

**Common Challenges with Pediatric Pain**

- **Myth:** children do not feel pain as their nervous system is not developed.<sup>1</sup>
- **Myth:** Let's get it over with quickly; they won't remember, they're scared.
- Not anticipating painful procedures (e.g. urethral caths, NG tube, lab work).
- Not completing a full **assessment**<sup>2</sup> or difficulty in assessing pain in very young
- Fear of "masking" signs of a more serious etiology → No adverse outcome or delays in diagnosis attributed to administration of opioid analgesia in acute abdominal pain.<sup>3,4,5</sup>
- Fear of adverse events & overdose (sedation, respiratory depression)<sup>6</sup>
- Tendency to underdose (lack of parent/caregiver understanding of toxicity; dosing without dose calculation)<sup>7</sup>
- Maintenance of pain control when transitioning e.g. when going home

**Pain Assessment in Pediatrics (will vary with age, pain type, etc.)**

- **Acute pain** (assess pain intensity): **Self-report scales**:<sup>9</sup> **NRS-11** Numerical (ensure numeric competency), age ≥ 6 yrs; **FPS-R** Faces Pain Scale-Revised, ≥ 4-7 yrs;<sup>10</sup> **CAS** Color Analogue Scale, ≥ 8 yrs.
- Documenting pain score assoc. with ↑ analgesic use & ↓ acute pain.<sup>8</sup>

**Observational Report:** Observe changes from usual in cues (if self-report not possible)

|          |   |
|----------|---|
| Vocal    | • crying, screaming, yelling, moaning, whimpering             |
| Social   | • quietness, irritability, difficult to console               |
| Facial   | • furrowed brow, grimace, clenched teeth, tightly closed eyes |
| Activity | • less movement, agitated, guarding of a body part            |
| Physical | • pallor, sweat, gasping/breathing change, tense/stiff        |
| Other    | • changes in sleeping & eating patterns                       |

Also **FLACC** scale Face/Legs/Activity/Cry/Consolability, 2mos-7yrs post-op;<sup>11</sup> CPS Position 2022<sup>56</sup>

- **Chronic pain** (assess pain's interference → function & coping): **BAPQ** Bath Adolescent Pain Questionnaire, 11-18 yrs. Resource for more tools: [Holland Bloorview Kids Rehab Hospital](#).

**Acute Procedural Pain (e.g. needle pain<sup>57</sup>) – Multimodal Tips**

**Use 3P Approach: Psychological** prep, distraction, **Physical** positioning, **Pharm.**

- **Parent:** be present, engage child in non-procedure talk, assist with child's position for comfort (sitting upright on or beside parent), apply numbing cream (Topical anaesthetic: OTC; apply prior to appointment; may ↓ pain 40%; Table 2), don't say "it's ok" or "it will be over soon"
- **Neonate/infant:** swaddle, initiate breastfeeding 2-3min pre-procedure<sup>17,18</sup>, if breastfeeding not feasible (e.g. NPO, contraindicated, parent not available), give oral sucrose e.g. **TootSweet** sol'n 24%<sup>14,15,27</sup> + sucking 1-2min pre-procedure & repeat PRN.
- Antipyretics may ↓ vaccine immune response not clinically sig<sup>50</sup>; avoid giving pre-emptively
- **Age ≥ 1yr**<sup>25,26</sup>: age-appropriate distraction, numbing cream, upright position.
- **Distraction/psychological techniques**<sup>16</sup> - very useful if age appropriate:
  - toys, books, bubbles, music, humour, TV, imagery, breathing, blowing pinwheel
- Apply **vibration** on the skin above where the immunization will be given.
- **Older child (≥4yr)**: may also add preparation / explanation, **Cough Trick**.<sup>49</sup>
- **Give information:** brief description, what to expect feels cold/warm, little pinch, will help you!
- Choose words such as "pressure/immunization/poke", instead of "pain/shot/needle".
- Resource: [Taking Fear & Pain Out of Needles – For Your Child and You](#)

**Specific Therapeutic Considerations**

| ACUTE PAIN  |   |
|---|---|
| Abdominal acute<br>-consider pain, age, ...   | Opioid does not delay surgical decision <sup>appendicitis</sup> ; <sup>20</sup><br><b>Relaxed patient → better exam &amp; better diagnosis!</b>   |
| Burns, Minor <sup>21</sup><br><5% TBSA in children  | Cold compress x20-30min before applying a dressing.<br>Give oral analgesic (ibuprofen or acetaminophen).  |
| Earache<br>acute otitis media (AOM): always treat pain whether "watchful waiting" or using antibiotics. | Acetaminophen or ibuprofen. Ensure adequate dose, initiate quickly (1 <sup>st</sup> dose in emerg dept./ clinic!) Give around the clock x24-48hr.<br>Warm heat-pad or cloth often helps.<br><b>AURALGAN</b> ear drops (antipyrine & benzocaine): sensitizing;<br>AVOID if perforated ear drum. Option but minimally effective.  |
| Emergency trauma<br>(e.g. musculoskeletal injury)   | <b>Ibuprofen</b> better than acetaminophen or codeine for pain relief & length of relief in musculoskeletal injury (extremities, back & neck) in ED. <sup>24</sup><br><b>Opioids</b> morphine suitable if moderate to severe pain.<br><b>Oral ibuprofen</b> 10mg/kg = to oral morphine 0.5mg/kg for post-op ortho pain <sup>53</sup> extremity fracture pain <sup>54</sup> and morphine assoc. with more adverse effects.   |
| Open wound (Not near eye) <sup>28</sup>   | Cold compresses (e.g. for sprains), splinting, elevation, bandaging +/- dressing (immobilizing area can ↓ pain)<br><b>Anaesthetics:</b> administer <b>topically</b> e.g. <b>LET</b> (see below), direct local infiltration or regional nerve block. Tetanus status?<br><b>Tissue adhesive:</b> ↓ pain in simple laceration <3cm. <sup>29</sup>  |
| Post-op analgesia.<br>(Concurrent opioids via IV & epidural: resp. depr. <1%) <sup>32</sup>             | Start analgesia before child awakens (e.g. supp): regular NSAID + acetaminophen + may add opioid PRN x3-5d for severe pain (caution: post-adeno-tonsillectomy); <b>Multimodal approach:</b> regional block if appropriate, epidural, cold/warm compresses.  |
| COMMON MINOR PROCEDURES (3P Approach to ↑ coping & pain threshold)                                      |   |
| Heel poke   | Breastfeeding, sucrose, sucking. Topical anaesthetic <b>no</b> effect!  |
| IV insertion*   | <b>Sucrose alone</b> in healthy term newborns, ↓ pain more than liposomal lidocaine ± sucrose; <sup>50</sup> sucrose + EMLA was better if pre-term. <sup>55</sup><br><b>Topical anaesthetics</b> (Table 2); takes time to absorb; pain relief incomplete. Place over vein on ≥2 sites. (↑ in cannulation rate <sup>NNTs</sup> ; ↓ procedure time) <sup>30</sup> Avoid mucous membrane contact or ingestion. <b>AMETOP</b> superior to <b>EMLA</b> for needles; <sup>31</sup> Liposomal lidocaine: <b>MAXILENE</b> ; effective, fast.<br><b>Vapocoolant Spray: PAIN EASE</b> ; onset ≤60sec. <sup>48</sup><br><b>Nitrous oxide (N<sub>2</sub>O)</b> also useful. |
| Lumbar puncture*  | Topical anaesthetic; po acetaminophen or ibuprofen; may mix in po midazolam 1yr +; sucrose if infant  |
| NG Tube insertion   | Lidocaine jelly; sucrose & pacifier, or endotracheal spray if >2yr (burns & dose caution)   |

\*Preventing pain may decrease analgesic requirement for future procedures!  
Link: [Management of Chronic Pain in Children & Young People](#) Scottish Guidelines 2018

**Q&As**

- Is alternating acetaminophen with ibuprofen appropriate?**
- Increased risk of potential for errors & adverse events (e.g. renal)
  - **Monotherapy sufficient & preferred for vast majority**,<sup>33,47</sup> if not effective, may **switch** to or **add** the other. Mechanisms differ for pain; may give one around the clock, with other PRN for breakthrough.
  - May use concomitantly; if so, advise appropriate doses of each.

- Alternatives in topical/local anaesthetic allergy?**
- True allergy to local anesthetic is **rare**;<sup>34</sup> often due to preservative
  - Repeated use also ↑'s potential for hypersensitivity reactions
  - Consider formulation without preservative if available/suitable<sup>35</sup>
  - If allergy to **amide** (e.g. lidocaine, bupivacaine, mepivacaine, prilocaine): try an **ester** (procaine, tetracaine, benzocaine, cocaine) & vice versa.<sup>36</sup> {Allergy to both amide & ester: diphenhydramine 1% or benzyl alcohol; efficacy = to 1% lidocaine}

**Extras: Drugs for Procedural Sedation (sedative/hypnotic adjuncts)**

- Monitor for procedural sedation & vital signs. Check protocols & be aware of guidelines/liability implications (institutional/departmental/professional). Should not be providing sedation & doing procedure.
- **N<sub>2</sub>O**: (50/50mix O<sub>2</sub>, demand valve) age ≥ 3: quick 3 min, short acting good for IV starts; **CI**: pneumothorax, bowel obstruction
  - **Midazolam**: as adjunct prior to minor procedures; po onset 10-20min, duration 30-45min; po: <20kg: 0.5-0.75mg/kg/dose; ≥20kg: 0.3-0.5mg/kg/dose; Max 10-20mg po; **Note IV midazolam dose is MUCH lower than po dose!!! (1/10th the dose)** (IV: 0.05mg/kg/dose IV x1; repeat x1 PRN; onset 2-5min, duration 10-20min); **AE**: disinhibition, apnea, paradoxical agitation; **Caution:** ↓ hepatic / renal fx; **DI**: CNS depressants: ↓ dose of both. (Nasal limited study; faster onset but ↓ sedation & duration than po; less effective than intranasal ketamine.<sup>37</sup>)
  - **Ketamine**: follow protocol;<sup>38</sup> 0.5-2mg/kg IV; onset 1-5min; duration 15-60min; **AE**: nystagmus, dissociative (looks awake but is asleep; inform parents); vivid dreams x48hrs (add low dose midazolam if ≥10 yrs to prevent nightmares); ↑BP, HR, salivation (co-administer atropine with 1<sup>st</sup> dose);<sup>39</sup> rash common but transient. **Rare-Severe AE**: laryngospasm, apnea, resp depression, recovery agitation, Preserves pharyngeal & resp fx. **CI**: airway instability, URTI, ↑ICP, ↑BP, acute globe injury, glaucoma, thyrotoxicosis, psych disorder. Age >1yr preferred; **DI**: CYP 2B6.
  - **Fentanyl**: chest wall rigidity possible with midazolam
  - **Propofol**: **CAUTION - SIGNIFICANT TOXICITY!** → metabolic acidosis; ↑BP, ↑death in ICU! Reserve for anaesthesia.

