Dispelling the Myths of Neonatal Pain Management

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Objectives

• The learner will be able to:
  – Verbalize the mechanism for pain in premature and term infants
  – Identify physiological and behavioral responses to pain in the premature and term infant
  – Identify methods of pain management for the premature and term infant
Fact or Myth

Pain in neonates is both measurable and treatable so to not treat pain is unethical.

A. True
B. False
Pain: Definition

- International Association for the Study of Pain (1994)
  - Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage

- McCaffrey (1968)
  - Pain is whatever the person says it is existing whenever the person says it does.
Neonatal Pain: Definition

• No universal definition

• Addition to IASP guideline (2001)
  “the inability to communicate in no way negates the possibility that an individual is experiencing pain.”
Fact of Myth

Neonates do not have the same pain pathways as adults or the emotional ability to anticipate pain, therefore, the pain response is not as acute as an adult.

A. True
B. False
Physiology of Neonatal Pain
Controversy

• Without the involvement of the cerebral cortex, the extent and intensity of pain in the premature infant has been questioned.

(BMJ 2002)
Controversy

• Studies on cerebral dynamic changes in premature infants as early as 25 weeks gestation showed somatosensory cortical activation with pain.

  (Bartocci, 2006; Slater, 2006)
Physiology of Neonatal Pain

The argument for preterm pain:

- Mostly transmitted through non-myelinated C-fibers
- Less specific transmission within spinal cord
- Sensory nerve cells in spinal cord are more excitable
- Descending modulation is immature and ineffective

(Fitzgerald 2000)
Fact or Myth

There are clear physiological and behavioral indicators specifically for pain in premature infants.

A. True
B. False
Stress Indicators

- Change in:
  - heart rate,
  - respiratory rate
  - BP
  - SaO₂,
- Changes in:
  - facial expression
  - body movements
  - Hypotonia/hypertonia
  - crying

Pain Indicators

- Change in:
  - heart rate,
  - respiratory rate
  - BP
  - SaO₂,
- Changes in:
  - facial expression
  - body movements
  - Hypotonia/hypertonia
  - crying
Pain Assessment Barriers

• Neurological Impairment
• Prenatal Alcohol Exposure
• Nurse-physician collaboration
• Care Giver Perceptions
Indicators of Neonatal Pain

- Physiological Indicators
- Behavioral Cues
- Immobility Theory
Behavioral Indicators

- Stiff, rigid, flaccid or limp
- Extended extremities, finger or toe splay
- Grimacing, frowning, chin quiver tautness, blank face
- Crying, whimpering, irritable
- Aversion to gaze
Behavioral Cues
Fact or Myth

There is a gold standard for neonatal pain assessment.

A. True
B. False
Neonatal Pain Tools

• Based on behavioral cues or physiological indicators or both.

• Measure procedural or long-term pain.

• Most are reliable, but construct validity may be questionable.
<table>
<thead>
<tr>
<th>Process</th>
<th>Indicator</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chart</td>
<td>Gestational age</td>
<td>36 weeks and more</td>
<td>32 weeks to 35 weeks, 6 days</td>
<td>28 weeks to 31 weeks, 6 days</td>
<td>28 weeks and less</td>
<td>0 – 2.9%</td>
</tr>
<tr>
<td>Observe infant for 15 seconds</td>
<td>Behavioral State</td>
<td>Active/awake</td>
<td>Quiet/awake</td>
<td>Active/sleep</td>
<td>Quiet sleep</td>
<td>3 – 2.9%</td>
</tr>
<tr>
<td>Observe baseline:</td>
<td></td>
<td>Eyes open facial movements</td>
<td>Eyes open</td>
<td>Eyes closed</td>
<td>Eyes closed</td>
<td>3 – 2.9%</td>
</tr>
<tr>
<td>Heart rate Max._____</td>
<td></td>
<td>0 to 4 beats per minute increase</td>
<td>5 to 14 beats per minute increase</td>
<td>15 to 24 beats per minutes increase</td>
<td>25 beats per minute or more increase</td>
<td>3 – 2.9%</td>
</tr>
<tr>
<td>Oxygen Saturation Min._____</td>
<td></td>
<td>0 to 2.4 % decrease</td>
<td>2.5 – 4.9% decrease</td>
<td>5.0 to 7.4% decrease</td>
<td>7.5 or more decrease</td>
<td>3 – 2.9%</td>
</tr>
<tr>
<td>Brow Bulge</td>
<td>None 0 – 9% of time</td>
<td>Minimum 10 – 39% of time</td>
<td>Moderate 40 – 69% of time</td>
<td>Maximum 70% of time or more</td>
<td>Maximum 70% of time or more</td>
<td>3 – 2.9%</td>
</tr>
<tr>
<td>Eye Squeeze</td>
<td>None 0 – 9% of time</td>
<td>Minimum 10 – 39% of time</td>
<td>Moderate 40 – 69% of time</td>
<td>Maximum 70% of time or more</td>
<td>Maximum 70% of time or more</td>
<td>3 – 2.9%</td>
</tr>
<tr>
<td>Nasolabial Furrow</td>
<td>None 0 – 9% of time</td>
<td>Minimum 10 – 39% of time</td>
<td>Moderate 40 – 69% of time</td>
<td>Maximum 70% of time or more</td>
<td>Maximum 70% of time or more</td>
<td>3 – 2.9%</td>
</tr>
</tbody>
</table>
# N-Pass

