active wrist extension and sensation in the web-space between thumb and index finger)
Management

<table>
<thead>
<tr>
<th>Type of Fracture</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-Part</td>
<td>Humeral brace&lt;br&gt;Post application x-ray&lt;br&gt;Adequate analgesia&lt;br&gt;Fracture clinic- next clinic</td>
</tr>
<tr>
<td>Three or More Parts</td>
<td>Humeral brace&lt;br&gt;Post application x-ray&lt;br&gt;Adequate analgesia&lt;br&gt;Refer to on-call orthopaedics</td>
</tr>
</tbody>
</table>

Elbow and Forearm Injuries

Elbow Dislocation

Clinical Features
- Gross deformity
- Loss of characteristic “triangular” appearance over posterior aspect of elbow
- Assess and document distal neurological function (Beware MEDIAN nerve)

<table>
<thead>
<tr>
<th>NERVE</th>
<th>MOTOR FUNCTION</th>
<th>SENSORY FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIAN</td>
<td>Thenar Eminence of thumb&lt;br&gt;Adduction on MCPJ&lt;br&gt;Flexion of MPCJ&lt;br&gt;Opposition</td>
<td>Radial border of index finger</td>
</tr>
<tr>
<td>RADIAL</td>
<td>Active wrist extension</td>
<td>Web-space between thumb and index finger</td>
</tr>
<tr>
<td>ULNAR</td>
<td>Intrinsic hand muscles- abduction and adduction of MCPJ</td>
<td>Ulnar border of little finger</td>
</tr>
</tbody>
</table>

- Assess and document distal vascular function
- IV Access and IV morphine prior to x-ray
- Immobilise in broad-arm sling

X-Ray Findings
- Request ELBOW X-RAY
- Usually olecranon dislocates posteriorly
- Assess for associated fracture- especially radial head/neck and coronoid process

In case of fracture-dislocation- refer to orthopaedics, DO NOT attempt reduction in ED. There is a significant danger of ingress of fracture fragments into the joint.
Management
- Transfer to resus
- Adequate monitoring
- Consent for procedural sedation
- Two doctors present
- Sedate
- Reduce—usually with longitudinal traction and slight flexion
- Assess and document distal neurological function post-reduction
- Long-arm backslab (apply BEFORE post reduction x-ray as reduced joint is often unstable)
- Post-reduction x-ray
- Refer to on-call orthopaedics.

Even if reduced- patients are often admitted for elevation and circulation, sensation and movement check as there is a significant incidence of neurological deficit associated with swelling.

Distal Humerus Fracture

Clinical Features
- Not generally associated with gross deformity
- Reduction in active elbow movement—especially reduced flexion
- Assess and document distal neurological function
- Assess and document distal vascular function

Fractures may be SUPRACONDYLAR or INTRA-ARTICULAR

X-ray findings
Fractures can be subtle.
Supracondylar fractures are seen on the lateral elbow view

ANTERIOR HUMERAL LINE
Draw a straight line down the anterior aspect of the distal third on the humerus
At least ONE-THIRD of the capitellum must lie IN FRONT of this line

An abnormal anterior humeral line indicates posterior angulation of a supra-condylar fracture

Management
- Ensure adequate analgesia
- Long-arm backslab
- Check neurological and vascular status post backslab application
- Refer to on-call orthopaedics
**Olecranon Fracture**

**Clinical Features**
- Gross deformity
- Palpable “gap” over the olecranon
- Loss of triceps function- unable to actively extend elbow
- Assess and document distal neurological function
- Assess and document distal vascular function

**X-ray Findings**
- Request ELBOW X-ray
- Obvious gap in olecranon best seen on LATERAL view

**Management**
- Ensure adequate analgesia
- Long arm back-slab and broad arm sling
- Refer to on-call orthopaedics

Olecranon fractures are generally operatively repaired using a tension band wire as there is a significant association with functional impairment and non-union

---

**Radial Head/Neck Fractures**

Often result from a fall onto an out-stretched hand

**Clinical Features**
- Not commonly associated with deformity
- Flexion and extension and usually preserved
- Reduced pronation and supination of the hand
- Assess and document distal neurological function
- Assess and document distal vascular function

**X-Ray Findings**
- Radial neck fractures are best seen on LATERAL view
- Radial head fractures are best seen on AP view

---

**Beware**

Supra-condylar fractures are associated with BRACHIAL ARTERY injury

Arterial Occlusion results in VOLKMANN’s CONTRACTURE resulting in necrosis of forearm tissue

Assess and document
- BRACHIAL PULSE
- RADIAL PULSE
- ULNAR PULSE
Management

<table>
<thead>
<tr>
<th>Type of Fracture</th>
<th>Initial Management</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial head- &lt;33% of articular surface</td>
<td>Broad arm sling Adequate analgesia</td>
<td>Discharge Advice leaflet form CEM website EARLY MOBILISAITON</td>
</tr>
<tr>
<td>Radial head- greater than 33% of articular surface</td>
<td>Broad arm sling Adequate analgesia</td>
<td>Virtual Fracture Clinic follow-up</td>
</tr>
<tr>
<td>Radial neck- less than 15° angulation</td>
<td>Broad arm sling Adequate analgesia</td>
<td>Discharge Advice leaflet form CEM website EARLY MOBILISAITON</td>
</tr>
<tr>
<td>Radial neck- greater than 15° angulation</td>
<td>Broad Arm Sling Adequate analgesia</td>
<td>Virtual Fracture Clinic follow-up</td>
</tr>
</tbody>
</table>

Joint Effusion
Patients with clinical findings consistent with a radial head fracture who do not have an obvious fracture on x-ray but have evidence of joint effusion ("fat-pads") on their x-ray should be managed with:
- Adequate analgesia
- Broad Arm Sling
- Advice leaflet from CEM website

RADIAL-CAPITELLAR LINE
On the lateral x-ray a line drawn through the middle of the shaft of the radius must pass through the capitellum
Disruption of this line indicates dislocation of the proximal radio-ulnar joint.

FAT PADS
"Fat-Pads" are seen on lateral elbow x-ray.

An anterior fat pad can be a normal variant but if elevated ("sail-sign") this is more suggestive of an intra-articular fracture

Posterior fat pads are always pathological
Forearm Fractures

Two eponymous fractures of the forearm exist. The forearm is a ring structure so will often disrupt in more than one place.

Clinical Findings
- Deformity of forearm
- Reduction in active range of elbow and/or wrist movement
- Assess and document distal neurological function
- Assess and document distal vascular function

X-Ray Findings
- Request RADIUS and ULNA x-ray
- If suspicious on MONTEGGIA fracture/dislocation (see below) may need dedicated LATERAL elbow view

<table>
<thead>
<tr>
<th>FACTURE NAME</th>
<th>X-RAY FINDINGS</th>
<th>INITIAL MANAGEMENT</th>
<th>FOLLOW-UP</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONTEGGIA</td>
<td>Fracture of ulnar shaft and dislocation of proximal radial-ulnar joint (Abnormal radial-capitellar line)</td>
<td>Adequate analgesia Longarm backslab Broad Arm Sling</td>
<td>Refer to on-call orthopaedics</td>
</tr>
<tr>
<td>GALEAZZI</td>
<td>Fracture of radius with dislocation of distal radial-ulnar joint</td>
<td>Adequate analgesia Longarm backslab Broad Arm Sling</td>
<td>Refer to on-call orthopaedics</td>
</tr>
</tbody>
</table>

Shaft of Ulna Fracture

Typically affects the middle third of the ulna
“Night-stick” fracture- resulting from a direct blow on the forearm when the patient raises their arm to protect their face

