

FRACTURE MANAGEMENT

PRACTICE GUIDELINE[®]

DOCUMENT SUMMARY/KEY POINTS

- Definition of fractures
- Assessment of fractures:
 - Symptoms of fractures
 - Examine limb carefully for possible neurovascular injury & compartment syndrome
 - Splint fracture early (immobilise)
 - Provide adequate analgesia
 - X-ray all suspected fractures
 - Consider whether fracture is a result from a non accidental injury.
- Specific management and treatment of common fractures with potential complications.
- Pathological Fractures

CHANGE SUMMARY

- New SCHN document based on the CHW guideline of the same title. The CHW guideline has been rescinded.
- No major changes from the CHW guideline.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date effective:	1 st July 2019	Review Period: 3 years
Team Leader:	Nurse Unit Manager	Area/Dept: Orthopaedics

READ ACKNOWLEDGEMENT

- Relevant clinical staff caring for patients with a (suspected) fracture should read and acknowledge they understand the contents of this document.

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Fractures

What causes a fracture?

Fractures occur when there is more force applied to the bone than the bone can absorb^{1, 2}. Breaks in bones can occur from falls, trauma, as a result of a direct blow or due to a weakness in the bone itself.

A child's bone differs from adult bone in a variety of ways:

- A child's bone heals much faster than an adult's bone. The younger the child, the faster the healing occurs.¹
- Bones are softer in children and tend to buckle or bend rather than completely break.¹
- Children have open growth plates located at the end of the long bones. This is an area where the bone grows. Injury to the [growth plate](#) can lead to limb length discrepancies or angular deformities.¹

Assessment of fractures

Initial Assessment

1. The following are the most common symptoms of a fracture; however each child may experience symptoms differently. Symptoms may include^{2,3}:
 - Pain in the injured area
 - Swelling in the injured area
 - Bony tenderness
 - Obvious deformity in the injured area
 - Difficulty using or moving the injured area in a normal manner
 - Warmth, bruising or redness in the injured area
2. Examine the affected limb carefully for neurovascular injury. Always be aware of the signs of compartment syndrome. Notify the consultant if compartment syndrome is suspected (see [Signs and symptoms of compartment syndrome](#) in the Appendix). Once the diagnosis is suspected measurement of compartment pressures or fasciotomy should be performed.

Note: Excessive pain is the earliest and most important sign of compartment syndrome².

3. Splint the fracture early - a plaster slab is often useful as a temporary measure^{2,3}.
4. Provide adequate analgesia^{2,3}.
5. X-ray all suspected fractures, including the joints above and below^{1,2}.
6. Consider whether this could be a [non-accidental injury](#) (NAI) (See appendix)^{1,2}.
7. Consider any differential diagnoses i.e. septic arthritis, osteomyelitis, malignancy.

Neurovascular Considerations

- Neurovascular assessment includes the assessment of the peripheral circulation and the peripheral neurologic integrity. Neurovascular impairment is usually caused by pressure on the nerve or altered vascular supply to the extremity⁴⁻⁷.
- Hourly neurovascular observations should commence on admission to the hospital.
- They should continue until the stability of the extremity is attained and maintained⁴⁻⁷.
- Refer to SCHN **Neurovascular Assessment Practice Guideline**: [SCHN ePolicy - Neurovascular Assessment](#)

Analgesia

- The type of analgesia used will depend on the injury suspected, the degree of pain experienced and the medical condition of the child⁸.
- Be aware that analgesia can mask the signs of compartment syndrome. Analgesic requirements should be in proportion to the injury that the child has sustained⁸

A Guide for the Use of Analgesia: First 24 hours Post Injury

Fractures involving	Drug					
Femur	Morphine/fentanyl given in ED on admission	Femoral nerve block, given in ED prior to transfer to ward	Oxycodone	Paracetamol	Ibuprofen	Diazepam
Upper Limbs	Morphine/fentanyl given in ED on admission		Oxycodone	Paracetamol	Ibuprofen	
Below Knee	Morphine/fentanyl given in ED on admission		Oxycodone	Paracetamol	Ibuprofen	

Note: Oral analgesia needs to be prescribed on the MAR in the Emergency Department **before transfer** to the ward.

