

<u>Hand injuries</u>			
Injury	MOI, Description	Splint, Management	Extra
<b>Tendon injuries</b>			
<a href="#">Flexor tendon injuries</a>	Associated with lacerations of FDS & FDP. If only the FDS is cut, both joints will still flex.	Dorsal splint, 30-degree wrist flex, 70degree MCP flexion, 30 to 40degree PIP flexion.	" <a href="#">Jersey Finger</a> " when FDP is avulsed from its insertion @ palmer base of the distal phalanx; requires close Ortho f/u.
<a href="#">Boutonniere deformity</a>	MOI: Forced flexion @ PIP causes central slip extensor hood disruption @ PIP joint. Lateral bands of extensor hood apparatus become flexors of PIP and hyperextensors of the DIP. Exam: PIP flexion & DIP extension: unable to fully extend PIP.	Dorsal Splint PIP in extension for 4-6 weeks.	
<a href="#">Mallet finger</a>	MOI: Forced hyperflexion of the DIP causes either a rupture of the extensor tendon at the level of the distal phalanx OR an avulsion fracture at the base of the distal phalanx. Exam: DIP joint is flexed & pt unable to extend DIP, dorsal tenderness (more with avulsion fracture).	Tendon injury: Dorsal DIP extension splint continuously for 6-8 wks. Avulsion fracture: Dorsal DIP extension splint continuously for 4-6 weeks (may require K-wire insertion if large, displaced fragment).	If untreated, progress to swan neck deformity (DIP flexion, PIP hyperextension).  F/u with hand specialist.
<b>Ligamentous Injuries</b>			
<a href="#">Gamekeeper thumb or Skier thumb</a>	Injury to the ulnar collateral ligament of the thumb MCP joint. +/- avulsion fracture. MOI: fall with forced radial abduction of the thumb. Exam: Decrease pinch strength, pain and swelling at thumb MCP joint ulnar side.	If X-ray normal (no avulsion fracture), then need to assess the degree of tear: I-stetch, II-partial tear, III-complete tear. (>40 degree radial angulation indicates complete tear).  Immobilize with Thumb Spica splint.	IF Grade I and II: need 4-6 wks of immobilization (may get custom made splint). IF Grade III: needs operative repairs within a week by hand specialist. 25% have a Stener's lesion.
<b>Dislocations</b>			
<a href="#">DIP joint dislocations</a>	MOI: Often dorsal from hyperextension injury.	Closed reduction, immobilization in slight flexion with dorsal splint for 2 weeks.	An irreducible joint may be from an entrapped volar plate, profundus tendon or avulsion fracture >> open reduction may be required.
<a href="#">PIP joint dislocations</a>	Often dorsal. Lateral dislocation results from rupture of one of the collateral ligaments. Volar PIP dislocations often injure the central slip and at risk of Boutonniere deformity.	Closed reduction under digital block (Post reduction, assess joint stability). If Stable post reduction: buddy tape for ~ 3 wks. If Unstable post reduction: Buddy tape, Dorsal Splint the joint in 30 degree flexion, & f/u with hand specialist. If Volar PIP dislocations: Buddy tape, splint immobilization, & hand specialist f/u even if stable post reduction.	If an irreducible joint from an entrapped volar plate or complete ligamentous disruption; Call Ortho as open reduction may be required.
<a href="#">MCP joint dislocations</a>	Usually dorsal.	Attempt closed reduction in the ED; however might requires surgical reduction due to volar plate entrapment. Splint with the MCP joint flexed 70-90 degree.	
Thumb IP joint dislocation	Usually involve volar plate rupture	Attempt closed reduction and place in a Thumb spica splint	
Thumb MCP dislocation	Usually dorsal and involve volar plate rupture	Reduce by flexing and abducting the metacarpal and apply pressure directed distally to the base of the proximal phalanx. Place in a thumb spica splint.	
<a href="#">Thumb CMC dislocation</a>	Mostly dorsal from axial force on a flexed thumb	Reductaion and immobilization in extension and pronation.	
<b>Fractures : Clinical Pearl:</b> with phalanx and metacarpal fractures, clinically (not radiographically) assess for rotation (and re-assess again if reduced).			
Tuft Fracture	It is a distal phalanx fracture; often associated with subungual hematoma and nail bed laceration. MOI: crush injury - closed door or dropped heavy object.	Volar or hairpin splint (Protective U shaped) to the DIP, joint not immobilizing @ PIP. If intra-articular > f/u with hand specialist.	

<p><a href="#">Phalanx Fractures</a></p>	<p>Always assess for rotation (clinically not radiographically).</p> <p>Transverse fracture that are anatomic (ie no displacement, angulation or rotation) are stable.</p> <p>Fractures are potentially unstable if either they are: 1-oblique, or 2-require reduction. (re-assess rotation after reduction).</p> <p>Unstable phalanx fracture are most unstable in extension.</p>	<p>If Stable: Buddy tape for ~3 weeks.</p> <p>If Unstable: Buddy tape, immobilize in an extension-block splint, &amp; f/u with hand specialist.</p> <p>For Thumb proximal phalanx: Thumb spica splint.</p>	
<p><a href="#">Base of thumb metacarpal fractures</a></p>	<p><b>Bennett Fracture:</b> Intraarticular fracture dislocation of the base of the 1st metacarpal.</p>	<p>Unstable injury: temporary splint with thumb spica; call Ortho for internal fixation.</p>	
	<p><b>Ronaldo Fracture:</b> Comminuted intra-articular fracture at the base of the 1st metacarpal.</p>	<p>Unstable injury: temporary splint with thumb spica; call Ortho for internal fixation.</p>	
<p><a href="#">Metacarpal Fractures</a></p>	<p>Fractures involve the 4<sup>th</sup> and 5<sup>th</sup> are the most common: <b>Boxer's Fracture:</b> fracture of the neck of the 5<sup>th</sup> metacarpal.</p> <p>MOI: usually from a punch.</p> <p>Exam: must check for rotation. Look closely at the overlying skin to ensure its not an open fracture (human bite).</p>	<p>Angulation more than 40deg in 5<sup>th</sup> MC, 30deg in 4<sup>th</sup> MC, 20 in 3<sup>rd</sup> MC or 15 in 2<sup>nd</sup> MC should be reduced. These angles apply ONLY to metacarpal neck fracture, not to more proximal shaft fractures.</p> <p>Closed reduction (if needed), buddy tape, Ulnar gutter splint for fractures of 4<sup>th</sup> and 5<sup>th</sup> MC/ Radial gutter splint for fracture of 2<sup>nd</sup> or 3<sup>rd</sup> MC. (must be well molded).</p> <p>— If Base fracture &gt;&gt; keep MCP free.</p>	<p>General rules when immobilising the hand: the wrist extended at 30degree, the MCP joint flexed at 90, &amp; PIP in extension.</p> <p>F/U hand specialist within 1 week.</p>