Clinical Features
- Forearm deformity
- Palpable step and/or crepitus over ulnar aspect of forearm
- Assess and document distal neurovascular function- especially ULNAR NERVE

X-Ray Findings
- Request RADIUS and ULNA x-ray
- Pay particular attention to the LATERAL elbow x-ray and the RADIAL-CAPITELLAR line. Fracture of the ulna is often associated with a MONTEGGIA fracture

Management
- Ensure adequate analgesia
- Long-arm back-slab
- Broad arm sling
- VFC
Wrist Injuries

**Colles Fracture**
Typically follows a fall on an out-stretched hand
Common in elderly patients with associated degenerative bone disease

Clinical Features
Deformity- typically described as “dinner-fork” with swelling to the dorsal surface of the wrist
Assess for distal neurological function- especially MEDIAN NERVE

<table>
<thead>
<tr>
<th>NERVE</th>
<th>MOTOR FUNCTION</th>
<th>SENSORY FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIAN</td>
<td>Thenar Eminence of thumb</td>
<td>Radial border of index finger</td>
</tr>
<tr>
<td></td>
<td>Adduction on MCPJ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flexion of MPCJ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opposition</td>
<td></td>
</tr>
<tr>
<td>RADIAL</td>
<td>Active wrist extension</td>
<td>Web-space between thumb and index finger</td>
</tr>
<tr>
<td>ULNAR</td>
<td>Intrinsic hand muscles- abduction and adduction of MCPJ</td>
<td>Ulnar border of little finger</td>
</tr>
</tbody>
</table>

Assess for distal vascular function

X-Ray Findings
Fracture of the distal radius with dorsal angulation of the distal fragment. When assessing the x-ray comment on:

<table>
<thead>
<tr>
<th>Fracture Feature</th>
<th>X-ray to Review</th>
<th>Clinical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMPACTION</td>
<td>AP View</td>
<td>Radial styloid should be 1cm distal to ulnar styloid</td>
</tr>
<tr>
<td>ANGULATON</td>
<td>Lateral View</td>
<td>In the NORMAL x-ray the joint line tips forward by 5°.</td>
</tr>
</tbody>
</table>
Assessing Angulation

Step 1 - Draw a line through the middle of the distal radius

Step 2 - Draw a line across the articular surface of the distal radius - this line will normally tip "forward" by five degrees

Step Three - If the fracture angulated by more than 15 degrees (so tilts "backwards" by 10 degrees) it will require manipulation
Management
• Ensure adequate analgesia
• Apply wrist splint
• Broad arm sling
• Patients NOT requiring manipulation should be referred to the virtual fracture clinic

Indications for manipulation
1. Displacement of ulnar styloid
2. Impaction resulting in radial styloid being less than 1cm distal to ulnar styloid
3. Angulation where joint line tips backwards by greater than 10° (15° from normal position)
4. Distal neurological deficit on examination

Colles fractures are manipulated to preserve function. The threshold for manipulation is patient dependent. Patients who are unfit for GA can have their fracture manipulated under procedural sedation. All patients requiring manipulation should be referred to the on-call orthopaedic service.

Smith’s Fracture
Sometimes called a “Reverse” Colles
Fracture of distal radius with volar angulation of the distal fragment

Clinical Features
Fall onto a flexed wrist, clinical deformity
Assess distal neurological function especially MEDIAN nerve

X-ray Findings
Lateral x-ray shows a fracture with VOLAR angulation of the distal fragment.

Management
These are inherently unstable injuries and require referral to the on-call orthopaedic service
Elevate and apply a Colles backslab

Barton’s Fracture
Intra-articular fracture of the distal radius
Volar angulation of the distal fragment
Clinically unstable
Refer to on-call orthopaedics

Scaphoid Injury
The scaphoid is one of the carpal bones, situated on the proximal of the two rows of the carpal bones and found on the radial aspect of the wrist.

The scaphoid is palpated in the “Anatomical Snuff Box”- ASB- An area found at the base of the thumb metacarpal and bordered by the tendons of:
• Extensor Pollicus Longus
• Abductor Pollicus Longus/Extensor Pollicus Brevis
Scaphoid fractures are associated with avascular necrosis owing to the nutrient blood supply entering the bone distally.
The scaphoid comprises:
• Proximal Pole (site of avascular necrosis)
• Waist (commonest site of fracture)
• Distal Pole

The distal pole of the scaphoid forms part of the articular surface of the wrist. Avascular necrosis of the proximal pole predisposes the patient to chronic wrist pain, stiffness and limitation of function.

Clinical Features
• Fall onto an outstretched hand
• Tender over anatomical snuff box
• Tender at base of thumb when thumb is “telescoped” (pulled out to length)
• Tender to palpate scaphoid- especially on volar aspect of wrist
• Assess for distal neurological and vascular function

X-Ray Findings
• Request SCAPHOID views
• Fractures are most commonly seen on the waist of the scaphoid
• It is comparatively to see scaphoid fractures on initial x-rays

Management of Scaphoid Injuries

<table>
<thead>
<tr>
<th>X-RAY FINDINGS</th>
<th>INITIAL MANAGEMENT</th>
<th>FOLLOW-UP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCAPHOID FRACUTRE</td>
<td>Splint- NO thumb extension Broad Arm Sling Adequate analgesia</td>
<td>Refer to virtual fracture clinic</td>
</tr>
<tr>
<td>NO FRACTURE SEEN</td>
<td>Adequate analgesia Wrist splint Broad Arm Sling</td>
<td>Refer to virtual fracture clinic</td>
</tr>
</tbody>
</table>

**Perilunate Dislocation**
Often missed on lateral x-ray- suspect in high energy injuries with a normal x-ray

Clinical Features
• Deformity of dorsal surface of wrist
• Absent extension
• Assess for neurological and vascular status

X-Ray Findings
Easiest seen on LATERAL x-ray. A straight line drawn on the lateral x-ray should pass through all three structures
Look for alignment of:
DISTAL RADIUS ARTICUALAR SURFACE (Saucer)
LUNATE (Cup)
CAPITATE (Apple)

Management
• Colles backslab
• Refer to on-call ortho for MUA

BEWARE
Scaphoid views should ONLY be requested where there is a clinical suspicion of a scaphoid injury.
Negative x-rays require the patient to have their wrist immobilised and follow-up.
Hand Fractures

- Hand fractures are managed symptomatically with the priority being on the maintenance and early restoration of function.
- Comprehensive assessment is necessary to ensure that functional status is preserved and injuries where function may be compromised are identified and appropriately treated.
- In general terms, hands should be immobilised for the least duration possible as prolonged splintage encourages stiffness and limits function.
- It is of paramount importance that hand injuries are ELEVATED. This will reduce swelling and encourage early mobilisation thereby facilitating early restoration of function.

Documentation
- DOMINANCE must be documented (which hand the patient writes with).
- OCCUPTION should be documented.

Hand Examination
Hand surfaces are described as PALMAR and DORSAL.
The borders of the hand are RADIAL and ULNAR.
Digits have names: THUMB, INDEX, MIDDLE, RING, LITTLE.

Neurological Examination

<table>
<thead>
<tr>
<th>NERVE</th>
<th>MOTOR FUNCTION</th>
<th>SENSORY FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIAN</td>
<td>Thenar Eminence of thumb Adduction on MCPJ Flexion of MPCJ Opposition</td>
<td>Radial border of index finger</td>
</tr>
<tr>
<td>RADIAL</td>
<td>Active wrist extension</td>
<td>Web-space between thumb and index finger</td>
</tr>
<tr>
<td>ULNAR</td>
<td>Intrinsic hand muscles-abduction and adduction of MCPJ</td>
<td>Ulnar border of little finger</td>
</tr>
</tbody>
</table>

Digital nerves are examined by assessing sensation of the RADIAL and ULNAR border of each finger.

