Treating Chronic Pain in Children: Addressing Best Practices

Chronic Pain Management in Pediatrics
Denise Taylor, MD
Conflicts of Interest

Nothing to Disclose
At the end of this presentation, the participant will be able to:

- Provide a basic assessment of acute and chronic pain throughout childhood
- Understand the Multi-disciplinary Approach in the management of both populations
- Describe 3 non-pharmacological interventions used to manage pain in both populations
- Give 3 pharmacological Options for pain management
Infants' Sense of Pain Is Recognized, Finally

Newborns do feel pain

by Phillip Boffey, November 24, 1987
Epidemiology

Pediatric
- Estimated to affect 15-20% of children
  (Goodman & McGrath, 1991).

Systematic Review 2011
- Girls > Boys
- Increase with age for most pain types (except for ABD pain)
- Lower socioeconomic status
- Psycho-social varies, anxiety, depression, low self-esteem

- Research suggests prevalence rates of childhood pain have increased over the last several decades.

Risk for Developing Chronic Pain...

- **Sex**
  - Female – 6:1 ratio

- **Age**
  - < 5 years – lowest risk
  - > 12 years – highest risk

- **Location**
  - Lower extremity >> Upper extremity

- **Type**
  - Boys: back and limb pain
  - Girls: headache and abdominal pain

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Assessment for Kids...

- **QUESTT** Approach
  - **Q**uestion the child (if verbal) and parent
  - **U**se pain scales
  - **E**valuate behavior and physiologic changes
  - **S**ecure the parent’s involvement
  - **T**ake the cause of pain into account
  - **T**ake action and evaluate results

Pediatric pain assessment scales

Pain Assessment tools

- **0-2 Years**: Neonatal Infant Pain Scale, Premature Infant Pain Profile, Neonatal Infant Pain Scale, **DAN score**
- **3-7 years old**: FACES pain rating scale, **OUCHER Scale**
- **7< years old**: Verbal Report Scale, **Visual Analog Scale**
## Summary of Neonatal Pain Scales

<table>
<thead>
<tr>
<th>Pain scale</th>
<th>What variables are included?</th>
<th>Type of pain</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPP (premature infant pain profile)</td>
<td>Heart rate, oxygen saturation, facial actions</td>
<td>Procedural, postoperative</td>
<td>Reliable, valid, clinical utility is well established</td>
</tr>
<tr>
<td>NIPS (neonatal infant pain score)</td>
<td>Facial expression, crying, breathing patterns, arm and leg movements, arousal</td>
<td>Procedural</td>
<td>Reliable, valid</td>
</tr>
<tr>
<td>NFCS (neonatal facial coding system)</td>
<td>Facial actions</td>
<td>Procedural</td>
<td>Reliable, valid, clinical utility is well established, high degree of sensitivity to analgesia</td>
</tr>
<tr>
<td>N-PASS (neonatal pain, agitation and sedation scale)</td>
<td>Crying, irritability, facial expression, extremity tone, vital signs</td>
<td>Procedural, postoperative, mechanically ventilated patients</td>
<td>Reliable, valid. Includes sedation end of scale, does not distinguish pain from agitation</td>
</tr>
<tr>
<td>CRIES (cry, requires oxygen, increased vital signs, expression, sleeplessness)</td>
<td>Crying, facial expression, sleeplessness, requires oxygen to stay at &gt;95 % saturation, increased vital signs</td>
<td>Postoperative</td>
<td>reliable, valid</td>
</tr>
<tr>
<td>COMFORT scale</td>
<td>Movement, calmness, facial tension, alertness, respiration rate, muscle tone, heart rate, blood pressure</td>
<td>Postoperative, critical care</td>
<td>Reliable, valid, clinical utility well established</td>
</tr>
<tr>
<td>DAN (Douleur Aiguë du Nouveau-né)</td>
<td>Facial expression, limb movements, vocal expression</td>
<td>Procedural</td>
<td>Reliable, valid</td>
</tr>
</tbody>
</table>
A Tiered Approach to Analgesia in the Neonate

Tier 5
- Wound Treatment, Incision and Drainage, Lumbar Puncture, Tracheal Intubation, Chest Tube Insertion, Central Line Placement,

Tier 4
- Wound Treatment, Incision and Drainage, Lumbar Puncture, Peripheral Arterial Line, PICC Line Placement, Circumcision, Chest Tube Insertion

Tier 3
- Heelstick, Fingerstick, Adhesive Removal, Dressing Change, Wound Treatment, Venipuncture, Arterial puncture, Circumcision

