

Local Guideline



Document Number: JHH_JHCH_0124

Initial clinical management of isolated, closed, paediatric femoral fractures

Sites where guideline applies: John Hunter Hospital & John Hunter Children's Hospital
 Target audience: JHH Emergency Department and JHCH wards
 Description: Initial management of isolated, closed paediatric femoral fractures in JHH /JHCH.

This local guideline applies to:

- | | |
|---------------------------------|-----|
| 1. Adults | No |
| 2. Children up to 16 years | No |
| 3. Neonates – less than 29 days | Yes |

Approval gained from the Children Young People and Families Network December 2017

Keywords: JHH, JHCH, JHH ED, children, orthopaedic

[Hyperlink to Guideline](#)

Replaces Existing Guideline Yes
 Registration Number(s) and/or name and of Superseded Documents: JHCH 10.6 July 2012.

Relevant or related Documents, Australian Standards, Guidelines etc:

- NSW Health Policy Directive PD2017_032 [Clinical Procedure Safety](#)
- NSW Health Policy Directive PD2005_406 [Consent to Medical Treatment](#)
- NSW Health Policy Directive PD 2017_013 [Infection Prevention and Control Policy](#)
- NSW Health Policy Directive PD2012_069 [Health Care Records – Documentation and Management](#)
- NSW Health Policy Directive PD2013_007 [Child Wellbeing and Child Protection Policies and Procedures for NSW Health](#)
- NSW Health Policy Directive PD2011_015 [Care Coordination: Planning from Admission to Transfer of Care in NSW Public Hospitals](#)
- HNELHD Policy Pol 15_06 [Patient Identification](#)
- NSW Health Policy Directive PD2009_060 [Clinical Handover – standard key principles](#)
- NSW Health Policy Directive PD2014_007 [Pressure Injury Prevention and Management](#)
- HNE LHD Policy Compliance Procedure PD2014_007:PCP1 [Pressure Injuries: Prediction, Prevention and Management](#)
- NSW Health Policy Directive 2013_049 [Recognition and management of Patients who are Clinically Deteriorating](#)
- HNE LHD Policy Compliance Procedure [Recognition and Management of Patients who are Clinically Deteriorating](#) PD2013_049:PCP 1
- JHCH 3.19 [Recognition of the deteriorating paediatric patient in JHCH/JHH](#)
- HNE LHD PD2013_049 PCP2 [Vital Sign Observations 16 years and over](#)

Note: Over time some links in this document may cease working. Where this occurs please source the document in the PPG Directory at: <http://ppg.hne.health.nsw.gov.au/>

Prerequisites: Nil

Local guideline note : This document reflects what is currently regarded as safe and appropriate practice. The guideline section does not replace the need for the application of clinical judgment in respect to each

individual patient but the procedure/s require mandatory compliance. If staff believe that the procedure/s should not apply in a particular clinical situation they must seek advice from their unit manager/delegate or the patient's medical officer and document the variance in the patient's health record.

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This local guideline contains advice on therapeutics: No
Contact Person: Clinical Nurse Consultant, Paediatric Orthopaedics
Contact Details: 0437 913 217
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PURPOSE AND RISKS

To provide a framework for safe, consistent and effective clinical management of infants, children and young people who present to John Hunter Hospital Emergency Department and John Hunter Children’s Hospital with a closed, isolated femoral fracture as their primary injury.

The staff of the Emergency Department at John Hunter Hospital, the Orthopaedic Department at John Hunter Hospital and the wards at John Hunter Children’s Hospital include a diverse variation in clinician experience and expertise, from senior physicians to beginning practitioner nursing staff. Many staff may not be familiar with the sub-specialty of paediatric orthopaedics. A standardised clinical guideline provides a framework for safe, consistent and effective treatment of children and young people 0-18 years.

Risk Category: *Clinical Care & Patient Safety*

BACKGROUND INFORMATION

From 2011-2015, 144 paediatric patients presented to John Hunter Hospital Emergency Department with femoral fractures, and 139 of these were isolated, closed femoral fractures.