Hand X-Rays
If the palmar surface of the hand is injured then HAND X-RAY should be requested.
For finger injuries a dedicated FINGER X-RAY of each affected digit is necessary (even if this means 5 separate films).
For metacarpal injuries a LATERAL HAND X-RAY is required.
**Thumb Metacarpal Fracture**
These are generally unstable and associated with significant functional impairment

Suspected thumb metacarpal fracture

Assess sensation to RADIAL and ULNAR border of thumb

Analgesia and high elevation sling

Request thumb x-ray

FRACTURE?

**YES**
- Apply BENNETT’S cast
- High Elevation Sling
- Adequate Analgesia
- Virtual fracture clinic

**NO**
- Wrist Splint with Thumb Extension
- Adequate analgesia
- Early mobilisation
- Ensure no UCL injury

**Beware Bennett’s Fracture**
Intra-articular thumb metacarpal fracture involving the carpo-metacarpal joint

- Apply Bennett’s Cast
- High Elevation Sling
- REFER ON-CALL ORTHOPAEDICS

**Metacarpal Shaft Fracture - Index-Little fingers**
Patients with a metacarpal shaft fracture require a LATERAL HAND X-RAY to assess the degree of angulation

Often the radiographer will provide this view when they identify this injury on the AP or oblique x-ray but you must ensure that it has been taken prior to discharging patient

Index/Middle/Ring/ Little Metacarpal Shaft Fracture

Ensure True Lateral Hand X-ray

Angulation greater than 20°

**YES**
- Volar Slab and Buddy Strap affected fingers
- High elevation sling
- Adequate Analgesia
- ON-CALL ORTHO

**NO**
- Buddy Strap affected fingers
- High elevation sling
- Adequate Analgesia
- VFC
Boxer's Fracture
This is a fracture of the little metacarpal neck- often associated with a punch injury
It is essential to examine for and document ROTATIONAL DEFORMITY

**ASSESSING ROTATIONAL DEFORMITY**

Ask the patient to make a fist
Ensure that none of the fingers overlap or turn under each other
**DOCUMENT** your findings as

- NO ROTATIONAL DEFORMITY
- ROTATIONAL DEFORMITY OF xxxx FINGER

Rotational deformity requires ORTHOPAEDIC REFERRAL
Angulation will often correct with remodelling- rotational deformity NEVER will correct

Little finger metacarpal neck fracture on x-ray

Rotational Deformity

- **YES**
  - Buddy strap ring and little fingers
  - High elevation sling
  - Adequate analgesia
  - REFER ON-CALL ORTHO

- **NO**
  - Buddy strap little and ring fingers- 2-4 WEEKS
  - High elevation sling
  - Adequate analgesia
  - Early Mobilisation
  - Discharge advice leaflet

**BEWARE**

Boxer’s fractures are often associated with a wound found on the dorsal surface of the hand over the little MCPJ
You must ask explicitly if this injury was caused by punching a third party in the mouth (patients are sometimes reluctant to admit this stating for example that they “punched a wall”)

If this was sustained by punching a third party in the mouth- a “fight bite” injury

1. Infiltrate wound with local anaesthetic
2. Scrub and irrigate wound
3. Prophylactic antibiotics- CO-AMOXICAV 375mg tid
4. BBV Screening- Often need accelerated Hepatitis B Vaccine Course
5. Ask about tetanus status
Fractures of Index/Middle/Ring Metacarpal Neck/Head
Less common than little metacarpal head/neck fractures
Standard AP and OBLIQUE x-rays of the hand are adequate
If rotational deformity- REFER ON-CALL ORTHOPAEDICS
No rotational deformity present then:
- Buddy strap affected and adjacent finger
- High elevation sling
- Adequate analgesia
- Virtual fracture clinic

Proximal and Middle Phalangeal Fractures

Suspected proximal or middle phalangeal fracture
Assess and document ROTATIONAL DEFORMITY
Request FINGER x-ray

Proximal or middle phalangeal fracture +/- rotational deformity

Buddy strap affected and adjacent fingers
Adequate analgesia
High elevation sling
Virtual Fracture Clinic

NO
Buddy strap affected and adjacent fingers
Adequate analgesia
High elevation sling
Early mobilisation
Discharge- No follow-up

Distal Phalangeal Fracture
These are often associated with a crush injury and nail-bed wound.
These do not require antibiotics even if open. Irrigate, close wound, buddy strap.

Dislocated finger
Fingers typically dislocate in a dorsal/palmar plane. Deformed fingers with radial/ulnar angulation are usually fractured with associated collateral ligament injury

Reducing a dislocated finger

Generally the dislocation will be dorsal
1. Ensure the finger is anaesthetised
2. Palpate the dislocated articular surface on the dorsal aspect of the finger
3. Whilst applying GENTLE traction to the finger- push the articular surface distally back into joint
4. It will be clinically apparent when the dislocation is reduced

Where the dislocation is associated with a fracture- reduction should still be attempted
Suspected dislocated finger

Assess and document sensation on radial and ulnar border of finger

Insert digital nerve “ring” block

High elevation sling

Request FINGER x-ray

DISLOCATION?

YES
Reduce
Repeat x-ray
Confirm reduction
Buddy strap
High elevation sling
Adequate analgesia
VIRTUAL FRACTURE CLINIC

NO
Buddy strap affected
and adjacent fingers
High elevation sling
Adequate analgesia
Early mobilisation
Discharge-no follow up

Dislocated Meta-Carpal phalangeal joint
These injuries are generally difficult to reduce owing to the difficulty in achieving adequate local regional anaesthesia.
They are also associated with moderate to severe functional impairment.
✓ Diagnosed on AP and oblique and x-rays
✓ High elevation sling and adequate analgesia
✓ Refer to on-call orthopaedics.

Hand Injuries

Ulnar Collateral Ligament Rupture
This is sometimes called Gamekeeper’s or Skier’s thumb
The ulnar collateral ligament is part of the stabilisation mechanism of the thumb metacarpal phalangeal joint.
It is of vital functional importance in providing stability of the pincer grip between thumb and index fingers
Associated with hyper-abduction injury of the thumb metacarpal phalangeal joint
Ulnar collateral ligament rupture is a functional disaster

Adopt a low threshold of suspicion for this injury in any patient with a painful thumb and an associated relevant mechanism of injury
## Examining UCL

1. Examine the unaffected side first
2. Stabilise the thumb metacarpal head on the radial border
3. Move the proximal phalanx into full abduction
4. Assess for demonstrable laxity

If the ligament is intact, resistance will be felt at full abduction

<table>
<thead>
<tr>
<th>Examination Findings</th>
<th>Management Plan</th>
</tr>
</thead>
</table>
| DEMONSTRABLE LAXITY                         | X-ray Thumb
|                                             | Rhizo Forte Splint
|                                             | Adequate analgesia and high elevation sling
|                                             | REFER ORTHOPAEDICS                                        |
| UNABLE TO ASSESS DUE TO PAIN AND/OR SWELLING| X-ray thumb
|                                             | Rhizo Forte Splint
|                                             | Adequate analgesia and high elevation sling
|                                             | ED Review in 5 days                                      |
| NO LAXITY                                   | X-Ray thumb
|                                             | Wrist splint with thumb extension
|                                             | Adequate analgesia
|                                             | Early mobilisation and DISCHARGE                         |

### Mallet Injury

Mallet injury involves injury to the distal phalanx associated with disruption of the distal extensor mechanism thereby preventing active extension of the DIPJ.