Tier 2
- Wound Treatment, Venipuncture, Arterial puncture, Subcutaneous Injection, Intramuscular Injection, Peripheral IV Cannulation, Central Line Placement, Lumbar Puncture, Peripheral Arterial Line, PICC Line Placement, Circumcision, Chest Tube Insertion

Tier 1

Baseline
- Avoid painful procedures
- Anticipate need of future studies
- Use non-invasive monitoring (NIRS, oxygen saturation, EtCO2 monitoring, transcutaneous bilirubin)

References for this figure: See References: See 1, 2, 36, 37, 50-53.
Multidimensional Infant Pain Measures

Designed for measurement of prolonged/ongoing pain

- **N-PASS**: Neonatal Pain, Agitation, and Sedation Scale
Pain Scales: FLACC Scale

- Infancy to 7 years of age
- Developmental delay
- Unable to report their pain

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

Each of the five categories (F) Face; (L) Legs; (A) Activity; (C) Cry; (C) Consolability is scored from 0–2, which results in a total score between zero and ten. From Menkel, Lewis, Shayevitz, Malviya, 1997. Used with permission.

Pain Scales: Wong-Baker FACES

- Ages 3 years and above

The Oucher Photographic Scale

Ages 3 years and above

- Available in different gender and ethnicities


- http://www.oucher.org/differences.html
Classification of Pain

- Nociceptive
- Neuropathic
- Mixed
Definition of Types of Pain

Pain

Nociceptive
Pain transmitted by normal physiologic pathways; starting with skin or joint transducers, via peripheral nerves to the CNS (eg. pinprick, arthritis, myofascial pain)

Neuropathic
Pain initiated or caused by a primary lesion or dysfunction in the nervous system (eg. Painful diabetic neuropathy, post-herpetic neuralgia, central pain)
Types of Pain

Nociceptive

- Postoperative pain
- Mechanical low back pain
- Sports/exercise injuries
- Sickle cell crisis
- Arthritis
Types of Pain

Neuropathic

Adult Peripheral
- Postherpetic neuralgia
- Neuropathic low back pain
- Distal polyneuropathy (e.g., diabetic, HIV)
- Trigeminal neuralgia

Adult Central
- Spinal Cord Injury
- Central post-stroke pain
- Multiple Sclerosis
- Guillain-Barre

Children
- Post-Amputation
- Spinal Cord Injury
- Guillain-Barre
- Multiple Sclerosis
Chronic pain management in SNI

- Due to the complexity of this population pain frequently goes unrecognized inadequately treated
- Increased severity – increased frequency and severity

Julie Hauer, Amy J. Houtrow, Pain Assessment and Treatment in Children With Significant Impairment of the Central Nervous System. SECTION ON HOSPICE AND PALLIATIVE MEDICINE, COUNCIL ON CHILDREN WITH DISABILITIES. Pediatrics Jun 2017, 139 (6) e20171002; DOI: 10.1542/peds.2017-1002
Parents Report

- Pain
- Sleep
- Feeding
Chronic pain management in SNI

Assessment

Identify Pain

- H&P
- Observational/behavioral Tools
  - FLACC-r
  - I-NRS
  - If Developmental age of 3 yrs or older-age appropriate scale

Track Interventions

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- Source
- GI
- Musculoskeletal
- Neuro

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Chronic pain management in SNI

Neuropathic Pain

- Peripheral
  - GBS

- Visceral
  - Hypersensitivity

- Autonomic Dysfunction

- Central
  - Metabolic
  - Genetic
  - Infection

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Chronic pain management in SNI

Nociceptive

- **Acute**
  - H&P
  - Work-up
  - Blood work
  - Imaging
  - Medication Evaluation

- **Chronic**
  - Work-up negative continue looking for source but start meds

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MAGIC PILL

- Physician
- Pharmacological
- Psychological
- Rehabilitation
- Educational
- Nutrition
- Integrative Medicine
World health Organization (WHO) Principles of Pediatric Acute Pain Management

- By the Clock → regular intervals
- With the child
- By the appropriate route
- WHO Ladder of Pain Management

- WHO guidelines on the pharmacological treatment of persisting pain in children with medical illnesses, WHO 2012
- WHO guidelines on the pharmacological treatment of persisting pain in children with medical illnesses
Step 1: Non-Opioids: Mild Pain

- **Acetaminophen**
  - Well tolerated
  - No GI or platelet side effects
  - Caution with hepatic toxicity
  - IV now available

- **Ibuprofen**
  - Least GI effects among NSAIDs
  - Caution
  - Hepatic or renal impairment
  - History of GI bleeding
  - Platelet function
  - May combine with Acetaminophen

- **Ketorolac (Toradol)**
  - IV or IM; 5 days maximum

Step 2: Weak Opioid

- **Codeine**

**Poor Metabolizers (3-17%)**
- Low or Absent Analgesia
- Infants and young children
- NSAIDs often provide better analgesia
- Tylenol #3 vs. Tylenol: no difference in analgesia

**Ultra-rapid Metabolizers (3-30%)**
- Toxicity and respiratory depression
- Reports in infants, breast feeding infants and adults
- Up to 30% in some African pop.