Immobilisation

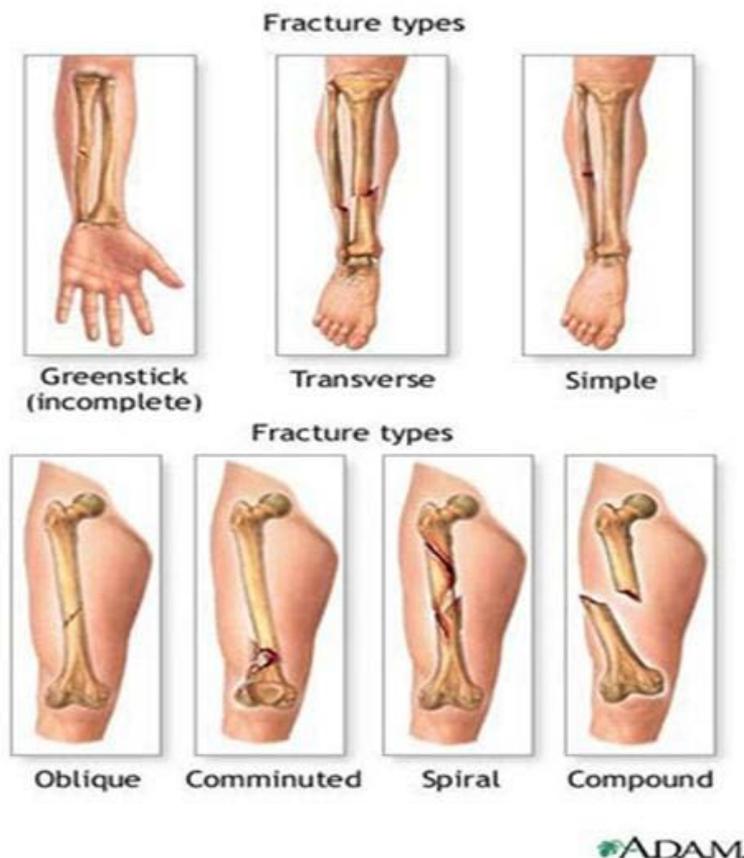
- Suspected fractures should be immobilised prior to going to radiology. Use a sling/collar and cuff/or plaster backslab. Plasters should be thin and padded. Immobilise the joints above and below the fracture. Plaster should be applied as per hospital guideline.
- Elevate the affected part eg. Arm sling, pillow support for legs, in a position of comfort.

Radiology

- Order relevant films including the joint above and below the suspected fracture site. On return ensure the films are of adequate quality e.g. properly penetrated true AP and lateral films of the appropriate area.
- X-rays of uninjured limb for comparison should only be considered after discussion with radiologist or orthopaedic surgeon.
- Describe fractures according to the site, and the degree of angulation or displacement.

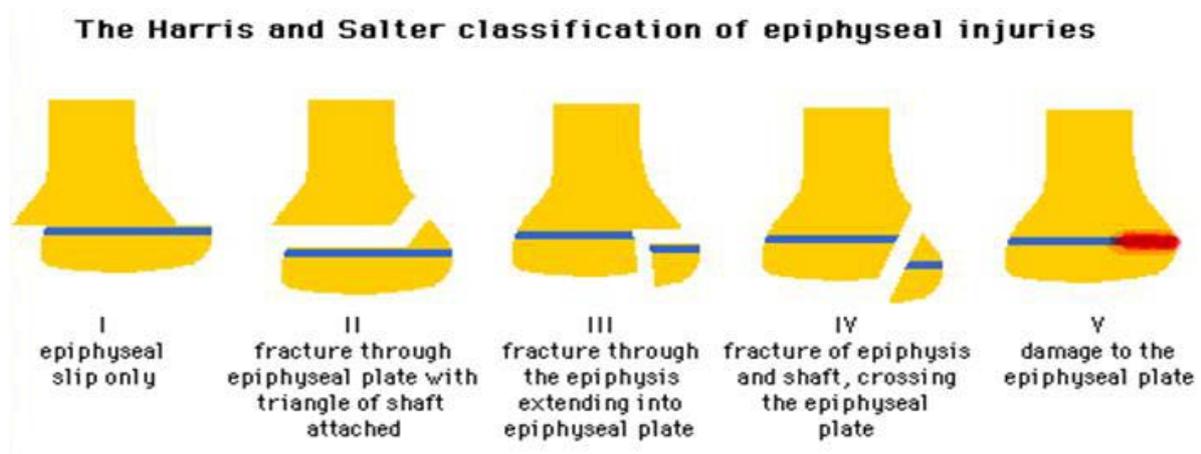
Types of Fractures

<https://nursingcrib.com/nursing-notes-reviewer/fractures/>



Use the Salter Harris Classification for fractures involving the growth Plate

<https://www.gpnotebook.co.uk/harrissalter.gif>



Reduction

- **Registrar/Fellow to decide whether the fracture requires reduction.** Urgent reduction may be required where there is skin or vascular compromise. If in any doubt seek an opinion from the Orthopaedic Registrar/Consultant. Reductions of selected fractures are performed in the Emergency Department under appropriate sedation by accredited personnel, or in the operating theatre if required.
- **Imaging post reduction** may be done in the immediate post-op period as per the Consultant's orders or at the first out-patient's appointment to ensure that the position of the fracture is acceptable in the plaster cast.
- **Open reduction of fractures** - all children should receive intravenous antibiotics intra-operatively. Post-operative intravenous antibiotics depend on the type of internal fixation used. The Consultant should be referred to for advice.