Wrist injuries			
Injury	MOI, description	Splint, management	Extra
<b>Carpal bone fractures</b>			
<a href="#">Scaphoid</a>	MOI: FOOSH injury Exam: Snuffbox tenderness (with ulnar deviation), pain with axial load of the 1 <sup>st</sup> metacarpal (Watson's scaphoid shift test), tenderness over the palmer side of scaphoid. XR: add scaphoid views.	>Suspected: removable or fixed thumb spica, Ortho in 10-14 days. >Undisplaced: thumb spica splint, Ortho referral within 1week. >Displaced: thumb spica splint, call Ortho - needs open reduction.	15-20% of fractures are not seen on initial X-rays. Major complication: Avascular necrosis of the proximal fracture segment.
Triquetrum	Often Avulsion fracture. MOI: FOOSH or twisting of hand against resistance. Exam: Dorsal wrist tenderness over the carpals in the 'divot' (in line with the 4th MC and digit). XR: chip fracture dorsal aspect proximal carpals.	Removable wrist splint for 3-4 weeks prn.	2 <sup>nd</sup> most common carpal bone fracture.
<a href="#">Hook of Hamate</a>	MOI: interrupted swing of a golf club, bat or racquet (trauma to the ulnar base of the hand). Exam: Tenderness at the hook of the hamate, just distal and radial to the pisiform/ may have positive pull test (pain while resisting extension of 4th and 5th digits). XR: Add 'Tunnel view' aka 'hook of hamate view'.	immobilize in ulnar gutter to the tip of 5th digit; need early specialist referral within a week.	A rare fracture: if high suspicion may require CT if persistent pain at f/u to confirm diagnosis.  Hook of hamate fracture often get excised due to significant risk of both non-union and chronic pain.
Lunate	FOOSH injury Exam: Tenderness over mid dorsal wrist	Thumb spica splint	Isolated lunate injuries are rare Complication: Kienbock's disease – lunate avascular necrosis
Trapezium	MOI: Direct blow to thumb; force to wrist while dorsiflexed and radially deviated Exam: Painful thumb movement and weak pinch strength and snuff box tenderness	Thumb spica splint	
<a href="#">Pisiform</a>	MOI: FOOSH - Fall directed on the hypothenar eminence Exam: Tender pisiform, prominent at the base of the hypothenar eminence	Ulnar gutter splint.	
Capitate	MOI: FOOSH - Forceful dorsiflexion of the hand with radial impact. Exam: Tenderness over the capitate just proximal to the 3 <sup>rd</sup> metacarpal.	Radial gutter splint.	
Trapezoid	MOI: Axial load onto the index metacarpal. Exam: Tenderness over the radial aspect of the base of the index metacarpal.	Thumb spica splint	
<b>Ligamentous injuries</b>			
MOI: Typically FOOSH injury with forceful dorsiflexion of the wrist.			
<a href="#">Scapholunate dissociation</a>	Exam: Tender both in the anatomic snuffbox and dorsal proximal wrist & at Lister's tubercle. XR: "Terry Thomas sign" – widening of the scapholunate joint space >3mm./ "Scaphoid Signet ring sign"- cortex appears as a ring due to rotary subluxation & palmer tilt of the scaphoid./ Add 'Clenched-fist' view if high suspicion.	Well molded thumb spica splint and early specialist referral (within 1 week).	Most common carpal ligamentous injury.
Triquetrolunate ligament instability	Exam: Localised tenderness on the ulnar aspect of the wrist just distal to the ulna. Ballottement of the triquetrum may produce a painful clicking sensation. XR: lateral view may reveal "volar intercalated segment instability".	Ulnar gutter splint.	
<a href="#">Perilunate dislocation</a>	Exam: Tenderness and Palpable dorsal wrist fullness. XR: the lunate remains anatomic and the distal carpal row dislocates either dorsally (more commonly) or volarly.	Call Ortho - attempt Reduction and immobilize in the ED with early specialist referral - Thumb spica.	Commonly associated with scaphoid fracture. Often missed on Xray: always assess the radio-lunate-capitate line).
<a href="#">Lunate dislocation</a>	Exam: Tenderness and Palpable volar wrist fullness. Lunate dislocates volarly (more common than dorsally), but the remainder of the carpus aligns with the radius. XR: spilled teacup sign on lateral view/ Triangular shape or Piece-of-pie sign on AP view.	Call Ortho - attempt Reduction and immobilize in the ED with early specialist referral - Radial gutter.	Complication: acute carpal tunnel syndrome, median nerve injury, avascular necrosis.

