LRI Emergency Department

Guideline for the management of:

Fracture Manipulation in the Children's Emergency Department

(UHL Category C Guideline)

Staff relevant to:	ED Medical and Nursing Staff Orthopaedic Staff
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Key Points

- Upper limb fractures are a common paediatric emergency presentation
- The healing capacity of children allows for greater conservative management if the fracture is adequately aligned
- Operative management can often be avoided with simple manipulation manoeuvres and immobilisation and is strongly supported by national guidance.
- A large proportion of simple manipulations can be facilitated in CED with the use of intranasal opiates and inhaled nitrous oxide
- Prompt discussion between the Orthopaedic Senior and the CED Senior can help ensure suitable patient selection, procedure planning and team working.

Contents

Fracture Manipulation – think "IN PAEDS ED"

Identify: **Patient <18yrs presents with Upper Limb Fracture likely needing manipulation?**

See Section "Fracture Types"

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Notify: **Orthopaedic Senior (e-Referral) AND Children's ED Senior (Tannoy, ext 0154)**

Orthopaedic Senior AND Children's ED Senior discuss discuss and agree suitable options for patient management

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Patient: **Following assessment, is the Patient suitable for manipulation IN PAEDS ED?**

See Section "Suitability of fracture manipulation in CED"

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Area: **Is a suitable area available for the procedure?**

Consider available Treatment Rooms and Monitored spaces if needed

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Equipment: **Is any equipment required? Is it available and ready?**

e.g. Plaster trolley, Entonox Cylinder, Monitoring

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Drugs: **Relevant medications prepared? Plan B ready?**

See section "Overview of Process"

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Staff: **Are appropriately qualified staff available? Is the department safe to proceed?**

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Evaluate: **Check x-ray and reassess, document,**

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Discharge: **Ensure fracture clinic appointment, Patient information leaflet, safety net advice**

Introduction

Paediatric fractures are a common presentation to the children's emergency department (CED). The purpose of this guideline is to highlight which fractures might be suitable for manipulation in CED and how this should be undertaken.

The primary objectives of treatment are to achieve definitive treatment in the first instance if this is feasible, improve alignment to reduce discomfort for the child, improve or minimise neurovascular compromise and enable appropriate splintage.

Other relevant objectives are to benefit from definitive treatment at the "front door" by reducing the number of admissions, minimise psychological distress to child and family during admission, reduce demand on theatre resources and avoid potential risks relating to undergoing treatment under general anaesthesia.

Suitability of fracture manipulation in Paediatric ED

This guidance outlines the broad categories of fractures that are suitable for manipulation in the ED setting. The manipulation needed is ultimately decided by, and is the responsibility of the treating Orthopaedic doctors at or above Registrar level or Trust grade equivalent.

The anatomical location of fracture and pattern of displacement must be considered alongside broader patient and injury factors *(see Table 1).*

The sedation and analgesia needed should follow a principle of the safest possible approach for the manipulation needed which is determined by the senior decision maker in the Children's Emergency Department in consultation with the Orthopaedic Registrar or Consultant.

If there are any concerns about the feasibility or appropriateness of undertaking manipulation of a fracture in CED by the Orthopaedic or CED team, the individual case must be discussed with the Orthopaedic Consultant on call, and the decision whether or not to treat in CED and the supporting reasoning must be clearly documented in the notes.

PATIENT FACTORS	INJURY FACTORS
Age of the patient	Site of fracture – involved bone and location (physeal, metaphyseal, diaphyseal)
Co-morbidities (consider contraindications to conscious sedation)	Pattern of displacement and ability to reduce angulation>rotation>translation
Patient compliance with procedure (patients with certain cognitive patterns eg learning difficulties, ADHD, autism may not tolerate procedure)	Remodelling potential – consider Age of child Extent of deformity Closeness to neighbouring physis and physis contribution to growth
Barriers to informed consent (patient requires a parent/guardian who can consent for the procedure)	Soft tissue compromise
	Neurovascular compromise
	Compartment syndrome

Table 1. Host and injury factors to be considered when deciding on manipulation in CED

Ideal fracture types

Individual fractures require assessment of all patient and injury factors before considering manipulation in CED. The Orthopaedic doctor must consider the aim of treatment in each instance and the likelihood of success of the procedure. **All procedures must be feasible with a simple reduction manoeuvre following analgesic administration.** Appropriate treatment aims are:

1. **Reduction of a simple angulated forearm fracture.** The aim here is to restore alignment within 10 degrees of anatomical alignment or better for definitive treatment. Significant angulation deformities, typically > 30 degrees, must be reduced for comfort of the child before immobilisation even if it is perceived that definitive treatment will be required with surgery. Children should not be left with significant angulatory deformities of long bones during admission whilst awaiting definitive treatment.

