

Analgesia for Children in the Emergency Department

INTRODUCTION

Pain is the commonest presenting symptom in patients attending Emergency Departments (EDs). There is definitive evidence that pain is managed sub-optimally in the ED setting, and this is particularly so when referring to pain in children.

The objective of these guidelines is to outline appropriate pharmacological and non-pharmacological techniques in paediatric pain management in the Emergency Department (ED). These guidelines have been developed to act as a guide to medical staff and nursing staff and other members of the multidisciplinary team in the ED to guide them through issues associated with achieving effective pain control in children in the ED setting. These guidelines are not intended to replace clinical judgement.

This guideline is not designed to address the specific issues associated with procedural pain in children. These are dealt with in the companion IAEM clinical guideline 'Procedural Sedation in Children'.

PRINCIPLES OF PAIN MANAGEMENT IN CHILDREN

ABCDE of Pain Assessment and Management

- Ask about pain regularly. Assess pain systematically.
- Believe the patient and family in their reports of pain and what relieves it.
- Choose pain control options appropriate for the patient, pain level and setting.
- Deliver intervention in timely, logical and coordinated fashion.
- Empower patients and their family. Enable them to control their pain to the greatest extent possible.

PAIN ASSESSMENT

- Pain assessment should be considered as the 5th vital sign and should be performed at triage and at regular intervals, taking into account the developmental age and cognitive understanding of the child as well as the analgesic technique chosen.
- The assessment of pain includes a careful history and physical examination.
- Pain Assessment Tools (see Appendix) used to assess pain in children include:
 - Self reporting (subjective pain assessment) - reliable in older, verbal children, e.g. Wong Baker FACES, Visual Analogue Scale (VAS), Numeric pain scales, Pain Ruler
 - Pain rating by parent/nurse/carers (objective pain assessment), e.g. FLACC, Alder Hey Triage Pain Score, Manchester Pain Ladder.
- It is important to distinguish other causes of distress in children e.g. emotional, parental separation, thirst, hunger, etc.

Pain assessment should be performed regularly and be repeated at appropriate intervals. Always reassess pain after the administration of opiate analgesia or administration of supplemental analgesia.

- Children <5 years use behavioural scale e.g. FLACC or Alder Hey Triage Pain Scale
- Children 5 to 7 years use Wong-Baker Faces Pain Rating Scale
- Children > 7 years use VAS (visual or verbal analogue scale between 0 - 10, where 0 = no pain and 10 is the worst pain ever) e.g. Pain Ruler.

PAIN TREATMENT

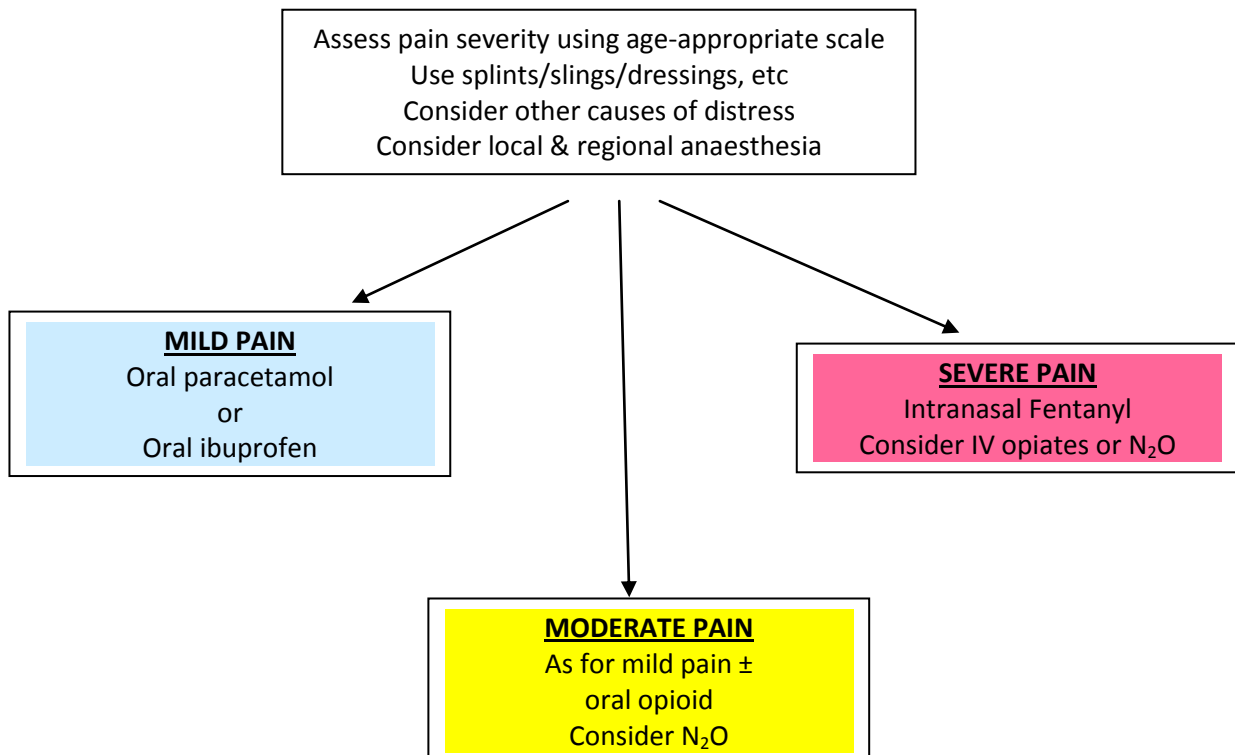
Although analgesics are usually the mainstay of “pharmacological” pain control, other methods of pain management such as psychological and physical therapies are important.