- **Route of administration:** generally use IV, po; but pr rarely
- Avoid the **IM route** (add to pain; erratic absorption)<sup>40</sup>
  - PCA pump option in cancer pain for older children <sup>anaesthesia referral</sup>
  - Epidural: option if AEs to po, IV meds; consider when indicated e.g. amputation
  - Patch: convenient & less messy vs crms: strong adhesion & pain on removal.
- **Dosing:** by weight mg/kg or per body surface area, don't exceed max adult dosing.
- Be prepared to prevent drug side effects +/- treat as soon as they happen {e.g. nausea, constipation & itch with opioids; dry mouth <sup>mouth care</sup>}

Resource: Best Practices in Pain Assessment and Management for Children: Canadian Paediatric Society, 2022: <https://cps.ca/en/documents/position/pain-assessment-and-management>

Table 1: Pain Medication in Pediatrics - Overview (See also RxFiles pain-related charts at www.RxFiles.ca)

| Drug   | Dose in Peds [po unless otherwise indicated]   | Comments [Acetaminophen po: Max 90mg/kg/day some refs.]  |
|--|--|--|
| <b>Acetaminophen</b> <sup>TYLENOL</sup><br>Liquids, Chew-tab <sup>80</sup> , 160mg, Tab <sup>325mg</sup> , Supp <sup>120mg</sup> , 325mg | 10-15mg/kg q4-6h; Max 75mg/kg/day <sup>200wks</sup><br>{Drops <sup>Infant</sup> : 80mg/mL; Liquid: 160mg/5mL<br>Supp pr: 15-20mg/kg/dose Max 5 doses/24hr} OTC | • Caution if malnourished or dehydrated; ↑ hepatotoxicity?<br>• { <b>Loading dose</b> x1: Emerg or post-op option; ≤30mg/kg po; ≤40mg/kg rectal}; <sup>41</sup> (Toxic single dose <6yrs: ≥200mg/kg);<br><b>Newborn 4-40wks:</b> Max 60mg/kg/day; may give drops pr for doses ≤80mg  |
| <b>Ibuprofen</b> <sup>6mon</sup><br>Susp <sup>20,40mg/mL</sup> , Tab <sup>100,200mg</sup>  | 5-10mg/kg q6-8h; Max 40mg/kg/day<br>buprofen <b>MOTRIN, ADVIL OTC, Naproxen ALEVE OTC</b> ≥12yrs   | • may give acetaminophen & NSAID together for pain, not fever<br>• some concern: long-term use may restrict healing fractures<br>• caution in ↓ renal fx, dehydration & ? bleeding disorder<br>• celecoxib FDA approval: Juvenile RA >2yrs 10-25kg: 50mg po BID                      |
| <b>Naproxen</b> <sup>2yrs</sup><br>Susp <sup>25mg/mL</sup> , Tab <sup>125mg</sup>  | 5-7mg/kg BID; Max 20mg/kg/day;<br>{pr: 25-49kg: 250mg/dose; ≥50kg: 500mg dose}   | • monitor respirations *reassess/titrate: sup, tab, safe storage/disposal<br>• avoid meperidine (dysphoric, seizures *avoid tramadol in peds<br>• Note: <b>Codeine</b> <b>not</b> recommended in peds; avoid in lactation (morphine toxicity risk in ultrarapid CYP2D6 metabolizers) |
| <b>Morphine</b><br>Sol'n <sup>1,5,mg/mL</sup> , Supp <sup>5,10mg</sup> , Tab <sup>5,10mg</sup> (also SR & ER tabs)                       | 0.2-0.4mg/kg po q4h<br>{IV: 0.05-0.1mg/kg IV/subcut q2-4h}   | • potent; chest wall rigidity neonates; alternative routes incidental pain   |
| <b>Hydromorphone</b><br><b>FENTAANYL</b> <sup>CAUTION!</sup>   | 0.04-0.08mg/kg PO q3-4h<br>Patch <b>officially CI</b> : <18yrs & opioid-naive  |  |
| <b>Options for Neuropathic</b>   | Tricyclic Antidepressants (e.g. amitriptyline), anticonvulsants (e.g. gabapentin), SNRIs (e.g. duloxetine)   |  |

• **Opioid Reversal:** naloxone **NARCAN** • **Benzo Reversal:** Flumazenil (short acting, rarely needed). RA= rheumatoid arthritis AE= adverse events  
CI=contraindications crm=cream PACU=post anaesthesia care unit PCA=patient-controlled analgesia

Table 2: Topical Anaesthetics\*OTC <sup>See handout for admin</sup> Comments: use only on intact skin; avoid middle ear <sup>ototoxic</sup>

|  |  |
|--|--|
| <b>AMETOP</b> tetracaine (amethocaine) 4% Gel <sup>x @15/1.5g</sup><br>{ester} (write time on patch & remove per instructions <sup>blistering</sup> )  | • Apply 30min venipuncture to 45min venous cannulation <b>prior</b> ; occlusion required! Lasts 4-6hrs after removal; Age: >1mo <sup>term infant</sup> <b>Vasodilation</b> (erythema, edema); Refrigerate.   |
| <b>EMLA</b> lidocaine <sup>2.5%</sup> + prilocaine <sup>2.5%</sup> crm <sup>\$65/30g, patch, \$18/2pat</sup><br>{amide} (Patch *cannot be cut; remove before MRI scan)   | • 60+ min prior; occlusion required! Age: term infant; vasoconstriction (Rare: risk of methemoglobinemia: ↑ if <3mos; & in <1yr if DI's that ↑ Met-Hgb risk e.g. sulfonamides)   |
| <b>MAXILENE 5</b> Liposomal Lidocaine 5% crm <sup>x @ \$64-72/30g</sup>  | • 15-45+ min prior; lasts 1-2hr, occlusion <b>not</b> required; minimally vasoactive. (Various products - strength may vary - e.g. <b>LMX-4</b> = 4% crm)  |
| Similar alternative products 4-5% - <b>LMX-4, ELA-Max</b> (5% oint)  |  |
| <b>LET</b> lidocaine 4% / epinephrine 0.1% / tetracaine 0.5%<br><b>Epinephrine (E):</b> ↑ hemostasis, ↑ anaesthetic duration; (compound)<br><b>AVOID:</b> digits, nose, tip, ear, penis (2 <sup>nd</sup> necrosis <sup>end artery</sup> ).   | • Topical anaesthetic for <b>open wounds</b> ; <sup>esp facial/scalp</sup> if <5cm <sup>in length</sup> ; max 3mL<br>1) mix with cellulose <sup>form gel</sup> , apply to wound, cover - occlusive dressing<br>2) place LET soaked cotton ball into wound; apply pressure x20min |
| <b>Methylcellulose / epinephrine 0.05% / cocaine 11.8%</b>   | • Mixed solution with methylcellulose forms gel, preventing running; <b>LET preferred!</b>   |
| <b>Local Infiltration:</b> 1) warm anaesthetic <sup>37 C</sup> , 2) use smaller gauge needle (e.g. 27 or 30-gauge), 3) inject at slow rate, proximal borders 1 <sup>st</sup> , from inside wound edge, 4) pre-treat with topical anaesthetic, 5) consider buffering (sodium bicarb 9mL mix with 1mL 1mEq/mL bicarb) for less pain, 6) pressure |  |
| <b>Lidocaine (L):</b> local onset rapid; duration 30min<br>{duration 1-2hr if regional block}; Age 3yrs+ ✓<br>{L: 0.5%, 1%, 2%; L+E: 1%, 2%; (L+E no preservative: 1.5%)}  | <b>Mepivacaine:</b> local onset 6-10min; duration 1-3hrs;<br>- if Age <3yrs or weight <13.6kg, use [0.5-1.5%];<br>- little vasodilation & epinephrine seldom needed  |
|  | <b>Bupivacaine (B):</b> local onset 8-12min;<br>duration 4-6hr; Age 12yrs+ ✓<br><b>CI:</b> sulfite allergy {B: 0.25%, 0.5%; B+E: 1%, 2%}   |

\*avoid if amide allergy (rare); \*\* systemic toxicity (cardiac & CNS-seizures) possible but rare with appropriate use: (careful with dose & site).  
⊖=Exception Drug Status in SK X=Non-formulary in SK ⚡=prior approval for NIHB ⊗=not covered by NIHB ▼=covered by NIHB

## Pediatric Pain

**Acknowledgements:** Written by Loren Regier, Brent Jensen, and Beth Kessler. Updated by Amy Wiebe. External Contributors & Reviewers: Dr Krista Baerg (SHR-Peds), Dr. Jim Cross, Carl L von Baeyer, Janlyn Rozdilsky (Nurse Educator, RUH), S. Weins (SHR Ped Anesthesia), Carmen Bell (SDIS Drug Info, U of S), Dr Ron Siemens (SHR-Ped Emerg), Dr. Francesco Martino (Brampton), the SHR Pediatric Pain Committee, Amanda Barton.

**Disclosures:** No conflicts of interest are reported by the authors.

**Disclaimer:** RxFiles Academic Detailing is part of the College of Pharmacy and Nutrition at the University of Saskatchewan. The content of this work represents the research, experience, and opinions of the authors and not those of the University of Saskatchewan. Neither the authors nor the University of Saskatchewan nor any other party who has been involved in the preparation or publication of this work warrants or represents that the information contained herein is accurate or complete, and they are not responsible for any errors or omissions or for the result obtained from the use of such information. Any use of the materials will imply acknowledgment of this disclaimer and release any responsibility of the University of Saskatchewan, its employees, servants, or agents. Readers are encouraged to confirm the information contained herein with other sources.

## Pediatric Pain Online Extras

**Table 3: Additional Analgesic Options**

**AMETOP: tetracaine (amethocaine) 4% Gel:** Adults (including geriatrics) & children over 1 month of age: Apply contents of the tube to the skin starting from the centre of the area to be anesthetized & cover with an occlusive dressing. The contents expellable from 1 tube (approximately 1 g) will cover & anesthetize an area of up to 30cm<sup>2</sup> (6x5 cm (~ 3/4 area of a credit card)). Smaller areas of anesthetized skin may be adequate in infants & small children. Adequate anesthesia can usually be achieved for venepuncture following a 30-minute application time, & for venous cannulation following a 45-minute application time; after which the gel should be removed with a gauze swab & the site prepared with an antiseptic wipe in the normal manner. It is not necessary to apply tetracaine gel for longer than the above times & anesthesia is maintained for 4 to 6 hrs in most patients after a single application.