The average age for a child presenting with an isolated, closed fractured femur at John Hunter Hospital in 2011-2015 was 7.4 years, with 33% aged 2 years or less and 27% 13-17 years of age. Males comprised 75% of all injuries.

Mechanisms of injury varied according to age. Infants (under 12 months) were dropped or intentionally injured. Falls accounted for a third of all injuries, with the largest proportion in the toddler age groups. Sport related injuries, including trampolines, skateboards and bicycles caused the majority of injuries in older children, while motorcycles were the leading cause in the adolescent age group.

Mid-shaft injuries occur in 70% of patients. Proximal injuries make up 15%, however, half of these are congenital slipped epiphyses. The remaining 15% were distal injuries.

Treatments consisted of conservative management in plaster or traction for infants and younger children, with older children and adolescents receiving internal fixation. The average length of stay for a child in traction is 31 days, while adolescents with internal fixation average 5.5 days (Hunter New England Citrix Data Program, 2016).

Refer to the table for resolving clinical problems PAGE 13

GUIDELINE

This Guideline does not replace the need for the application of clinical judgment in respect to each individual patient.

A. ASSESSMENT

This document is suitable for children and young people 0-18 years with closed, isolated femoral fractures. This document is a guide for initial clinical management.

The initial clinical approach should be a primary and secondary survey to identify and manage immediate life threatening injuries, followed by a tertiary survey to identify all injuries. Significant injury transfer can occur when a long bone is fractured and the potential for other concurrent injury is high. The exception is the occurrence of pathological fractures.

These guidelines are not intended for patients with:

1. Co-existing abdominal, pelvic, neurological or other injuries requiring surgical intervention
2. Open femoral fractures
3. A history of significant co-morbidities such as; bone disease, neuromuscular disease, metabolic disorders and metastatic cancers
4. A mechanism of injury that suggests the possibility of other trauma

GENERAL CONSIDERATIONS

Treatment options consist of surgical and non-surgical approaches. This is directed by; the patient age, weight, the circumstances of the injury, family dynamics and specialist input.

These options will be discussed with the parents and patients as appropriate, so an informed decision can be made.