Forearm and Elbow Injuries			
Injury	MOI, description	Splint, management	Extra
<a href="#">Distal Radius Fractures</a>	Better to get rid of the terms Colles and Smith fractures, just think of them as distal radius fractures.		
Pediatric distal radius fracture	MOI: FOOSH injury. Most commonly 'buckle' fracture occurs on the dorsal aspects (may be subtle) & Salter II fracture. Exam: tenderness at the distal radius.	Treatment of undisplaced pediatric distal radius: > 'simple' dorsal buckle (stable): removable velcro splint, 2-3 weeks, f/u with ortho. > complete fracture (potentially unstable- have potential to angulate): immobilize well molded in flexion (radial gutter or sugar-tong), f/u w ortho within 1 week.	If tenderness at the distal radius + normal X-rays + open growth plates => Salter I fracture.
		Treatment of displaced/ angulated pediatric distal radius fractures: >closed reduction, must immobilize in a well molded radial gutter splint (or sugar-tong).	At the wrist, fractures remodels well in the dorsal/ volar plane; not in the radial/ulnar plane. Acceptable degree of angulation: if under 5 years, up to 30deg/ between 5-10 years, up to 20deg/ 10-12, up to 15deg.
Adults distal radius fractures	<b>Colles' fracture:</b> FOOSH injury: distal radius extra-articular fracture with dorsal displacement. Exam: distal radius tenderness, "dinner fork" deformity. XR: impacted (shortened), Radially deviated, dorsally displaced and angulated, often a/w ulnar styloid fracture (from distal radio-ulnar ligament avulsion).	<b>Who needs reduction?</b> Dorsal Tilt > 10 deg/ Radial Shortening >5mm/ Radial Inclination <15deg/ Any articular step off. Treatment: Closed reduction (if required), well molded splint (radial gutter or sugar-tong) in slight flexion and ulnar deviation, f/u w ortho within 1 week. <b>What's Unstable fracture?</b> (communited, significantly angulated and/or displaced, intra-articular). > If mildly unstable: extend the splint above the elbow by adding a posterior slap (alternative is double sugar-tong); to eliminates the pronation/supination which may compromise the maintenance of the reduction); requires ortho f/u within few days. > If grossly unstable; may reduce in the ED to reduce pain and swelling; but will need operative management > Call Ortho.	Complication: median nerve injury, early OA Normal values to remember: > on the lateral, the distal radius should tilt 11deg volubly (palmar tilt). > on the AP, the distal radius should extend 11mm beyond the end of the ulna. When reduction is obtained, keep in mind these values as changes can results in wrist weakness and loss of ROM.  Splinting position: Forearm in neutral, wrist in flexion and ulnar deviation.
	<b>Smith's fracture</b> aka "reverse Colles": FOOSH injury (fall on the back on the hand): distal radius fracture with volar displacement "garden spade" deformity.	Whether reduction is required or not, immobilize with well molded radial gutter splint in extension, supination and usually above elbow (add posterior slap); (alternative is double sugar-tong)	Note the distal fragment is angulated volarly and hence the tendency of the fracture is to drift more volarly.
	<b>Barton's Fracture:</b> a specific Intra-articular volar or dorsal rim fractures of the distal radius. (dorsal rim fracture is more common).	Unstable fracture and often requires open reduction (since it is intra-articular and difficult to maintain in a cast)> Call Ortho. If dorsal rim >> immobilize as Colles'. If volar rim >> immobilize as Smith's.	
Radial styloid fracture	From direct force along the radial aspect of the hand	Radial gutter splint in slight flexion & ulnar deviation.	Can produce carpal instability with scapholunate dissociation
Ulnar styloid fracture	Forced radial deviation, dorsiflexion or rotatory stress	Ulnar gutter splint (or Sugar-tong).	
<a href="#">Distal Radioulnar Joint Disruption DRUJ</a>	Twist or FOOSH injury: can occur in isolation or a/ w a distal radius fracture. Exam: pain distal ulna/ to test acutely, stabilise distal radius and depress distal ulna dorsally/volarly - "Piano Key" sign. XR: either volar or dorsal displacement of the ulna, which is normally centered and overlapping the radius.	If injured, stress DRUJ in both pronation and supination, and check where the injury is more stable. Treatment: reduction (if dislocated), immobilize (radial gutter) in position of greater stability (usually supination), extend above elbow (keep wrist neutral); alternative is double sugar-tong; Ortho f/u in ~1 week.	Dorsal dislocations are far more common and are usually more stable in supination.
<b>Forearm Fractures</b>			
Midshaft Radius and/or Ulna fracture	Direct blow: typically midshaft fractured forearm involves both the radius and the ulna.  "Nightstick fracture": isolated midshaft ulnar fracture from direct blow.	Undisplaced: Long arm splint (immobilize both wrist and elbow), close Ortho f/u. Displaced and/or Angulated: may reduce in the ED, Long arm splint (immobilize both wrist and elbow), Call Ortho (since often requires operative management; especially in adults).	Midshaft fractures are at greater risk of non-union.  Pearl: it is uncommon to have an isolated midshaft fracture of either the radius or the ulna - always look for the 2nd injury (eg Monteggia, Galeazzi).
<a href="#">Monteggia fracture-dislocation</a>	Ulnar fracture (usually proximal third) with radial head dislocation. XR: The radiocapitellar line is disrupted, and the apex of the ulna fracture points in the direction of the radial head dislocation.	May attempt reduction in the ED, Long arm splint (immobilize both wrist and elbow), Call Ortho - often requires operative management.	Complication: radial nerve injury, compartment/ Posterior interosseous nerve lies in close prox to radial head > stretched> neuroparaxia and inability to extend thumb or wrist.
<a href="#">Galeazzi fracture-dislocation</a>	Distal radial shaft fracture & distal radioulnar joint disruption XR: AP view widened radioulnar joint space/ Lateral view ulna displaced dorsally	May attempt reduction in the ED, Long arm splint (immobilize both wrist and elbow), Call Ortho - often requires operative management.	Complication: ulnar nerve injury, compartment syndrome.
Essex-Lopresti lesion	FOOSH injury: Radial head fracture with disruption of the interosseous membrane & disruption of the distal radioulnar joint.	Long arm splint, early Ortho f/u within 1 week.	Suspect in FOOSH injury, with radial head fracture and severe wrist pain with negative wrist XR.

<b>Elbow fractures</b>	Distal humerus / Proximal Ulna/ Proximal Radius		
<b>Suspected Occult Fracture</b>	Exam: Elbow tenderness with traumatic effusion. It is common to have an occult elbow fracture with only an effusion seen on Xray.  Important distinction: status of growth plates	<b>Open growth plates</b> - likely supracondylar fracture (Salter I): > Posterior slab and Ortho f/u in 1-2 weeks. <b>Closed growth plates</b> (ie adults) - likely occult radial head fracture: > Best managed with a sling, ROM exercises, & Ortho f/u 1-2 weeks. > May apply posterior slab (ideally removable) if significantly painful.	Unlikely to have an acute elbow fracture if no effusion is seen on Xrays.  Review the elbow xray rules/line in CASTED: Emergency Course Manual.
<a href="#">Radial head fractures</a>	MOI: direct trauma or FOOSH injury causing axial load on the radius. Exam: pain over radial head exacerbated by pronation/supination.	Undisplaced radial neck fracture: sling is best (but may opt for posterior slab if significantly painful) and Ortho f/u within a week. Undisplaced and intra-articular: posterior slab and Ortho f/u within a week. Displaced: may need surgery > Call Ortho from the ED.	Most common adult elbow fracture. Here is a link for <a href="#">Radial head and neck fractures in Pediatrics</a> .
<a href="#">Coronoid Process fracture</a>	Uncommon injury; often a/w occult posterior elbow subluxation.	Undisplaced: posterior slab and Ortho f/u in 1 week. Displaced and large fragment: Call Ortho from the ED.	
<a href="#">Olecranon fracture</a>	MOI: fall on tip elbow./ Often displaced fracture. Exam: check active elbow extension (triceps) with gravity eliminated (ie, with forearm parallel to the ground).	Undisplaced and active triceps function: posterior slab & Ortho f/u in 1 week. Displaced: needs operative management; put a Posterior slab and Call Ortho.	Complication: ulnar nerve injury ( <a href="#">link for fracture in Peds</a> )
<a href="#">Supracondylar fractures</a>	MOI: direct trauma or indirect via a FOOSH injury if hyperextension occurs at the elbow.  Common injury in children.	Undisplaced or minimal AP angulation: posterior slab with Ortho f/u in 1 week. Significant AP angulation or ANY varus/valgus angulation: posterior slab for comfort and Call Ortho.	Complications: brachial artery injury, radial & median nerve injuries, Volkmann's ischemic contracture (flexion contracture of hand & wrist due to untreated forearm compartment syndrome).  In pediatrics, remodelling only occurs in the plane of ROM of the joint closest to the fracture. In supracondylar #, slight AP angulation is acceptable; No varus or valgus deformity is acceptable.
<a href="#">Intercondylar fractures</a>	Many classification systems (eg high & low T, Y, H, & medial and lateral lambda)	Long arm splint	
<a href="#">Epicondylar fractures</a>	Medial – usually in children and adolescents; “little league” elbow – repeated valgus stress Lateral – rare	Long arm splint w forearm in pronation (M)/ supination (L)	Extra-capsular – so no fat pad seen on XR
<a href="#">Condylar fractures</a>	Usually involve articular and non articular surface; lateral condylar fracture is more common; medial condylar fracture seen in children	Long arm splint w forearm in pronation (M)/ supination (L)	
Articular surface fractures	Trochlea fracture <a href="#">Capitellum</a> fracture Proximal ulna fracture	Long arm splint	Nearly all proximal ulna fractures are considered intraarticular with the exception of a proximal olecranon chip fracture
<a href="#">Elbow dislocations</a>	MOI: usually hyperextension: 90% posterior (proximal ulna is posterior to distal radius). XR: may show “ <b>Terrible triad</b> ” – elbow dislocation with radial head & coronoid fractures	Closed reduction, Posterior slab with the elbow in slightly less than 90degree of flexion, add U-splint.	Complications; injuries to brachial artery, ulnar nerve, stiffness and myositis.  Here is a link to <a href="#">Elbow dislocation in peds</a> .
<a href="#">Nursemaid elbow 'Pulled elbow'</a>	Subluxation of the annular ligament around the radial head. MOI: typically one is being pulled on (though ~15% will be a fall). Exam: there is no excessive crying but the child is not using the arm. XR: not required if physical and history suggest diagnosis. However, if there is swelling; do not manipulate, get Xray first.	Closed reduction (place your thumb on the radial head> gently, slowly but firmly, either supinate the wrist OR pronate the wrist and flex the elbow. Thumb will both guide the radial head back in and feel the 'click' when it reduces). Reduction successful: no further treatment or referral required unless multiple previous episodes.	Reduction unsuccessful: ensure no problem elsewhere along the arm, then order Xray to r/o an effusion or occult fracture. >if X-ray negative (and diagnosis remains a pulled elbow), then sling, +/- ice and ibuprofen; re-assess in ED in 24hrs. > if still not reduced/moving normally next day, then refer to Ortho.
<b>Elbow soft tissue injuries</b>			
Biceps rupture	Vast majority proximal	SLING, ice, analgesia & ortho referral	
Triceps rupture	Almost always distally		
<a href="#">Lateral epicondylitis</a>	Aka tennis elbow	Above + counterforce brace; +/- corticosteroids injections	
<a href="#">Medical epicondylitis</a>	Aka golfer's elbow		
<b>How to diagnose traumatic Arthrotomy (open joint)?</b>	Don't probe a wound in a proximity to a joint XR may reveal air in the joint Definitive diagnosis made by performing saline load test: injecting saline (+/- small amount of methylene blue) into the joint to distend the joint (may need large amount to cause distention), then inspect the wound for fluid extrusion, then withdraw the fluid from the joint. This should be done under sterile conditions.		
<b>Elbow Ossification centres: Order of appearance - CRITOE</b>	<ul style="list-style-type: none"> <li>- Capitellum - 1 yr</li> <li>- Radial head - 3 yrs</li> <li>- Internal (Medial) epicondyle - 5 yrs</li> <li>- Trochlea - 7 yrs</li> <li>- Olecranon - 9 yrs</li> <li>- External (Lateral) epicondyle - 11 yrs</li> </ul>		