**EMLA (lidocaine and prilocaine)** - for intact skin, requires occlusion, needs to be applied for at least one hour **Dose** — To attain adequate anesthesia, 1 to 2 g of EMLA cream should be applied per 10 sq cm (approximate size of a Canadian "toonie") of skin and covered with an occlusive dressing for 45 to 60 minutes. The maximum application areas recommended for children are Less than 10 kg — 100 sq cm (~2.5x area of a credit card); 10 to 20 kg — 600 sq cm; Greater than 20 kg — 2000 sq cm; causes vasoconstriction & ? seizures.

- ◆ **Benzocaine** —in NG tube placement controversial.<sup>10</sup> Causes methemoglobinemia!!! **AVOID!**
- ◆ **Lidocaine iontophoresis (Numby Stuff):** mild electric current penetrates skin more quickly; effective in 10-20min.<sup>43</sup> EMLA similar or slightly better.<sup>44,45</sup> (Tingle may be bothersome.)
- ◆ **TAC** tetracaine 0.5% / epinephrine 0.05% / cocaine ≤ 11.8%; AE: seizures, arrhythmias, fatal; requires narcotic storage (LET preferred)
- ◆ **Cancer Pain:** see reference #46
- ◆ **Urethral Catheterization:** lidocaine gel 5-10 min prior to insertion while setting up then use as the lubricant as well (UI Children's hospital video: <https://www.youtube.com/watch?v=U9wnbmP5EpM>)
- ◆ **SaskPain:** <https://www.saskpain.ca/>
- ◆ **mom & kids Health Saskatchewan Pain Clinic:** <https://momsandkidsask.saskhealthauthority.ca/infant-child-health/specialty-care/pain-clinic>

**Health Canada Advisory, March 2009:** Caution regarding serious adverse events, including fatalities, with excessive application of topical anesthetics in adults & peds!

## FLACC SCALE – for assessing pain in very young children non-verbal; suitable for cognitively impaired

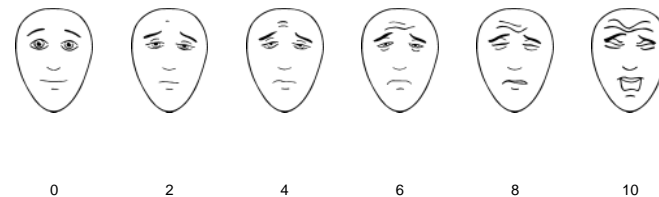
|                      |  |   |   |
|----------------------|--|---|---|
| <b>Face</b>          | No particular expression or smile            | Occasional grimace or frown, withdrawn, disinterested | Frequent to constant quivering chin, clenched jaw     |
| <b>Legs</b>          | Normal position or relaxed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

## Pain Intensity Scoring:

- ◆ Chose a scale that is age appropriate to patient & become familiar with using!
- ◆ Interpret in light of any other pain related physical factors (e.g. heart rate)
- ◆ Also interpret according to trends for improvement or worsening of pain control
- ◆ Sherbrooke algorithm for acute pain in children (post-op): gave regular analgesic according to pain scale: {0-3: acetaminophen; 3-6: naproxen + acetaminophen; 6-9: morphine + naproxen + acetaminophen; 9-10: notify MD. Overall ↓ in pain scores & a ↓ in opioid requirement as algorithm required patient to receive round the clock acetaminophen and NSAID if opioid received.}
- ◆ Other links: **Visual Analogue Scale:** suitable for age 7+ (McGrath PA, Seifert CE, Speechley KN, et al. A new analogue scale for assessing children's pain: an initial validation study. Pain. 1996 Mar;64(3):435-43.) **Oucher Scale:** age 3-12: <http://www.oucher.org/history.html> BMJ Clinical Review: Pain Management and Sedation for Children in the Emergency Setting: [http://www.bmj.com/cgi/content/full/339/oct30\\_1/b4234](http://www.bmj.com/cgi/content/full/339/oct30_1/b4234)

## Faces Pain Scale – Revised (FPS-R) – age 4+

This is a thumbnail image. The full-size FPS-R with instructions is available at <https://www.iasp-pain.org/resources/faces-pain-scale-revised/>. Numbers are not shown to children.



From: Hicks CL, von Baeyer CL, Spafford PA, Van Kortaar I, Goodenough B. The Faces Pain Scale – Revised. Toward a common metric in pediatric pain measurement. Pain 2001;93:173-183. ©2001 International Association for the Study of Pain. Reprinted with

## Search Terms

|                    |     |
|--------------------|-----|
| Acetaminophen      | 139 |
| ADVIL              | 139 |
| ALEVE              | 139 |
| AMETOP             | 139 |
| Anesthetic         | 139 |
| AURALGAN           | 139 |
| Breastfeed         | 139 |
| Bupivacaine        | 139 |
| Codeine            | 139 |
| EMLA               | 139 |
| Fentanyl           | 139 |
| Hydromorphone      | 139 |
| Ibuprofen          | 139 |
| Ketamine           | 139 |
| LET                | 139 |
| Lidocaine          | 139 |
| MAXILENE           | 139 |
| Mepivacaine        | 139 |
| Midazolam          | 139 |
| Morphine           | 139 |
| MOTRIN             | 139 |
| Naloxone           | 139 |
| Naproxen           | 139 |
| NARCAN             | 139 |
| Nitrous Oxide      | 139 |
| Pain               | 139 |
| PAIN EASE          | 139 |
| Pediatric Pain     | 139 |
| Prilocaine         | 139 |
| Propofol           | 139 |
| Sucrose            | 139 |
| Tetracaine         | 139 |
| Topical Anesthetic | 139 |
| TYLENOL            | 139 |

## References Pediatric Pain:

- Anand KJ, Hickey PR. Pain and its effects in the human neonate and fetus. *N Engl J Med.* 1987 Nov 19;317(21):1321-9. (Also: Finley, G.A., Franck, L.S., Grunau, R.E., & von Baeyer, C.L. (2005). Why children's pain matters. International Association for the Study of Pain. *Pain: Clinical Updates*, XIII(4), 1-6. Online (PDF) available at <http://www.iasp-pain.org/AM/Template.cfm?Section=Resources1&Template=/CM/ContentDisplay.cfm&ContentID=2265> ;
- Taylor EM, Boyer K, Campbell FA. Pain in hospitalized children: A prospective cross-sectional survey of pain prevalence, intensity, assessment and management in a Canadian pediatric teaching hospital. *Pain Res Manag.* 2008 Jan-Feb;13(1):25-32.
- McHale PM, LoVecchio F. Narcotic analgesia in the acute abdomen--a review of prospective trials. *Eur J Emerg Med.* 2001 Jun;8(2):131-6.
- Ann Emerg Med.* 2007 Oct;50(4):371-8. Epub 2007 Jun 27. Efficacy and impact of intravenous morphine before surgical consultation in children with right lower quadrant pain suggestive of appendicitis: a randomized controlled trial. Bailey B, Bergeron S, Gravel J, Bussi eres JF, Bensoussan A.
- Thomas SH, Silen W. *Br J Surg* 2003;90(1):5-9. & *J Fam Pract.* 2003;52(6):435-6. Effect on diagnostic efficiency of analgesia for undifferentiated abdominal pain.
- Zemsky WT, Cravero JP. Relief of pain and anxiety in pediatric patients in emergency medical systems. *Pediatrics.* 2004 Nov;114(5):1348-56.
- Dlugosz CK, Chater RW, Engle JP. Appropriate use of nonprescription analgesics in pediatric patients. *J Pediatr Health Care.* 2006;20(5):316-25; quiz 326-8.
- Drendel AL, Brousseau DC, Gorelick MH. Pain assessment for pediatric patients in the emergency department. *Pediatrics.* 2006 May;117(5):1511-8.
- Birnie KA, Hundert AS, Lalloo C, Nguyen C, Stinson JN. Recommendations for selection of self-report pain intensity measures in children and adolescents: a systematic review and quality assessment of measurement properties. *Pain.* 2019 Jan;160(1):5-18. doi: 10.1097/j.pain.0000000000001377. PMID: 30180088. (Previous: von Baeyer CL. Children's self-reports of pain intensity: scale selection, limitations and interpretation. *Pain Research and Management* 2006;11(3):157-62.)
- Hicks CL, von Baeyer CL, Spafford PA, van Korlaar I, Goodenough B. The **Faces Pain Scale-Revised**: toward a common metric in pediatric pain measurement. *Pain* 2001;93(2):173-83 Available online at: <http://www.iasp-pain.org/FPSR>. See thumbnail of scale at lower right of page.
- Merkel SJ, Voepel-Lewis T, Shayevitz J, Malviya S. The FLACC: a behavioral scale for scoring postoperative pain in young children. *Pediatr Nurs.* 1997 May-Jun;23(3):293-7. Accessible online: <http://www.childcancerpain.org/content.cfm?content=assess08>
- Stinson JN, Kavanagh T, Yamada J, Gill N, Stevens B. Systematic review of the psychometric properties, interpretability and feasibility of self-report pain intensity measures for use in clinical trials in children and adolescents. *Pain* 2006;125(1-2):143-57.
- von Baeyer CL, Spagrud LJ. Systematic review of observational (behavioral) measures of pain for children & adolescents aged 3 to 18 years. *Pain* 2007;127:140-50.
- Stevens B, Yamada J, Ohlsson A. Sucrose for analgesia in newborn infants undergoing painful procedures. *Cochrane Database Syst Rev.* 2004;(3):CD001069.
- Acad Emerg Med.* 2006 Jun;13(6):617-22. Epub 2006 Apr 24. A randomized, controlled trial of sucrose analgesia in infants younger than 90 days of age who require bladder catheterization in the pediatric emergency department. Rogers AJ, Greenwald MH, Deguzman MA, Kelley ME, Simon HK.
- Uman LS, Chambers CT, McGrath PJ, Kisely S. Psychological interventions for needle-related procedural pain and distress in children and adolescents. *Cochrane Database of Systematic Reviews.* 2006 Oct 18;(4):CD005179.0
- Shah PS, Aliwalas L, Shah V. Breastfeeding or breastmilk to alleviate procedural pain in neonates: a systematic review. *Breastfeed Med.* 2007 Jun;2(2):74-82. Shah PS, Aliwalas L, Shah V. Breastfeeding or breast milk for procedural pain in neonates. *Cochrane Database Syst Rev.* 2006 Jul 19;3:CD004950
- Efe E, Ozer ZC. The use of breast-feeding for pain relief during neonatal immunization injections. *Appl Nurs Res.* 2007 Feb;20(1):10-6.
- Lakeside clinic medical staff. {Quote: "I usually tell them I'm going to have to pinch them for a second (again no need to know the pinch is a needle) and that I'm going to put some magic potion on the cut so it doesn't hurt anymore. Parents can read to them from a BIG picture book if the wound is below their eyes, which also blocks their view of what I'm doing. Also, when inserting a needle, the tissue edge of the wound has no pain receptors, so entering the tissue from the wound edge, rather than going through skin is helpful. They still feel the burn of the local, but not the sharpness of the needle. Local kept in a warming cupboard or neutralized with bicarb is less painful too. Kids LOVE to talk about themselves--so asking lots of questions about who they play with, what their favorite things are, etc is a big distraction." }
- Bailey B, Bergeron S, Gravel J, Bussi eres JF, Bensoussan A. Efficacy & impact of intravenous morphine before surgical consultation in children with right lower quadrant pain suggestive of appendicitis: a randomized controlled trial. *Ann Emerg Med.* 2007 Oct;50(4):371-8.
- Singer et al. Management of Local Burns in the ED. *The Am J of Emerg Med* 2007;25:666-71. Estimation of burn size for PDA: <http://www.sagediagram.com/>
- Moore AJ, Shevell M. Chronic daily headaches in pediatric neurology practice. *J Child Neurol.* 2004 Dec;19(12):925-9. [http://www.medscape.com/viewarticle/501997\\_print](http://www.medscape.com/viewarticle/501997_print)
- Gunner KB, Smith HD. Practice guideline for diagnosis & management of migraine headaches in children & adolescents: Part 2. *J Pediatr Health Care* 2008;22:52-9.
- Clark E, Plint AC, Correll R, Gaboury I, Passi B. A randomized, controlled trial of acetaminophen, ibuprofen, and codeine for acute pain relief in children with musculoskeletal trauma. *Pediatrics.* 2007 Mar;119(3):460-7. Comment in: *Evid Based Med.* 2007;12(5):144. *Pediatrics.* 2007;120(1):237; author reply 237-8.