Post-operative Period

- **Elevate affected limb.** The limb should be maintained at heart level to reduce swelling and enhance the neurovascular status⁴⁻⁷
- **Neurovascular observations.** They should continue until the stability of the extremity is attained and maintained
- **Record vital signs** as per SCHN [SCHN ePolicy: Hip Spica Cast: Inpatient Care](#) – immediate post-operative period – observations section.
- Monitor input and output on fluid balance chart.
- Commence clear fluids as desired. If tolerating, can grade up to normal diet.

Discharge

- Every child who is discharged with a fracture must have appropriate discharge and follow-up arrangements in place. Parents should also be given a [Plaster cast or backslab care Factsheet](#), and information about appropriate analgesia for their child.^{10,11}

- All post reduction children should be followed up in one week with an x-ray in the Orthopaedic Outpatient Fracture Clinic. ^{10,11}

General Practitioner Follow Up

- Buckle fractures or fractures (such as a fractured middle third of clavicle) which are unlikely to require further treatment may be referred to the patient's GP for follow up.
- Buckle fractures should be placed in a plaster cast backslab. The plaster cast backslab should be removed at 3 weeks, and the patient should begin to use their arm. At 6 weeks they should present to their GP for assessment. Children should not participate in contact sports until GP clearance is obtained.
- Clavicle middle third (Undisplaced) - should be treated in a broad arm sling. The sling should be used for 3 weeks, after that time the child may remove their sling and begin to mobilise their arm. No contact sports for 6 weeks. Follow up GP 6 weeks.

Specific Management of Common Fractures

Upper Limb

Clavicle

1. **Middle third** - Sling for 3 weeks.
 - Inform parents of the lump that will develop at the fracture site and may be visible for up to 1 year or longer.
 - No contact sports for 6 weeks.
 - No review or re-x-ray necessary / follow up GP.
 - Supply written information.
2. **Medial/lateral third** - seek advice from the Consultant
3. **Adolescent patient** - seek advice from the Consultant. ^{12, 13}

Humerus

1. **Surgical neck**
 - *Undisplaced* – Collar and Cuff for total of 3 weeks.
 - i. Follow up in consultant clinic in 5-10 days with x-ray.
 - ii. If x-ray satisfactory follow up in 2 weeks for removal of collar and cuff and begin mobilisation of limb. At this time range of motion (**ROM**) and neurovascular assessment must be attended and documented.
 - iii. Follow up at 4 – 6 weeks for final ROM check.
 - *Displaced*. Frequently treated with collar and cuff alone. Seek Consultant advice^{12, 13}
2. **Shaft**

- Check the neurovascular status of the limb. Specifically check the integrity of the radial nerve
- *Undisplaced* - collar and cuff. A "U" shaped plaster cast slab may be applied to the humerus to reduce movement and minimise knocks.
 - i. Follow up 4 weeks for removal of collar and cuff and begin Range of Motion (ROM). At this time ROM and neurovascular assessment must be attended and documented
 - ii. Follow up at 6 weeks for final ROM check
- *Displaced / comminuted* - seek Consultant advice ^{12, 13}

3. Supracondylar / lateral epicondyle/medial epicondyle

- Specifically check the integrity of the radial artery, radial nerve, median nerve and ulnar nerve. (as described in [Neurological Injury](#) section in the Appendix)
If vascular compromise is present, extend the elbow to around 30 degrees until perfusion returns. Avoid excessive flexion.
- *Undisplaced* – Place in a collar and cuff, with elbow flexion beyond 90 degrees. (Ensure radial nerve and artery is still patent).
 - i. The patient should then be referred to a consultant's clinic for review within 5 – 10 days. If neurovascular status remains intact and limb is in an appropriate position they may then be followed up by their GP.
 - ii. They should see their GP at 3 weeks for removal of the collar and cuff. Complete Range of Motion should return between 6 – 12 weeks.
- *Angulated, displaced or comminuted* - seek Consultant advice ^{12, 13}

Radius and Ulna

1. Shaft

- *Undisplaced* - above elbow plaster cast back slab in neutral, consultant's clinic with x-ray in 5-10 days.
 - i. If x-ray satisfactory, apply full Plaster Cast for a further 3 – 4 weeks. If unsatisfactory refer to the consultant.
 - ii. Removal of cast between 3 – 4 weeks. Begin Range of Motion (ROM) exercises. At this time ROM and neurovascular assessment must be attended and documented.
 - iii. Follow up 6 weeks to assess ROM. ^{12, 13}
- *Displaced* - seek Consultant advice.