SUMMARY

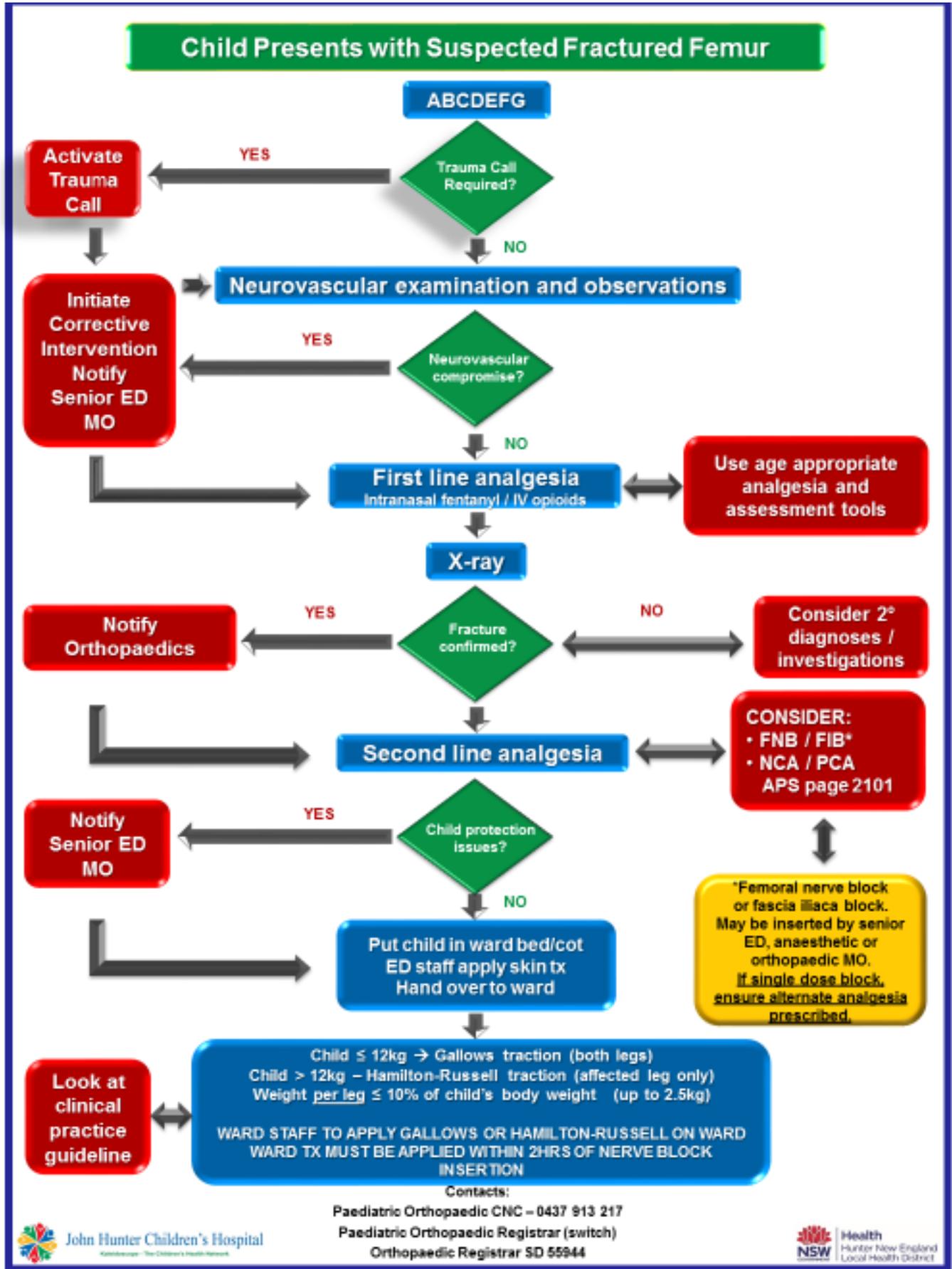
1. The child will receive a thorough medical assessment and stabilisation in the Emergency Department.
2. The child will be given a developmentally appropriate pain assessment using a paediatric pain assessment tool with a pain score, administration of effective analgesia and re-assessment as a priority.
3. The child is to have a documented full neurovascular assessment on arrival to the Emergency Department and then on arrival to the ward.
4. Injury by intent or neglect should always be considered.
5. The child will have an appropriate analgesia plan documented and commenced prior to discharge from the Emergency Department.
6. Appropriate radiologic procedures will be attended.
7. The child and their x-ray will be reviewed by an Orthopaedic medical officer in a timely manner.
8. Immobilisation / splinting devices will be removed in the Emergency Department.
9. Traction will be prescribed and applied in the Emergency Department.
10. The parent / carer will be included in treatment decisions and given consistent information.

B. CLINICAL RESPONSIBILITIES FOR EACH DEPARTMENT

1. The clinical care of the child that takes place in each department is based on what is in the best interests of the child.
2. Primary care and treatment will take place in the Emergency Department where analgesia can be administered safely under the supervision of a senior paediatric emergency medical officer.
3. Definitive care and treatment will take place on the ward after an appropriate analgesia and treatment plan has been prescribed (refer to flowchart).

EMERGENCY DEPARTMENT	WARD
Femoral nerve block	Send traction bed / cot to ED
PCA / NCA prescribed (refer to guideline)	Send traction kit/s, hydrocolloid and weight bag/s on bed to ED (appropriate sized kits)
Place patient on traction bed / cot	
Remove ambulance splint	
Apply skin traction in straight leg form (<i>except for Gallows traction</i> – apply skin traction to both legs, however, leave the set-up and application of weights for the ward)	
Sign off PEDOC	Sign off PEDOC
	Complete the set-up of Gallows or Hamilton-Russell traction on the ward (see individual protocols)

FLOW CHART



C. GUIDELINES FOR CLINICAL PRACTICE AND MANAGEMENT

1. Medical assessment and stabilisation in the Emergency Department

- Record the mechanism of injury. Injury patterns differ significantly between adults and children subjected to similar mechanisms of trauma (Rosen, 2009).
- Conduct a comprehensive formal neurovascular assessment on *BOTH* lower limbs and document in the notes.
- Look for Waddell's Triad of Injury (abdominal/thoracic, extremity and head injuries) for children where motor vehicle / cycle impact has been the mechanism of injury (Nunez-Fernandez et al 2010).
- Isolated femoral injuries do not usually cause haemodynamic instability in paediatric patients, look for other possible causes if there is clear clinical evidence of haemodynamic instability.