See mallet finger guideline on CEM.
Pelvic Injuries

Pelvic injuries are associated with significant trauma and high velocity injuries. In this context, they will often be diagnosed and evaluated on trauma CT scan series of CT Head/Neck/Chest/Abdomen/Pelvis

Initial management of pelvic injuries in ED includes ABDCE assessment, adequate analgesia and SAM splintage to minimise associated blood loss.

Urethral catheterisation should be avoided until CT has excluded urethral injury.

Symptoms include:
- Pelvic pain
- External evidence of bruising either anterior or posterior
- Clinical evidence of hypovolaemia

**Significant mechanism of injury**  
**Clinical suspicion of pelvic fracture**

- Manage in Resus
- ABCDE Assessment including C-Spine
- IV Access
- Bloods including FBC and Group and Save
- IV Analgesia
- Application of SAM Splint
- Discussion with radiology regarding imaging
- Low threshold for full body CT in context of significant mechanism of injury
- Refer to Orthopaedics on Call

**BEWARE**

Pelvic fractures can be associated with significant blood loss. This may be occult and in otherwise well patients may be physiologically compensated. Careful monitoring of patients cardiovascular status is necessary. Ensure that blood has been requested and is available for transfusion.
In general terms, these fractures are managed conservatively

**Clinical Features**
- Simple fall
- Impaired or significantly compromised mobility
- Anterior pelvic tenderness
- Reduced hip flexion and hip abduction
- No shortening or external rotation of affected limb

---

**DISCHARGE?**
Remember to involve patient’s relatives in the discharge plan
ALWAYS take relatives reservations about discharge into account

---

**Clinical suspicion of ramus fracture**
- Adequate analgesia
- Request AP Pelvis and Hip X-ray
- Pubic Ramus Fracture
- Mobility Assessment

**MOBILE**
- Consider discharge
- Ensure adequate analgesia
- Think about discharge support services
- Think about falls risk/investigation

**NON-MOBILE**
- Adequate analgesia
- Refer orthopaedics

---

**MEDICAL ADMISSION?**
Patients with frequent falls or who are at significant falls risk should be discussed with the receiving medical team for consideration of admission

Similarly, where there is ambiguity regarding the circumstances of attendance (for example where the patient may have collapsed)- these cases should be discussed with the receiving medical team
**Acetabular Fractures**

The acetabulum is the “socket” component of the ball and socket hip joint. Common amongst elderly patients, even after comparatively insidious falls.

**Clinical features**
- Severe unilateral pain
- Global reduction in range of hip movement
- No shortening or rotation
- Patient non-weight bearing

Suspected acetabular fracture
→ Adequate analgesia (Usually IV morphine)
   If cannulating patient- take routine bloods
→ AP Pelvis X-ray

**FRACTURE**

Yes
- No specific splintage required
- Bed-rest
- Consider catheter
- Adequate analgesia
- Refer ORTHOPAEDICS
- Likely to need CT Pelvis

No
- ASSESS MOBILITY

**MOBILE?**
- Consider Discharge
- Adequate analgesia
- Involve relatives
- Think about discharge services

**NON-MOBILE**
- REFER ORTHO Analgesia
HIP INJURIES

Hip Dislocation
In general terms, dislocated hips are NOT reduced in ED
Patients with a dislocated hip usually require a GA to facilitate reduction

<table>
<thead>
<tr>
<th>Type of Joint Dislocation</th>
<th>Clinical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native hip joint</td>
<td>Usually significant trauma</td>
</tr>
<tr>
<td></td>
<td>ABCDE Approach</td>
</tr>
<tr>
<td></td>
<td>Adequate analgesia</td>
</tr>
<tr>
<td></td>
<td>Consider need for more extensive CT imaging</td>
</tr>
<tr>
<td>Prosthetic hip joint</td>
<td>Relatively minor mechanism</td>
</tr>
<tr>
<td></td>
<td>Commonly recurrent presentation</td>
</tr>
</tbody>
</table>

Clinical Features
- Affected leg shortened
- Affected leg internally rotated
- Examine and document sciatic nerve function

Suspected hip dislocation
- IV Access
- IV Morphine
- Routine bloods
- Assess and document sciatic nerve function
- AP Pelvis X-Ray
- Confirmed Dislocation?
  - YES
    - PROSTHETIC JOINT
      - Adequate analgesia
      - Keep patient fasted
      - REFER ORTHOPAEDICS
  - YES
    - NATIVE JOINT
      - Consider need for further imaging
      - REFER ORTHOPAEDICS
  - NO
    - CONSIDER DISCHARGE

SCIATIC NERVE ASSESSMENT
Motor Function
DORSIFLEX foot against resistance
**Neck of Femur Fracture**

**Clinical Features**
Elderly patients following a simple fall
Affected leg shortened
Affected leg internally rotated

**Classification**
There are several classifications of neck of femur fracture which are generally more pertinent to the receiving orthopaedic service
From an ED perspective, classify neck of femur fractures as

<table>
<thead>
<tr>
<th>Classification</th>
<th>Clinical Features</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRACAPSULAR</td>
<td>More proximal injury</td>
<td>Hemi-arthroplasty</td>
</tr>
<tr>
<td></td>
<td>Femoral head becomes avascular</td>
<td>Worse prognosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generally longer in-patient hospital stay</td>
</tr>
<tr>
<td>EXTRACAPSULAR</td>
<td>More distal injury</td>
<td>Dynamic Hip Screw (DHS)</td>
</tr>
<tr>
<td></td>
<td>Nutrient supply of femoral head is maintained</td>
<td>Less invasive operative procedure and earlier mobilisation combine to given</td>
</tr>
<tr>
<td></td>
<td>Generally seen on AP Pelvis</td>
<td>a better prognosis</td>
</tr>
</tbody>
</table>

**Investigation**
Request AP Pelvis and Lateral View of affected hip
Intracapsular fractures are sometimes best seen on the lateral hip x-ray
Radiographers will provide a chest x-ray on patients over 65 who have a radiologically diagnosed neck of femur fracture

Suspected Neck of Femur Fracture
Inform FLOW CO-ORDINATOR and TRAUMA LIAISON
IV Access and IV Analgesia (morphine)
Routine bloods including Group and Save
Request AP Pelvis and Lateral Hip X-Ray

FRACTURE ?
YES
Neck of femur big 6 checklist
NO
MOBILISE

Mobile
Consider Discharge
Discuss with relatives / discharge services
Not Mobile
REFER ORTHO

**SHENTONS LINE- AP PELVIS XR**
A line drawn from the INFERIOR border of the FEMORAL NECK
Should form a smooth continual curve with a line drawn on the INFERIOR border of the SUPERIOR RAMUS
Patients with a fractured neck of femur fracture should be admitted directly to the receiving orthopaedic ward. Admission MUST NOT be delayed to allow review by the receiving orthopaedic doctor in ED. Patients can be reviewed by the receiving orthopaedic doctor and “clerked-in” once they are comfortable and in a bed in the orthopaedic ward.

<table>
<thead>
<tr>
<th>Parameter to consider</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture confirmed on AP and Lateral Hip X-Ray</td>
<td></td>
</tr>
<tr>
<td>Long femoral X-Ray if history of malignancy</td>
<td></td>
</tr>
<tr>
<td>Chest x-ray</td>
<td></td>
</tr>
<tr>
<td>Bloods including Group and Save</td>
<td></td>
</tr>
<tr>
<td>Kardex with as required analgesia (ORAMORPH 5mg)</td>
<td></td>
</tr>
<tr>
<td>Consider urinary catheter (especially in females)</td>
<td></td>
</tr>
<tr>
<td>Consider fascia iliaca block if ongoing analgesia needed</td>
<td></td>
</tr>
<tr>
<td>IV fluids and fasting instructions</td>
<td></td>
</tr>
<tr>
<td>Inform patient and relatives of diagnosis and plan</td>
<td></td>
</tr>
<tr>
<td>Inform trauma liaison and/or orthopaedic ward</td>
<td></td>
</tr>
<tr>
<td>Inform receiving orthopaedic doctor</td>
<td></td>
</tr>
</tbody>
</table>

Fascia iliaca blocks are a useful adjuvant to opiate analgesia, especially in elderly frail patients.

