Trust Guideline for the Management of: Closed Diaphyseal (Midshaft) Femoral fractures in Children from birth to 16 years

For use in:	Emergency Department (including CHED), Buxton Ward and the Children's Assessment Unit (CAU)
By:	Doctors and Registered Nurses
For:	Children with closed diaphyseal femoral fractures
Division responsible for document:	Division 3 (Women and Children) Division 2 (Paediatric Trauma and Orthopaedics)
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Names and job titles of document authors:	Mr Anish Sanghrajka, Orthopaedic Consultant, David Wormald, Paediatric Orthopaedic Nurse Specialist
Name of document author's Line Manager:	Teresa Miles
Job title of author's Line Manager:	Matron for Women and Children
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If Yes - does the strategy/policy deviate from the recommendations of NICE? If so why?	NA

This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes.

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Version Number	Date of Update	Change Description	Author
5	28/03/2022	Compartment syndrome reminders, new references	Mr Anish Sanghrajka, David Wormald

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Trust Guideline for the Management of: Closed Diaphyseal (Midshaft) Femoral fractures in Children from birth to 16 years

Objectives

This guideline has been developed (and revised for later editions) to provide a framework for the assessment and initial management of a child under 16 years old presenting with a fracture of the mid-shaft of femur with a specific focus on the issues relating to pain management and application of appropriate traction. (If the fracture is not mid-shaft appropriate advice on management should be sought from the on-call orthopaedic team Bleep 0996).

Rationale

There is limited research-based practice in the initial care of mid-shaft femur fractures. This has led to a variety of approaches being used depending on the experience of the person treating the child initially. A guideline was developed to help standardise the approach giving specific focus on pain relief and traction application. The use of such techniques as femoral nerve blocks have been shown to provide excellent pain relief but an audit of previous patients have demonstrated issues with delay in application of traction which can cause issues with worse outcome.

Broad recommendations

This guideline is to help standardise a care pathway for children with closed diaphyseal femoral fractures who do not have other life or limb threatening injuries.

The main aims are to –

- Achieve a rapid diagnosis.
- Administer effective, lasting pain relief.
- Application of appropriate traction at the earliest opportunity.

This, in turn, decreases the stress and anxiety felt by the patient and their carers and facilitates transfer of the patient between the emergency department and the ward setting.

This guideline should not take the place of a thorough assessment of the patient for other injuries, especially in the context of high energy trauma or suspected non-accidental injury.

It is recognised that a femoral nerve block is the gold standard for pain relief in femoral fractures allowing manipulation and application of traction. It is however recognised that the nerve block procedure is a technical skill that needs to be carried out by suitably trained individuals and is therefore beyond the scope of this guideline to describe the procedure.

Also, it is recognised that the application of traction should **not** be delayed by waiting for an individual to be called in (the Children's anaesthetists are not on call for this

procedure). Other forms of pain relief and antispasmodics should be optimised if nerve block is not available.

In children it is also important to use nonpharmacological methods of pain relief alongside medications. Play specialists are available at certain times in the ED and Children's Department to help with distractions. Family and carers must also be fully informed and involved in the care and preparation of their child.

During working hours (8am – 5pm) there is a Paediatric Orthopaedic Nurse Specialist available (Bleep 0298 DECT Phone 7422) who will help to facilitate administration of care according to this guideline.

Training in the application of traction will be undertaken by the Paediatric Orthopaedic Nurses to the staff of the Jenny Lind and the CHED.

Clinical audit standards

Following introduction of this guideline, its implementation will be audited on an annual basis (or earlier if required) and any necessary amendments made. Audit tool shown in appendix 3. Previous audits are available on request from the Orthopaedic Nurse Specialists.

Summary of development and consultation process undertaken before registration and dissemination

The authors listed above drafted this guideline on behalf of the Emergency, Anaesthetic, Paediatric and Orthopaedic Departments who have agreed the final content. During its development it has been circulated for comment to Consultants within the above-named departments.

