Pain and Peds: The Ouchless ED
John D. Hoyle, Jr. MD FACEP, FAAP
MSU Dept of Emergency Medicine
Associate Medical Director,
HDVCH Emergency Department

Objectives
- Improve your ability to care for children in pain
- Explain why treating infant/pediatric pain is critical
- I’m going to challenge you to think differently about your approach to pediatric (and adult) patients with pain.
- I’m going to ask you to make a paradigm shift in treating these patients.

One Patient’s Story
- Pt had a GSW to hip. Held down while the surgeon stuck finger into wound to try and locate bullet. Initially the patient screamed and withdrew, patient was then given some “sedation” and moaned heavily through the procedure.
- Have you seen similar things recently?

One Parent’s Story
- 13 yo, 53 kg pt with a URI awakens with RLQ pain & has trouble walking. His cough makes his pain worse. For his 9/10 pain he receives 2 mg of MS. At US the exam is very painful and he is told “hold still”. He is given 1 mg of Ativan. He returns from US (+ appy) writhing in pain. He is given another 2 mg of MS. After a third dose of MS, he rates his pain 6/10. His father arrives and asks for an additional higher dose of MS. 2 months later he has persistent abdominal pain, mostly at night, and is anxious about having to have surgery again.

How do children express pain?
- Expression is different by age groups
- Not necessarily by crying
  - Withdrawing
  - Nervousness
  - Anxiety about being separated from parents
  - Acting out
- Your language will affect the child’s response.
### Pain expression by age

<table>
<thead>
<tr>
<th>Age</th>
<th>Perception</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6 mo</td>
<td>No understanding</td>
<td>General stress response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>withdrawal, crying, physiologic response</td>
</tr>
<tr>
<td>6-18 mo</td>
<td>Fear of painful stim</td>
<td>Screaming, restlessness localization, physiologic response</td>
</tr>
<tr>
<td>18m-6yr</td>
<td>Illogical &amp; egocentric</td>
<td>Reality distortion, fantasies, poor time appreciation</td>
</tr>
<tr>
<td>7-10y</td>
<td>Cause &amp; effect, understand descriptions</td>
<td>Physiologic response</td>
</tr>
<tr>
<td>11-17y</td>
<td>Logical perception abstraction</td>
<td>Deception / bravado to hide pain</td>
</tr>
</tbody>
</table>

### Neonates and Pain

- **Myth:** Infants can't feel pain because of unmyelinated nerves & don't remember pain
- **Fact:** Term and preterm infants have fully developed pain transmission pathways
  - BUT, LACK inhibitory pathways
  - Based on PET scanning (Chugani, 1998)
- **Fact:** Untreated infant pain causes irritability, exhaustion and slowed healing. McDermott, et al 2002
- **Fact:** Untreated pain causes increased pain responses later in life. Taddio et al, 1997 Lancet

### Neonates and Pain

- **FACT:** Neonates experience hyperalgesia after multiple painful stimuli (i.e. septic workup)
  - More pain with near-future painful procedures and even with handling

### Do we treat infant pain adequately?

- Survey study of 156 EM, PEM physicians in the Midwest
- Practice and beliefs regarding infant (<3 mo) LP in the ED
  - 78% thought infant pain response was the same or less than an adult
  - Only 30% thought pain of an LP could have long term effects
  - 78% thought treating the pain of LP was worthwhile
  - If physician believed that pain treatment was worthwhile, they were 11 times more likely to use some sort of pain intervention

<table>
<thead>
<tr>
<th>Intervention</th>
<th>% who never use</th>
<th>% who use for &gt;50 LPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sucrose</td>
<td>53%</td>
<td>19%</td>
</tr>
<tr>
<td>Lidocaine (injectable)</td>
<td>41%</td>
<td>30%</td>
</tr>
<tr>
<td>Anesthetic Cream</td>
<td>49%</td>
<td>27%</td>
</tr>
<tr>
<td>Pacifier</td>
<td>11%</td>
<td>67%</td>
</tr>
</tbody>
</table>

### Why treat pain adequately?

- One of our most basic moral obligations as healthcare providers.
- Reduction of psychological trauma
- Reduction of patient (child) stress
- Reduction of parent stress
- Improved parental acceptance of care
- Improved evaluation of patient (appendiceal fracture)
- Facilitation of painful procedures
- Inappropriate treatment of pain has long term consequences for child

### Why treat pain adequately?

- NICU pts w/ repeated heel lances have increased pain responses versus pts w/ few heel lances. Taddio et al 2002
- Somatization complaints (stomach ache, headache, leg pain) more common in NICU grads versus aged-matched controls. Weissman et al 1998
- Keeping neonates sedated in NICU has greatly reduced the rate of intraventricular hemorrhage.
- Male infants circumcised w/out anesthesia/analgesia respond more intensely after immunizations versus those that did get anesthesia. Taddio et al 1997
Why treat pain adequately?

- Children ≤ 8 who received placebo for painful procedure rated pain of subsequent procedures higher than controls (given fentanyl), even if given “adequate analgesia” for repeat procedures. Weisman et al 1998
  - They require more pain meds if not medicated initially even if years before.
  - By not treating pain you are altering the child’s nervous system and their future response to pain.