**Fascia Iliaca Block - Landmarks**

Draw a line from the Anterior Superior Iliac Spine To the Pubic Tubercle

Divide the line into **THIRDS**

Identify the junction between the LATERAL THIRD and the MEDIAL TWO-THIRDS

Injection point is 1cm DISTAL to this junction

There is a box of equipment specifically organised to administer a block. Two separate “pops” are felt as the needle is advanced into the compartment. The local anaesthetic should infiltrate easily into the compartment.
**Femoral Shaft Fracture**

A fracture of the femoral shaft is associated with significant blood loss.

Suspected femoral shaft fracture

Transfer patient to resus

**ABCDE Approach**

IV Access

IV Analgesia (morphine)

Routine bloods (including group and save)

AP Pelvis X-Ray

AP and Lateral Femur X-Ray

Fracture?

YES

Femoral nerve block

THOMAS SPLINT

ECG and Chest X-ray

REFER ORTHOPAEDICS

NO

Mobilise

Mobile

Consider discharge

Involves relatives

Consider discharge services

Non-Mobile

REFER ORTHO

**FEMORAL NERVE BLOCK**

Use bupivicaine

Landmark is 1cm to FEMORAL PULSE

Needle inserted to 2-3 cm- perpendicular to skin

Aspirate to exclude blood vessel cannulation

Infiltrate in a “fanning motion”

Apply pressure
Knee Injuries

The majority of knee injuries are soft tissue in nature. It is often possible to identify the diagnosis related to the mechanism of injury.

<table>
<thead>
<tr>
<th>STRUCTURE INJURED</th>
<th>TYPICAL MECHANISM OF INJURY</th>
<th>COMMON EXAMINATION FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTERIOR CRUCIATE LIGAMENT</td>
<td>Hyper-extension injury</td>
<td>Significant effusion Pain/laxity on ANTERIOR DRAWER test</td>
</tr>
<tr>
<td>POSTERIOR CRUCIATE LIGAMENT</td>
<td>Fall onto FLEXED knee with anterior trauma to proximal tibia</td>
<td>Significant effusion Pain/laxity on POSTERIOR DRAWER test</td>
</tr>
<tr>
<td>MEDIAL COLLATERAL LIGAMENT</td>
<td>Lateral trauma resulting in VALGUS strain</td>
<td>Medial tenderness/laxity on VALGUS stress</td>
</tr>
<tr>
<td>LATERAL COLLATERAL LIGAMENT</td>
<td>Medial trauma resulting in VARUS strain</td>
<td>Lateral tenderness/laxity on VARUS stress</td>
</tr>
<tr>
<td>MEDIAL/LATERAL MENSICUS</td>
<td>Twisting injury with foot planted on the ground</td>
<td>Joint line tenderness McMurray’s test - crepitus</td>
</tr>
</tbody>
</table>

Examination Techniques

Anterior Drawer Test
- Patient on a trolley
- Hip flexed and knee flexed
- Stabilise foot (easiest by sitting on it!)
- Index to little fingers of each hand in popliteal fossa, thumbs on tibial tuberosity
- Pull on proximal tibia
- Test is POSITIVE if laxity is felt and proximal tibia moves beyond distal femur

Posterior Drawer Test
- Patient on a trolley
- Hip flexed and knee flexed
- Stabilise foot (easiest by sitting on it!)
- Index to little fingers of each hand in popliteal fossa, thumbs on tibial tuberosity
- Push on proximal tibia
- Test is POSITIVE if laxity is felt and the proximal tibia moves under the distal femur

Valgus Stress Test
- Patient on a trolley
- Hip flexed and knee extended
- One hand over lateral femoral condyle, one hand over medial maecollus
- Apply VALGUS stress (move lower leg away from mid-line)
- Assess for tenderness over medial collateral ligament and laxity when compared with the unaffected side
Varus Stress Test
- Patient on a trolley
- Hip flexed and knee extended
- One hand over medial femoral condyle
- One hand over lateral maeollus
- Apply VARUS stress (move lower leg towards mid-line)
- Assess for tenderness over lateral collateral ligament and laxity when compared with the unaffected side

McMurray’s Test (Medial Meniscus)
- Patient on a trolley
- Hip flexed and knee flexed
- Find joint line- palpate tibial tuberosity- 1cm superior to this
- Thumb in medial aspect of joint line
- Place other hand under the patient’s heel
- Rotate the foot outwards- away from the mid-line
- Gently passively extend the knee
- Assess for pain and crepitus at the meniscus (under your thumb)

McMurrays test is not as sensitive for lateral meniscus pathology- the examiner’s thumb should be placed over the lateral meniscus and the foot turned inwards (towards mid-line) then passively extend knee.

Knee X-rays
Most knee injuries- even with significant swelling and limitation of function, are soft tissue in nature

Apply the Ottawa Knee Rules to determine which patients require knee x-rays

Indications for knee x-ray- At least ONE of the following:
- Patient over age of 55 years
- Tender fibula head
- Tender patella
- Flexion reduced to less than 90°
- Inability to weight bear 4 steps

Interpretation of knee x-rays
Lateral X-ray
Look for lipo-haemarthrosis- evidence of fluid level in the supra-patella pouch- suggestive of intra-articular fracture

AP X-ray
Draw a straight line directly inferior from the medial and lateral condyles of the distal femur. None of the tibia should be visible beyond this line.
Egress of the tibia beyond this line suggests a tibial plateau fracture.

REMEMBER
When x-raying knees, a lipo-haemarthrosis is a concerning feature.
The emulsification process takes 10-15 minutes for this to occur
Patients MUST be conveyed to x-ray on a trolley to allow this process to take place prior their x-ray being taken
Management of Soft-Tissue Knee Injuries

<table>
<thead>
<tr>
<th>Injury Classification</th>
<th>Clinical Features</th>
<th>Initial Management</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINOR INJURY</td>
<td>Weight bearing</td>
<td>Rest</td>
<td>GP</td>
</tr>
<tr>
<td></td>
<td>No effusion</td>
<td>Ice</td>
<td>Consider physiotherapy depending on patient’s base-line function and likely compliance</td>
</tr>
<tr>
<td></td>
<td>No instability</td>
<td>Compression</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Full active</td>
<td>Elevation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>extension</td>
<td>Tubigrip if required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Established OA</td>
<td>Knee exercise sheet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adequate analgesia</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emphasis on early mobilisation</td>
<td></td>
</tr>
<tr>
<td>MODERATE INJURY</td>
<td>Non-weight bearing</td>
<td>Rest</td>
<td>Review at SOFT TISSUE CLINIC in 10-14 days post injury</td>
</tr>
<tr>
<td></td>
<td>Minor effusion</td>
<td>Ice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diagnostic</td>
<td>Compression</td>
<td></td>
</tr>
<tr>
<td></td>
<td>uncertainty</td>
<td>Elevation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No demonstrable</td>
<td>Tubigrip if required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>instability</td>
<td>Knee exercise sheet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adequate analgesia</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emphasis on early mobilisation</td>
<td></td>
</tr>
<tr>
<td>SEVERE INJURY</td>
<td>Acute haemarthrosis</td>
<td>Adequate analgesia</td>
<td>ORTHOPAEDIC REFERRAL</td>
</tr>
<tr>
<td></td>
<td>Demonstrable</td>
<td>Elevate knee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ligamentous laxity</td>
<td>REFER ORTHOPEDICS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Locked Knee</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BEWARE
If it is not possible to conduct a full examination due to pain then SOFT TISSUE CLINIC FOLLOW-UP in at least 5-7 days should be arranged.
Summary of Approach to Knee Injuries

History Elicitation
Ensure robust understanding of exact mechanism of injury

Adequate analgesia

Focussed examination
Assess for instability and/or laxity

Consider x-ray
See above for indications

Categorise injury

MILD
RICE
Tubigrip
Analgesia

Moderate
RICE
Tubigrip
Analgesia

Severe
Elevate
Analgesia

GP
Soft Tissue Clinic
Refer

Physiotherapy
Physiotherapy
ORTHO

Locked Knee
A locked knee is one which is held in FLEXION.
This is typically associated with a meniscal injury and will generally required urgent MRI +/- Arthroscopic decompression.