It is not always possible to achieve a completely “pain-free” condition but this should be the constant goal. It is important that the child is not restricted by pain if at all possible.

Treatment of pain is typically through one, but ideally both, of the following:

- Non-pharmacological methods
- Pharmacological methods

Algorithm for the ED management of acute pain in children



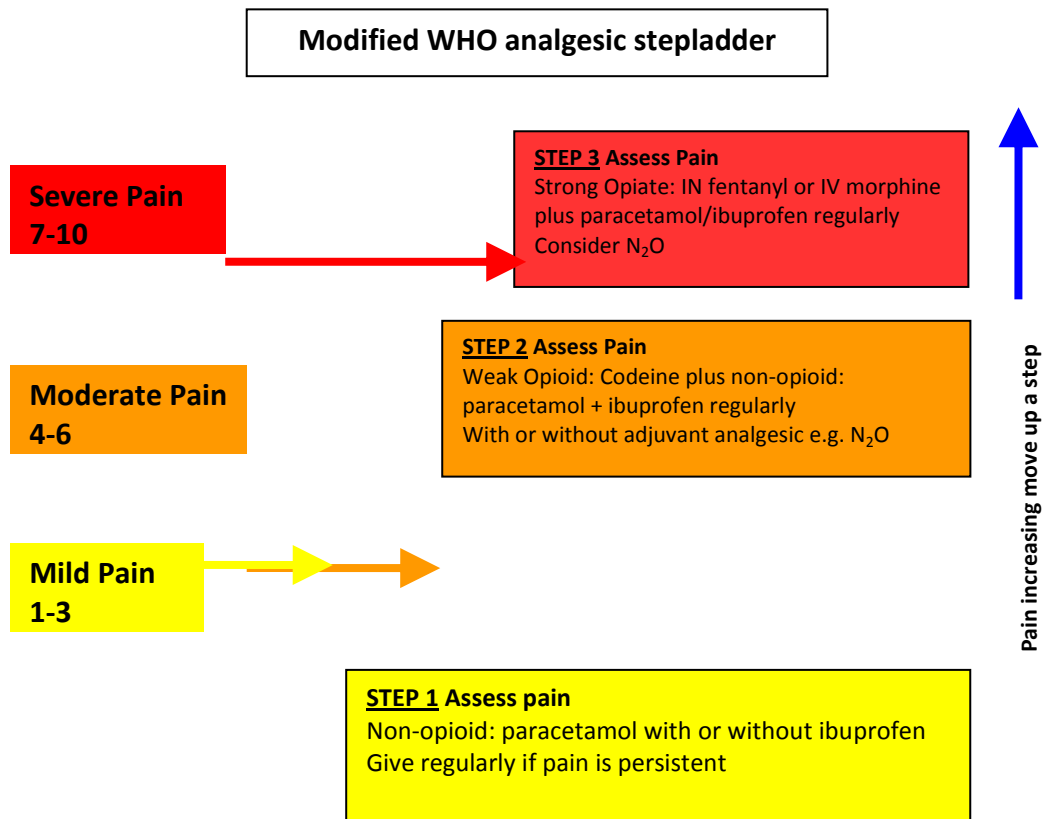
NON-PHARMACOLOGICAL METHODS OF PAIN MANAGEMENT

Non-pharmacological methods of pain control should fundamentally include verbal reassurance to both child and parent. A **child-friendly environment** may go a long way towards alleviation of pain. In addition, distraction techniques can be used to reduce situational anxiety in older children and reduce the parental perception of pain distress in younger children. A choice of age-appropriate distraction techniques such as music video games or a cartoon video can be used or a story to be read by a member of staff/parent or blowing bubbles. Early splinting of suspected fractures and dressing of wounds, e.g. specific burns dressings, are also known to reduce pain intensity.

PHARMACOLOGICAL METHODS OF PAIN MANAGEMENT

Analgesics comprise three classes:

- **Non-opioid** (Paracetamol and NSAIDs e.g. ibuprofen, diclofenac)
- **Opioid** (Weak (codeine) and Strong (morphine))
- **Other** e.g. inhaled analgesia such as nitrous oxide
- The World Health Organisation analgesia step ladder provides a framework to guide analgesic therapy. The concept behind the analgesic ladder is “**multi-modal analgesia**” i.e. drugs from each of the three classes of analgesic are used appropriately, either singly or in combination, to maximise their impact. Importantly if a patient is suffering from a severely painful condition such as a displaced fracture of diffuse burns then the first analgesic given should be opiate-based.



Pain increasing move up a step

Specific analgesic agents

- Paracetamol