Developmentally appropriate pain assessment using a paediatric pain assessment tool with a pain score, administration of effective analgesia and re-assessment as a priority

- Pain management in emergency departments has been identified as inconsistent. Children in mixed departments are consistently undertreated and receive less analgesia than adults. Young children are the most vulnerable to being undertreated. A contributing factor is the poor use of pain scores (Herd et al, 2009).
- Pain assessment and management is important for optimal patient outcomes. A guideline for paediatric pain management in the Emergency Department is available via the intranet on the HNEkidshealth (Children, Young People & Families) website <http://www.hnekidshealth.nsw.gov.au/site/p-guidelines#P>
- Pain assessment using validated and developmentally appropriate paediatric pain assessment tools will be undertaken routinely (at least when other vital signs are assessed) and effective analgesia and pain management strategies employed, including distraction techniques.
- Initial analgesia is to be prescribed and administered by Emergency Department staff (refer to flow chart).

Completion of a comprehensive formal neurovascular assessment on arrival to the emergency department and then on arrival to the ward

- A comprehensive formal neurovascular assessment to both lower limbs is required when other routine observations are attended
- Baseline observations **MUST** be recorded prior to the application of traction
- Use the HNELHD Neurovascular Observation Chart (Form 77420).
- When significant neurovascular changes occur, a clinical review must be instigated
- Neurovascular observations should be undertaken hourly for the first 24 hours after admission and then as per the Neurovascular Observations protocol for JHCH.

INTERVENTION

The presence or development of ischaemia is an orthopaedic emergency and an urgent clinical review must be initiated.

- In non-ambulatory children, fractures of the femur are more commonly seen as a result of abuse rather than accident.
- An important element of evaluation for abuse or neglect is for the treating medical staff (Emergency Department or Orthopaedics) to conduct a thorough history and physical examination.

2. Red Flags

- No history (to explain a fracture in an infant/toddler) or changing history
- A sibling has been blamed for the injury
- The child is not ambulant, or less than 12 months old
- The history cannot account for the fracture mechanism
- Lack of seeking immediate care for a displaced fracture
- Additional soft tissue injuries, or other fractures, seen on initial films
- Previous injury presentations
- Inappropriate behaviours from parents and / or child
- Failure to provide adequate adult supervision

Any one of the above flags should prompt careful evaluation, completion of the Mandatory Reporter guide, and consultation with the John Hunter Children's Hospital Child Protection Team.

NOTE

If there is no evidence of injury by intent or neglect, a statement must be documented to this effect in the patient's health care records.

Contacting the Child Protection team does not exclude staff from mandatory reporting responsibilities

- Link to Child Protection Team contact details and Clinical Practice guideline
<http://www.hnekidshealth.nsw.gov.au/site/p-guidelines#C>
- Refer to the Mandatory Reporter Guide and policy directive on Protecting Children
<http://www.hnekidshealth.nsw.gov.au/site/p-guidelines#C>

NOTE

There is no single characteristic fracture pattern that is typical of intentional or neglectful injury. All fractures should be considered.

3. Analgesia and pain management

Analgesia plan documented and commenced prior to discharge from the emergency department

CHARTING ANALGESIA FOR THE WARD

The admitting team must ensure the child has an appropriate pain management plan charted for use on the ward. This can be in consultation with a Staff Specialist from Emergency, Paediatrics or Anaesthetic and Pain Service. The paediatric ward staff will not accept a patient without an appropriate plan.

Fractured femurs are painful, especially in the first three days where the inflammatory process is at its peak. Prevention of pain in children reduces subsequent morbidity, including pain sensitisation.