2. Distal end

- *Undisplaced and non-deformed clinically* - above elbow plaster cast back slab in neutral, fracture clinic with x-ray in 5-10 days.
 - i. If x-ray satisfactory application of a full cast and follow up in 3 to 4 weeks.

- ii. Removal of plaster cast between 3 -4 weeks and begin Range of Motion (ROM) exercises. At this time ROM and neurovascular assessment must be attended and documented.
- iii. Follow up at 6 weeks to assess ROM.
- o *Displaced and clinically deformed* – Refer to consultant^{12, 13}

Metacarpals

- Check carefully for rotation at fracture site
 - o *Undisplaced* - Volar slab, consultant clinic with X-ray within 7 days
 - i. X-ray on arrival.
 - o *Displaced* - Seek Consultant advice. ^{12, 13}

Scaphoid Fracture

- o X-ray the wrist to confirm diagnosis (Scaphoid views should be performed.)
- o The injury may not always show up on x-ray. If the x-ray is normal, but clinically a scaphoid fracture is suspected, place in a scaphoid plaster and see the child between 10 – 14 days for a repeat x-ray. A fracture if present should be visible at this time.
- o If a scaphoid fracture is detected on x-ray, immobilise the hand in a thumb spica.
- o Follow up in 6 weeks for removal of cast, x-ray and clinical assessment. If fracture has not healed return to scaphoid cast for a further 4 weeks and inform consultant. Review at 4 weeks. If fracture has still not healed refer to consultant.
- o Scaphoid fractures can have a risk of not healing due to poor blood supply. ^{12,13}

Phalanges (HAND)

- Check carefully for rotation at fracture site, or mallet finger deformity.
- Intra articular fractures require anatomical reduction.
 - o *Undisplaced* – Buddy strap to adjacent finger; follow up in consultant clinic with X-ray within 7 days.
 - i. X-ray on arrival. If position acceptable, continue buddy strapping for a further 3 weeks.
 - ii. Follow up at 6 weeks.
 - o *Displaced or into a joint*- seek Consultant advice - some may be reduced. ^{12,13}

Lower Limb

Femur

- See [SCHN ePolicy Femoral Fractures: Assessment and Management in ED - CHW Practice Guideline](#)

- Ensure adequate analgesia with opioid and a femoral nerve block is administered in ED¹⁵
- Notify orthopaedic consultant
- Apply traction as ordered (Accredited RN or Orthopaedic Fellow/Registrar)
- See [SCHN ePolicy Orthopaedic Traction: Care and Management Practice Guideline](#)
- See SCHN Orthopaedic Traction: Care and Management Practice Guideline¹⁴
- For fractures of the mid shaft of the femur:
 - Gallows Traction if child is under 14 kg, and non-walking
 - Thomas splint if child is walking and over 14kg
- For fractures at either the proximal or distal end of the femur seek Consultant advice.
- Admit under Orthopaedics ^{12, 13}

Tibia

- *Undisplaced* - above knee plaster back slab, consultant clinic with x-ray in 5-10 days.
- If concerned about swelling/ compartment syndrome admit for observation
 - i. If x-ray satisfactory application full long leg Plaster cast for 3 weeks.
 - ii. At 3 week mark re-x-ray and if the x-ray shows adequate fracture healing change to a short leg full weight bearing cast for a further 3 weeks.
 - iii. Follow up then for removal of cast. At this time Range of Motion (ROM) and neurovascular assessment must be attended and documented.
 - iv. The child may increase their weight bearing as tolerated, Follow up in 6 weeks for ROM check.^{12, 13}
- *Displaced* - will need manipulation. Admit under Orthopaedics ^{12, 13}
- **Toddler fracture** - is a clinical diagnosis in a young child where a fractured tibia is suspected on clinical grounds but an abnormality is not detected on the X-ray.
 - i. Exclude septic arthritis / osteomyelitis.
 - ii. Apply an above knee plaster for pain relief, allow weight bearing as child desires.
 - iii. Consultant clinic in 5-10 days with x-ray.^{12,13}

Ankle

- *Undisplaced* - below knee plaster back slab, Non weight bearing. Consultant clinic with x-ray in 5-10 days.
 - i. If x-ray satisfactory application of a full plaster cast. At this time Range of Motion (ROM) and neurovascular assessment must be attended and documented.
 - ii. Follow up in a further 5 weeks for removal of plaster cast and begin mobilisation. May increase weight bear as tolerated.