25. Schechter NL, Zempsky WT, Cohen LL, McGrath PJ, McMurtry CM, Bright NS. Pain reduction during pediatric immunizations: evidence-based review and recommendations. *Pediatrics*. 2007 May;119(5):e1184-98.
26. Taddio A, Manley J, Potash L, Ipp M, Sgro M, Shah V. Routine immunization practices: use of topical anesthetics & oral analgesics. *Pediatrics* 2007;120(3):e637-43.
27. Hatfield LA, Gusic ME, Dyer AM, Polomano RC. Analgesic properties of oral sucrose during routine immunizations at 2 and 4 months of age. *Pediatrics*. 2008;121. Harrison D, et al. Efficacy of sweet solutions for analgesia in infants between 1 and 12 months of age: a systematic review. *Arch Dis Child*. 2010 Jun;95(6):406-13. [Home made sugar solution: 1 packet or 1 sugar cube mixed into 10ml water. Taddio A. *New Clinical Practice Guideline for pain...childhood vaccination*. *CPJ* 2011;144(3):114-115]
28. O'Sullivan R, Oakley E, Starr M. Wound repair in children. *Aust Fam Physician*. 2006 Jul;35(7):476-9.
29. Farion KJ, Osmond MH, Hartling L, Russell KF, Klassen TP, Crumley E, Wiebe N. Tissue adhesives for traumatic lacerations: a systematic review of randomized controlled trials. *Acad Emerg Med*. 2003 Feb;10(2):110-8. Review.
30. Taddio A, Soin HK, Schuh S, Koren G, Scolnik D. Liposomal lidocaine to improve procedural success rates and reduce procedural pain among children: a randomized controlled trial. *CMAJ*. 2005 Jun 21;172(13):1691-5.
31. Lander JA, Weltman BJ, So SS. **Cochrane Database** 2006;19;3:CD004236.EMLA & amethocaine for reduction of children's pain associated with needle insertion.
32. Anghelescu DL, Ross CE, Oakes LL, Burgoyne LL. The Safety of Concurrent Administration of Opioids via Epidural and Intravenous Routes for Postoperative Pain in Pediatric Oncology Patients. *J Pain Symptom Manage*. 2008 Feb 19; [Epub ahead of print] PMID: 18291619
33. Therapeutic Dilemma Alternating acetaminophen and ibuprofen. *L Shortridge, V Harris February 2007, Volume 12 Issue 2: 127-128*  
Mehlich Donald R., Aspley Sue, Daniels Stephen E., et al., Comparison of the analgesic efficacy of concurrent **ibuprofen and paracetamol** with ibuprofen or paracetamol alone in the management of moderate to severe acute postoperative dental pain in adolescents and adults: A randomized, double-blind, placebo-controlled, parallel-group, single-dose, two-center, modified factorial study, *Clinical Therapeutics*, Volume 32, Issue 5, May 2010, Pages 882-895.  
Paul IM, Sturgis SA, Yang C, et al. Efficacy of standard doses of **ibuprofen alone, alternating, and combined with acetaminophen** for the tx of febrile children. *Clin Ther*. 2010 Dec;32(14):2433-40.  
Pursell E. Systematic review of studies comparing combined treatment with paracetamol and ibuprofen, with either drug alone. *Arch Dis Child*. 2011 Dec;96(12):1175-9.
34. Eggleston ST, Lush LW. Understanding allergic reactions to local anesthetics. *Ann Pharmacother*. 1996 Jul-Aug;30(7-8):851-7.
35. DeBoard RH, Rondeau DF, Kang CS, et al. Principles of basic wound evaluation & management in the emergency department. *Emerg Med Clin North Am*. 2007;25:23-39.
36. Therapeutic Choices 5<sup>th</sup> ed. Canadian Pharmacists Association 2007. Editor J Gray. (pg 201).
37. Nasal Midazolam for Sedation in Pediatric Patients Prior to Invasive Procedures. CADTH HTIS. Email: [this@cadth.ca](mailto:this@cadth.ca)
38. PA protocols - in PA Pearls January 1999. Accessed online at: <http://www.erpearls.com/content/publications/01%20PA%20Pearls%20JAN%2099.pdf>
39. Confirmed by Emergency Medicine: A Comprehensive Study Guide – 6<sup>th</sup> Ed(2004) through StatRef <http://online.statref.com.cyber.usask.ca/document.aspx?fxid=80&docid=949>
40. Acute Pain Management And Procedural Sedation In Children - Michael N. Johnston, Erica L. Liebelt (STAT REF)
41. Birmingham PK, Tobin MJ, Fisher DM, et al. Initial & subsequent dosing of rectal acetaminophen in children: a 24-hour pharmacokinetic study of new dose recommendations. *Anesthesiology*. 2001;94:385-9. [See also: Kleiber C. Acetaminophen dosing for neonates, infants, & children. *J Soc Pediatr Nurs*. 2008;13:48-9. ]
42. Emslander HC. Local and topical anesthesia for pediatric wound repair: a review of selected aspects. *Pediatr Emerg Care*. 1998 Apr;14(2):123-9.
43. UPTODATE reference on topical anaesthesia (2006) (<http://www.uptodate.com/home/index.html>)
44. Eur J Anaesthesiol. 2004 Mar;21(3):210-3. Comparison of EMLA and lidocaine iontophoresis for cannulation analgesia. Moppett IK, Szypula K, Yeoman PM
45. Galinkin JL, Rose JB, Harris K, Watcha MF. Lidocaine iontophoresis versus eutectic mixture of local anesthetics (EMLA) for IV placement in children. *Anesth Analg*. 2002;94:1484-8.
46. Pediatric Cancer Pain; Access: [http://www.nccn.org/professionals/physician\\_gls/PDF/pediatric\\_pain.pdf](http://www.nccn.org/professionals/physician_gls/PDF/pediatric_pain.pdf) ; National Comprehensive Cancer Network (NCCN) ; 2006
47. Sarrell EM, Wielunsky E, Cohen HA. Antipyretic treatment in young children with fever: acetaminophen, ibuprofen, or both alternating in a randomized, double-blind study. *Arch Pediatr Adolesc Med*. 2006 Feb;160(2):197-202
  
48. Farion KJ, Splinter KL, Newhook K, Gaboury I, Splinter WM. The effect of vapocoolant spray on pain due to intravenous cannulation in children: a RCT. *CMAJ*. 2008;179:31-6.
49. Wallace DP, Allen KD, Lacroix AE, et al. The **"Cough Trick,"** a Brief Strategy to Manage Pediatric Pain From Immunization Injections. *Pediatrics*. 2010 Jan 11.
50. Taddio A, Shah V, Stephens D, et al. Effect of Liposomal Lidocaine and **Sucrose** Alone and in Combination for **Venipuncture** Pain in Newborns. *Pediatrics*. 2011 Mar 14.
51. Wren AA, Ross AC, D'Souza G, et al. Multidisciplinary Pain Management for Pediatric Patients with Acute and Chronic Pain: A Foundational Treatment Approach When Prescribing Opioids. *Children (Basel)*. 2019;6(2):33. Published 2019 Feb 21. doi:10.3390/children6020033.
52. Managing pain and distress in children undergoing brief diagnostic and therapeutic procedures. *Paediatr Child Health*. 2019 Dec;24(8):509-535. doi: 10.1093/pch/pxz026. Epub 2019 Dec 9. PMID: 31844394; PMCID: PMC6901171. [Accessed online](#).
53. Poonai N, et al. **Oral morphine versus ibuprofen** administered at home for **postoperative orthopedic pain in children**: a randomized controlled trial. *CMAJ*. 2017 Oct 10;189(40):E1252-E1258.
54. Poonai N, Bhullar G, Lin K, et al. Oral administration of morphine versus ibuprofen to manage postfracture pain in children: a randomized trial. *CMAJ*. 2014;186(180):1358-1363.
55. Biran V, Gourrier E, Cimerman P, Walter-Nicolet E, Mitanchez D, Carbajal R. Analgesic effects of EMLA cream and oral sucrose during venipuncture in preterm infants. *Pediatrics*. 2011 Jul 1;128(1):e63-70.
56. Trottier ED, Ali S, Dore-Bergeron M-J, et al. Best practices in pain assessment and management for children. *Canadian Pediatric Society Position Statement*. *Paediatr Child Health* 2022 27(7):429-437.
57. Taddio A, McMurtry CM, Shah V, et al. Reducing pain during vaccine injections: clinical practice guideline. *CMAJ*. 2015 Aug 24;187(13):975-982. <http://www.cmaj.ca/content/early/2015/08/24/cmaj.150391.full.pdf>.
58. Oskoui M, Pringsheim T, Billingham T, et al. Practice Guideline Update: Pharmacologic treatment for pediatric migraine prevention. *American Academy of Neurology and the American Headache Society*. Aug 2019. Available from: <https://www.aan.com/Guidelines/home/GuidelineDetail/967>. (last accessed Apr 19, 2023).
59. Maneval M, Vemuri-Reddy S. Does premedication with ibuprofen affect the immunogenicity of childhood vaccinations more than acetaminophen? *Evidence-Based Practice*. March 2021;24(3):22-23. DOI: 10.1097/EBP.0000000000000930.