Shoulder & Humerus Injuries			
Injury	MOI, description	Splint, management	
<a href="#">Sternoclavicular sprains and dislocations</a>	Pain and tenderness localized to the joint, more severe in dislocation. Consider septic arthritis in the non traumatic pt, esp in IVDUs. CT is the imaging of choice. IV contrast if concerned for mediastinal injuries.	Sprains and uncomplicated anterior dislocations > sling immobilization without attempted closed reduction. Posterior dislocation > immediate ortho consult for open reduction.	Sxs of hoarseness, dysphagia, dyspnea, upper ext paresthesias or weakness may indicate life-threatening injuries to mediastinal contents
<a href="#">Clavicle fracture</a>	MOI: fall on shoulder tip. 3-Types: medial 1/3, middle 1/3 (most common) or distal 1/3 (potentially complicated). Exam: ensure skin is intact.	Even if significantly displaced; Sling, restricted activity, Ortho f/u in 1-2 weeks (earlier for distal third fracture).  Call Ortho for open fracture, neurovascular compromise or persistent skin tenting (risk of becoming open; prep the skin, cover with sterile gauze and Tegaderm).	Midshaft #: gets operated on if comminuted (>2pieces), >2cm shortened, >2cm displaced.  Distal third fracture often gets operated on if displaced, so requires early Ortho f/u. Non-displaced distal third fracture may develop impingement secondary to healing callus.
<a href="#">Scapular fracture</a>	MOI: Significant force: usually occurs in association with injuries to lung, ribs and shoulder girdle.  May need CT imaging as part of trauma evaluation.	Vast majority treated non surgically with Sling. Ortho consult for significant or displaced articular fracture of the glenoid	
<a href="#">Acromio-clavicular joint separation</a>	MOI: fall on the shoulder tip with arm adducted. Injury to A-C and often CoracoClavicular ligaments. Classified into 6 grades. Exam: tender over the A-C joint. Obtain AC XR specifically because standard shoulder XR over penetrate the AC joint and small fracture may be missed	Grade I & II > sling and f/u (ortho, sports med, or FMD); ensure relatively early ROM. Grade III > sling and Ortho f/u. May operate if the patient does significant work above shoulder height (overhead lifting, swimming, throwing, tennis). Type IV – VI > operative management; call Ortho.	Grades: I- sprained AC lig; distal clavicle not riding higher. II- AC lig disruption + sprained CC lig; distal clavicle riding slightly higher. III- AC lig + CC lig disruption; distal clavicle riding high, distance btw A&C increased by full width of clavicle IV-VI rare; exist with distal clavicle posterior, superior or inferior respectively.
<b>Shoulder (Glenohumeral joint) dislocation</b>			
<a href="#">Anterior</a>	MOI: abduction/external rotation. Vast majority of shoulder dislocations are anterior: Subcoracoid (>90%), Subglenoid, Subclavicular, Intrathoracic.  Exam: Arm abducted & externally rotated, "squared off" shoulder./ document axillary nerve function.  XR: need adequate trans-scapular view (Y view) or an axillary view.	Reduction: various techniques described: here is a link of <a href="#">10 shoulder reduction techniques</a> . Determining the amount of force involved helps determine the amount of acute ligamentous damage and duration of immobilization. Significant force (ie fall or tackle) + 1st time dislocation >> shoulder immobilizer (or Sling+Swathe) for up to 3 weeks (less for elderly due to risk of frozen shoulder)>> close Ortho f/u. Minimal force (ie putting on shirt) + recurrent dislocations >> sling for comfort and early mobilisation>> Ortho referral.	Associated injuries: axillary nerve palsy, fracture of the greater tuberosity, fracture of the humeral neck, Bankart lesion, axillary artery disruption, Hill-Sacks deformity  Hill-Sacks deformity: Depression fracture of the posterolateral surface of the humeral head that results from compression of the dislocated head by the lower glenoid rim. The presence of these lesions do not change ED management.  Bony Bankart lesion: Fracture of the anterior aspect of the inferior glenoid rim; occurs in 10-20% of traumatic anterior dislocations. It is unstable and if present requires operative management.
<a href="#">Posterior</a>	MOI: Classically from seizure, electrical shock, fall on to anterior shoulder. Exam: Arm adducted & internally rotated XR: "Rifle barrel" & "light bulb" signs, vacant glenoid sign, Posterior rim sign (space btw anterior rim of glenoid & humeral head > 6mm).	Reduction: traction then anteriorly directed pressure on the posterior humeral head with gentle external rotation. If stable post-reduction >> shoulder immobilizer and close Ortho f/u. If unstable >> Call Ortho from the ED.	Associated injuries: fracture of post glenoid rim, fracture of the humeral head (reversed Hill-Sacks deformity), fracture of the lesser tuberosity
<a href="#">Inferior (Laxatio erecta)</a>	Forearm locked over forehead – due to forceful hyperabduction of shoulder	Modified Hippocratic technique	Associated injuries: rotator cuff tear, neurovascular compression injuries, fracture of proximal humerus, severe soft tissue injuries.
<b>Humerus fractures</b>			
<a href="#">Proximal humeral fracture</a>	Common, especially in the elderly.	Relatively undisplaced or "one-part" fracture > shoulder immobilizer or sling & swathe immobilization, and close f/u. Significantly displaced or comminuted > discuss with Ortho since various options (including operative).	There can be multiple fragments, but if none of the fragments are displaced >1cm or are angulated >45 degrees, the proximal humerus fracture is termed "one-part" fracture. Complications: 'frozen shoulder' and avascular necrosis.
<a href="#">Humeral shaft fracture</a>	MOI: often high energy: Fall, MVC, blow to arm. If relatively mild mechanism, look for pathologic fracture.	Relatively undisplaced > sugar-tong splint extended past the shoulder known as coaptation splint & close f/u. Displaced/angulated > coaptation splint & close f/u (some advocate a "hanging cast"). Comminuted or pathologic > discuss with Ortho.	Radial nerve injury is the most common nerve injury seen after humeral shaft fracture. The injury is usually a neuropraxia and resolves spontaneously in most pts.