An audit of children presenting at John Hunter Children's Hospital in the last five years showed that non-verbal children presenting with fractured femurs, such as infants and children with global delay, received less analgesia than children who are able to verbalise their pain.

The goals of analgesia are to:

- Establish analgesia on arrival and during assessment
- Provide effective analgesia for procedures, i.e., x-ray transfer, splint removal & traction application, pressure area care, bed transfers, personal hygiene needs
- Maintain analgesia until background pain is minimal

The most appropriate and effective analgesia for that child must be used.

Femoral nerve or fascia iliaca compartment block

- Provides excellent analgesia and relief from muscle spasm. It facilitates patient transfer, splint removal, traction application and physical assessment. It is very effective analgesia for children with fractured femurs
- A nerve or compartment block is appropriate for most children with a fractured femur and this practice is supported by Australian and New Zealand College of Anaesthetists (ANZCA)
- A nerve or compartment block must only be administered by a senior medical officer who is experienced and confident with insertion of nerve or compartment blocks in children
- Ultrasound guidance is recommended
- If a 'single dose' technique is used, an appropriate analgesia plan must be in place for when the effect of the block has worn off

Opioid analgesia

- The intramuscular and subcutaneous routes should be avoided in children
- Children will refuse analgesia and deny pain if they believe it will result in having a needle
- Intravenous opioid boluses are recommended to establish analgesia in the presence of severe, acute pain
- Pain severity should be assessed to establish the required route for ongoing opioid analgesia
- Afterwards, maintenance analgesia could be delivered either by Patient Controlled Analgesia (PCA) or Nurse Controlled Analgesia (NCA), with or without a background infusion
- The NCA can be commenced by any clinician with authority to chart opioids, but junior staff should always seek guidance
- Where orthopaedic medical officers are unfamiliar with charting analgesia for children – it is suggested they contact the Acute Pain Service (APS) or Paediatric Registrar for advice filling out the PCA / NCA form and prescribing adjunctives
- The prescriber should follow the guidelines on the PCA/NCA form
- Standard doses information is available on the NCA form

- Make a referral to the APS for follow-up if PCA/NCA commenced
- If intravenous access is interrupted, analgesia can be temporarily maintained by appropriate oral dosing

Simple analgesia

- Regular, non-steroidal, anti-inflammatory medication and/or paracetamol may be added to supplement opioid analgesia in an attempt to reduce the total opioid dose required.
- Simple analgesics may also be required even when the patient has a fully functioning nerve block, as they may have more than one site of pain.

Traction

- Traction reduces muscle spasm and offers relief when applied correctly.

Benzodiazepines

- Benzodiazepines may be used for their relaxant properties, with the intention of reducing muscle spasm.
- There is no scientific evidence to support the use of benzodiazepines for treatment of muscle spasm.
- Benzodiazepines are not analgesia.
- Interaction and cumulative sedative effect with other drugs should be considered.

Pain management resources

- The medical officer charting analgesia has the following resources available:
- John Hunter Hospital Acute Pain Service and/or on-call paediatric registrar (for charting advice)
- HNELHD PCA/NCA sheet prescribing instructions
- Australian Medicine's Handbook

INITIAL ANALGESIA

Children with a fractured femur will require opioid therapy during the first days after injury. In that time, the intravenous route is preferred.

The treating doctor should consult the acute pain service if routine analgesia is found to be ineffective

- This should occur before the child has left the Emergency Department
- If the recommended 'dose for age' opioids are not relieving the patient's pain, re-assess the patient for possible causes, i.e., compartment syndrome, tissue cannula, incorrectly applied traction, other injuries

EXCESSIVE SEDATION

Children should not be medicated to the point of sedation during attempts to provide analgesia, unless it is the intention during a procedure and the child is being appropriately monitored.

Excessive sedation can impede a child's ability to indicate (directly or implicitly) the presence of other injuries and may lead to airway or haemodynamic compromise.

4. Radiology

Clinically appropriate radiologic procedures will be attended.