## Additional References

- Adams Denise, Cheng Florence, Jou Hsing, et al. The Safety of Pediatric **Acupuncture**: A Systematic Review. *Pediatrics* 2011; peds.2011-1091; November 21, 2011
- Ahola Kohut S, Stinson JN, Ruskin D, et al. iPeer2Peer program: a pilot feasibility study in adolescents with chronic pain. *Pain*. 2016 May;157(5):1146-55.
- Ahrari M, Ali S, Hartling L, et al. **Nonmedical Opioid** Use After Short-term Therapeutic Exposure in Children: A Systematic Review. *Pediatrics*. 2021;148(6):e2021051927
- Anghelescu DL, et al. Prospective Randomized Crossover Evaluation: Three Anesthetic Regimens for Painful Procedures in Children with Cancer. *J Pediatr*. 2012 Aug 8.
- Atkinson Paul, Chesters Adam, Heinz Peter. Pain management and sedation for children in the **emergency** department. *BMJ* 2009;339:b4234, doi: 10.1136/bmj.b4234
- Axelin A, Salantera S, Kirjavainen J, et al. Oral glucose and parental holding preferable to opioid in pain management in preterm infants. *Clin J Pain*. 2009 Feb;25:138-45. Our study demonstrated that **"facilitated tucking by parents"** is not just equal, but preferable to other pain management methods when both efficacy and safety are considered.
- Babl FE, Goldfinch C, et al. Does **nebulized lidocaine** reduce the pain and distress of **nasogastric tube** insertion in young children? A randomized, double-blind, placebo-controlled trial. *Pediatrics*. 2009 Jun;123(6):1548-55. Nasogastric tube insertion results in very high FLACC scores irrespective of lidocaine use. [Nebulized lidocaine cannot be recommended as pain relief for nasogastric tube insertion](#) in children. The delay and distress of nebulization likely outweigh a possible benefit in the postinsertion period.
- Bapat R, Duran M, Piazza A, et al. A Multicenter Collaborative to Improve **Postoperative Pain Management in the NICU**. *Pediatrics*. 2023 Jul 6:e2022059860. doi: 10.1542/peds.2022-059860.
- Belliveau MJ, Jordan DR. **Minimizing injection pain**. *CMAJ*. 2012 Oct 16;184(15):1715.
- Bembich S, Cont G, Baldassi G, et al. **Maternal Holding vs Oral Glucose Administration** as Nonpharmacologic Analgesia in Newborns: A Functional Neuroimaging Study. *JAMA Pediatr*. 2015 Mar 1;169(3):284-5.
- Bembich S, Cont G, Causin E, Paviotti G, Marzari P, Demarini S. **Infant Analgesia** With a Combination of Breast Milk, Glucose, or Maternal Holding. *Pediatrics*. 2018 Sep;142(3). pii: e20173416
- Biran V, Gourrier E, et al. Analgesic Effects of **EMLA Cream and Oral Sucrose** During Venipuncture in Preterm Infants. *Pediatrics*. 2011 Jul;128(1):e63-70.
- Bloch-Salisbury E, Wilson JD, Rodriguez N, et al. **Efficacy of a Vibrating Crib Mattress** to Reduce Pharmacologic Treatment in Opioid-Exposed Newborns: A Randomized Clinical Trial. *JAMA Pediatr*. 2023 May 15:e231077.
- Brummelte S, Grunau RE, Chau V, et al Procedural pain and brain development in **prematu**re newborns. *Ann Neurol*. 2012 Feb 28.
- Bueno M, Stevens B, et al. Breast Milk and **Glucose 25%** for Pain Relief in Preterm Infants: A Noninferiority Randomized Controlled Trial. *Pediatrics*. 2012 Mar 5.
- Bullock B et al. Reliability of the **color analog scale**: Repeatability of scores in traumatic and nontraumatic injuries. *Acad Emerg Med* 2009 May; 16:465.
- Campbell-Yeo ML, Johnston CC, et al. **Cobedding** and recovery time after heel lance in preterm twins: results of a randomized trial. *Pediatrics*. 2012 Sep;130(3):500-6.
- Carbajal R, Rousset A, et al. Epidemiology and treatment of painful procedures in neonates in intensive care units. *JAMA*. 2008 Jul 2;300(1):60-70. During neonatal



intensive care in the Paris region, large numbers of painful and stressful procedures were performed, the majority of which were not accompanied by analgesia.

Chan E, Hovenden M, Ramage E, et al. **Virtual Reality for Pediatric Needle Procedural Pain:** Two Randomized Clinical Trials. *J Pediatr.* 2019 Jun;209:160-167.e4.

Chester SJ, Tyack Z, De Young A, et al. Efficacy of **hypnosis on pain, wound-healing, anxiety, and stress in children with acute burn injuries:** a randomized controlled trial. *Pain.* 2018 Sep;159(9):1790-1801.

Chermont, Aurimery Gomes, Falcao, Luis Fabio Magno, et al. Skin-to-Skin Contact and/or Oral 25% Dextrose for Procedural Pain Relief for Term Newborn Infants. *Pediatrics* 2009 124: e1101-e1107.

Chowdhary S, Bukoye B, Bhansali AM, et al. Risk of Topical **Anesthetic-Induced Methemoglobinemia:** A 10-Year Retrospective Case-Control Study. (benzocaine) *JAMA Intern Med.* 2013 Apr 1:1-6.

Chua ME, Firaza PNB, Ming JM, et al. **Lidocaine Gel for Urethral Catheterization in Children:** A Meta-Analysis. *J Pediatr.* 2017 Sep 13.

Cignacco EL, Sellam G, et al. **Oral Sucrose** and "Facilitated Tucking" for Repeated Pain Relief in Preterms: A Randomized Controlled Trial. *Pediatrics.* 2012 Jan 9.

Cobb JE, Cohen LL. A randomized controlled trial of the **ShotBlocker** for children's immunization distress. *Clin J Pain.* 2009 Nov-Dec;25(9):790-6. (Data not support effectiveness)

Codipietro L, et al. **Breastfeeding** or oral sucrose solution in term neonates receiving heel lance: a randomized, controlled trial. *Pediatrics.* 2008 Sep;122(3):e716-21. This study suggests that breastfeeding provides superior analgesia for heel lance compared with oral sucrose in term neonates.

Cohen D. **Acetaminophen** for the Treatment of Pain in **Newborns.** *Am Fam Physician.* 2016 Aug 1;94(3):216-7

Committee on Fetus and Newborn and Section on Anesthesiology and Pain Medicine. **Prevention and Management of Procedural Pain in the neonate:** An Update. *Pediatrics.* 2016 Jan 25.

Cullen SM, Osorio SN, Abramson EA, et al. Improving Caregiver **Understanding of Liquid Acetaminophen Administration** at Primary Care Visits. *Pediatrics.* 2022;150(2):e2021054807

Curtis S, Kilpatrick R, Billimoria ZC, et al. Use of **Dexmedetomidine and Opioids** in Hospitalized Preterm Infants. *JAMA Netw Open.* 2023 Nov 1;6(11):e2341033.

de Sousa Freire NB, et al. Evaluation of analgesic effect of skin-to-skin contact compared to oral glucose in preterm neonates. *Pain.* 2008 Sep 30;139(1):28-33.

Devlin LA, Hu Z, Merhar SL, et al; (ECHO) Trials Network. Influence of Eat, Sleep, and Console on **Infants Pharmacologically Treated for Opioid Withdrawal:** A Post Hoc Subgroup Analysis of the ESC-NOW Randomized Clinical Trial. *JAMA Pediatr.* 2024 Apr 15:e240544.

Dilli D, K  c  k IZ, Dallar Y. Interventions to Reduce Pain during Vaccination in Infancy. *J Pediatr.* 2008 Oct 10

Ding Y, Yin H, Wang S, et al. Effectiveness of **clown intervention for pain relief** in children: A systematic review and meta-analysis. *J Clin Nurs.* 2022 Jan 5. doi: 10.1111/jocn.16195

Disher T, Cameron C, Mitra S, et al. Pain-Relieving Interventions for **Retinopathy of Prematurity:** A Meta-analysis. *Pediatrics.* 2018 Jun 1.

Drendel AL, Lyon R, Bergholte J, et al. Outpatient pediatric **pain management practices for fractures.** *Pediatr Emerg Care.* 2006 Feb;22(2):94-9. Most children with fractures have the "worst" pain in the first 48 hours after injury and used analgesia for 3 days after injury. There are noteworthy functional limitations for both children and their caregivers. **Ibuprofen and acetaminophen with codeine are the analgesics most commonly used, with no clear superiority.**

Drendel AL, Gorelick MH, Weisman SJ, et al. A randomized clinical trial of **ibuprofen** versus acetaminophen with codeine for acute pediatric arm fracture pain. *Ann Emerg Med.* 2009 Oct;54(4):553-60.

Duerden EG, Guo T, Chau C, et al. Association of **Neonatal Midazolam Exposure** With Hippocampal Growth and Working Memory Performance in Children Born Preterm. *Neurology.* 2023 Nov 7;101(19):e1863-e1872.

Dulai SK, Firth K, Al-Mansoori K, et al. Does **Topical Anesthetic Reduce Pain During Intraosseous Pin Removal in Children?** A Randomized Controlled Trial. *J Pediatr Orthop.* 2015 Feb 26.

Ekbom K, Kalman S, Jakobsson J, Marcus C. Efficient Intravenous Access Without Distress: A Double-blind Randomized Study of **Midazolam and Nitrous Oxide** in Children and Adolescents. *Arch Pediatr Adolesc Med.* 2011 Sep;165(9):785-91.

Eidelman A, Weiss JM, Baldwin CL, et al. **Topical anesthetics** for repair of dermal laceration. *Cochrane Database of Systematic Reviews* 2011, Issue 6. Art. No.: CD005364. DOI: 10.1002/14651858.CD005364.pub2. Based on mostly descriptive analysis, topical anaesthetics are possibly an efficacious, non-invasive means of providing analgesia prior to suturing of dermal lacerations.

Falagas ME, Vouloumanou EK, Plessa E, et al. Inaccuracies in **dosing drugs with teaspoons and tablespoons.** *Int J Clin Pract.* 2010 Aug;64(9):1185-9.

**FDA Jan/09** An public health advisory reminds patients and physicians of potentially serious side effects from the improper use of topical anesthetics, including **lidocaine, tetracaine, benzocaine, and prilocaine.** The latest advisory was prompted by a small study that tested whether lidocaine reduced discomfort during breast mammography. No serious adverse events were noted. However, the FDA remains concerned about the potential for seizures, irregular heartbeat, and breathing problems when topical anesthetics are applied over a large area or are covered by plastic wrap or a heating pad. Two deaths were previously reported in women using the anesthetics before laser hair removal.