- iii. Follow up in a further 6 weeks for ROM check.
- o *Displaced* - will need manipulation. Admit under Orthopaedics^{12, 13}
 - i. Check with consultant, a CT scan may be required to clarify joint involvement
 - ii. If a large amount of swelling is present manipulation and or open reduction may be delayed until swelling decreases^{12,13}

Metatarsals

- o *Undisplaced* - lower leg plaster back slab, consultant clinic with x-ray in 5-10 days. To remain non weight bearing. If x-ray satisfactory , apply full Plaster cast for a further 4-6 weeks^{12, 13}
- o *Displaced* – seek Consultant advice.

Phalanges (FOOT)

- o *Undisplaced* – Buddy strap, consultant clinic with x-ray within 7 days. If x-ray satisfactory continue buddy strapping for a further 3 weeks. Follow up at GP at 6 weeks.^{12, 13}
- o *Displaced* - seek Consultant advice.

NOTE

If Range of Motion (ROM) is found to be limited at 6 week follow-up, formal physiotherapy should be commenced. An x-ray to assess bone healing should also be attained at this stage.

An exception to this is supracondylar fractures that may take up to 12 weeks to get full extension. However at 6 week check-up an improvement in ROM should be noted.

Salter Harris fractures will need regular follow-up to assess for growth disturbance. This will often include x-rays as well as clinical assessment.

Pathological Fractures

Definition:

A pathologic fracture occurs when a bone breaks in an area that is weakened by another disease process. Causes of weakened bone include tumours, infection, and certain inherited bone disorders.^{12, 13}

Why do pathologic fractures occur?

A pathologic fracture usually occurs with normal activities-patients may be doing very routine activities when their bone suddenly fractures. The reason is that the underlying disease process weakens the bone to the point where the bone is unable to perform its normal function.^{12, 13}

What is the treatment of a pathologic fracture?

Both the fracture and the underlying process must be considered in order for treatment to be safe and effective. Some pathologic fractures require the same treatment as a normal fracture, while others may require highly specialised care, refer to Orthopaedic Consultant.

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APPENDIX

1.1 Neurological injury

- Accurately assess and document the extent of the deficit. This is often difficult in younger and uncooperative children ⁴⁻⁷.
- Not all neurological deficits associated with fractures or dislocations require active intervention but all should be referred for specialist advice.

1.2 Non Accidental Injury (NAI)

- Fractures are the second most common presentation of physical abuse after skin lesions.
- 30 to 50% of cases have skeletal injury.
- Most frequent fractures involve ribs, humerus, femur, and tibia in decreasing order.
- 79% of femoral fractures under the age of 2yrs are due to NAI¹.

Highly Specific for NAI	Moderately Specific for NAI
Metaphyseal lesions Posterior rib fractures Scapular fractures Spinous process fractures Sternal fractures Multiple fractures	Fractures of different ages Epiphyseal separations Vertebral body fractures & subluxations Digital fractures Complex skull fractures

History

- Degree of physical injury may be inconsistent with the history given.
- Discrepancy between reported time of injury and its' apparent age.
- Delay in seeking medical advice.

Examination

- Must be complete & systematic.
- Look for behavioural signs such as withdrawal or fear of adults.
- Look for bruises, burns, lacerations over any part of the body.
- Palpable callus without tenderness may be noted in healing fractures.

Refer to CHW **Child Protection Policies**: <http://webapps.schn.health.nsw.gov.au/epolicy/policy/3999>

1.3 Signs and Symptoms of Compartment Syndrome

PAIN – on passive flexion and extension of the extremity
PARAESTHESIA – loss of sensation
PARALYSIS – loss of motion of involved extremity
PALLOR – excessive oedema or firmness of tissue
PULSELESSNESS – no pulse ^{4,5,6}

- Pain, either out of proportion to the injury, requiring frequent strong analgesia, or exaggerated pain with passive stretch of the distal joints is the earliest indicator of compartment syndrome, other important findings are swelling and tenseness of the compartment.⁴⁻⁷
- Pallor, paralysis, paraesthesia and pulselessness are late findings and the diagnosis should not be excluded if these are absent.⁴⁻⁷