Step 3: Strong Opioids: Moderate- Severe Pain

- MORPHINE (Low Dose)
- CODEINE
- TRAMADOL
Non-Opioid Pharmacological Options

Membrane Stabilizers
- Gabapentin
- Pregabalin
- Carbamazepine
- Valproic acid

Antidepressants
- Amitriptyline
- Nortriptyline
- Cymbalta
- Duloxitene (SNRI)

Muscle Relaxants
- Baclofen
- Diazepam
- Benzodiazepines
## Common Side Effects Associated with TCA's

<table>
<thead>
<tr>
<th></th>
<th>Sedation</th>
<th>Anti Cholinergic effects</th>
<th>Hypotension</th>
<th>Cardiac effects</th>
<th>Seizures</th>
<th>Weight gain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amitriptyline</strong></td>
<td>+ ++</td>
<td>+ ++</td>
<td>+ ++</td>
<td>+ ++</td>
<td>+ +</td>
<td>+</td>
</tr>
<tr>
<td><strong>Clomipramine</strong></td>
<td>+ +</td>
<td>+ +</td>
<td>+</td>
<td>+ ++</td>
<td>+ + +</td>
<td>+</td>
</tr>
<tr>
<td><strong>Desipramine</strong></td>
<td>o/+</td>
<td>+</td>
<td>+</td>
<td>+ ++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Nortriptyline</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+ ++</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

o/+ = minimal;  + = mild;  + + = moderate;  + + + = moderately severe

Hardman, JG, Limbird LE, Motioff PB, Rudden, RW, Gilman AG, eds
## Pharmacological Management

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hyperalgesia</strong></td>
<td>EMLA cream</td>
</tr>
<tr>
<td></td>
<td>Lidocaine IV</td>
</tr>
<tr>
<td></td>
<td>Gabapentin</td>
</tr>
<tr>
<td><strong>Allodynia</strong></td>
<td>Gabapentin</td>
</tr>
<tr>
<td></td>
<td>Ketamine IV or IM Morphine IV</td>
</tr>
<tr>
<td><strong>Shooting, lancinating pain</strong></td>
<td>Amitriptyline</td>
</tr>
<tr>
<td></td>
<td>Gabapentin</td>
</tr>
<tr>
<td></td>
<td>Lamotrigine</td>
</tr>
<tr>
<td></td>
<td>Venlafaxine</td>
</tr>
<tr>
<td></td>
<td>Carbamazepine</td>
</tr>
<tr>
<td></td>
<td>Imipramine</td>
</tr>
<tr>
<td></td>
<td>Phenytoin IV</td>
</tr>
<tr>
<td><strong>Burning pain</strong></td>
<td>Amitriptyline</td>
</tr>
<tr>
<td></td>
<td>Gabapentin</td>
</tr>
<tr>
<td></td>
<td>Phenytoin IV</td>
</tr>
</tbody>
</table>
Evidence Based Approach

• The best evidence based approach to assessing the efficacy and safety of drugs is by assessing the NNT (number needed to treat) and NNH (number needed to harm) for various drug classes.

• In a meta-analysis of 105 studies of analgesia:
  • In Peripheral neuropathic pain, the lowest NNT was for tricyclic antidepressants
  • The second lowest NNT was for opioids, gabapentin, and pregabalin.

• Tricyclic antidepressants as well as the anticonvulsants gabapentin and pregabalin were the most studied agents in these studies.
Chronic pain management in SNI

**Management**

- Customizing treatment to child depending on severity

**Medications**

- Same WHO guidelines for mild - non opioid
- Moderate-Severe – may not respond to opioids