Pelvic Injuries			
If a pelvic fracture is found, assume associated intraabdominal, retroperitoneal, gynecologic, or urologic injuries exist until proven otherwise			
Injury	MOI, description	Splint, management	
<b>Avulsion &amp; single Bone fracture</b>			
<a href="#">Iliac wing (Duverney) fracture</a>		Analgesia, NWB until hip abductors pain-free	
Single ramus of pubis or ischium fracture		Analgesia, crutches	
Ischium body fracture		Analgesia, bed rest, donut-ring cushion, crutches	
<a href="#">Sacral fracture</a>		Analgesia, bed rest/ surgery may be needed for displaced fracture or neurologic injury	Ortho consult mandatory
Coccyx fracture		Analgesia, bed rest, stool softeners, donut-ring cushion	Surgical excision of fracture fragment if chronic pain
<a href="#">ASIS avulsion fracture</a>	Forceful Sartorius muscle contraction (sprinters)	Analgesia, bed rest for 3-4 wks with hip flexed and abducted, crutches	
<a href="#">AIIS avulsion fracture</a>	Forceful rectus femoris muscle contraction (soccer players)	Analgesia, bed rest for 3-4 wks with hip flexed, crutches	
Ischial tuberosity avulsion fracture	Forceful contraction of hamstrings	Analgesia, bed rest for 3-4 wks in extension, external rotation, crutches	
<a href="#">Pelvic Ring fractures</a>	-Lateral Compression fracture – Type I-III -AP Compression fracture – Type I-III -VS fracture -Mixed patterns	Stabilize the pelvis with a bed sheet or pelvic binding device (over greater trochanters). Treatment occurs after the associated injuries have been addressed. With the exception of later compression type I and APC type I injuries, all other pelvic ring fracture require ORIF	
<a href="#">Acetabular fracture</a>	5 types and nearly all are associated with hip dislocations	Early ortho consult and admit Non displaced fracture may be treated with bed rest and analgesia	Risk of Sciatic nerve injury

Hip and Femur injuries			
Injury	MOI, description	Splint, management	
<b>Hip Fractures</b>	MOI: typically elderly patient after a fall. Occasionally occurs with rotation while standing. Exam: unable to straight leg raise. If displaced, Leg classically, shortened and externally rotated. Classification from ED perspectives: Sub-capital, Intertrochanteric or Sub-trochanteric.	Admit, Call Ortho: management varies from non-operative, ORIF to total hip arthroplasty.  Extra reading - links to specific types: <a href="#">Femoral head fracture</a> <a href="#">Femoral neck fracture</a> <a href="#">Intertrochanteric fracture</a> <a href="#">Subtrochanteric fracture</a>	Xray not 100% sensitive, may miss ~5% of hip fractures. If suspect a fracture clinically and X-rays normal, then: assess for possible pelvic #, Hold/Admit for further imaging (CT or bone scan).  Main risk is AVN.
Greater trochanteric fracture	MOI: Direct trauma; avulsion in young pts due to contraction of gluteus medius.	Analgesia, protected weightbearing	
Lesser trochanteric fracture	MOI: Uncommon; avulsion due to forceful contraction of iliopsoas.	Analgesia, weightbearing as tolerated	
<a href="#">Hip dislocations</a>			
Posterior	More common than anterior. MOI: By posterior force through flexed knee Exam: Shortened, internally rotated and adducted.	Reduction: various techniques reported. 2 sub-types commonly seen in ED: 1- MVC: True orthopedic emergency due to risk of AVN of femoral head > must reduce ASAP. 2- Post-total hip arthroplasty: not a true emergency since femoral head is prosthetic.	Post-reduction; >gentle ROM to ensure stability, discuss with Ortho. >Place on knee immobilizer to prevent excessive hip flexion.  Complications often a/w significant force - subtype-1: sciatic nerve injury, femoral head AVN, acetabular fracture.
Anterior	Exam: leg is abducted, externally rotated and slightly flexed. may appreciate groin mass 'palpable femoral head'.	Same ED sub-types and implications as above. Reduction: longitudinal traction.	same post-reduction care as above.
<a href="#">Femoral shaft fractures</a>	High energy trauma	Traction splint unless the patient has a sciatic nerve injury (splint only) or grossly contaminated open fracture	