NEVER attempt to “force” the knee into an extended position- this is unlikely to be successful and will undoubtedly be extremely painful.

Suspected “locked” knee

Patient unable to actively extend knee
Not weight bearing

Adequate analgesia

Knee x-ray

Refer to orthopaedics on-call
Distal Femur Fracture
Common periprosthetic fracture in patients with total knee replacement

Suspected distal femur fracture

Adequate analgesia
(Usually IV morphine)

Request KNEE and FEMUR x-rays

Fracture Confirmed

Intra-articular Fracture
Infra-condylar Fracture

Supra-condylar Fracture

Above knee back-slab

Thomas Splint

REFER ORTHOPAEDICS

In patients with confirmed distal femur fracture- consider pathological fracture.

Distal Femur Fracture Check-list
✓ Adequate analgesia- including Kardex with as-required analgesia
✓ Immobilisation as above depending on fracture site
✓ Routine bloods including LFT and bone profile
✓ Chest x-ray
✓ Refer to on-call orthopaedics

Patella Dislocation
Patella dislocation usually occurs laterally. It is generally easy to reduce- usually be extending the patient’s knee.

Suspected patella dislocation

Adequate analgesia(Entonox is useful)

Clinically reduce
Passive extension of lower limb and gentle medial pressure on patella

Assess and document straight leg raise
Assess distal neurological function
Post reduction x-ray
Knee splint and VFC

REFER ORTHOPAEDICS
Knee Effusion
Many patients present with non-traumatic knee effusion. In anti-coagulated patients with a traumatic effusion- aspiration and compression dressing can alleviate symptoms

Non-traumatic effusion
ABCDE Assessment
Routine observations
IV Access
Bloods- Including CRP/ESR and Urate
Blood cultures
Adequate Analgesia
Knee x-ray
REFER ORTHPAEDICS

Tibial Plateau Fracture
Common in elderly patients after relatively minor trauma
In younger patients- represents significant mechanism of injury

Clinical features
• Significant effusion
• Reduced active range of movement
• Unable to weight bear

X-ray findings
• Tibia migrates beyond lines drawn perpendicularly inferior from condyles on AP x-ray
• Lipohaemarthrosis on lateral x-ray

Management
• Adequate analgesia
• Above knee back-slab
• Elevate leg
• Refer to on-call orthopaedics

TIBIAL PLATEAU FRACTURE
Patients generally will have CT knee to more comprehensively assess the fracture
Generally patients require bone grafting +/- reconstructive intervention
Proximal Fibula Fracture
Common “fender fracture” where pedestrians are knocked-down and struck by the bumper of a car

Suspected proximal fibula fracture
   → Adequate analgesia
   → Assess and document
   COMMON PERONEAL NERVE FUNCTION
   → Request Tibia and Fibula X-ray
   → Fracture Confirmed
   → Padded crepe bandage
   → Non-weight bearing with crutches
   → Adequate analgesia
   → REFER VIRTUAL FRACTURE CLINIC

ASSESSMENT OF COMMON PERONEAL NERVE FUNCTION

   Sensory function
   Lateral border of foot

   Motor function
   Dorsiflexion of foot
   Eversion of ankle
Ankle Injuries
Ankle injuries represent the most common musculoskeletal presentation in ED.

History
Establish the mechanism of injury.
Most common is an inversion injury or a forced plantar flexion injury
Document whether the patient is able to weight-bare

Examination
LOOK
Assess for bruising/swelling
Document any deformity

Feel
Palpate:
1. Medial maeollus
2. Lateral maeollus (posterior aspect)
3. Base of 5th Metatarsal
4. Calcaneus
5. Proximal fibula
6. Specific ligaments

<table>
<thead>
<tr>
<th>LIGAMENT</th>
<th>ANATOMICAL LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior Talofibular Ligament</td>
<td>Lateral maeollus extending anteriorly onto talus-most commonly injured</td>
</tr>
<tr>
<td>Calcaneo-Fibular Ligament</td>
<td>Lateral maeollus extending inferiorly towards calcaneum</td>
</tr>
<tr>
<td>Deltoid Ligament</td>
<td>3 part ligament extending from medial maeollus. Much stronger and less frequently injured than lateral ligaments</td>
</tr>
</tbody>
</table>

Move
Ankle movements are of DORSIFLEXION (foot “lifting-up”) and PLANTARFLEXION (foot “pointing-down”)

TALAR TILT TEST
Position the patient in a neutral position
Examine the unaffected side first for comparison purposes
Apply passive INVERISON to the ankle
Assess for laxity at full inversion

If possible- each movement should be assessed against resistance however this is likely to be very difficult in a recently injured ankle.
Active and Passive examination of the ankle should focus on determining the presence of demonstrable ligamentous laxity.

**Who to X-ray:**
Apply the OTTOWA ANKLE RULES to stratify which patients require an x-ray:

Request ANKLE X-RAY where ANY of the following are present:
1. Bony tenderness over distal 6cm of POSTERIOR DISTAL TIBIA
2. Bony tenderness over tip of MEDIAL MAEOLLUS
3. Bony tenderness over distal 6cm of POSTERIOR DISTAL FIBULA
4. Bony tenderness over tip of LATERAL MAEOLLUS
5. Inability to weight bare 4 steps in ED

Request FOOT X-RAY where ANY of the following are present:
1. Bony tenderness over NAVICUALR (dorsum of foot)
2. Bony tenderness over BASE OF 5th METATARSAL (lateral foot)
3. Inability to weight bare 4 steps in ED

It is very uncommon for patients to require ankle and foot x-rays and it is usually possible to differentiate between these investigations by adequate clinical examination.