2. **Reduction of a distal radius/ulna physeal injury.** These are typically Salter Harris II injuries with minimal translation that principally require angulatory correction to bring them within range of remodelling. The distal radius physis contributes 70-80% of longitudinal growth of the bone enabling rapid remodelling.

3. **Improvement in angulation of tibial shaft fractures**. These typically occur in older children and the aim of treatment here is to improve alignment to minimise the risk of neurovascular compromise and compartment syndrome development while awaiting definitive treatment under anaesthetic.

4. **Simple elbow Type I supracondylar fractures.** These are typically Gartland Type 1 fractures purely hinging in the sagittal plane with no rotation or translation and usually occur in the younger child. Application of a high arm sling with elbow flexion past 90 degrees may be sufficient to completely re-align the fracture. Supracondylar fractures must never be casted in this position due to the attendant risks of compartment syndrome.

Open fractures

These require mandatory assessment by the Orthopaedic team with respect to manipulation under conscious sedation in CED. These will usually require definitive treatment in theatre but the treating team must be aware of potential delays if the child is admitted overnight with the attendant need to improve alignment to improve neurovascular compromise or minimise the risk of compartment syndrome development.

Many injuries are Gustillo-Anderson type 1 injuries where the soft tissue compromise is minimal but the extent of angulation of the fracture requires expedient manipulation whilst awaiting definitive treatment. The feasibility of maintaining alignment with grossly unstable fractures and significant soft tissue compromise must be considered before undertaking manipulation in CED.

Fractures with neurovascular compromise or developing compartment syndrome

These injuries must be assessed by the Orthopaedic doctor to determine the influence of the fracture pattern and accompanying deformity on soft tissue or neurovascular compromise. Although definitive treatment with intervention under general anaesthesia may be considered mandatory in many of these

cases, the timing of such treatment and the effects of any delays must be considered. Significant angulatory deformities contribute to soft tissue and neurovascular compromise in a time dependent manner. The need for improving the alignment of a significantly angulated fracture to reduce morbidity must be considered by the treating team.

Fractures that may not require manipulation

1. **Fractures with acceptable alignment** – Moderate angulatory deformities in a single plane rapidly remodel in young children. Forearm fractures angulated in two planes are more likely to restrict forearm rotation and may therefore require manipulation. Fractures with angulation and translation may still be acceptable if the patient is young and the deformity is mild. The treating Orthopaedic doctor must consider whether alignment is acceptable without restriction in function if the fracture is treated with cast immobilisation alone.

2. **Fractures that will rapidly remodel** – The age of child, extent of deformity, proximity to physis and the contribution of the physis to longitudinal growth require cumulative assessment by the treating Orthopaedic doctor. Young children frequently fall over and the risk of re-fracture through an angulatory deformity awaiting remodelling must be considered and communicated to the patient and parents. Re-fracture may occur up to a year after injury with significant angulation and this must be borne in mind when discussing treatment options.

3. **Fractures where manipulation will delay going to theatre**- This is a very rare occurrence. Severely angulated fractures with neurovascular compromise require emergency improvement in the ED to prevent damage to distal tissues.

Overview of Process:

1. After referral to the orthopaedic team and face-to-face patient assessment, the orthopaedic registrar must consider the feasibility and merits of manipulation under conscious sedation and document the treatment aims. Specific treatment aims include definitive treatment, comfort of the child, improve neurovascular compromise and minimising the risk of compartment syndrome. A detailed assessment of neurovascular status with documentation of individual nerve status must be completed in the notes. **The decision to manipulate must be discussed with the senior decision maker in the CED** and if there are any concerns before undertaking the procedure this must be discussed with the orthopaedic consultant on call. The outcome of this discussion must be clearly documented in the notes.

