

# PEDIATRIC ACUTE PAIN MANAGEMENT

Improve the safety and effectiveness of pain management in neonates, infants and children with these best practices. These recommendations may not be appropriate for patients with a primary pain disorder (chronic pain).

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The Kid Experts®

Level I Pediatric Trauma Center

## ANALGESIA for neonates and infants ages 0–6 months

Drug	Route	Pediatric dose (age)	Max. dose	Dosing interval
Acetaminophen*	PO, PR	15 mg/kg		6 hrs (max. 5 doses/day)
Morphine	PO	0.075–0.15 mg/kg (0–30 days) 0.08 mg/kg (1–12 mos)		6 hrs 4 hrs
Oxycodone	PO/SL	0.05 mg/kg (1–6 mos)		4–6 hrs
Acetaminophen	IV	<10 kg = 7.5 mg/kg	30 mg/kg/day	6 hrs
Fentanyl	IV	0.5–1 mcg/kg (0–12 mos)		2–4 hrs
Morphine	IV	0.025 mg/kg (0–30 days) 0.05 mg/kg (1–6 mos)		4 hrs
Fentanyl	PCA	<b>Continuous infusion:</b> 0.05 mcg/kg/hr (0–6 mos)		<b>1 hr max. limit =</b> 5 PCA demand doses
Morphine	PCA	<b>Continuous infusion:</b> 0.005 mg/kg/hr (0–30 days) 0.01 mg/kg/hr (1–6 mos)		<b>1 hr max. limit =</b> 5 PCA demand doses

\*Only if rectal or oral administration contraindicated; reevaluate daily.

## NON-OPIOIDS commonly used for mild to moderate pain (children >6 months of age and older)

Drug	Route	Pediatric dose	Max. dose	Dosing interval
Celecoxib*	PO	<50 kg = 1–2 mg/kg >50 kg = 50–100 mg	100 mg/all weights	12–24 hrs
Ibuprofen	PO	5–10 mg/kg	600 mg	6–8 hrs
Acetaminophen	PO	15 mg/kg	Do not exceed 650mg/dose. 3 g/24 hours preferred	4–6 hrs
Acetaminophen**	PR	15–20 mg/kg	3 g/24 hours preferred	4–6 hrs
Acetaminophen***	IV	<50 kg = 15 mg/kg/dose >50 kg = 650–1,000 mg	<50 kg = 15 mg/kg/dose >50 kg = 750 mg dose; 3 g/24 hours preferred	6 hrs
Ketorolac (Toradol)****	IV	0.5 mg/kg	15 mg	6–8 hrs

\*If classical NSAIDs contraindicated; safety and efficacy is not established in children less than 2 years of age.

\*\*Rectal acetaminophen is intended for use <48 hours. Oral administration is preferred.

\*\*\*ONLY if rectal or oral administration contraindicated; reevaluate daily.

\*\*\*\*Recommend dosing no longer than five days.

## OPIOID ANALGESICS commonly used for mild to moderate pain (children >6 months of age and older)

Drug	Route	Initial pediatric dose	Max. dose	Dosing interval
Oxycodone	PO	0.05 mg/kg	5 mg	4–6 hrs

Note: The use of acetaminophen and NSAIDs while taking opioids has been shown to reduce total opioid need. Consider prescribing acetaminophen and NSAIDs while on opioids if clinically indicated.

## PROCEDURAL PAIN

(e.g., for venipuncture, lab draws, suturing, dressing changes)

### 1. “Numb” the skin: topical local anesthetics

- **Should always be offered!** (Teenagers may decline)
- Choice of topical anesthetic depends on clinical scenario (ease of administration, cost, feasibility) — one of the following:
  - EMLA Cream (lidocaine 2.5% and prilocaine 2.5%) [at least 60 min]
  - 4% Lidocaine Topical Anesthetic Cream [at least 30 min]
  - J-tip (needleless lidocaine injector) [works in 1–3 minutes]
  - LET gel (for suturing): lidocaine 4%, epinephrine 0.18%, tetracaine 0.5% [30–45 minutes]

### 2. Sucrose or breastfeeding for children 0–12 months

- Reduces pain and cry during painful procedure
- Effective dose (24%): 0.05–0.5 mL (= 0.012–0.12 g)
- Administer 2 minutes prior to procedure, lasts about 4 minutes
- Breastfeeding should begin 2–5 minutes prior to procedure and continue throughout

### 3. Comfort positioning

- Infants <6 months: keep warm, swaddle and use facilitated tucking or skin to skin contact
- Upright positioning will increase sense of support and decrease pain and anxiety, suggest comfort positions (e.g., sit on parent lap, chest to chest hugging)

### 3. Comfort positioning, continued

- When feasible, offer choice to child (parent’s lap?)
- Encourage parent to hold or be close
- Child should **NOT** be held down by adults

### 4. Distraction and integrative therapies

- Identify modalities based on age and development: positioning, diaphragmatic breathing, distraction, imagery, hypnosis, books, bubbles and pinwheels; video games; tablet/smartphone apps, “Buzzy Bee”
- At time of injection, offer to rub or stroke skin near injection site
- Parent coaching: Nonprocedural talk, suggestions on how to cope, humor decrease children’s distress and pain
- Include child life specialist or assign parent/nurse as “comfort coach”

### 5. Other pharmacological approaches

- For short procedures (chest tube removal), consider using short acting opioid (e.g., intranasal fentanyl 1.5mcg/kg/dose; max dose 100 mcg, one additional 0.5–0.75 mcg/kg/dose (max 50mcg) at 10–20 minutes respectively at discretion of clinician)
- Consider use of nitrous oxide for minimal sedation for needle phobia or significant anxiety

*Disclaimer: This guideline is designed for general use with most patients; each clinician should use his or her own independent judgment to meet the needs of each individual patient. This guideline is not a substitute for professional medical advice, diagnosis or treatment.*

## OPIOID ANALGESICS commonly used for moderate to severe pain (children >6 months of age and older)

These represent starting doses only — children may require higher doses.