**Interpreting the x-ray:**

<table>
<thead>
<tr>
<th>View</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP</td>
<td>Look for lateral maeollus fracture</td>
</tr>
<tr>
<td></td>
<td>Assess syndemosis</td>
</tr>
<tr>
<td></td>
<td>Look for medial maeollus fracture</td>
</tr>
<tr>
<td></td>
<td>Assess for TALAR SHIFT</td>
</tr>
<tr>
<td>LATERAL</td>
<td>Look for posterior maeollus fracture</td>
</tr>
<tr>
<td></td>
<td>Look for anterior avulsion fracture from distal tibia</td>
</tr>
</tbody>
</table>
Approach to Ankle Injuries

Patient presents with ankle injury

- Establish mechanism of injury
- Document whether patient is able to bare weight
- Examine and Document MEDIAL TENDERNESS
- Adequate analgesia
- Examine for ligamentous laxity
- Apply OTTOWA ANKLE RULES to determine if X-ray is indicated
- Manage patient using table below

<table>
<thead>
<tr>
<th>Examination/ X-ray Findings</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>No ligamentous laxity X-ray NOT indicated</td>
<td>RICE Adequate analgesia Ankle exercise leaflet</td>
</tr>
<tr>
<td>Ligamentous laxity X-ray NOT indicated OR X-ray shows no fracture</td>
<td>Consider walking boot Adequate analgesia Ankle exercise leaflet Soft-tissue clinic follow-up- 10 days</td>
</tr>
<tr>
<td>No ligamentous laxity X-ray shows no fracture</td>
<td>RICE Adequate analgesia Ankle exercise leaflet Crutches if not weight baring</td>
</tr>
<tr>
<td>X-ray shows ankle fracture</td>
<td>Assess for talar shift Establish Weber classification</td>
</tr>
</tbody>
</table>

Discharge Advice for patients with ankle sprain

Patients frequently complain of having a “weak ankle” and frequently present with recurrence of inversion injuries and mild/moderate ankle sprains. This is generally caused by inadequate rehabilitation of a previous injury

1. Patients should be advised to regularly exercise their ankle to maintain movement and stability and encourage rehabilitation. They should be given an ankle exercise leaflet and encouraged to undertake the manoeuvres described on a regular basis.

2. Tubigrip can be used if the patient has moderate to severe soft tissue swelling and/or pain.

3. Breg boots are useful for patients with severe swelling or demonstrable laxity. The patient should be reminded that the boot may require to be adjusted as their swelling resolves to ensure it remains adequately supportive.
4. Any immobilisation should be used for two weeks. One week at ALL TIMES and the second week only when outdoors as the undulating ground outside requires increased proprioceptive input and puts additional strain on ligaments to maintain balance.

5. Patients who are unable to weight bare but have no positive examination findings and a normal x-ray can be discharged with crutches. It is NOT NECESSARY to arrange follow-up for these patients and they should be invited to return the crutches to ED once they are no longer required.

6. Patients with demonstrable ligamentous laxity should be referred to the soft tissue clinic AT LEAST one week post injury and preferably 10-14 days after injury to allow swelling to resolve.

Ankle rehabilitation takes 2-3 weeks depending on the severity of the injury.

<table>
<thead>
<tr>
<th>DURATION SINCE INJURY</th>
<th>PROGNOSTIC FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE WEEK</td>
<td>RICE</td>
</tr>
<tr>
<td></td>
<td>3-4 Times daily ankle exercise</td>
</tr>
<tr>
<td></td>
<td>If used: Tubigrip/Breg Boot at ALL TIMES</td>
</tr>
<tr>
<td>TWO WEEKS</td>
<td>3-4 Times daily ankle exercise</td>
</tr>
<tr>
<td></td>
<td>If used: Tubigrip / Breg Boot when OUTDOORS</td>
</tr>
<tr>
<td></td>
<td>Soft Tissue Appointment if arranged</td>
</tr>
<tr>
<td>THREE WEEKS</td>
<td>Weaning of immobilisation</td>
</tr>
<tr>
<td></td>
<td>Gradual return to athletic activity governed by pain</td>
</tr>
</tbody>
</table>

Approach to Ankle Fractures

Patient presents with ankle injury

Establish mechanism of injury
Document whether patient is able to bare weight
Examine and document MEDIAL TENDERNESS
Adequate analgesia
Examine for ligamentous laxity
Apply OTTOWA ANKLE RULES to determine if X-ray is indicated
X-ray shows fracture
Assess X-ray for Talar Shift
Classify distal fibula fractures using Weber Classification
The syndesmosis is the fibrous joint between the distal tibia and the fibula. This joint has an essential role in maintaining stability of the ankle.

**BEWARE**
It is essential to document:
- MEDIAL TENDERNESS
- MEDIAL SWELLING
- MEDIAL BRUSING

This is important for the virtual fracture clinic in stratifying follow-up.

### Management of Ankle Fractures

<table>
<thead>
<tr>
<th>DIAGNOSIS</th>
<th>ED TREATMENT</th>
<th>FOLLOW-UP</th>
</tr>
</thead>
</table>
| TIP OR LATERAL MAEOLLUS FRACTURE | • RICE  
   • Adequate analgesia  
   • Ankle advice leaflet  
   • Breg Boot OR Tubigrip depending on pain  
   • Weight Baring | Discharge to GP |
| AVULSION FRACTURE MEDIAL MAEOLLUS | • RICE  
   • Adequate analgesia  
   • Ankle advice leaflet  
   • Breg Boot OR Tubigrip depending on pain  
   • Weight Baring  
   **EXAMINE AND DOCUMENT PROXIMAL FIBULA** | Discharge to GP |
| WEBER A FRACTURE            | • RICE  
   • Adequate analgesia  
   • Ankle advice leaflet  
   • Breg Boot  
   • Weight Baring  
   **REMEMBER MEDIAL EXAMINATION DOCUMENTATION** | Discharge to GP  
   Contact Fracture Clinic for symptoms persist after THREE MONTHS |
| WEBER B FRACTURE - NO TALAR SHIFT | • RICE  
• Adequate analgesia  
• Ankle advice leaflet  
• Breg Boot  
• Weight Baring as able  
**REMEMBER MEDIAL EXAMINATION DOCUMENTATION** | Refer to VIRTUAL FRACTURE CLINIC |
| WEBER B FRACTURE - TALAR SHIFT | • Adequate Analgesia  
• Below Knee Back-slab | Refer to ON CALL ORTHOPAEDICS |
| WEBER C FRACTURE - NO TALAR SHIFT | • RICE  
• Ankle advice leaflet  
• Breg Boot  
• Weight Baring as able  
**REMEMBER MEDIAL EXAMINATION DOCUMENTATION** | Refer to VIRTUAL FRACTURE CLINIC |
| WEBER C FRACTURE – TALAR SHIFT | Adequate Analgesia  
Transfer to Resus  
Reduce under sedation  
Below knee Back-slab | Refer to ON CALL ORTHOPAEDICS |

---

**BEWARE- MAISONNEUVE FRACTURE**

Medial Maeollus fracture associated with spiral fracture of proximal fibula

ALL PATIENTS with medial maellolus fracture MUST have documented examination of proximal fibula

If tender then a KNEE X-Ray IS REQUIRED

Application of a back-slab or walking boot to immobilise a medial maellolus fracture in patients with a Maisonneuve Injury increases the risk of peroneal nerve injury and subsequent foot-drop

---

**ASSESSING TALAR SHIFT**

Use the AP view  
The gap around the ANKLE MORTICE should be equal on the medial and lateral side

The superior talus should sit in a horizontal plane without any tilt
Management of Bimaeollar/Trimaeollar Fracture

Suspected ankle fracture
Adequate Analgesia
Examine for PROXIMAL FIBULA tenderness
Examine for MEDIAL tenderness
Document NEURO-VASCULAR status of foot
X-ray confirms fracture
Talar Shift?

YES
Transfer to Resus
Check and Document Skin
Adequate analgesia
Reduce under sedation
Below knee backslab
REFER ORTHOPAEDICS

NO
Adequate analgesia
Check and Document Skin
Below knee backslab
Crutches non weight-bearing
REFER VIRTUAL FRACTURE CLINIC

Reducing a Dislocated Ankle
Assess and document neuro-vascular status of foot
Confirm patient’s fasting status
IV Access and IV morphine
Take and send routine bloods
Transfer to resus
Consent for procedural sedation
Adequate monitoring including End-Tidal CO2
IV Sedation
Left fully extended leg by great toe
Apply slight inversion and gentle pressure over lateral maeollus
Assess and document neuro-vascular status post-reduction
Apply below knee backslab
Post reduction x-ray
REFER ORTHOPAEDCIS
Foot Injuries

Calcaneal Fracture
Injuries to the calcaneum infrequently occur without significant trauma
This is a common injury after jumping from a height and landing on one or both feet.