- NSAIDs (including Ibuprofen and Diclofenac)
- Sucrose
- Opioids
 - Codeine
 - Morphine
 - Fentanyl
- Nitrous Oxide

PARACETAMOL

- Paracetamol is widely used in the management of pain and fever but lacks anti-inflammatory effects. When used in combination with opioids it has a synergistic effect, producing an analgesic effect comparable to a higher opioid dose. It has an excellent risk profile and few contraindications.
- There is no therapeutic advantage with intravenous paracetamol versus other routes of administration. IV paracetamol has utility only where other routes of administration are unavailable for clinical reasons.

Dosage to be administered under this guideline

- 15 mg/kg (max 60 mg/kg/day) orally or PR
 - For severe symptoms, use a loading dose 30 mg/kg PR

NON STEROIDAL ANTI-INFLAMMATORY DRUGS

The NSAIDs are a heterogeneous group of compounds that share common antipyretic, analgesic and anti-inflammatory effects. NSAIDs offer effective analgesia, anti-inflammatory properties and anti-pyretic effects. Like paracetamol, they are also synergistic with opioids and can reduce doses and hence side effects.

NSAIDs are rapidly absorbed in the gastrointestinal tract after oral administration in children. The rate and extent of rectal administration of NSAIDs such as ibuprofen or diclofenac is less than oral routes. The most common adverse events in NSAID recipients are nausea, dizziness and headache. NSAIDs have the potential to cause gastrointestinal irritation, blood clotting disorders, renal impairment, neutrophil dysfunction and bronchoconstriction effects. Renal compromise is described in children compromised by dehydration, hypovolaemia, hypotension or pre-existing renal disease. NSAIDs might also potentiate the toxicity of other drugs such as aminoglycosides and cyclosporin. NSAIDs unfortunately cannot be recommended for routine use in patients with significant burn injuries due to the already increased risk of renal failure.