Knee injuries			
Injury	MOI, description	Splint, management	
<b>Fractures</b>			
<a href="#">Patellar fracture</a>	MOI: Direct blow or forceful contraction of quadriceps muscle Exam: swollen tender patella. check active knee extension. XR: get "skyline" view of the patella (may help with vertical fractures).	>Non-displaced fracture with intact extensor mechanism: knee immobilizer, no knee flexion, Ortho f/u in ~1week. >Displaced or with disruption of extensor mechanism > knee immobilizer + Call Ortho from the ED (needs operative repair).	
<a href="#">Femoral condyles fracture</a>	MOI: Fall with axial load or a direct blow	Incomplete or non-displaced fracture in any age group or stable impacted fracture in the elderly > long leg splint Displaced fracture or fracture with any degree of joint incongruity > long leg splint, ortho consult for ORIF	Potential for popliteal artery injury and deep peroneal nerve injury (sensation btw 1 <sup>st</sup> & 2 <sup>nd</sup> toes, foot and toe dorsiflexion)
Tibial spines & tuberosity fracture	Force directed against flexed proximal tibia in an anterior or posterior direction	Incomplete or non-displaced fracture > knee immobilizer, ortho referral in 2-7 days Complete or displaced fracture > ortho consult for ORIF	Usually result in Cruciate ligaments injury.
Tibial tubercle fracture	Sudden force to flexed knee with quadriceps contracted	Incomplete or small avulsion > knee immobilizer Complete avulsion > ortho consult for ORIF	
<a href="#">Tibial plateau fracture</a>	MOI: usually high velocity force (valgus or varus combined with axial load) required for fracture in the younger patient - leg hit by car bumper. / can be a relatively low velocity mechanism in the elderly due to osteoporosis. Exam: usually unable to wt bear, swollen, and marked joint line tenderness. XR: often subtle on X-rays and may require confirmation with CT or MRI.	>X-rays normal, suspected fracture: either further imaging in the ED or long leg splint, non-weight bearing, and very close Ortho f/u. > Undisplaced: long leg splint, non-weight bearing, and very close Ortho f/u. > Displaced: Call Ortho from the ED (need operative management).	Associated with ligamentous injury in 1/3 cases; Anterior cruciate and MCL injuries are associated with lateral plateau fracture, whereas posterior cruciate & LCL injuries occur with medial plateau fracture.
<b>Dislocations</b>			
<a href="#">Patella dislocation</a>	Most common in teenagers and young adults and almost always dislocates laterally. Important to differentiate 1st time dislocation from recurrent; 1st time will often have more swelling and more pain on the medial aspect of the patella (since more acute ligamentous injury).	>Reduction: flex (mild) the hip and hyperextend the knee while pushing up and medially along the lateral border of the patella.  > 1st time dislocation: Tensor, knee immobilizer, no flexion allowed, & close Ortho f/u. >Recurrent dislocations: less need to immobilize & can f/u semi-electively with ortho for physio and possible surgery.	5% have an associated osteochondral fracture (from either the lateral femoral condyle or the undersurface of the patella. Those often not seen on initial Xray and commonly present later as a loose body (intermittent locking).
<a href="#">Knee dislocation</a>	>Rare but potentially limb-threatening. Over half are reduced before arrival in ED (either spontaneous or by prehospital personnel). >3 out of 4 acute ligament instability is evidence of a probable knee dislocation. >Types (tibia in relation to the femur): anterior (most common), posterior, medial, lateral, rotational. XR: may be normal if knee has spontaneously reduced.	If not reduced: > immediate reduction with longitudinal traction and reduction (relatively simple reduction since a dislocated knee is so unstable).  Immobilize in long leg splint, knee flexed to 20deg. Immediate referral to Ortho from ED. Any evidence of vascular injury mandates immediate vascular referral (Vascular injury can be present even with a palpable distal pulse >> GET CTA).	Result in significant ligamentous and capsular disruption. Multidirectional instability of the knee should raise suspicion for a spontaneously reduced knee dislocation.
<b>Ligamentous injuries</b>	<a href="#">ACL</a> MOI: sudden deceleration. patient reports Immediate swelling (hemarthrosis). Often feel a 'pop'. Exam: Lachman test is the most sensitive test for ACL injury. XR: usually normal but may see effusion. May see avulsion of the anterior tibial spine (much more common in children).  ACL injury more common than <a href="#">PCL</a> injury.	Tensor, crutches, weight bearing as tolerated, Knee immobilizer prn. Needs strict instructions to do ROM exercises, as tolerated. Early Ortho f/u 1-2 weeks (or sports medicine MD).	Second #: An avulsion fracture of the lateral tibial plateau/condyle at the attachment of the lateral capsular ligament. It is a marker for ACL rupture (75-100% association).  O'Donohue's Terrible Triad = ACL & MCL tears with meniscal injury due to lateral blow to the knee with planted foot.

	<p><a href="#">MCL</a> MOI: valgus strain. Can be associated with other soft tissue injuries (eg ACL, meniscus) that may be clinical occult initially. Exam: tenderness and laxity on valgus stress. Typically Grade I, II, and III classification. XR: normal for most MCL injuries (+/- effusion). MCL injury more common than <a href="#">LCL</a> injury.</p>	<p>Tensor, weight bearing as tolerated, crutches prn, Knee immobilizer prn. Needs strict instructions to do ROM exercises, as tolerated. Early Ortho f/u 1-2 weeks (or sports medicine MD).  If tibial plateau fracture is seen or suspected, then treat with posterior slab, non-weight bearing and close f/u with Ortho.</p>	<p>Clinical Pearl: if after a valgus strain the patient is tender both medially and laterally, consider a lateral tibial plateau fracture as well as a MCL injury.</p>
<a href="#">Meniscal injuries</a>	<p>MOI: twisting. patient often reports delayed swelling by hours. However can be immediate if peripheral rim tear of the meniscus. Commonly complain of pain with squatting/ stairs and swelling after activity. Exam: pain with full flexion, pain with full extension, medial joint line tenderness and often a small effusion ('fluid bulge' sign).</p>	<p>Analgesia. Ortho (or sports medicine MD) f/u in 1-2 weeks. Unless the knee is locked, in which case urgent referral is recommended, as patients needs urgent arthroscopy.</p>	<p>Pt may complain of locked knee (lacking full extension), popping, clicking or sensation of instability with activity secondary to a bucket handle tear of the meniscus. If locked knee is not intermittent, pt needs urgent referral to Ortho.</p>
<a href="#">Quadriceps tendon rupture</a> / <a href="#">Patellar tendon rupture</a>	<p>MOI: usually from sudden quadriceps contraction of the knee flexed. Exam: feel for gap &amp; hyper-mobile patella. Always assess active straight leg raise. XR: Usually normal. With patellar tendon rupture may show a high riding patella (patella alta) or avulsion fracture at the tibial tubercle. With quadriceps tendon rupture may show avulsion fracture off superior pole of the patella.</p>	<p>Call Ortho consult for operative repair.</p>	<p>Patellar tendon rupture more likely if less than 40 years old. Quadriceps tendon rupture more common if over 40.</p>
<a href="#">Osteochondritis dissecans</a>	<p>Rare – segment of articular cartilage and subchondral bone become partially or totally separated from the underlying bone.</p>	<p>Protective weightbearing if the epiphyses are still open. If the epiphyses are closed and the fragments are detached, will require arthroscopy or arthrotomy</p>	
<a href="#">Patellar tendinitis</a>	<p>Aka jumper knee – pain over the patellar tendon worsened by running up hills and standing from seated position</p>	<p>Heat, NSAIDs and quadriceps strengthening exercises</p>	
<p>Clinical Pearls: The acute knee exam in the ED is compromised by:</p> <ul style="list-style-type: none"> <li>- a limited history (with acute injury, unable to assess for symptoms of locking, giving way, pain with squatting, swelling with activity, etc).</li> <li>- a limited physical exam (acute knee pain renders ligament assessment less sensitive).</li> <li>- limited ED investigations (initial X-rays diagnostic &lt;7% of cases).</li> </ul> <p>Ligamentous/soft tissue injuries are often suspected yet unconfirmed in the ED. Therefore, the “kneed” for follow up is “pivotal”.</p> <p>In the elderly, much less common to get ligament strains and more likely to get fractures of the tibial plateau, etc.</p> <p>Knee is very prone to stiffness and quadriceps weakness, so ensure early ROM exercises, whenever appropriate.</p>			