This version has been endorsed by the Clinical Guidelines Assessment Panel.

Distribution list / dissemination method

This guideline will be circulated via Trust E-Mail to the Emergency, Anaesthetic, Paediatric and Orthopaedic Departments and any other parties likely to be involved in the care of children with closed diaphyseal femoral fractures. It will also be available on the Trust Intranet.

Glossary

ATLS	Advanced Trauma Life Support
NAI	Non-Accidental Injury
QDS	Four times a day
PRN	As required
GCS	Glasgow Coma Score
TPR	Temperature Pulse Respiration
HCP	Health Care Professional
CHED	Childrens Emergency Department (Part of ED)

References and further reading

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Femoral Nerve Block — Appendix 1

Indications

As with all blocks a femoral nerve block can reduce systemic opiate requirements with their side effects. This is particularly important in children. Thus the femoral nerve block can be performed to provide perioperative analgesia for diaphyseal fractures of the femur.

This nerve block should only be performed by someone who feels adequately trained and competent to perform the procedure safely and effectively. A number of staff within ED are trained in this method

N.B. The child's ongoing care should not be compromised by a delay in the nerve block being performed. If no one is available to perform the block within the department, alternative analgesia should be administered to allow application of traction. It should be done as soon as possible by the most appropriate person available over the shortest time period.

Contraindications

Absolute

- Patient refusal.
- Inflammation or infection over injection site.
- Allergy to local anesthetics.

Relative

- Anticoagulation or bleeding disorders.
- Where dense sensory block could mask compartment syndrome (for example fractures of the tibia or fibula). If unsure discuss with the surgeons prior to performing the block.
- Pre-existing peripheral neuropathies.

Post Procedure care

Continue monitoring the child carefully, looking particularly for signs of local anaesthetic toxicity **for at least one hour**.

These should include regular:

- Heart rate
- GCS
- Blood pressure
- Plus Lower limb neurovascular observations and Capillary refill
- Document the block clearly the side and site of injection, needle used, volume and name of local anaesthetic and any associated problems (for example paraesthesia, pain or vascular puncture).

Complications

Common to all blocks

- Block failure
- Intravascular injection
- Local anaesthetic toxicity
- Nerve damage- temporary or permanent
- Infection
- Allergy to local anaesthetic

Specific to Femoral nerve block

- Vascular puncture.
- Haematoma.
- Difficulty weight bearing/mobilising leading to falls and injuries.

Alternative pain relief methods

If the option to have a femoral nerve block is not available there are a number of options available to achieve pain relief for traction application.

- Optimized oral analgesia – simple analgesia should be given to optimal levels, check for allergies and dosing in BNF for Children. It may not be possible to accurately weigh a child with a fractured femur so using age appropriate dosing would be required unless careers have recent weight. Simple oral analgesia can take 20-30 minutes to be effective.
- Oral/nasal opiate medications- be aware if any previous opiates given by ambulance crew. Nasal route is a safe and effective route with rapid onset of pain relief.
- Intravenous medications –
    - Paracetamol - especially if the child is struggling to take oral medications.
    - Morphine - rapid onset of pain relief and dosing can be titrated easily, but need to be aware of associated side effects.
- Entonox – (inhaled 50% nitrogen & 50% oxygen) given for conscious sedation whilst undertaking procedure. See Patient Group Direction (PGD) for the administration of Entonox (Nitrous oxide 50% - oxygen 50%) Trustdocs Id No: 476 for information and instructions. Rapid onset of pain relief but requires the child to be cooperative. Entonox is well tolerated if good explanations are given and career involved and there is good experience of use in ED.
- Distraction – there are Play Specialists on duty in CHED who can help the child with preparation for procedure, distraction during and to support the career support the child during procedure. If no Play Specialists available encourage use of book or screen to occupy child whilst procedure undertaken.
- Alternative conscious sedation medications have been used on occasions but can only be undertaken when there is adequate experience and support available to

support the child if required and they are beyond the scope of this guideline.