Do we treat pain adequately?

- Pts who were treated with analgesics waited an average of 1 hour. Lewis et al 1994
  - Suboptimal dosing occurs in 33%. Wilson & Pendleton 1989
  - PedsED: 31% w/ long bone fx, 26% w/ 2nd degree burns got pain med, but 100% w/ SS crisis got meds. Finkbeiner et al
  - PED children 2-6 less likely to get pain meds than 8-10yo for same conditions. Alexander & Aebi 2003
  - Rx of potent pain meds for children is less vs adults for similar conditions Hauswald & Arz Fax 2007
  - Not just in ED
  - 2003 NHAMCS: 74% of pts with long bone fx had pain assessed, 56% received opiates. Ritsema et al. AEM 2007

Why do we treat pain inadequately?

- Lack of education: pain management not a formal part of the residency curriculums
- WE underestimate patients pain
  - Nurses tend to underestimate pt pain versus MDs
  - Healthcare providers generally rate pain less than their patients due to a different frame of reference
    - If you’ve had a kidney stone/ femur fx...
    - We’re habituated to pain
    - Lessens our compassion?

Steps in pain management

- Prevention/Anticipation
- Adequate Assessment
- Multimodal approach
- Parental Involvement
- Nonnoxious delivery route
- Pain control during procedure

Prevention/Anticipation

- Anticipate pain
  - Any procedure you do that will cause pain (IV, LP, Cath UA)
  - Child going to xray for fx films
- Treat prophylactically
  - IV Start
  - Jtip, LMX, buffered lidocaine, vapocoolant
  - Nursing protocols for pain meds
- Avoid causing pain
  - IM and heel sticks both very painful
  - IV less painful vs IM
  - Use warmed buffered lidocaine & inject slowly 30 gauge needle

Multimodal Approach

- More than meds, more than just one med
- Multiple analgesics
  - systemic, topical, inhalational
- Behavioral (Child Life)
  - Distraction
  - Preparation and Rehearsal
  - Breathing techniques
  - Don’t forget ice!!
Non-noxious route

- Always choose the least painful route
  - Oral < Inhaled < Rectal/Nasal < IV < IM
  - Oral: Lortab, oxycodone liquid, sucrose for pain
  - Decadron po for croup
  - Inhalation: Nitrous (US), methoxyfluorane (Australia) for pain/anxiety
  - Nasal: Fentanyl
  - Topical: LET gel for lacs as much as possible
  - Jtip/LMX for IV starts LP
  - Warmed buffered lido via 30 gauge needle and 3 cc syringe

Pain control during procedures.

- Treat pain and anxiety early, adequately & preemptively.
- If you cause the child pain early in the procedure, you’re causing unnecessary anxiety for the child and decreasing your chances at success.

Neonatal Sepsis Workup

- Prevention/Anticipation
  - Cath UA
  - IV/blood draw
  - LP
- Assessment
  - NIPS, NFCS
  - Not as helpful here because procedures are short, but can help us realize there is pain to procedure

Neonatal Septic workup

- Multimodal Approach
  - IV start: LMX or EMLA, Lidocaine inj, Jtip, sucrose/ pacifier
  - Cath UA: sucrose/ pacifier, Lidocaine jelly?
  - LP: Lidocaine injection, Jtip, sucrose/ pacifier, LMX
  - Skin to skin contact with mother after procedures

Sucrose

- Believed to work via the opioid receptor
  - In adult rats reduces the subsequent pain relief of opioids
  - In rat pups: immediate increase in pain threshold that is antagonized by nalaxone.
  - Cochrane database 2013: “Sucrose is safe and effective for reducing needle-related procedural pain in neonates ≤ 1 month.”
  - Cochrane database 2012: In infants 1-18 months, sweet solutions (dextrose, sucrose) significantly reduce crying time after immunizations.
Sucrose: Dosing

- 0.5 ml-2 ml of 24% solution
- PO or by dipping pacifier into sol’n
  - If you dip it, you’ll need to redose it
  - The older the child, the more they’ll need
  - 2 month old will need dose every couple minutes
  - May be less effective after 6 months
- Pacifier offers additional comfort measure of non-nutritive sucking
- It’s fast, easy, cheap and effective!! Give it a try.

LMX/EMLA

- Can use for LP or IV starts
- LMX: lido in liposomal suspension
  - Effective in 30 minutes
  - Needs to be applied with occlusive dressing
  - More expensive vs EMLA
  - Not extensively studied in neonates (vs EMLA)
- EMLA: mixture of lidocaine and prilocaine
  - Effective after 45-60 minutes
  - Needs to be applied with occlusive dressing
  - Depth of anesthesia: 5mm

Buffered Lidocaine

- Decreases struggling of neonates undergoing LP
- Does NOT lower success rate
- Does not increase incidence of traumatic taps Pinheiro, et al 1993
  - Bloody tap caused by not removing your stylet once the needle is below the skin surface (Nigrovic, et al)
- Personal experience: very effective and doesn’t increase bloody taps.
- Recipe: 9 ml of lido: 1 ml of bicarb solution