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Pharmacological Management

<table>
<thead>
<tr>
<th>Medication</th>
<th>Beginning Dosage</th>
<th>Titration</th>
<th>Maximum Dosage</th>
<th>Duration of Adequate Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gabapentin</td>
<td>100-300 mg every night or 100-300 mg 3 times daily</td>
<td>Increase by 100-300 mg 3 times daily every 1-7 d as tolerated</td>
<td>3600 mg/d (1200 mg 3 times daily); reduce if low creatinine clearance</td>
<td>3-8 wk for titration plus 1-2 wk at maximum tolerated dosage</td>
</tr>
<tr>
<td>5% Lidocaine patch</td>
<td>Maximum of 3 patches daily for a maximum of 12 h</td>
<td>None needed</td>
<td>Maximum of 3 patches daily for a maximum of 12 h</td>
<td>2 wk</td>
</tr>
<tr>
<td>Opioid analgesics*</td>
<td>5-15 mg every 4 h as needed</td>
<td>After 1-2 wk, convert total daily dosage to long-acting opioid analgesic and continue short-acting medication as needed</td>
<td>No maximum with careful titration; consider evaluation by pain specialist at dosages exceeding 120-180 mg/d</td>
<td>4-6 wk</td>
</tr>
<tr>
<td>Tramadol hydrochloride</td>
<td>50 mg once or twice daily</td>
<td>Increase by 50-100 mg/d in divided doses every 3-7 d as tolerated</td>
<td>400 mg/d (100 mg 4 times daily); in patients older than 75 y, 300 mg/d in divided doses</td>
<td>4 wk</td>
</tr>
<tr>
<td>Tricyclic antidepressants (eg, nortriptyline hydrochloride or desipramine hydrochloride)</td>
<td>10-25 mg every night</td>
<td>Increase by 10-25 mg/d every 3-7 d as tolerated</td>
<td>75-150 mg/d; if blood level of active drug and its metabolite is &lt;100 ng/mL, continue titration with caution</td>
<td>6-8 wk with at least 1-2 wk at maximum tolerated dosage</td>
</tr>
</tbody>
</table>

*Dosages given are for morphine sulfate.

- From Archives of Neurology, Advances in Neuropathic Pain, 2003
Chronic pain management in SNI

Pharmacological

- Membrane Stabilizers
- Tricyclics/Anti-Depressants
- Alpha2Agonist
- Opioids +/-
- SNRIs

- Botox
- ITB

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Non Pharmacological Interventions

- Rehabilitation
  - Positioning
  - Swaddling
  - Supportive seating
  - Pillows
  - Warm bath
  - Massage
  - Weighted blanket
  - Music

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“You’ve been fooling around with alternative medicines, haven’t you?”
“On the plus side, you’ve cured my back pain.”
Therapeutic Options

Education

Rehabilitation
• Functional Restoration
• Aquatic Therapy
• Physical Therapy
• Occupational Therapy

Behavioral Health
• Cognitive Behavioral Therapy
• Biofeedback
• Guided Visual Imagery

Integrative Medicine
• Acupuncture
• Myofascial
• Art, Music, & Dance
• Mediation
• Nutrition
Impact on Children
Impact on Child

- 30-68% - daily life restrictions
- 90% less sports participation
- Strained peer relationships
- 50% - sleep difficulties
- Potential for permanent alteration of child’s development and future role functioning

Academic
- Poor performance
- Frequent school absence
Adolescents → Young Adulthood

- Non-medical use of opioids highest in 18-25 year olds
  - 1 in 10 high school seniors reported opioid misuse

- But... Misuse and addiction rare in adolescents with chronic pain
  - Hyperalgesia
  - Care-seeking behavior vs. Drug-seeking
  - Inappropriate therapeutic expectations

- Motives of non-medical use of opioids
  - “to relax”, “to get high” – 55%
  - “to relieve pain” – 45%

Adolescents → Young Adulthood

- Highest risk for drug experimentation and abuse
  - Major transitions
  - Social, emotional, and educational challenges
  - Increased availability of drugs

- Key Risk Factors
  - Poverty
  - Drug Availability
  - Lack of parental supervision

- What to do?
  - **LOCK UP PRESCRIPTION DRUGS**
  - Talk to adolescents and families of adolescents
Increase Transparency

- Pediatric Advisory Committee
  - Recommendations
    - Provide Opportunity for public input
    - Advisory committee will meet regarding opioid REMS May 3-4, 2016 (Extended Release Hydromorphone)

Increase Communication

- Within the Medical Community
Opioid addiction is driving this epidemic

- Adolescents (12 to 17 years old)
  - Current nonmedical users of pain reliever
  - Addiction
- Used heroin in the past year
  - Heroin use disorder in 2014
- Share their unused pain relievers
- Prescribing rates for prescription opioids among adolescents and young adults nearly doubled from 1994 to 2007
Summary

Hopefully you should be able to:

- Provide a basic assessment of acute and chronic pain throughout childhood
- Have an understanding of the Multi-disciplinary Approach in the management of both populations
- Describe 3 non pharmacological interventions used to manage pain in both populations
- Give 3 pharmacological Options for pain management
“Are we there yet?”