Dosage to be administered under this guideline

- Ibuprofen
 - 7.5-10 mg/kg 6-8 hourly orally (max single dose 400 mg; maximum daily dose 20-30mg/kg/24 hours)
 - 60mg suppository: one suppository every 6-8 hours
- Diclofenac (> 6 months only)
 - 1 mg/kg 6-8 hourly PO or PR (max 3 mg/kg/day or 150mg daily)

SUCROSE

Sucrose administered orally before performing painful procedures has been shown to decrease the duration of crying, facial action associated with pain, heart rate and composite pain scores in infants less than 3 months of age.

Indications are any procedure that can be painful for a neonate or infant e.g. heel prick blood sampling, eye examination, insertion or removal of IV lines, phlebotomy, lumbar puncture, insertion of gastric tube, wound dressings, etc.

Sucrose is more effective if given with a soother as this promotes non-nutritive sucking which contributes to calming. Other strategies which assist in calming infants and can be used as an adjunct to sucrose include feeding (if allowed), cuddling, and swaddling. Other appropriate local or systemic analgesic agents should be administered as required.

Contraindications

- Neonates with known fructose intolerance
- Glucose-galactose malabsorption
- Sucrase-isomaltase deficiency
- Oesophageal Atresia or tracheal oesophageal fistula.
- Altered gag/swallow reflexes
- Pre-op sedated patients due to risk of aspiration.
- Neonates < 31 weeks post-conceptual age
- Maximum age of 52 weeks corrected conceptual age
- Parental refusal

Dosage to be administered under this guideline

- **>1500g:** 0.2-0.25ml of 24% Sucrose (*Sweetease*) dropped on the anterior tongue in divided doses 2 minutes before procedure, continue during procedure for a total dose of 2mls (action lasts approximately five minutes). No additional benefit has been demonstrated with doses in excess of 2ml.
- Maximum of 4 doses in 24 hours.
- There is no minimum interval time between doses of oral sucrose.

- **<1500g:** 0.1-0.2ml administered as above.
- Maximum dose: 0.5ml
- Maximum of 4 doses in 24 hours

Note: Discard remaining sucrose after the procedure.

- Sucrose is only effective if given orally. There is no effect if given via an oral or nasogastric tube.
- The addition of non-nutritive sucking enhances the analgesic effect of sucrose.

OPIOIDS

Opioids are a cornerstone of pain control. They are effective and the variety of drugs available provides a range of potencies, methods of administration and duration of actions. The effects of opioids are wide ranging and include clinically relevant side effects such as respiratory depression, itch, nausea and vomiting.

- **CODEINE**
 - 0.5-1 mg/kg orally (maximum 30mg per dose)
- **MORPHINE**
 - **Intravenous**
 - 0.05 - 0.1 mg/kg IV (reassess pain and administer 0.05mg/kg bolus for uncontrolled or unimproved pain)
 - **Oral**
 - 200-500 micrograms/kg orally (up to 6 times in 24 hours) >2yrs only
 - 1mth-1yr: 80-200 micrograms/kg
 - 1-2yrs: 200-400 micrograms/kg
- **FENTANYL**
 - **Intranasal**
 - 1.5 micrograms/kg/dose (use 50 microgram/mL solution)

Fentanyl (50mcg/ml) Intranasal Dose of for Weight guide

Weight	Dosage (1.5mcg/kg)	Volume(ml)
10	15	0.3
11	15	0.3
12	20	0.4
13	20	0.4
14	20	0.4
15	24	0.5
16	24	0.5
17	24	0.5
18-24	30	0.6
25-29	40	0.8
30-34	45	0.9
35-39	55	1.1
40-44	60	1.2
45-49	70	1.4
50-54	75	1.5
55-59	85	1.7
60-64	90	1.8
65-69	100	2

- Administration
 - Draw up dose plus additional to prime atomiser
 - Absorption from anterior nasal mucosa (patients do not need to sniff or breathe in)
 - Alternate each 0.5mLs of the dose between nostrils
 - Insert atomiser loosely and aim for centre of nasal cavity (depress plunger quickly)
 - Hold atomiser for 5-10 seconds after administration to ensure maximal absorption
- Intranasal fentanyl (INF) is typically used in the Emergency Department for severe pain associated with burns and long bone fractures.
- A video demonstration of the use of a mucosal atomiser device is available from this external [website](#).
- **Transmucosal lozenge (Actiq)** 200 microgram lozenge
 - 2-18yrs (>10kg): 15-20 microgram/kg as a single dose for breakthrough pain
 - Place lozenge next to buccal mucosa (between cheek and gum) moving it gently from side to side. Lozenge should be consumed in 15 minutes to achieve the desired onset and peak effect