For every neonatal sepsis w/u

- Pacifier and sucrose from the start of any/ all procedures
- Buffered lidocaine +/- JTip for LP
  - 1-2 cc in a 3cc syringe
  - 30g needle
  - Put it in your pocket to warm up
  - Small wheal by injecting perpendicular to skin
  - Inject deeper (down to hub) withdrawing as you go
  - Combo makes LP virtually/ actually painless

Jtip

- New way of painlessly injecting local anesthetic
  - Uses compressed air to push liquid into epidermis/ dermis
  - No needle and virtually painless
  - No wait: effective within 1 minute (vs 30 min for LMX)
  - No “bandaid” to “rip off” vs LMX
  - Does make a loud pop
  - Describe it to child before use
    - Rocket blasting off, opening a pop can

Jtip

What did kids and parents think?

Parents

Kids
Nitrous for Lacs

- Luhman, et al at St. Louis Children’s
- Pts randomized to:
  - Standard Care (SC): LET + Child Life
  - SC + Oral Midazolam
  - SC + Nitrous (continuous flow)
  - SC + Nitrous and Midazolam
- Children videotaped, blinded (except for Nitrous) distress measured w/ objective scale

Venous Access Pain in Children: Evidence, Impact, and Implementation

Results:
- Distress scores significantly less in Nitrous group
- Versed caused a higher score (more distressed) and longer recovery time
- More crying, ataxia, dizziness & difficulty walking up to 24 hours after
- 2/3 failures were in Versed group
- 2 patients: inconsolable/ agitated & required 3-5 hours observation
- Suturer’s preferred Nitrous only group

Nitrous in Action

Triage protocols for pain relief

- Average time to pain med delivery when done by triage nurse was 1.3 min.
- If the patient had to wait until seen by the MD: 80+ min., Goh et al 2005
- Why don’t we have protocols for automatic pain relief?
  - John’s kid with a broken arm in June: 5 minutes.

Conclusions

- We underestimate and under treat pediatric pain.
- Using objective scales and asking the right questions can help us identify children’s pain better. Make this a part of your daily practice.
- When you see a child with a painful condition immediately begin thinking how you will treat it and do so aggressively.
- Neonates DO experience pain. Not treating it can permanently alter their nervous system. Anticipate and treat it!!
- Use effective meds
  - Lortab, oxycodone instead of APAP/ codeine
  - Sucrose/ lido for neonates
Questions?

Pictures of pain

Infant Pain Scale

<table>
<thead>
<tr>
<th>Facial expression</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - Relaxed Muscles</td>
<td>Restful face, neutral expression</td>
</tr>
<tr>
<td>1 - Grimace</td>
<td>Tight facial muscles, furrowed brows, chin, jaw (mimic facial expression—nose, mouth, and brow)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cry</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - No Cry</td>
<td>Quiet, not crying</td>
</tr>
<tr>
<td>1 - Whisper</td>
<td>Mild moaning, intervention needed</td>
</tr>
<tr>
<td>2 - 'Vigorous Cry'</td>
<td>Loud screams, moans, shrill, continuous (Teardrop at the corner of the eye may be scored if fully intubated, as evidenced by obvious mouth, facial movements, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Breathing patterns</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - Normal</td>
<td>Usual pattern for the baby</td>
</tr>
<tr>
<td>1 - Change in Breathing</td>
<td>Indrawing, irregular, faster than usual, gagging, breath-holding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Arms</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - Relaxed/Restrained</td>
<td>No muscular rigidity, occasional random movement of arms</td>
</tr>
<tr>
<td>1 - Stiff</td>
<td>Tense, straight arms, rigid and rapid extension</td>
</tr>
<tr>
<td>2 - Flexed</td>
<td>Tense, straight legs, rigid and/or rapid extension</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Legs</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - Relaxed/Restrained</td>
<td>No muscular rigidity, occasional random leg movement</td>
</tr>
<tr>
<td>1 - Stiff</td>
<td>Tense, straight legs, rigid and rapid extension</td>
</tr>
<tr>
<td>2 - Flexed</td>
<td>Tense, straight legs, rigid and/or rapid extension</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State of arousal</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - Sleeping/Ankle</td>
<td>Quiet, peaceful, sleep and alert and settled</td>
</tr>
<tr>
<td>1 - Patsy</td>
<td>Alert, restless, and breathing</td>
</tr>
</tbody>
</table>

Pain Scales for Older Kids

Nitrous the wave of the future?

- Has been underutilized in EM and Pediatrics
- 50/50 mixture (Nitronox) may not be as effective as higher mixtures (60%)
- Children can’t generate enough negative pressure to trigger demand valve
- Is being used extensively at many Peds EDs
- Is safe, quick and effective
Jtip

- HDVCH ED study of Jtip
  - Not randomized or placebo controlled
  - Nurse rated ease of use: 1.3 (0-10)
  - Nurse rated pt pain with Jtip use: 1.4 (0-10)
  - Nurse rated pt pain with IV start 1.3 (0-10)

Pain Management Down Under

- [Link to video](http://www.youtube.com/watch?v=28dAu3dc4)