2. Orthopaedic team to **obtain written consent** from the patient's legal guardian to include discussion on aims of treatment, risks of procedure and natural history of injury if procedure not undertaken in CED.

3. A **play specialist** should be involved early on, wherever possible. They can support the child and family, but would not determine optimal treatment.

4. Discussion on the appropriate analgesic and sedation regime during the procedure must be undertaken with the **CED Senior on duty**.

5. Intranasal opiate administration combined with Entonox has been shown to provide effective and safe analgesia for fracture deformity correction [1, 2], and **is a suitable option for the majority of patients**. The child must demonstrate that they can use Entonox effectively before the procedure is commenced.

6. **Conscious sedation** (see separate policy) may be considered for specific cases if the above analgesia option is unsuitable (e.g. notably unsettled / distressed) and should be discussed with the CED Senior.

   During periods of excessive demand or understaffing, it may not be feasible for CED to accommodate the request for procedural analgesia using the above regimes. If the manipulation cannot be undertaken due to resource limitation, this should be clearly documented in the notes.

   Inability to provide analgesia and sedation commensurate with a fracture that could be manipulated in the department must be audited and subject to regular review. These findings will be presented at departmental meetings to determine whether resources, both in the CED and with

orthopaedic directorates are adequate to deliver the care suggested in this guideline. Failure to be able to deliver procedural sedation has an impact on both CED and orthopaedic departments (e.g. displaced trauma activity, cancellation of elective cases and the delivery of unsafe practices in overcrowded departments)

7. Recommended team structure

   i) **Paediatric ED nurse** (To take observations where necessary, ensure the child is able to use Entonox effectively and to administer analgesic regime)
   ii) **Orthopaedic Consultant, registrar or equivalent training grade** – manipulation procedure to be undertaken by Registrar grade or above
   iii) **Orthopaedic practitioner** – to assist in plaster application. This member of the orthopaedic or CED teams must be proficient in plaster application and may be a doctor, nurse or HCA

8. **Orthopaedic doctor undertakes reduction manoeuvre** – this may include preliminary traction followed by a single considered fluid step reducing the deformity with a gradual correction.

9. **If any concern is raised** by the treating team that the procedure will not be tolerated, then the manipulation attempt must be stopped.

   It must be remembered, however, that one successful attempt despite brief low-level distress is better than a failed procedure and the need for a subsequent general anaesthetic.

   The appropriateness of continuing is best judged jointly by the **orthopaedic doctor delivering the procedure in collaboration with the senior decision maker in CED**. If the procedure is abandoned, then the reasons must be clearly documented in the notes by the Orthopaedic doctor and the team member with concerns if they are different individuals. These cases must be reviewed and discussed in the morning Trauma meeting and audited for governance purposes.

10. With the alignment maintained, a full plaster is applied. The orthopaedic doctor should consider the need to include the elbow and the position of forearm rotation.

11. After X-ray, split plaster and check finger movements. Document radiographic assessment post manipulation and neurovascular status in the notes.

12. Patient can be discharged after suitable period of observation depending on type of analgesic regime. **Patient to be provided with cast care patient information leaflet**.

13. Patient to be booked into **next paediatric fracture clinic appointment**.

Audit and periodic review

In line with GIRFT recommendations, ongoing audit of fracture manipulations in CED must be periodically undertaken jointly by CED and the Paediatric Orthopaedic departments. The aim is to identify potential resource barriers to implementation which can be improved in anticipation of. Patient outcomes must also be audited to determine appropriate application of this guideline in managing paediatric fractures in the CED setting. Please also see point 6 above.

Guideline review

The guideline will require periodic review in light of the findings from clinical audit and advances in understanding the management of these injuries. The UK CRAFFT study is underway and will better define outcomes from paediatric wrist fractures. The guideline will be reviewed in December 2021 to take account of the findings from this national RCT.

References:

1. Kurien T, Price KR, Pearson RG, Dieppe C, Hunter JB. Manipulation and reduction of paediatric fractures of the distal radius and forearm using intranasal diamorphine and 50% oxygen and nitrous oxide in the emergency department: a 2.5-year study.
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