**FDA Aug/12** is reviewing reports of children who developed serious adverse effects or died after taking **codeine** for pain relief after tonsillectomy and/or adenoidectomy for obstructive sleep **apnea** syndrome. Recently, three pediatric deaths and one non-fatal but life-threatening case of respiratory depression were documented in the medical literature.

**FDA Jun/14** warns that prescription **oral viscous lidocaine** 2 percent solution should not be used to treat infants and children with teething pain. We are requiring a new Boxed Warning, FDA's strongest warning, to be added to the drug label to highlight this information. Oral viscous lidocaine solution is not approved to treat teething pain, and use in infants and young children can cause serious harm, including death

**FDA May/18** is warning that over-the-counter (OTC) oral drug products containing benzocaine should not be used to treat infants and children younger than 2 years. We are also warning that benzocaine oral drug products should only be used in adults and children 2 years and older if they contain certain warnings on the drug label. These products carry serious risks and provide little to no benefits for treating oral pain, including sore gums in infants due to teething. Benzocaine, a local anesthetic, can cause a condition in which the amount of oxygen carried through the blood is greatly reduced. This condition, called methemoglobinemia, can be life-threatening and result in death.

Fein JA et al. Relief of **pain and anxiety in pediatric patients in emergency** medical systems. *Pediatrics* 2012 Nov; 130:e1391.

Fortier, Michelle A., MacLaren, Jill E., Martin, Sarah R., et al. Pediatric Pain After **Ambulatory Surgery:** Where's the Medication? *Pediatrics* 2009 124: e588-e595.

Frank LS, Oulton K, Nderitu S, et al. **Parent involvement** in Pain Management for NICU Infants: A Randomized Controlled Trial. *Pediatrics.* 2011 Aug 22.

Frey TM, Florin TA, Caruso M, et al. Effect of **Intranasal Ketamine vs Fentanyl on Pain Reduction for Extremity Injuries in Children:** The PRIME Randomized Clinical Trial. *JAMA Pediatr.* 2018 Dec 28.

Gao H, Xu G, Gao H, et al. Effect of repeated **Kangaroo Mother Care** on repeated procedural pain in preterm infants: A randomized controlled trial. *Int J Nurs Stud.* 2015 Jul;52(7):1157-65.

Gargya A, Zats A, Lake T. **Peripheral Nerve Stimulation** for the Management of Pediatric Neuropathic Pain. *Pediatrics.* 2023 Nov 10:e2023061843.

Gates M, Hartling L, Shulhan-Kilroy J et al. **Digital Technology Distraction** for Acute Pain in Children: A Meta-analysis. *Pediatrics.* 2020 Jan 22 doi:10.1542/peds.2019-1139.

Giordano V, Edozor J, Deindl P, et al. Pain and Sedation **Scales for Neonatal and Pediatric Patients** in a Preverbal Stage of Development: A Systematic Review. *JAMA Pediatr.* 2019 Oct 14. doi: 10.1001/jamapediatrics.2019.3351.

Gold JI, Soohoo M, Laikin AM, et al. Effect of an **Immersive Virtual Reality Intervention on Pain and Anxiety** Associated With Peripheral Intravenous Catheter Placement in the Pediatric Setting: A Randomized Clinical Trial. *JAMA Netw Open.* 2021 Aug 2;4(8):e2122569

Goldman RD. **Analgesia for lumbar puncture** in infants and children. *Can Fam Physician.* 2019 Mar;65(3):192-194.

Gordon M, Sinopoulou V, Tabbers M, et al. **Psychosocial Interventions** for the Treatment of Functional Abdominal Pain Disorders in Children: A Systematic Review and Meta-analysis *JAMA Pediatr.* 2022 Apr 11. doi: 10.1001/jamapediatrics.2022.0313.

Gray L, Garza E, Zageris D, et al. **Sucrose and Warmth** for Analgesia in Healthy Newborns: An RCT. *Pediatrics.* 2015 Feb 16.

Groenewald CB, Wright DR, Palermo TM. **Health care expenditures** associated with pediatric pain-related conditions in the USA. *Pain* 2015;156:951-7.

Hagg L, Leung S, Carr R. **Characterizing the Use of Nabiximols** ( $\Delta^9$ -Tetrahydrocannabinol-Cannabidiol) Buccal Spray in Pediatric Patients. *Can J Hosp Pharm.* 2023 Jul 5;76(3):216-220.

Harrington JW, Logan S, Harwell C, et al. Effective **Analgesia Using Physical Interventions for Infant Immunizations.** *Pediatrics.* 2012 Apr 16.

Harman S, Zemek R, Duncan MJ, et al. Efficacy of pain control with topical **lidocaine-epinephrine-tetracaine (LET)** during laceration repair with tissue adhesive in children: a randomized controlled trial. *CMAJ*. 2013 Aug 6.

Harrison D, Stevens B, et al. Efficacy of **sweet solutions** for analgesia in infants between 1 and 12 months of age: a systematic review. *Arch Dis Child*. 2010 May 12.

Harrison D, Beggs S, Stevens B. **Sucrose** for Procedural Pain Management in Infants. *Pediatrics*. 2012 Oct 8.

Harrison D, Reszel J, Bueno M, et al. **Breastfeeding for procedural pain in infants beyond the neonatal period**. *Cochrane Database Syst Rev*. 2016 Oct 28;10:CD011248. We conclude, based on the 10 studies included in this review, that breastfeeding may help reduce pain during vaccination for infants beyond the neonatal period. Breastfeeding consistently reduced behavioural responses of cry duration and composite pain scores during and following vaccinations. However, there was no evidence that breastfeeding had an effect on physiological responses. No studies included in this review involved populations of hospitalised infants undergoing other skin-breaking procedures. Although it may be possible to extrapolate the review results to this population, further studies of efficacy, feasibility, and acceptability in this population are warranted.

Harrison D, Larocque C, Bueno M, et al. **Sweet Solutions** to Reduce Procedural Pain in Neonates: A Meta-analysis. *Pediatrics*. 2016 Dec 16.

Hartling L, Newton AS, et al. **Music** to Reduce Pain and Distress in the Pediatric Emergency Department: A Randomized Clinical Trial. *JAMA Pediatr*. 2013 Jul 15.

Haslund-Krog S, Barry JM, Birnbaum AK, et al. Pharmacokinetics and safety of **prolonged paracetamol treatment** in neonates: An interventional cohort study. *Br J Clin Pharmacol*. 2023 Jun 23. doi: 10.1111/bcp.15834.

Hauer J, Houtrow AJ, AAP Section on Hospice and Palliative Medicine, Council on Children with Disabilities. **Pain Assessment and Treatment in Children With Significant Impairment of the Central Nervous System**. *Peds*. 2017;139(6):e20171002

Hauer JM. **Pain in Children With Severe Neurologic Impairment**: Undoing Assumptions. *JAMA Pediatr*. 2018 Aug 20.

Hay AD, Redmond NM, Costelloe C, et al. Paracetamol and ibuprofen for the treatment of fever in children: the **PITCH** randomised controlled trial. *Health Technol Assess*. 2009 May;13(27):iii-iv, ix-x, 1-163. Young children who are unwell with fever should be treated with ibuprofen first, but the relative risks (inadvertently exceeding the maximum recommended dose) and benefits (extra 2.5 hours without fever) of using paracetamol plus ibuprofen over 24 hours should be considered.

Health Canada Apr/12 is informing Canadians that it has requested companies to add new risk statements to the packaging and labelling of licensed benzocaine products. In April 2011, Health Canada reminded Canadians of certain health risks associated with **benzocaine** products, including a very rare but serious blood condition known as **methemoglobinemia** that can affect sensitive individuals.

Health Canada Oct/20 is reminding parents and caregivers not to use products containing **benzocaine** in children under two years of age. Benzocaine products may cause a serious blood condition called methemoglobinemia (MetHb), which reduces the ability of red blood cells to deliver oxygen throughout the body.

Hechler T, et al. Systematic Review on **Intensive Interdisciplinary Pain Treatment** of Children With Chronic Pain. *Pediatrics*. 2015 Jul;136(1):115-27.

Hippard HK, Govindan K, Friedman EM, et al. Postoperative Analgesic and Behavioral Effects of **Intranasal Fentanyl, Intravenous Morphine, and Intramuscular Morphine** in Pediatric Patients Undergoing Bilateral Myringotomy and Placement of Ventilating Tubes. *Anesth Analg*. 2012 Jun 5.

Hogan ME et al. Systematic review and meta-analysis of the effect of **warming local anesthetics** on injection pain. *Ann Emerg Med* 2011 Jul; 58:86.

Holsti, Liisa, Grunau, Ruth E. Considerations for Using **Sucrose** to Reduce Procedural Pain in Preterm Infants. *Pediatrics* 2010 125: 1042-1047.

Ikeri K, Anderson A, Eyal F, Whitehurst R. **Neonatal Opioid Withdrawal Syndrome** Following Prenatal Use of Supplements Containing Tianeptine. *Pediatrics*. 2024 Jan 12:e2023062382.

Jain S, Hegenbarth MA, Humiston SG, et al. Increasing **ED Use** of Jet Injection of **Lidocaine for IV-Related Pain Management**. *Pediatrics*. 2017 Mar 9

Jalota Leena, Kalira Vicki, George Elizabeth, et al. on behalf of the Perioperative Clinical Research Core. **Prevention of pain on injection of propofol**: systematic review and meta-analysis. *BMJ* 342:doi:10.1136/bmj.d1110 (15 Mar 2011)

Johnston CC, Campbell-Yeo M, Filion F. Paternal vs **maternal kangaroo care** for procedural pain in preterm neonates: a randomized crossover trial. *Arch Pediatr Adolesc Med* 2011;165:792-6.

Johnston C, Campbell-Yeo M, Disher T, et al. **Skin-to-skin care for procedural pain in neonates**. *Cochrane Database Syst Rev*. 2017;(2):CD008435. SSC appears to be effective as measured by composite pain indicators with both physiological and behavioural indicators and, independently, using heart rate and crying time; and safe for a single painful procedure. Purely behavioural indicators tended to favour SSC but with facial actions there is greater possibility of observers not being blinded. Physiological indicators were mixed although the common measure of heart rate favoured SSC. Two studies compared mother-providers to others, with non-significant results. There was more heterogeneity in the studies with behavioural or composite outcomes.

Karlsson J, Lewis G, Larsson P, et al. **Intranasal dexmedetomidine sedation** for paediatric MRI by radiology personnel: A retrospective observational study. *Eur J Anaesthesiol*. 2023 Mar 1;40(3):208-215.

Kassab M, Foster JP, Foureur M, et al. **Sweet-tasting solutions** for needle-related procedural pain in infants one month to one year of age. *Cochrane Database of Systematic Reviews* 2012, Issue 12. Art. No.: CD008411. DOI: 10.1002/14651858.CD008411.pub2. There is insufficient evidence to confidently judge the effectiveness of sweet-tasting solutions in reducing needle-related pain in infants (one month to 12 months of age). The treatments do, however, appear promising.

