Emerging Therapies in Pediatric Pain Management

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Barriers

• Belief children, especially infants, don’t feel pain
• Belief unable to assess pediatric patient pain
• Belief it is just a stick w/ no long term effect
• Belief managing pain takes too much time
• Belief pain treatment for kids doesn’t exist

Professional Perception

1968

“Pediatric patients seldom need medications for relief of pain. They tolerate pain well.”
We know now!

Substantial evidence shows that even the smallest of preterm infants not only perceives but remembers pain and demonstrates recognizable pain behaviors.

Age/Perception of Pain

<table>
<thead>
<tr>
<th>Age</th>
<th>Perception of Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-term</td>
<td>By mid/late gestation has anatomical/functional ability to process pain; sensitivity to pain - Term infants or children</td>
</tr>
<tr>
<td>Newborn</td>
<td>Response to pain is inborn; newborns respond to pain with behaviors such as grimacing, crying, moving body</td>
</tr>
<tr>
<td>Infants older than one month</td>
<td>Metabolize analgesics/anesthesia effectively; Caregiver recognized as comforter</td>
</tr>
</tbody>
</table>

Age/Perception of Pain

<table>
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<tr>
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<th>Perception of Pain</th>
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<tbody>
<tr>
<td>Toddlers and Preschoolers</td>
<td>Pain description of location/intensity possible; anger, crying, sadness response; may think pain punishment; may hold someone accountable for pain and remember experiences, i.e. IV RN!</td>
</tr>
<tr>
<td>School-age children</td>
<td>When facing painful procedure may try to be brave; developmental regression to earlier stage common; seeks to understand reasons for pain</td>
</tr>
<tr>
<td>Adolescents</td>
<td>May try to avoid acknowledging pain; showing signs of pain may be considered weak; regression to earlier stages of development common with persistent pain</td>
</tr>
</tbody>
</table>
Pain doesn’t just hurt!

- Stress hormones released
  - Systemic changes
    - Increased heart rate, BP, ICP
    - Increased oxygen consumption and hypoxemia
    - Reduced tidal volume/abnormal respirations
    - Weakened immune function → delayed healing
  - Lengthened hospital stay

Needle Pain

- It isn’t JUST A STICK!
- Two most common sources of pain in hospitalized children
  - Venipuncture
  - Intravenous (IV) cannula insertion
    - 2nd most common cause of worst pain in hospital
    - 1st is underlying disease!

Pain doesn’t just hurt!

- Maladaptive response development to future painful procedures
  - ↑ pain intensities + fear/non compliance
  - Procedural conditioned anxiety
  - Significant anticipatory stress/anxiety
  - Analgesic effectiveness diminished
  - Needed medical care avoided or postponed
  - Chronic pain more likely as an adult
... Just because the patient is unable to scream the words 'That HURTS' doesn't mean there is no way to tell they are suffering and can't mean we don't at least try treatment!...

**FLACC**

**Face**
1. **0** = No particular expression or smile
2. **1** = Occasional grimace/frown, withdrawn or distracted, appears sad or worried
3. **2** = Consistent grimace or frown, frequent/constant quivering chin, distanced face, distressed looking face

**Legs**
1. **0** = Normal position or relaxed, steadied feet & motion in stride
2. **1** = Upright, restless, tense, occasional tremors
3. **2** = Kicking, or high driven up, marked increase in spasticity, continued tremors or jerking

**Activity**
1. **0** = Sleepy, quiet, normal position, moves easily
2. **1** = Unsteady, stiff or jerking, occasional agitation
3. **2** = Arching, rigid or jerking, severe agitation

**Cry**
1. **0** = No cry/verbalization
2. **1** = Moans or whimpers, occasional complaint
3. **2** = Crying steadily, screams or sobs, repeated outbursts

**Individualized behavior:**

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**Wong-Baker FACES Pain Rating Scale**

**Brief word instructions:** Point to each face using the words to describe the pain intensity. Ask the child to choose the face that best describes their pain and record the appropriate number.

Presumed Pain

- Knowing what you know now, ask yourself, if this was happening to me, would I think it hurt?
  - If the answer is yes or even maybe, you need to make sure the child is adequately treated.

Evolving Our Legacy

Painful procedure in Neonates

- >10,000 infants in NICU across US

<table>
<thead>
<tr>
<th>Authors</th>
<th># Painful Procedure in NICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnston et al, 1997</td>
<td>2-10 per day</td>
</tr>
<tr>
<td>Benis &amp; Suresh, 2001</td>
<td>6 per day</td>
</tr>
<tr>
<td>Simons et al, 2003</td>
<td>14 per day</td>
</tr>
<tr>
<td>Carbajal et al, 2008</td>
<td>16 per day</td>
</tr>
</tbody>
</table>

- Pre-emptive analgesia <35%
- Nearly 40% had NO analgesia

Evolving Our Legacy

Painful procedures in older children

- Kids undergo many painful procedures
  * 14-20 separate immunization injections by age 2
  * Venipuncture, IV start, laceration repair
- Children interviewed 7 years after pediatric cancer stated procedural pain (lab draws, IV start) worse than cancer pain

Evolving Our Legacy
Procedural Pain

So we are all convinced they hurt.