Drug	Route	Initial pediatric dose	Initial adult dose	Dosing interval
Hydromorphone	PO/SL	0.05 mg/kg	1–2 mg	3–4 hrs
Morphine	PO/SL	0.15–0.3 mg/kg	10–15 mg	2–4 hrs
Oxycodone	PO/SL	0.05 mg/kg if opioid naive; 0.1–0.15 mg/kg	5–10 mg	4–6 hrs
Fentanyl	Intranasal	1.5 mcg/kg; initial max. dose = 2 mcg/kg	100 mcg	Additional 0.5–0.75 mcg/kg dose at 10–20 min. if needed
Fentanyl	IV	0.5–1 mcg/kg	25–50 mcg	10 min–1 hr (bolus)
Hydromorphone	IV	0.01–0.015 mg/kg; initial max. dose = 0.5 mg	0.2–0.6 mg	3–4 hrs
Morphine	IV/SC	0.05–0.1 mg/kg	5–10 mg	2–4 hrs
Fentanyl	PCA	<b>Continuous infusion:</b> 1–2 mcg/kg/hr <b>PCA dose:</b> 1–2 mcg/kg/hr <b>Lockout:</b> 5–7 minutes	<b>Continuous infusion:</b> 50 mcg/hr <b>PCA dose:</b> 50 mcg <b>Lockout:</b> 5–7 minutes	<b>1 hr max.=</b> 5 PCA demand doses
Hydromorphone	PCA	<b>Continuous infusion:</b> 2–5 mcg/kg/hr <b>PCA dose:</b> 2–5 mcg/kg <b>Lockout:</b> 7–10 minutes	<b>Continuous infusion:</b> 100–250 mcg/hr <b>PCA dose:</b> 100–250 mcg <b>Lockout:</b> 7–10 minutes	<b>1 hr max.=</b> 5 PCA demand doses
Morphine	PCA	<b>Continuous infusion:</b> 0.015 mg/kg/hr <b>PCA dose:</b> 0.015 mg/kg	<b>Continuous infusion:</b> 3 mg/hr <b>Lockout:</b> 7–10 minutes	<b>1 hr max.=</b> 5 PCA demand doses

### Note:

- Opioid PCAs typically have the demand dose equal to the continuous infusion.
- Scheduled or PRN fentanyl is typically avoided given short time of effect (10–20 minutes).
- Long-acting opioids (e.g., methadone, buprenorphine, transdermal opioids) are typically reserved for pain and palliative care specialists.

### Medications NOT recommended:

- Codeine is not recommended for pediatric patients. Variations in pharmacogenomics-driven metabolism can lead to either low/no effect or dangerously toxic levels.
- Acetaminophen combination products (e.g., Tylenol #3, Vicodin [hydrocodone], Percocet [oxycodone]) are not recommended as dosing cannot be increased with increasing pain without risking associated liver toxicity of high doses of acetaminophen.
- Tramadol is reserved for proven and needed effect. Variations in pharmacogenomics-driven metabolism can lead to either low/no effect or dangerously toxic levels.

## OPIOID ANTAGONIST and side effect management

Drug	Route	Initial dose	Clinical indication	Dosing interval
Low dose Naloxone infusion	IV	0.5–2 mcg/kg/hr	Mild–moderate opioid induced side effects such as pruritus, nausea, etc. May be beneficial for patients on opioid PCAs	<b>Continuous infusion:</b> Typically start at 2 mcg/kg/hr

## WHO Principles of Pediatric Pain Management

1. Apply the WHO-pain ladder: Do **NOT** undermedicate; advance to opioids if pain control suboptimal
2. Use around the clock medications for predictable pain PLUS additional breakthrough doses (**NOT** just prn pain medication)
3. Use the simplest and least invasive routes whenever possible (e.g., oral vs. IV, NEVER IM)
4. Assess the pain regularly and change your plan accordingly
5. Always integrate non-drug strategies in combination with medications to enhance pain control (e.g., cuddling, distraction, relaxation techniques, massage, hypnosis, aromatherapy)

### Multi-modal analgesia

In complex pain situations opioids alone might not be sufficient. Effective opioid-sparing analgesia includes some or all of:

- Acetaminophen and/or NSAID/Cox-2 inhibitor
- Regional anesthesia (e.g., nerve block, epidural infusion)
- Adjuvant analgesia
- Physical therapy, sleep hygiene
- Psychology, child life

### Denying Pain

When a child denies or minimizes pain, consider possibility that the child:

- was previously treated for pain with injections or painful procedures
- has been encouraged to be “brave”
- lacks understanding that the pain can be treated
- lacks understanding regarding the words being used to ask about pain
- is afraid of medication side effects or addiction
- is worried that if still in pain, they will not be discharged as planned
- believes that tubes (such as NG) won’t come out until pain medications are stopped

If you have questions about medications or pain management, please call the Pain and Palliative Care Team 24/7 at **651-813-7888**.

## AVOID MEDICATION ERRORS while prescribing

Write comprehensive orders, avoid abbreviations.

- Spell out micrograms to avoid a transcription error.
- Spell out morphine, to avoid medication error when writing “ms.”
- Per kg dosing maximum = 50 kg (>50 kg = adult dosing)

Avoid decimal errors:

- Write “0.1” not “.1” / Write “1” not “1.0”. These can cause 10-fold dosing errors.
- NEVER prescribe volume [mL], ALWAYS prescribe dose [mg or mcg]

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