Keane OA, Ourshalimian S, Lakshmanan A, et al. Institutional and Regional Variation in **Opioid Prescribing for Hospitalized Infants** in the US. *JAMA Netw Open*. 2024 Mar 4;7(3):e240555.

Keane OA, Zamora AK, Ourshalimian S, et al. **Opioid and Methadone Use** for Infants With Surgically Treated Necrotizing Enterocolitis. *JAMA Netw Open*. 2023 Jun 1;6(6):e2318910.

Kelly LE, Sommer DD, Ramakrishna J, et al. **Morphine or Ibuprofen for Post-Tonsillectomy Analgesia**: A Randomized Trial. *Pediatrics*. 2015 Jan 26.

Kinoshita M, Olsson E, Borys F, Bruschetti M. Opioids for procedural pain in neonates. *Cochrane Database Syst Rev*. 2023 Apr 5;4(4):CD015056. Compared to placebo, opioids probably reduce pain score assessed with PIPP/PIPP-R scale during the procedure; may reduce NIPS during the procedure; and may result in little to no difference in DAN one to two hours after the procedure. The evidence is very uncertain about the effect of opioids on pain assessed with other pain scores or at different time points. No studies reported if any harms occurred. The evidence is very uncertain about the effect of opioids on episodes of bradycardia or hypotension. Opioids may result in an increase in episodes of apnea. No studies reported parent satisfaction with care provided in the NICU. The evidence is very uncertain about the effect of opioids on any outcome when compared to non-pharmacological interventions or to other analgesics. We identified no studies comparing opioids to other opioids or comparing different routes of administration of the same opioid.

Klein EJ, Brown JC, Kobayashi A, et al. A randomized clinical trial comparing oral, **aerosolized intranasal, and aerosolized buccal midazolam**. *Ann Emerg Med*. 2011 Oct;58(4):323-9.

Krauss BS, Krauss BA, Green SM. Videos in clinical medicine. **Procedural sedation and analgesia in children**. *N Engl J Med*. 2014 Apr 10;370(15):e23.

Krauss BS, Calligaris L, Green SM, et al. Current concepts in management of **pain in children in the emergency department**. *Lancet*. 2015 Jun 18.

Kumar A, Gosavi RS, Sundaram V, et al. Oral Paracetamol vs Oral Ibuprofen in **Patent Ductus Arteriosus**: A Randomized, Controlled, Noninferiority Trial. *J Pediatr*. 2020;222:79-84.e2

Kwon H, Lee JH, Choi YJ, Jung JY. Is ketamine sedation without local anesthesia sufficient for **pediatric laceration repair**? A double-blind randomized clinical trial. *Am J Emerg Med*. 2020 Mar 19. doi: 10.1016/j.ajem.2020.03.030

Lambarth A, Katsoulis M, Ju C, et al. **Prevalence of chronic pain or analgesic use** in children and young people and its long-term impact on substance misuse, mental illness, and prescription opioid use: a retrospective longitudinal cohort study. *The Lancet Regional Health - Europe*, Volume 35, Dec 2023, 100763. <https://doi.org/10.1016/j.lanep.2023.100763>.

Lambert C, Goldman RD. Pain management for **children needing laceration repair**. *Can Fam Physician*. 2018 Dec;64(12):900-902.

Lavingia R, Mondragon E, McFarlane-Johansson N, Shenoi RP. Improving **Opioid Stewardship in Pediatric Emergency Medicine**. *Pediatrics*. 2021 Nov 2:e2020039743.

Le May S, Ali S, Plint AC, et al. **Oral Analgesics Utilization for Children With Musculoskeletal Injury (OUCH Trial)**: An RCT. *Pediatrics*. 2017 Oct 11.

Lee J, Lee J, Lim H, et al. Cartoon distraction alleviates anxiety in children during induction of anesthesia. *Anesth Analg*. 2012 Nov;115(5):1168-73.

Lee GY, Yamada J, Kyololo O, et al. Pediatric clinical practice **guidelines for acute procedural pain**: a systematic review. *Pediatrics*. 2014 Mar;133(3):500-15.

Lee HN, Park JW, Hwang S, et al. Effect of a Virtual Reality Environment Using a Domed Ceiling Screen on Procedural Pain During Intravenous Placement in Young Children: A Randomized Clinical Trial. *JAMA Pediatr*. 2022 Nov 21. doi: 10.1001/jamapediatrics.2022.4426.

Li Y, Jackson KA, Slon B, et al. CYP2B6\*6 allele and age substantially reduce steady-state **ketamine** clearance in chronic pain patients: impact on adverse effects. *Br J Clin Pharmacol*. 2015 Feb 22.

Lioffi C, Howard RF. Pediatric **Chronic Pain : Biopsychosocial Assessment and Formulation**. *Pediatrics*. 2016 ;138(5) :e20160331

Long B, Gottlieb M. **Ibuprofen vs. Acetaminophen** for Fever or Pain in Children Younger Than Two Years. *Am Fam Physician*. 2021 May 1;103(9):Online

Mascarenhas M, Wachman EM, Chandra I, et al. Advances in the Care of Infants With Prenatal Opioid Exposure and **Neonatal Opioid Withdrawal Syndrome**. *Pediatrics*. 2024 Jan 5:e2023062871.

Meesters N, Simons S, et al. **Waiting 2 minutes after sucrose administration- unnecessary?** *Arch Dis Child Fetal Neonatal Ed*. Published Online First. 2016.

Nabulsi M. Is combining or alternating **antipyretic** therapy more beneficial than **monotherapy** for febrile children? *BMJ*. 2009 Oct 1;339:b3540. doi: 10.1136/bmj.b3540.

**NICE** Guidelines: National Institute for Health and Care Excellence. **Feverish** illness in children: assessment and initial management in children younger than five years. (Clinical guideline CG160.) 2013. <http://guidance.nice.org.uk/CG160>.

Palermo TM, et al. **Problem-solving skills training** for parents of children with chronic pain: a pilot randomized controlled trial. *Pain*. 2016 Jun;157(6):1213-23.

Patel AK, Gai J, Trujillo-Rivera E, et al. Association of **Intravenous Acetaminophen Administration With the Duration of Intravenous Opioid Use** Among Hospitalized Pediatric Patients. *JAMA Netw Open*. 2021 Dec 1;4(12):e2138420.

Persad E, Pizarro AB, Bruschetti M. Non-opioid analgesics for procedural pain in neonates. *Cochrane Database Syst Rev*. 2023 Apr 4;4(4):CD015179. The two small included studies comparing ketamine versus either placebo or fentanyl, with very low-certainty evidence, rendered us unable to draw meaningful conclusions. The evidence is very uncertain about the effect of ketamine on pain score during the procedure compared with placebo or fentanyl. We found no evidence on NSAIDs or studies comparing different routes of administration.

Pillai Riddell RR, Bucsea O, Shiff I, et al. **Non-pharmacological management** of infant and young child procedural pain. *Cochrane Database Syst Rev*. 2023 Jun 14;6(6):CD006275.

Overall, non-nutritive sucking, facilitated tucking, and swaddling may reduce pain behaviours in preterm born neonates. Non-nutritive sucking may also reduce pain behaviours in full-term neonates. No interventions based on a substantial body of evidence showed promise in reducing pain behaviours in older infants. Most analyses were based on very low- or low-certainty grades of evidence and none were based on high-certainty evidence. Therefore, the lack of confidence in the evidence would require further research before we could draw a definitive conclusion.

Pillai Riddell RR, Racine NM, Turcotte K, et al. **Non-pharmacological** management of infant and young child procedural pain. *Cochrane Database Syst Rev*. 2011 Oct 5;10:CD006275. There is evidence that different non-pharmacological interventions can be used with preterms, neonates, and older infants to significantly manage pain behaviors associated with acutely painful procedures.

Poonai N, et al. **Oral morphine versus ibuprofen** administered at home for **postoperative orthopedic pain in children**: a randomized controlled trial. *CMAJ*. 2017 Oct 10;189(40):E1252-E1258.

Poonai N, Cohen DM, MacDowell D, et al; (PERN) PAINT Study Group. Sedation and Analgesia for **Reduction of Pediatric Ileocolic Intussusception**. *JAMA Netw Open*. 2023 Jun 1;6(6):e2317200

Poonai N, Li J, Langford C, et al. **Intraurethral Lidocaine for Urethral Catheterization** in Children: A Randomized Controlled Trial. *Pediatrics*. 2015 Sep 28.

Poonai N, Paskar D, Konrad SL, et al. **Opioid analgesia for acute abdominal pain** in children: A systematic review and meta-analysis. *Acad Emerg Med*. 2014 Nov;21(11):1183-92.

Prymula R, Siegrist CA, Chlibek R, et al. Effect of prophylactic **paracetamol/acetaminophen** administration at time of vaccination on febrile reactions and antibody responses in children: two open-label, randomised controlled trials. *Lancet*. 2009 Oct 17;374(9698):1339-50.

Racoolin JA, Roberson DW, Pacanowski MA et al. New Evidence about an Old Drug - **Risk with Codeine after Adenotonsillectomy**. *N Engl J Med*. 2013 Apr 24.

Rasooly IR, Mullins PM, Mazer-Amirshahi M, van den Anker J, Pines JM. The Impact of **Race on Analgesia** Use among Pediatric Emergency Department Patients. *J Pediatr*. 2014 Jun 11.

Rearдон AWT, Earp BD, Andreski P, et al. **Medical Student Assessment of Pediatric Patient Pain** as a Function of Perceived Child Gender. *JAMA Netw Open*. 2021 Jun 1;4(6):e2113010.

Reinoso-Barbero F, Pascual-Pascual SI, de Lucas R, et al. Equimolar **Nitrous Oxide/Oxygen** Versus Placebo for Procedural Pain in Children: A Randomized Trial. *Pediatrics* 2011;127:e1464-70.

Renny MH, Jent V, Townsend T, Cerdá M. Impact of the 2017 FDA Drug Safety Communication on **Codeine and Tramadol Dispensing to Children**. *Pediatrics*. 2022 Oct 19:e2021055887

Robinson N, Delorenzo A, Howell S, et al. **Pediatric Distraction Tools** for Prehospital Care of Pain and Distress: A Systematic Review. *Pediatrics*. 2023 Jun 1:e2022059910.

Sasidharan R, Gupta N, Yadav B, et al. **25% Dextrose Versus 24% Sucrose** for Heel Lancing in Preterm Infants: A Noninferiority RCT. *Pediatrics*. 2022 Apr 22:e2021054618.

Savino, Francesco, Lupica, Maria Maddalena, Tarasco, Valentina, et al. Fulminant **Hepatitis After 10 Days of Acetaminophen** Treatment at Recommended Dosage in an Infant. *Pediatrics* 2011 127: e494-e497.