Appendix 2

Application of:

- **Adhesive Skin Extensions**
- **Gallows Traction**
- **Thomas Splint**

Equipment:

- One adhesive skin extensions kit.
- Crepe bandages, if bandages not supplied with the kit.
- Scissors.
- Tape for securing bandages.

Application of Adhesive skin extensions

Following the provision of adequate pain relief

1. Unroll and stretch the extensions prior to removing the backing paper (Taylor 1987) to unkink the extensions and make them easier to handle against the limb.
2. The extensions are cut to length and rounded at the top edges, nicks can be made in the length of the adhesive strips to improve the confirmation of the extensions to the contours of the skin and to prevent the corners peeling (Taylor 1987)
3. One HCP to support the limb exerting gentle traction in line of pull, to provide patient comfort.
4. Place the adhesive strips in position, the integral protection foam must cover the bony prominences i.e., the malleoli, preventing a pressure sore occurring over bony prominence and avoiding nerve compression.
5. Only apply adhesive skin traction up to the level of the fracture, to avoid bridging the fracture site
6. Bandages should be applied to cover the adhesive strips starting above the malleoli, using a figure of eight or spiral technique. This will keep the extensions in place and transfer traction forces to the skin and underlying tissues.
7. **Avoid bandaging around the knee and fibular head**, to reduce the risk of peroneal nerve compression.
8. Secure bandages with short lengths of tape, not completely encircling the limb in order to secure the bandages and to avoid a tourniquet effect.

Use Neurovascular chart to monitor NV status and any developing Compartment syndrome

Gallows Traction

If using gallows traction (see guide for weight/age in algorithm) attach hoop frame to cot prior to commencement of procedure. Hoops and cream cots are available from Buxton Ward (hoops in the bathroom).

Once traction extensions have been applied to both legs:

1. Tie a knot in the traction cord at the base of the extension near the foot giving two cords of equal length.
2. Two people attach left and right extensions simultaneously to the hoop whilst maintaining traction.
3. Put one cord through each side of the appropriate hole on the hoop, keeping legs a hip width apart and pull gently until the baby's legs are raised and their bottom is just off the cot, you can slide a flat hand between the cot mattress and the baby's buttocks.
4. Ensure the baby's hips are directly below the hoop.
5. Loop the cords over and under the hoop until you finish on top e.g., once or twice, and then tie a simple single knot and bow (only one knot and bow so it can be quickly released in an emergency).

Use Neurovascular chart to monitor NV status and any developing Compartment syndrome

Thomas Splint

Ossur Traction kit must be assembled at the time of need, as it is dependent on size of child.

Paediatric sized splints are kept on Buxton ward, adult splints are kept in A&E

Kits Consists of:

- Thigh hoop (in 3 sizes small, medium, large).
- Thomas splint (fully adjustable).

These are reusable and should be washed according to IP&C recommendations when finished with.

Also required:

- Thigh hoop cover.
- Adhesive skin extension set, child (up to 7-8years) or adult.
- Several slings (different sizes may be needed).
- Velcro to secure slings.
- Gamgee.
- Bandages.
- Traction cord for counter traction on bed.
- Windlass (see traction manual on Buxton ward if not sure).
- Tape.

These are all disposable and must be thrown away after each patient use. (Except metal windlass)

Paediatric Thomas Splints fit children up to the average 7 - 8-year-old or about 140cm tall. Inside leg about 70cm. If required for a bigger child an adult splint will be needed (available in A&E)

If the child goes to theatre for definitive treatment, please ensure the non-disposable elements of the kit are returned to Buxton ward.

Copies of the 'RCN Traction: Principles and application' are available in the traction kit boxes and these give a pictorial guide to application.

Thomas Splint Application

Measurement:

- Measure uninjured limb inside leg measurement groin to heel (add a further 20-30cm to this to allow ankle planter flexion in splint and accommodate length required for windlass-always go longer if unsure).