Note:

- Titrate IV boluses (i.e. give 1/2 of dose first to determine effect, then repeat at 5 minute intervals as required up to maximum total dose).
- Respiratory depression risk - reduce doses if combined with sedatives. May get delayed respiratory depression after treating cause of pain. Use cautiously in infants and neonates consult senior physician before use in this age group. Observe children every 15 mins for first hour, every 30 mins for second hour, and hourly thereafter.
- Multi-trauma - do not withhold but give with caution, particularly if hypovolaemic.
- There is little or no role clinically for IM morphine.
- Intranasal fentanyl (INF) is not licensed for use in the ED setting in children but is used extensively nonetheless. Individual departments who wish to introduce INF for this purpose should seek the approval of the appropriate committee e.g. Drugs & Therapeutics Committee, etc.

NITROUS OXIDE

Nitrous oxide has been used for many years in EDs. It has both analgesic and amnesic properties. It has a quick onset of action and fast offset which makes it ideal for use in an emergency department. It has sedative properties and thus must be used on patients who are typically co-operative (i.e.>4yrs of age).

It comes as a pre-mixed 50:50 combination of nitrous oxide and oxygen on a demand triggered system (Entonox), or, less widely available, as a continuous flow via a mixer (maximum concentration is 70% N₂O:30% O₂).

Side-effects associated with administration of Nitrous Oxide

Side-effects are few and usually resolve once the child stops inhaling the Nitrous Oxide. Once increased sedation occurs, with Entonox the child will drop the mouthpiece, and thus inhale room air.

- Nausea
- Light-headedness
- Tingling of fingertips
- Earache if nitrous oxide accumulates in the middle ear
- Inactivation of Vitamin B12 has been reported with prolonged exposure to Entonox, which can cause megaloblastic changes to the red blood cells.

Indications

- Moderate-severe pain typically associated with bony and/or soft tissue injury

Contraindications

Conditions where air may be trapped in the body:

- Head injury with LOC or altered conscious state
- Raised intracranial pressure
- Chest injury or suspicion of pneumothorax
- Current acute asthma episode
- Maxillofacial injuries/surgery
- Middle ear occlusion
- Intestinal obstruction

TOPICAL AND REGIONAL ANAESTHESIA

In the management of traumatic wounds in particular, the adequate use of anaesthesia is necessary for complete examination, cleansing and repair of wounds.

- Topical anaesthesia
 - LAT (lignocaine/adrenaline/tetracaine) 0.1 ml/kg.
 - EMLA or Ametop applied to the wound (most effective on limb wounds)
- Local anaesthesia e.g. 1% lignocaine with adrenaline slowly infiltrated into the wound (care should be taken not to use adrenaline in anatomical areas with terminal circulation, such as the fingers, toes, ears and nose).
- Regional block e.g. infiltrate nerve proximal to injury (ring block digits - use plain lignocaine, no adrenaline); Nitrous oxide may facilitate a more comfortable injection.
- Bier's Block (intravenous regional anaesthesia)
 - To be performed by doctor of appropriate training only

GLOSSARY OF TERMS

Pain: Pain is a subjective experience as described in the formal definition: "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (www.iasp-pain.org). Note: The inability to communicate verbally does not negate the possibility that an individual is experiencing pain and is in need of appropriate pain-relieving treatment.

Procedure: Any medical intervention that may be potentially painful, or cause distress or anxiety.

Procedural sedation: Administration of sedatives or dissociative agents with or without analgesia to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function.

Analgesic: A drug or non-pharmacological technique that relieves pain.