Schechter NL, Bernstein BA, Zempsky WT, Bright NS, Willard AK. **Educational Outreach to Reduce Immunization Pain** in Office Settings. *Pediatrics*. 2010 Nov 15.

Selvanathan T, Ufkes S, Guo T, et al. **Pain Exposure and Brain Connectivity** in Preterm Infants. *JAMA Netw Open*. 2024 Mar 4;7(3):e242551.

Shah V, Taddio A, McMurtry CM, et al. **Pharmacological and Combined Interventions to Reduce Vaccine Injection Pain in Children and Adults**: Systematic Review and Meta-Analysis. *Clin J Pain*. 2015 Oct;31(10 Suppl):S38-63.

Shah SR, Kadage S, Sinn J. Trial of **Music, Sucrose, and Combination Therapy for Pain Relief** during **Heel Prick Procedures** in Neonates. *J Ped*. 2017;190:153-8

Shahid S, Florez ID, Mbuagbaw L. Efficacy and Safety of **EMLA Cream for Pain Control Due to Venipuncture** in Infants: A Meta-analysis. *Pediatrics*. 2018 Dec 26

Sharara-Chami R, Lakissian Z, Charafeddine L, et al. **Combination Analgesia for Neonatal Circumcision**: A Randomized Controlled Trial. *Pediatrics*. 2017 Nov 17.

Sikka K, Ahmed AA, Diaz D, et al. Automated Assessment of Children's **Postoperative Pain Using Computer Vision**. *Pediatrics*. 2015 Jul;136(1):e124-31.

Simonse E, Mulder PG, et al. Analgesic Effect of **Breast Milk Versus Sucrose** for Analgesia During Heel Lance in Late Preterm Infants. *Pediatrics*. 2012 Mar 5.

Slater R, Cornelissen L, Fabrizi L, et al. Oral **sucrose** as an analgesic drug for procedural pain in newborn infants: a randomised controlled trial. *Lancet*. 2010 Sep 1.

Smith D, Cheek H, Denson B, Pruitt CM. **Lidocaine Pretreatment** Reduces the Discomfort of **Intranasal Midazolam** Administration: A Randomized, Double-blind, Placebo-controlled Trial. *Acad Emerg Med*. 2017 Feb;24(2):161-167.

Snyder AB, Zhou M, Attell BK, et al. **Opioid Use After First Opioid Prescription** in Children With Sickle Cell Disease. *JAMA Pediatr*. 2024 Feb 19:e236500.

Stevens, Bonnie J, Abbott, Laura K., Yamada, Janet, et al. Epidemiology and management of **painful procedures** in children in Canadian hospitals. *CMAJ* 2011 0: cmaj.101341

Strazar R, Lalonde D. **Minimizing injection pain** in local anesthesia. *CMAJ*. 2012 Apr 30.

Sutherland TN, Wunsch H, Newcomb C, et al. Trends in Routine Opioid Dispensing After Common Pediatric Surgeries in the United States: 2014-2019. *Pediatrics*. 2022 Apr 4:e2021054729.

Taddio A, Shah V, Katz J. Reduced infant response to a routine care procedure after **sucrose** analgesia. *Pediatrics*. 2009 Mar;123(3):e425-9.

Taddio A, Shah V, Hancock R, et al. Effectiveness of **sucrose** analgesia in newborns undergoing painful medical procedures. *CMAJ*. 2008 Jul 1;179(1):37-43.

Taddio, A, Appleton, M, et al. **Reducing the pain of childhood vaccination**: an evidence-based clinical practice guideline (**summary**). *CMAJ* 2010 0: cmaj.092048.

Taddio, A, Appleton, M, Bortolussi, R, et al. **Reducing the pain of childhood vaccination**: an **evidence-based clinical practice guideline**. *CMAJ* 2010 0: cmaj.101720

Taddio, Anna, Shah, Vibhuti, Stephens, Derek, et al. Effect of Liposomal Lidocaine and **Sucrose** Alone and in Combination for Venipuncture Pain in Newborns. *Pediatrics* 2011 0: peds.2010-2914

Taddio A, McMurtry CM, Shah V, et al. **Reducing pain during vaccine injections**: clinical practice guideline. *CMAJ*. 2015 Aug 24. <http://www.cmaj.ca/content/early/2015/08/24/cmaj.150391.full.pdf> (accessed September 16, 2015).

Taddio A, Pillai Riddell R, Ipp M, et al. Relative effectiveness of **additive pain interventions during vaccination** in infants. *CMAJ*. 2016 Dec 12.

Thyr M, Sundholm A, Teeland L, et al. Oral glucose as an analgesic to reduce infant distress following immunization at the age of 3, 5 and 12 months. *Acta Paediatr* 2007;96(2):233-6.

Tinner EM, Hoesli I, Jost K, et al. **Rectal Paracetamol** in Newborn Infants after Assisted Vaginal Delivery May **Increase Pain Response**. *J Pediatr*. 2012 Jul 17.

Toce MS, Michelson KA, Chen KY, et al. Trends in **Dispensing of Controlled Medications** for US Adolescents and Young Adults, 2008 to 2019. *JAMA Pediatr*. 2022 Oct 10. doi: 10.1001/jamapediatrics.2022.3312

Tomlinson D, von Baeyer CL, Stinson JN, Sung L. A Systematic Review of **Faces Scales** for the Self-report of Pain Intensity in Children. *Pediatrics*. 2010 Oct 4.

Tsze DS, von Baeyer CL, Bulloch B, Dayan PS. **Validation of Self-Report Pain Scales** in Children. *Pediatrics*. 2013 Sep 2.

Uman LS, Birnie KA, Noel M, et al. **Psychological interventions** for needle-related procedural pain and distress in children and adolescents. *Cochrane Database Syst Rev*. 2013;10:CD005179.

Unesi Z, Amouzeshi Z, Jamavar J, et al. The Effect of a Combination of **Vibration and External Cold on Pain Caused during Vaccine Injection** in Infants: A Randomized Clinical Trial. *Int J Clin Pract*. 2024 Mar 4;2024:7170927.

van Tilburg MA, et al. **Audio-Recorded Guided Imagery** Treatment Reduces Functional Abdominal Pain in Children: A Pilot Study. *Pediatrics*. 2009 Oct 12.

Walia A, Markfort C, Frey-Law L. **Assessment of Multisensory Sensitivity** May Assist With the Management of Children With Chronic Pain. *Pediatrics*. 2024 Apr 5:e2023061840.

Wallace C, Gordon M, Sinopoulou V, Akobeng AK. Probiotics for management of functional abdominal pain disorders in children. *Cochrane Database Syst Rev*. 2023 Feb 17;2(2):CD012849.  
The results from this review demonstrate that probiotics and synbiotics may be more efficacious than placebo in achieving treatment success, but the evidence is of low certainty. The evidence demonstrates little to no difference between probiotics or synbiotics and placebo in complete resolution of pain. We were unable to draw meaningful conclusions about the impact of probiotics or synbiotics on the frequency and severity of pain as the evidence was all of very low certainty due to significant unexplained heterogeneity or imprecision.

Walson PD, Halvorsen M, Edge J, et al. Pharmacokinetic Comparison of **Acetaminophen Elixir Versus Suppositories** in Vaccinated Infants (Aged 3 to 36 Months): A Single-Dose, Open-Label, Randomized, Parallel-Group Design. *Clin Ther*. 2013 Jan 22.

Wang S, Giannakopoulos H, Lowstetter J, et al. **Lack of Methemoglobin Elevations After Topical Applications of Benzocaine Alone or Benzocaine Plus Tetracaine** to the Oral Mucosa. *Clin Ther*. 2017 Sep 21.

Warren OU, Blackwood B. **Acquired Methemoglobinemia**. *N Engl J Med*. 2019 Sep 19;381(12):1158

Weissman, Amir, Aranovitch, Michal, Blazer, Shraga, Zimmer, Etan Z. **Heel-Lancing** in Newborns: Behavioral and Spectral Analysis Assessment of Pain Control Methods. *Pediatrics* 2009 124: e921-e926.

Whitney DG, Shapiro DN. National Prevalence of **Pain Among Children and Adolescents With Autism** Spectrum Disorders. *JAMA Pediatr*. 2019 Oct 28. doi: 10.1001/jamapediatrics.2019.3826.

Wong CL, Choi KC. Effects of an **Immersive Virtual Reality Intervention** on Pain and Anxiety Among Pediatric Patients Undergoing Venipuncture: A Randomized Clinical Trial. *JAMA Netw Open*. 2023 Feb 1;6(2):e230001.

Wong T, Stang AS, Ganshorn H, et al. **Combined and alternating paracetamol and ibuprofen** therapy for febrile children. *Cochrane Database of Systematic Reviews* 2013, Issue 10. Art. No.: CD009572. DOI: 10.1002/14651858.CD009572.pub2. There is some evidence that both alternating and combined antipyretic therapy may be more effective at reducing temperatures than monotherapy alone. However, the evidence for improvements in measures of child discomfort remains inconclusive.

Wysocki J, Center KJ, Brzostek J, et al. A randomized study of **fever prophylaxis and the immunogenicity of routine pediatric vaccinations**. *Vaccine*. 2017 Apr 4;35(15):1926-1935.

Yang YT, Chen B, Bennett CL. **FDA Approval** of Extended-Release **Oxycodone** for Children With Severe Pain. *Pediatrics*. 2016 May;137(5).

Yıldız İU, Yıldırım Ç, Özhasenekler A, et al. Effectiveness of **lidocaine spray on radial arterial puncture pain**: A randomized double-blind placebo controlled trial. *Am J Emerg Med*. 2021 Dec;50:724-728.

Young LW, Ounpraseuth ST, Merhar SL, et al; ACT NOW Collaborative. **Eat, Sleep, Console Approach** or Usual Care for Neonatal Opioid Withdrawal. *N Engl J Med*. 2023 Jun 22;388(25):2326-2337.

Zarnegar-Lumley S, Lange KR, Mathias MD, et al. Local Anesthesia With General **Anesthesia for Pediatric Bone Marrow Procedures**. *Pediatrics*. 2019 Aug;144(2)

Zempsky WT, et al. **Needle-free powder lidocaine** delivery system provides rapid effective analgesia for venipuncture or cannulation pain in children: randomized, double-blind Comparison of Venipuncture and Venous Cannulation Pain After Fast-Onset Needle-Free Powder Lidocaine or Placebo Treatment trial. *Pediatrics*. 2008 May;121(5):979-87. The needle-free powder lidocaine delivery system was well tolerated and produced significant analgesia within 1 to 3 minutes.

Zimmerman KO, et al. **Sedatives and Analgesics Given to Infants** in Neonatal Intensive Care Units at the End of Life. *J Pediatr*. 2015 Aug;167(2):299-304.e3.