- Obtain oblique thigh circumference to determine thigh hoop size (size in cm is etched into the thigh hoops for reference).

Adjustment

- Adjust splint to left or right orientation depending on fracture side (put upside down over unaffected leg for visual reference).
- Length increments are marked in cm and inches on side of splint.
- Attach correctly sized hoop to splint ensuring an audible click is heard.
- At the hoop end make sure there are at least two 'notches' visible on the inside length to allow for any adjustments once the frame is in place.

Preparation

- Drape fabric slings over frame to form a trough, leaving a gap where the knee will be. Do **not** place slings behind the knee.
- Slings can be held in place with Velcro strips, including to the hoop to prevent them moving.
- Place Gamgee onto splint from hoop to heel, trim to size, allow looseness behind the knee.

Positioning

- Having applied the adhesive skin extensions, the limb can be placed onto the Thomas splint. Continue with gentle traction in the line of pull.
- The hoop (with cover attached) should rest just under the ischial tuberosity.
- The heel should be free of pressure.
- Hoop cover fastened and strap cover placed.

Securing

- Once in the splint, secure a windlass to provide traction to the limb.
- Pull traction cords to equal lengths and wind over each side of the splint (one over lateral side and one under medial side).
- Tie cord to the end of the Thomas splint securely.
- Use the windlass provided or two tongue depressors taped together by placing it between the two cords and then winding it clockwise until a firm pull has been achieved.
- Bandage over whole splint from ankle to groin to secure leg to splint.
- Once the child has been transferred to their bed on the ward Tip end of bed, attach traction cord to end of splint, over swan neck and hang free weight (prescribed verbally or written by doctor).

Close post Traction application monitoring for at least one hour to include:

- Heart rate.
- GCS.
- Blood pressure.
- Lower limb neurovascular observations.
- Capillary refill.

Continue with standard observations including TPR, Neurovascular observations and capillary refill as condition dictates. See ward care plan for further clarification.

Use Neurovascular chart to monitor NV status and any developing Compartment syndrome (especially if had nerve block as will not feel pain for 6-12 hours)

Appendix 3 Audit Tool

Hospital No.
Date admitted
Consultant

Initials

Cause of Injury

Left Right
Time in A&E

Triage level

Trauma call
Y / N
Time of analgesia

Type of analgesia

Record of review of effectiveness

Time of x-ray

Result

Poly trauma
Y / N
Time of Orthopaedic review

Paediatric Orthopaedic review
Y / N
Date/ Time
Specialist Nurse contacted
Y / N
Not available
Time of Nerve block

Successful
Y / N
Alternative if unsuccessful or unavailable
Grade of person undertaking block

Any known delay
Y / N

Time of immobilisation

Type of immobilisation
Thomas Splint

Gallows Traction
Simple Traction
Grade of person applying immobilisation

Notes on immobilisation

Immobilisation done in
A&E Resus Childrens Area Ward
Time of X-ray in immobilisation

Satisfactory position
Y / N

Time of transfer

Ward

Guideline medicines prescribed
Y / N
Paediatric medical review
Y / N

Outcome
Theatre
Y / N
Date

Procedure
ORIF / Spica
Paediatric team
Y / N

Audit carried out by

Monitoring Compliance / Effectiveness Table					
Element to be monitored	**Lead Responsible for monitoring**	**Monitoring Tool / Method of monitoring**	**Frequency of monitoring**	**Lead Responsible for developing action plan & acting on recom**	**Repor arrang**

				menda tions	
Effectiveness of pre application pain relief	Paediatric Orthopaedic Nurse Specialist	Pain scale review	individually	Paediat ric Orthop aedic Nurse Special ist & CHED nurse	Throug audit r within
Teaching of traction application to staff	Paediatric Orthopaedic Nurse Specialist	Mandatory training records	yearly	Practic e develo pment Nurse for Paediat ics	Within structu