Suspected calcaneal fracture
Adequate analgesia
Examine BOTH sides
Examine for lumbar spine tenderness
Document NEURO-VASCULAR status of foot
Request CALCANEAL X-RAY
Fracture Confirmed
Check Skin
Adequate analgesia
ELEVATE and ICE
REFER ORTHOPAEDICS

Patients with calcaneal fracture frequently need CT to establish degree of comminution

BOHLER’S ANGLE

Calcaneal x-rays include a dedicated calcaneal view and a lateral ankle x-ray.
Fractures are easiest to diagnose on the lateral ankle x-ray

Draw a line from upper edge of posterior aspect of Calcaneus to superior point of calcaneus at sub-talar joint

Draw a second line from superior point of calcaneus at sub-talar joint to anterior process of calcaneus

The angle between these lines should be 20° to 40°. An angle of LESS THAN 20° indicates a fracture
Talus Fracture
Talus fractures are frequently associated with significant trauma and disruption of soft tissues of the foot
Patients with a talus fracture have gross soft tissue swelling and a marked reduction in active range of ankle movements
It is unusual to be able to weight-bearing

**Suspected Talus Fracture**
- Adequate analgesia
- Assess NEURO-VASCULAR status of foot
  - Document swelling/bruising to foot
- Request ANKLE X-RAY
- Fracture confirmed
  - Adequate analgesia
  - Check and document skin
    - Below knee back-slab
    - Non weight-bearing
    - Elevate
- REFER ORTHOPAEDICS

X-Ray Interpretation
Talus fractures most often occur at the neck
These are most readily seen on the lateral ankle x-ray

Patients with talus fractures often require CT ankle to establish degree of comminution

Tarsal Fracture
Common mechanism of injury resulting in tarsal fracture
Forced plantar flexion injury
Crush injury- something dropped on foot or vehicle driven over foot

**HIGH VELOCITY INJURY**
- This is likely to involve significant soft tissue trauma
  - X-RAY
  - ELEVATE and ICE
  - Adequate analgesia
  - REFER ORTHOPAEDICS
  - Likely to need CT

**MULTIPLE FRACUTRES**
- Refer patients with multiple tarsal fractures to orthopaedics irrespective of displacement
**Suspected tarsal fracture**

- Establish mechanism of injury
- Document if HIGH VELOCITY injury
- Adequate analgesia
- Document NEURO-VASCULAR status of foot
- Document swelling/bruising
- Document whether patient can weight-bare
- Request FOOT X-RAY
- Fracture confirmed
- DISPLACEMENT PRESENT
  - YES: Adequate Analgesia
    - Check and document skin
    - Elevate
    - Below-knee Backslab
    - REFER ORTHOPAEDICS
  - NO: Adequate analgesia
    - Check and document skin
    - Breg Boot
    - Crutches-weight bare as able
    - REFER VIRTUAL FRACTURE CLINIC

**Assessing Displacement**

**AP VIEW**

Base of 2\textsuperscript{nd} Metatarsal MUST align with INTERMEIDATE CUNEIFORM

**OBLIQUE VIEW**

Base of 3\textsuperscript{rd} Metatarsal MUST align with LATERAL CUNEIFORM

**HIGH VELOCITY INJURY**

Significant trauma to the foot raises the possibility of occult injury.

Refer patients to orthopaedics for consideration of CT

Adequate analgesia

Elevate and ice
**Metatarsal Fracture**
Typically associated with a crush injury to the foot or forced plantar flexion injury

Suspected Metatarsal fracture
- Adequate analgesia
- Elicit history
- Enquire about HIGH VELOCITY INJURY
- Document NEURO-VASCULAR status of foot
- Request Foot X-Ray
- Fracture Confirmed
  - LATERAL FOOT X-ray to assess angulation
  - DISPLACED?

**Assessing Displacement**
- **AP VIEW**
  - Base of 2\(^{nd}\) Metatarsal MUST align with INTERMEIDATE CUNEIFORM
- **OBLIQUE VIEW**
  - Base of 3\(^{rd}\) Metatarsal MUST align with LATERAL CUNEIFORM

YES
- Adequate Analgesia
- Below-knee backslab
- Elevate
- REFER ORTHOPEDICS

NO
- Breg boot
- Weight-bearing as able
- Adequate analgesia
- Check and document skin
- VIRTUAL FRACTURE CLINIC

**Lisfranc Fracture**
Fracture of base of 2\(^{nd}\) and/or 3\(^{rd}\) metatarsals with disruption of tarsal/metatarsal joints
Typically associated with a crush injury to the foot or forced plantar flexion injury against resistance such as falling off a ladder and striking dorsum of foot against a rung

**Clinical Features**
- Suspicious mechanism of injury
- Gross swelling and/or bruising to dorsum of foot
- Significant pain
Suspected Lisfranc fracture
Adequate analgesia
Elicit history
Enquire about HIGH VELOCITY INJURY
Document NEURO-VASCULAR status of foot
Request Foot X-Ray
LISFRANC INJURY CONFIRMED
Adequate Analgesia
Check and document skin
Below-knee backslab
Elevate
REFER ORTHOPAEDICS

Assessing Displacement
AP VIEW
Base of 2nd Metatarsal MUST align with INTERMEIDATE CUNEIFORM
OBLIQUE VIEW
Base of 3rd Metatarsal MUST align with LATERAL CUNEIFORM

Base of 5th Metatarsal Fracture
Typically associated with an ankle inversion injury caused by an avulsion injury of the peroneus Brevis tendon
Differentiate between whether ankle or foot x-rays are required. It is very unusual for both to be needed
Discharge simple fractures with Breg boot and advice sheet

JONES FRACTURE
Fracture of proximal 5th metatarsal at joint between 4th and 5th metatarsal bases
Prone to non-union
Treat in Breg boot but VFC follow up
March Fracture
Stress fracture of third metatarsal neck

Clinical features
- Insidious tenderness to dorsum of foot
- Painful to weight-bare
- Associated with commencement of new activity

Clinical March Fracture with Suspicious history
Adequate analgesia
Request foot x-ray
FRACTURE CONFIRMED

YES
Breg Boot
Weight-bare as able
Adequate analgesia
VFC

NO
Breg Boot
Weight-bare as able
Adequate analgesia
STC 10 days

BEWARE
March fracture is prone to non-union resulting in chronic foot pain

If the history and examination is consistent but there is NO fracture- then FOLLOW-UP MUST be arranged for repeat examination and consideration of second x-ray
**Toe Injuries**
Toe injuries generally require only symptomatic treatment

**Indications for Toe X-ray**
- Clinical dislocation
- Metatarsal head tenderness
- Great toe injury

---

**Toe Injury**

1. Adequate analgesia
2. Document NEURO-VASCULAR status of toe
3. Assess for metatarsal head tenderness
4. Assess for dislocation
5. Is x-ray indicated

---

### DIAGNOSIS

<table>
<thead>
<tr>
<th>Clinical toe fracture OR Fracture confirmed on x-ray</th>
<th>Buddy-strap adjacent toes Adequate analgesia Discharge- GP follow-up</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dislocated toe</th>
<th>Digital local anaesthetic block Reduce Post-reduction x-ray Buddy strap adjacent toes Discharge – GP follow-up REFER ORTHOPAEDICS if unable to reduce</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Intra-articular great toe fracture</th>
<th>Toe Spica bandage Adequate analgesia Weight-bare Document neuro-vascular status of toe REFER VIRTUAL FRACTURE CLINIC</th>
</tr>
</thead>
</table>