Leg injuries			
Injury	MOI, description	Splint, management	
<a href="#">Tibial shaft fracture</a>	MOI: high energy injury. Often open fracture since limited soft tissue coverage anteriorly.	Undisplaced: Long leg splint (from high above the knee with the knee at 5 degrees of flexion and the foot in slightly plantarflexion. Call Ortho from ED for early appointment. Displaced: Call Ortho as needs operative management. If delay to OR, reduce in the ED to decrease swelling, pain, risks of compartment syndrome and a secondarily open fracture. Long leg splint.	Risk of compartment syndrome.
<a href="#">Proximal Third Tibia Fracture</a>	3 Types: simple, Wedge, Comminuted	Long leg splint (above knee to foot), Call Ortho.	
Toddler's fracture	MOI: twisting injury of planted foot causes rotational force and Oblique/Spiral fracture fo the tibia – children under age of 5 yrs. Exam: inability to bear weight, often minimal or no swelling and subtle tenderness. XR: often normal, may show subtle oblique line through the tibia. GET additional Oblique views.	If negative Xray with a high clinical suspicion: treat for a fracture: Long leg splint (above knee to foot) and close Ortho f/u within a week.	Not related to child abuse.
<a href="#">Pilon fracture</a> aka Tibial Plafond	MOI: When axial force on the foot drives the talus into the articular surface of the tibia, grinding or crushing the distal tibia.	Unstable: immobilize with posterior slab + U-splint>> CALL Ortho.	May be accompanied by compartment syndrome or by vertebral body fracture, particularly a fracture of the L1
Midshaft fibula fracture		Below knee posterior slab, crutches, & Ortho f/u.	
<a href="#">Stress fracture</a>	Runners typically sustain fracture at the junction of the middle third and distal third of the tibia	Discontinuation of activity, weight bearing as tolerated, Ortho f/u 1-2 weeks.	
<a href="#">Achilles Tendon Rupture</a>	MOI: Typically middle age participates in strenuous activities on an occasional basis. Sudden pain or 'snap' felt at the back of the heel. Almost always complete tendon rupture. Exam: feel a palpable gap in the tendon (rupture may occur higher up at the musculo-tendinous junction). Positive Thompson test.	Usually operative therefore Call Ortho from the ED. If treat non-operatively, then put posterior slab in equines (foot plantar flexed), non-weight bearing, and close Ortho f/u.	Thompson test – positive; calf squeeze fails to cause planter flexion of the foot. US useful tool in diagnosis
Medial gastrocnemius muscle strain	MOI: Forceful plantar flexion of the foot while the knee is extended. Immediate sharp pain, audible pop may be heard	Immobilization with the foot maximally plantar-flexed.	
<a href="#">Shin splints</a> = Tibial stress syndrome	Pain over anterior leg; typically sudden increase in training activity; exercise induced pain over the medial aspect of the tibia	Cessation of activity that precipitated the pain	If severe pain, bone scan may be needed to exclude the possibility of stress fracture

Ankle Injuries			
Injury	MOI, description	Splint, management	
<b>Dislocations</b>	Posterior dislocations are most common.	'Obtain & Maintain' Reduce ankle dislocations --immediately (without XR) if vascular compromise (absent pulses, dusky foot) or skin tenting is present. Immobilize with well molded posterior slab+U-splint, Call Ortho from the ED.	Usually results in in rupture of the tibiofibular ligaments or a lateral malleolus fracture.
<b>Ankle injuries: <a href="#">Sprains &amp; Fractures</a></b>	Terms: High ankle sprain refers to Syndesmosis injury. Low ankle sprain refers to ligamentous injuries to the ATFL, CFL and PTFL (lateral ligaments). Pearl: Displaced ankle injuries must be reduced ASAP since they swell, are painful, can become secondarily open fractures, and can develop compartment syndrome. Easier to perform the reduction while the knee is flexed.		
<b>Isolated Lateral Ankle injuries</b>	Most common. MOI: usually from inversion injury with foot in planter flexion. Sprains usually have isolated pain at the anterior aspect of the lateral malleolus at the origin of ATF. Significant fractures at the malleolus are painful both anteriorly and posteriorly. Avulsion fractures represent significant ligamentous injuries.	Isolated lateral ankle sprain (including distal fibular avulsion fractures): Air-stirrup brace very helpful, Significant sprains may need physiotherapy, f/u with family doctor.  Isolated lateral malleolus fracture: younger patients usually tolerate an air-stirrup brace, whereas older patients often require an air foam walker. f/u with Ortho within a week.	lateral ligament complex composed of 3 ligaments: ATF, CF, & PTF.  In children, lateral malleolus pain localized to the growth plate with swelling but no fracture seen on X-ray, often represents a Salter I fracture of the lateral malleolus.  Fibular avulsion fractures: treated as ankle sprains when minimally displaced (<3mm) and no signs of medial ligamentous injury
<b>Bimalleolar ankle injuries</b>	These are more concerning. Must ensure mortise is anatomic on Xrays.	Bimalleolar swelling, no fracture seen: significant ankle sprain (and in some cases, represents an ankle subluxation that spontaneously reduced). >Long leg air foam walker (or posterior slab with U-splint), relatively restricted weight bearing and close Ortho f/u.  Lateral malleolus fracture with medial swelling (but no fracture seen: represents potentially surgical ankle. >If the mortise is undisplaced, then posterior slab + U-splint (medial molding), non-weight bearing and close Ortho f/u. > If any mortise displacement, then by definition the deltoid ligament must be disrupted; immobilize as above, Call Ortho for probable operative management.	Bimalleolar fractures: unstable and require operative management. > manage as Trimalleolar fracture below.
<b>Trimalleolar ankle fracture</b>	Fracture of medial and lateral malleolus as well as the distal posterior part of the tibia (aka the posterior malleolus).	If undisplaced or minimally displaced: posterior slab+U-splint, non-weight bearing, Call Ortho from ED.  If anything more than minimally displaced: reduce, Posterior slab+U-splint, non-weight bearing, Call Ortho from ED.	Apply slabs immediately after reduction (before Xrays) since injury is so unstable and may spontaneously shift again.  Clinical Pearl: when reducing an ankle fracture, flex the knee to help relax the gastrocnemius muscle.
<b>Isolated Medial Malleolar injuries</b>  <b>Maisonneuve fracture:</b> Medial malleolus injury (fracture or rupture of the deltoid ligament) with associated fracture of the proximal 1/3 of the fibula.  <b>Dupuytren's fracture:</b> same mechanism except the fibular fracture exists below the proximal 1/3 and above the syndesmosis.	Uncommon but often represents a significant injury that is commonly missed. MOI: External rotation/eversion mechanism (eg, slip with leg caught behind and sit on ankle causing external rotation) resulting in medial injury (either fracture of the medial malleolus or disruption of the deltoid ligament) with disruption of the syndesmosis. Exam: must examine the entire fibula. The fibular fracture is often quite subtle. XR: get full length "tib-fib" views for any patient with isolated medial malleolar pain (fracture or deltoid injury) after an external rotation injury.	Even if undisplaced, the injury is unstable since it represents an ankle diastasis. Most often treated operatively with a 'syndesmosis' (or 'diastasis') screw across the distal tibio-tibia-fibular ligaments, therefore CALL Ortho from the ED to discuss.	Note: isolated posterior malleolus fracture can also be a part of the same injury.