What should we do?

Ethically? Morally?

- Nurses obligated to relieve children’s pain
  - ANA code of ethics
    - Right behavior, right knowledge, compassion
  - Immanuel Kant duty based perspective
    - When the knowledge/tools exist, poor management is wrong
  - Relational ethics
    - Nurses “are the healthcare system”
    - Child depends on nurses to protect from pain

Procedural Pain

- Plan ahead—we almost always have time to provide pain management before sticks

- TJC considering 2 new standards
  - Involving parents in identifying signs of pain
  - Intervening before the procedure
    - Pharmacologically
    - Non pharmacologically
**Intramuscular - IM**

Just plain mean!!

- Painful administration and for days
- Sterile abscesses
- Fibrosis of muscle and soft tissue
- Absorption erratic
- Titration not possible
- Respiratory depression more likely
- ↑↑ expense over oral meds
- Needle stick risk to care provider


**DO NOT USE**

DEMEROL
Devil Drug

**PLAN AHEAD**

- Develop standard protocols
- Develop standard orders
- Develop staff expectations
- Develop education for parents
- Organize needed equipment
- Make it easy to do the right thing
**Environment**

– Child friendly
– May or may not be the child's room

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**Comfort Hold**

Saint Joseph's Children's Hospital, Marshfield, WI

• Comfort positioning purpose is to increase the comfort of infants and children as well as parents and medical staff.
  – Invites the presence of the parent/caregiver
  – Prepares the child/parent for procedure and their role
  – Gives the option of the treatment room
  – Positions child in a that allows control and comfort
  – Maintain a calm, positive atmosphere

• Youtube video from Dell Children’s Medical Center

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Side Sitting Position
Saint Joseph's Children's Hospital, Marshfield, Wi

IV Start Sitting Position
Saint Joseph's Children's Hospital, Marshfield, Wi

Distraction
• Child Life Specialist
  • Trained professional not causing pain
• Distraction
  • Infant: pacifier, bubbles, toys
  • Toddler: bubbles, songs, pop-up books, party blower, kaleidoscope, toys
  • School-age: videos, video games, search for objects in pictures, stories, jokes, counting, nonprocedural conversation
  • Adolescent: music by headphones, video games, nonprocedural conversation, focusing on objects
Non Pharm with some effect but incomplete

- Pre term Infants
  - Skin to skin contact
  - Sucking related interventions
  - Swaddling/facilitated tucking

- Neonates
  - Sucking related interventions
  - Rocking/holding

Older infants – the latest Cochrane review did not find sufficient evidence for any of the above (sucrose, breast feeding and music were excluded from the review)

Sucrose solution 24%

- Neonates >28 days
- Infants >4kg up to 6 months of age

- 0.1 mL of solution at a time on anterior section of infant’s tongue PRN pain, irritability, or prior to a procedure.
- For optimal effect, begin 2 minutes before procedure.
- Maximum volume of 24% sucrose is 0.5mL per procedure or 2 mL in 24 hours

NON-NUTRITIVE SUCKING

NNS shown to reduce pain behavior.

Offer dummy (pacifier) at least 2 minutes before minor procedure.

May be dipped in sucrose solution or offered after sucrose.
L·M·X·4

- Topical 4% liposomal Lidocaine cream
- Intact skin needed, cover with clear occlusive dressing
- Available over the counter
- May be applied by parent
- Effective from 30 minutes
  - Longer is better, up to 5 hours is safe

**Evolution Our Legacy**

**LIDOCAINE/PRIOCAINE CREAM EMLA**

**Age up to 3 months or weight < 5 kg:**
Apply a maximum of 1 gram to affected area x 1, 60 mins prior to procedure. Maximum application area = 10 cm². Maximum application time = 1 hour. Cover with clear occlusive dressing

- Example only, please develop your own procedures based on your population

**EMLA CREAM**

For LP and implanted port access

<table>
<thead>
<tr>
<th>Age and Body Weight Requirements</th>
<th>Max. Total Dose of EMLA Cream</th>
<th>Maximum Application Area</th>
<th>Maximum Application Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 up to 3 months or &lt; 5 kg</td>
<td>1 g</td>
<td>10 cm²</td>
<td>1 hour</td>
</tr>
<tr>
<td>3 up to 12 months and &gt; 5 kg</td>
<td>2 g</td>
<td>20 cm²</td>
<td>4 hours</td>
</tr>
<tr>
<td>1 to 6 years and &gt; 10 kg</td>
<td>10 g</td>
<td>100 cm²</td>
<td>4 hours</td>
</tr>
<tr>
<td>7 to 12 years and &gt; 20 kg</td>
<td>20 g</td>
<td>200 cm²</td>
<td>4 hours</td>
</tr>
</tbody>
</table>