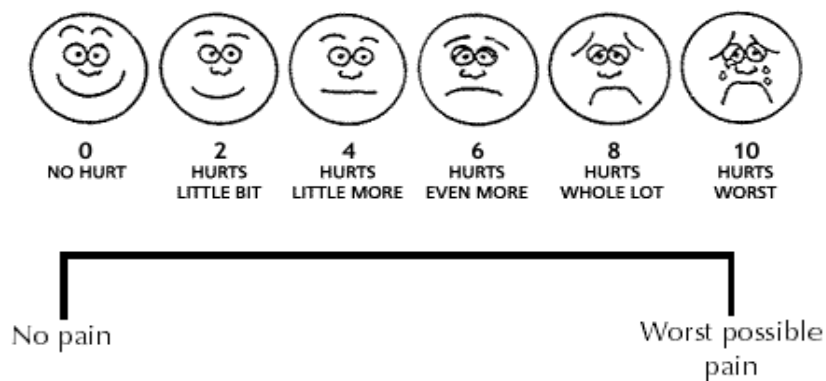
Non-pharmacological procedural pain management: The management of procedural pain and distress without medications. This includes behavioural and psychological techniques not only to manage and reduce pain but also to control anxiety and distress. Methods of non-pharmacological procedural pain management include appropriate preparation for the procedure, involvement of a support person for the child, appropriate surrounds and physical positioning of the child as well as specific psychological techniques such as distraction, deep breathing and relaxation.

APPENDIX: PAIN ASSESSMENT TOOLS

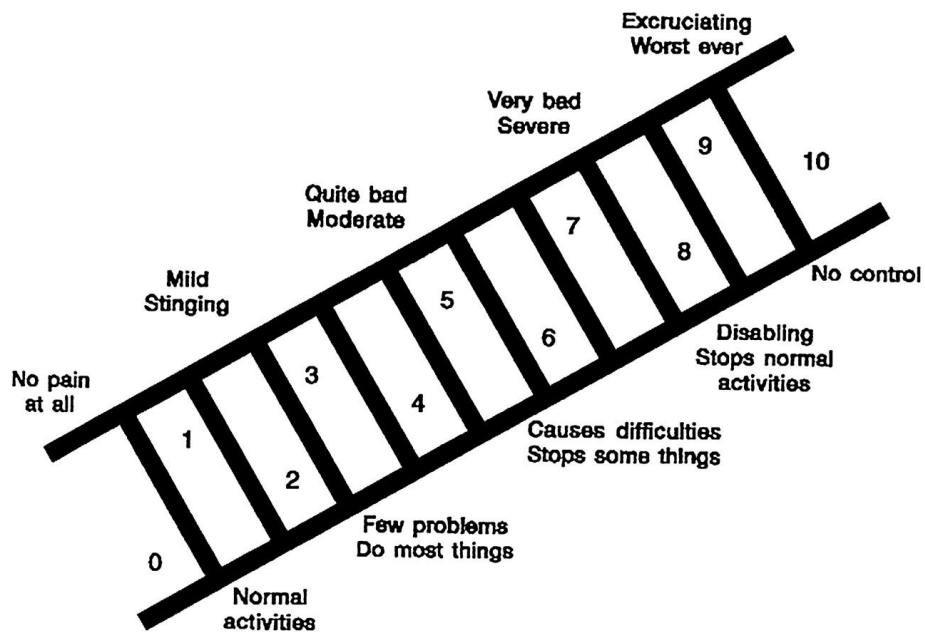
Faces, Legs, Activity, Cry, Consolability (FLACC) Scale

Category	FLACC SCALE		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractable	Difficult to console or comfort

Wong-Baker Faces Pain Rating Scale and Numeric Pain Scale



Pain Ruler



Alder Hey Triage Pain Scale

Table 1 The Alder Hey Triage Pain Score; reference scoring chart

Response	Score 0	Score 1	Score 2
1. Cry or voice	No complaint/cry Normal conversation	Consolable Not talking negative	Inconsolable Complaining of pain
2. Facial expression	Normal	Short grimace <50% of time	Long grimace >50% of time
3. Posture	Normal	Touching/rubbing/sparing	Defensive/tense
4. Movement	Normal	Reduced or restless	Immobile or thrashing
5. Colour	Normal	Pale	Very pale/"green"