An x-ray should be performed within 1 hour of arrival to the Emergency Department. The x-ray should be:

- Anterior / posterior view of the limb
- Joints below and above the fracture site clearly visible
- X-ray is clear and of adequate quality
- The view is not impeded by splints or other items (whenever practical)
- Reproductive organs are protected

LIFE BEFORE LIMB

In the event that trauma call criteria are identified, Airway, Breathing and the trauma series will take priority over the leg x-ray.

The x-ray and child will be reviewed by the orthopaedic team in a timely manner

- The child is to be physically examined and reviewed by the on-call Orthopaedic registrar within 1 hour of the x-ray.
- Clothing is to be removed and / or cut away to allow a proper physical examination to take place

5. Removal of immobilisation / splinting devices in the Emergency Department

- A delay in the application of traction is not associated with a poor outcome for children with fractured femurs if the limb has no neurovascular complications and pain is effectively controlled (Chu et al, 2003).
- Ambulance officers may have applied splinting to older children and adolescents, however, infants and young children may present to the hospital without any splinting. All splinting devices are based on the same principle, which is a rigid frame that immobilises a damaged limb. Splinting options can include:
 - Inflatable splints
 - Aluminium ambulance splints
 - Molded cardboard
 - Pillow / blanket
 - Thomas / Hare splints
 - Back slabs

PRE-HOSPITAL SPLINTS

Splints applied in the pre-hospital setting (especially rigid metal splints) should be exchanged for traction as soon as possible. If they are on for extended periods, they should be checked every 2 hours for signs of neurovascular compromise or pressure areas to the foot and groin.

- Removing the ambulance splint to apply skin traction and moving the patient onto a ward bed is likely to be the most painful hospital experience for the patient.
- *The ambulance splint must be removed in the Emergency Department when the femoral nerve block is at its peak effect.*
- In the event that the nerve block fails to provide adequate analgesia, alternate analgesia/sedation can be administered in the Emergency Department while the splint is removed and traction applied.

6. Traction

Prescribing traction

- The orthopaedic registrar / consultant must prescribe the traction in the child's notes. It must include:
 - Type of traction required
 - Amount of weight required - based on the child's weight (between 5-10%) is usual. To avoid confusion, the weight must be written using metric units of weight
 - Any other specific requirements i.e., pillow / towel under thigh

CLOSED REDUCTIONS

Children with fractured femurs require a general anaesthetic for closed reductions. These must be performed in the Operating Suite.

Preparation for traction

- Once the ward has been notified of the new patient, the ward is to send a traction bed or cot to the Emergency Department for the patient
- If a femoral nerve block is appropriate, the patient should be transferred onto the ward bed after the femoral nerve block
- The skin traction should be applied immediately after the ambulance splint has been removed
- Skin traction is used for:
 - Gallows' traction
 - Hamilton-Russell traction
 - Straight leg traction
- Skin traction will be applied in the Emergency Department
- Skin traction will be applied by trained Emergency Department staff
- Instructions and clinical photographs for skin traction application are in the Application of Paediatric Skin Traction in the Emergency Department Guideline
- Emergency department staff do not have to set up or place the patient in Gallows' or Hamilton-Russell traction.
- The Emergency Department staff and the paediatric ward staff must ensure that children are not sent to or accepted by the ward without an analgesia plan that can be used on the ward
- Staff from each unit must sign the PEDOC prior to patient transfer out of the emergency department

Resources for the application of traction

Resources include:

- Traction application guidelines available on the HNEkids website or the HNE guidelines website
- Paediatric Orthopaedic CNC
- Team leader J1
- Orthopaedic registrar / consultant
- Staff may call the Emergency Department Clinical Nurse Educator and/or the Paediatric Orthopaedic Clinical Nurse Consultant during normal working hours to assist with the management of children with fractured femurs and assistance with traction application

The parent / carer will be kept with the child, be included in treatment and management decisions and be given the correct information

- Children are less anxious and fearful when a parent is present during procedures and medical examinations
- Parental presence promotes effective coping mechanisms (Atkinson et al, 2009)
- Before speaking to parents, clinical staff should ensure the information given to parents regarding their child's management plan is for the typical management, it is correct and consistent