<p><b>Isolated anterior joint line pain</b></p> <p>Can indicate significant injury to the syndesmosis ligaments, pediatric distal tibial fractures, and even occult fractures of the tibial plafond and talar dome.</p>	<p>Uncommon, but commonly missed injuries. Often a forgotten part of the ankle exam.</p> <p><b>Tillaux fracture:</b> injury specific to certain pediatric age groups (girls 11-13, boys 12-15). Distal tibial growth closes from medial to lateral in the above age groups. An external rotation injury results in a Salter III fracture of the distal tibia.</p> <p>Lack of coronal plane fracture in the posterior distal tibial metaphysis distinguishes Tillaux from a <b>Triplane fracture</b> (the planes: at the growth plate, sagittal and coronal planes).</p>	<p>Tillaux fracture: intra-articular fracture and requires precise anatomic reduction; Call Ortho from ED to discuss.</p> <p>Syndesmosis injury: recommend posterior slab+U-splint, crutches, non-weight bearing with early Ortho referral.</p> <p>If X-rays normal, and significant anterior pain and swelling, may have occult fracture of either the tibial plafond or the talar dome &gt;&gt; may require posterior slab+U-splint, non-weight bearing with early Ortho referral.</p>	<p>Note: external rotation injury can injure the syndesmosis in isolation (with isolated anterior joint line pain) or can extend to involve the medial ankle and proximal fibula as described above.</p> <p><a href="#">Pilon fracture</a> aka Tibial Plafond: MOI: When axial force on the foot drives the talus into the articular surface of the tibia, grinding or crushing the distal tibia.</p>
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### Foot injuries

The foot is divided into the hindfoot, midfoot, and forefoot. The Chopart joint separates the hindfoot and midfoot, and the Lisfranc joint separates the midfoot and forefoot.

Hindfoot			
<a href="#">Calcaneus fracture</a>	MOI: High impact injury; commonly fall from height landing on the heel(s)- "lover's fracture. Exam: specifically "cup" the heel for tenderness. Look for associated injuries. XR: request specific calcaneal views (Harris view) , measure Bohler angle( <20% highly suggestive of a fracture). CT can be helpful for diagnosis and demonstrate the extent of the injury.	If undisplaced: posterior slab+U-splint, non-weight bearing, and Ortho f/u in a week.  If significantly displaced or intra-articular: posterior slab+U-splint and Call Ortho from the ED.	Look for associated injuries at the opposite calcaneus (~8%), ipsilateral knee/hip (~10%), and T/L spine (~10%).
Talar fractures	<a href="#">Talar neck fracture</a> , <a href="#">body fracture</a> , <a href="#">subtalar dislocation</a>	Posterior slab + U-splint, NWB, Immediate ortho consult.	High rate of AVN.
Midfoot			
<a href="#">Lisfranc's injury</a>	MOI: high velocity injuries from MVC or foot planted in a hole and rotated. Injuries range from sprain to Fracture-dislocation. Exam: tenderness, bruising and swelling over the dorsal aspect of the medial midfoot. May also have planter ecchymosis. XR: stress views can be diagnostic (but extremely painful). >medial edges of the base of the 1st and 2nd metatarsal should line up with the medial edge of their respective cuneiforms. >be suspicious if there is widening (>2mm) between the 1st/2nd or 2nd/3rd metatarsal bases. >be suspicious if there are any fractures in the vicinity of Lisfranc's joint (even small avulsions).	If undisplaced (or suspected injury): posterior slab, non-weight bearing, close Ortho f/u.  If displaced: may attempt reduction in the ED. Successful or not, all require ED Ortho referral; Call from the ED.	Pearl: medial mid foot pain after a twisting injury requires very careful assessment of Lisfranc's joint.  Complications; dorsalis pedis artery injury, arthritis & chronic pain
<a href="#">Navicular</a> , cuboid, cuneiform	Isolated injuries are rare	Undisplaced: Posterior slab. Displaced fracture: ortho consult	
Forefoot			
<a href="#">Metatarsal shaft fracture</a>	5th metatarsal common location for spiral fracture after 'rolling' the foot.	If relatively undisplaced: either a low profile foam walker or a posterior slab, and close Ortho f/u.  If >3-4mm displacement require surgical reduction; Call Ortho from the ED.	
Metatarsal stress fractures	MOI: usually precipitated by a recent increase in activity ('March' fracture). Distal shaft and neck are common sites for stress fractures. XR: may show subtle transverse fracture, mild periosteal reaction, or may be normal.	X-rays normal, moderate clinical suspicion: weight bear as tolerated, if remain symptomatic, f/u with FMD in 10-14 days for repeat X-rays (+/- bone scan).  Confirmed stress fracture: weight bear as tolerated, foam walker prn, & Ortho f/u in 1-2 weeks.	
<a href="#">5th Metatarsal base fracture</a>	<b>Pseudo-Jones fracture:</b> Avulsion fracture of the tuberosity of the 5 <sup>th</sup> metatarsal (aka Dancer's fracture).  Often misdiagnosed as a Jones Fracture.	Even if displaced, almost all heal well: >low profile air foam walker prn OR surgical shoe. >weight bear as tolerated. >Ortho f/u in 1-2 weeks.	Very common injury secondary to ankle inversion. Anatomically, avulsion from either insertion of peroneus braves tendon or lateral planter aponeurosis.
	<b>Jones Fracture:</b> Proximal 5th metatarsal fracture; metaphyseal-diaphyseal junction fracture of the 5 <sup>th</sup> metatarsal (ie, occurs closer to the junction of the proximal and middle thirds of the 5th metatarsal). XR: transverse fracture of the 5th metatarsal and may see periosteal reaction (indicative of the chronic stress fracture component of the injury).	Posterior slab + U-splint, non-weight bearing, and close f/u with Ortho. For high-level athletes, there is a higher risk of non-union and more likely operative management.	Far less common but potentially more complicated. High risk of non-union.  A 'true' Jones fracture represents an 'acute-on-chronic' stress fracture and is often seen in athletes who do repetitive starts/stops of the side of the foot (ie, tennis and basketball players).
Phalangeal fracture	Non displaced fracture	buddy taping and a stiff-sole shoe	
	Displaced fracture and dislocations	Digital block, reduction by manual traction, then buddy taping.	