Please note: If a patient greater than 3 months old does not meet the minimum weight requirement, the maximum total dose of EMLA Cream should be restricted to that which corresponds to the patient’s weight. From AstraZeneca package insert—Demonstration purposes only

**Evolution Our Legacy**
**Lidocaine/Tetracaine**

SYNERA is a peel-and-stick procedural topical anesthetic patch with a novel heating technology designed to enhance the delivery of the anesthetic. The anesthetic formulation is a eutectic mixture of equal parts lidocaine and tetracaine.

**Iontophoresis**

- 10-20 minutes
- Use in kids older than age 5
- Non Invasive
- Small electrical charge
  - Tingling
- Unbroken skin needed
- Application to contoured skin difficult

**J - TIP**

- Needle free lidocaine by jet of compressed CO2
- Anesthesia in 1-3 minutes
- Popping noise
- Can be prefilled or filled at facility
Injection Pain Management

- Warm Hands
- Warm Medication
- Buffer if needed
- Ask yourself if the medication can be given any other way

Buzzy

- Decrease injection pain relief by use of vibration, cold and distraction
- See on YouTube and Web
- http://www.buzzy4shots.com/
- Data on effectiveness for IV starts >4
Vapocoolant Pain Ease

- Ethyl vinyl chloride skin refrigerant
- Spray onto intact skin
- Lasts for up to one minute

Opiates

- Mu Agonist (Morphine Like)
  - Morphine, Hydromorphone, Oxycodone, Fentanyl

  No ceiling dose  (NSAIDS/APAP do!)  
  Do NOT cause end organ damage  (NSAIDS/APAP do!)

  Safe for children
  Utilize weight based dosing
  Small frequent doses
  Pre printed orders for post op pain, sedation, PCA

Opiates

- Opiates safe for children
- Weight based dosing
- Utilize pre printed orders sedation, PCA
- IV small frequent dose safest way
**Pediatric Morphine IVP Dose**

- All <3 months: 0.025 - 0.05 mg/kg (start low 0.012 mg/kg titrate up)
- Infants/Children: 0.1 - 0.2 mg/kg (start low 0.05 mg/kg titrate up)
- You can always give more; harder to suck it back out!
- IV peak 20 minutes, Duration 3-5 hours

**Morphine Maximum Single Dose**

- Neonate: 0.1 mg/kg/dose
- Infants: 2mg/dose
- Children 1-6 yr: 4mg/dose
- Children 7-12 yr: 8mg/dose
- Adolescents: 15mg/dose

START LOW GO SLOW
YOU CAN ALWAYS GIVE MORE
HARD TO SUCK IT BACK OUT
Please develop your own reference, recommendations vary.

**IV Acetaminophen**

- Offirmev
- Mild to moderate pain or adjunct
- Generally post op
- > age 2
- 15 mg/kg over 15 minutes
- Don’t use if you wouldn’t use oral
- May mask fever
May need sedation

- If you are giving a medication so you can do something (a procedure, a test, a treatment) to a child, then that medication is considered sedation and must be monitored as such.

Sedation for Procedures

Sedative hypnotic medication may be required to bring pain/stress levels under adequate control for many procedures.

Even those you may consider painless with the use of a topical or local anesthetic.

Sedation for Procedures

Current guidelines from AAP, ASA and ACEEP require structured evaluation of children’s risk before beginning sedation.

A critical component of any sedation protocol is a trained observer to be solely responsible for monitoring the patient while the procedure is being performed.

Physicians administering sedation and analgesia must have proven training and skills and ongoing training in the management of pediatric airways and resuscitation.
Believe!

Infants and children feel at least as much pain as adults.
There are harmful effects, both physical and psychological of unrelieved pain.
There are reasonable behavioral, non pharmacological and pharmacological solutions to pain management that every child deserves.

Evolving Our Legacy

Be known for excellent pain management!

Evolving Our Legacy

Questions?

Dedicated to Dr. Donna Wong (1948-2008) for her devotion to assessment and management of children’s pain.

Contact me at
wmosiman@via-christi.org

Evolving Our Legacy
References


Evolving Our Legacy


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• Kutner L. No Fears No Tears: Children With Cancer Coping With Pain [videotape]. Vancouver, BC, Canada: Canadian Cancer Society; 1986

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• Pediatric Dosage Handbook. 2010-2011. 17th ed, Lexi-Comp