7. Resolving clinical problems

PROBLEM	WHAT IS THE GOAL FOR THE PATIENT?	WHAT ARE YOU GOING TO DO ABOUT THE PROBLEM?	HOW ARE YOU GOING TO ASSESS IF YOUR INTERVENTION HAS BEEN SUCCESSFUL?
The extremity is swollen	Maintain neurovascular circulation Reduce or prevent swelling <i>*IV therapy should not be running through an affected limb unless there is no alternative option – where this occurs, staff need to be aware of the extra risks of neurovascular compromise and not assume the IV therapy is the cause of neurovascular differences</i>	Encourage movement of the distal joint (where appropriate) Check for and release restrictive materials down to the level of the skin Instigate a clinical review within 30 minutes Increase the frequency of neurovascular assessment according to the recommendation in the procedure	Corrective intervention has been initiated The swelling has been reduced
Pulseless extremity	Maintain circulation to the limb	Check other pulses on the extremity Get another person to check the pulse Instigate an urgent clinical review Increase the frequency of neurovascular assessment Check and release restrictive materials down to the level of the skin	The cause of the pulseless extremity has been identified and corrective intervention has been successful. The pulse has returned.
White, cool extremity (ischaemia)	Maintain vascular circulation	Compare extremities Look for other causes, e.g. bleeding, low Hb Instigate urgent clinical review Check and release restrictive materials down to the level of the skin	The cause of the ischaemia has been identified and corrective intervention has been successful. The limb colour is natural.
Altered sensation in extremity	Maintain neurological function	Check for signs of swelling and pressure, particularly at the knee Check and record the areas of sensation Check and release restrictive materials down to the level of the skin Instigate clinical review within 30	The sensation is within the expected limits for the injury

		minutes Increase frequency of neurovascular assessment	
Limited or no movement in the foot	Maintain neurological function	Check and release restrictive materials down to the level of the skin Check for signs of compression or swelling Instigate clinical review within 30 minutes Increase frequency of neurovascular assessment	The movement is within expected limits for the injury
Haemodynamic instability	Maintain effective haemodynamic function	Check for signs of occult bleeding Instigate an urgent clinical review	Haemodynamic stability is maintained
Skin integrity is impaired	Reduce the risk of further damage to the skin Provide the skin with an environment that will optimise skin healing Maintain effective traction	Request a clinical review within 4 hours Apply an appropriate dressing Take care not to cause further damage Assess whether skin traction will be appropriate	Further damage to skin is prevented Damaged skin has been documented with clinical photography
Ineffective and/or inadequate analgesia	The patient is assessed for pain using an appropriate paediatric pain assessment tool and is treated according to the paediatric pain procedure	Use a paediatric pain scoring tool to assess the patient's pain and document the assessment Administer appropriate and effective analgesia Check for occult sources of pain Re-assess regularly Request clinical review within 30 minutes	The patient has an appropriate and definitive pain management plan and the pain is effectively controlled The patient's pain score is <3 Staff and family are able to perform care
Pressure injury is developing	Preventative practices implemented	Glamorgan assessment Implement pressure injury prevention	Pressure is reduced and resolved

COMPLIANCE, IMPLEMENTATION AND MONITORING

The clinical areas using the procedure will be given a fact sheet and Orthopaedic CNC will liaise with relevant NUM / Educator regarding the most appropriate roll-out for the specific area. The relevant learning package is available on the JHCH ward share drives.

The results of audit will be addressed with the Acute Services Manager

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APPENDIX ONE: Clinical Audit Tool

Criterion no.	Criterion	Exceptions	Definition of terms and/or general guidance	Data source	Frequency	Position Responsible
1	Children with femoral fractures will have a chart audit to ensure compliance with the clinical protocol	None	The aim is to ensure: Staff adhered to the clinical protocol The therapy was initiated and managed appropriately and safely Children and their families were satisfied with their child's clinical management and outcome Non-adherence to protocol will be recorded in the IIMS and fed back to the relevant stakeholders	Patient health record	Within month after discharge	Paediatric Orthopaedic CNC

Reference: *Electronic audit tool - National Institute for Health and Clinical Excellence (NICE):*
www.nice.org.uk/nicemedia/live/10996/56372/56372.xls