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Sedation</th>
<th>Sedation/Pain</th>
<th>Pain / Agitation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criteria</strong></td>
<td>-2</td>
<td>-1</td>
<td>0/0</td>
</tr>
<tr>
<td><strong>Crying Irritability</strong></td>
<td>No cry with painful stimuli</td>
<td>Moans or cries minimally with painful stimuli</td>
<td>No sedation/ No pain signs</td>
</tr>
<tr>
<td><strong>Behavior State</strong></td>
<td>No arousal to any stimuli No spontaneous movement</td>
<td>Aroused minimally to stimuli Little spontaneous movement</td>
<td>No sedation/ No pain signs</td>
</tr>
<tr>
<td><strong>Facial Expression</strong></td>
<td>Mouth is lax No expression</td>
<td>Minimal expression with stimuli</td>
<td>No sedation/ No pain signs</td>
</tr>
<tr>
<td><strong>Extremities Tone</strong></td>
<td>No grasp reflex Flaccid tone</td>
<td>Weak grasp reflex ↓ muscle tone</td>
<td>No sedation/ No pain signs</td>
</tr>
<tr>
<td><strong>Vital Signs HR, RR, BP, SaO₂</strong></td>
<td>No variability with stimuli Hypoventilation or apnea</td>
<td>&lt; 10% variability from baseline with stimuli</td>
<td>No sedation/ No pain signs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+1 if <30 weeks gestation / corrected age
# FLACC

<table>
<thead>
<tr>
<th></th>
<th>DATE/TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face</strong></td>
<td></td>
</tr>
<tr>
<td>0 – No particular expression or smile</td>
<td></td>
</tr>
<tr>
<td>1 – Occasional grimace or frown, withdrawn, disinterested</td>
<td></td>
</tr>
<tr>
<td>2 – Frequent to constant quivering chin, clenched jaw</td>
<td></td>
</tr>
<tr>
<td><strong>Legs</strong></td>
<td></td>
</tr>
<tr>
<td>0 – Normal position or relaxed</td>
<td></td>
</tr>
<tr>
<td>1 – Uneasy, restless, tense</td>
<td></td>
</tr>
<tr>
<td>2 – Kicking, or legs drawn up</td>
<td></td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td></td>
</tr>
<tr>
<td>0 – Lying quietly, normal position, moves easily</td>
<td></td>
</tr>
<tr>
<td>1 – Squirming, shifting back and forth, tense</td>
<td></td>
</tr>
<tr>
<td>2 – Arched, rigid or jerking</td>
<td></td>
</tr>
<tr>
<td><strong>Cry</strong></td>
<td></td>
</tr>
<tr>
<td>0 – No cry (awake or asleep)</td>
<td></td>
</tr>
<tr>
<td>1 – Moans or whimpers; occasional complaint</td>
<td></td>
</tr>
<tr>
<td>2 – Crying steadily, screams or sobs, frequent complaints</td>
<td></td>
</tr>
<tr>
<td><strong>Consolability</strong></td>
<td></td>
</tr>
<tr>
<td>0 – Content, relaxed</td>
<td></td>
</tr>
<tr>
<td>1 – Reassured by occasional touching, hugging or being talked to, distractible</td>
<td></td>
</tr>
<tr>
<td>2 – Difficult to console or comfort</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL SCORE</strong></td>
<td></td>
</tr>
<tr>
<td>Indicator</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Facial Activity</strong></td>
<td>1. Relaxed facial activity</td>
</tr>
<tr>
<td></td>
<td>2. Transient grimaces with frowning, lip purse and chin quiver or tautness</td>
</tr>
<tr>
<td></td>
<td>3. Frequent grimaces, lasting grimaces</td>
</tr>
<tr>
<td></td>
<td>4. Permanent grimaces resembling crying or blank face</td>
</tr>
<tr>
<td><strong>Body Movement</strong></td>
<td>1. Relaxed body movements</td>
</tr>
<tr>
<td></td>
<td>2. Transient agitation, often quiet</td>
</tr>
<tr>
<td></td>
<td>3. Frequent agitation but can be calmed down</td>
</tr>
<tr>
<td></td>
<td>4. Permanent agitation with contraction of fingers and toes and hypertonia of limbs or infrequent slow movements.</td>
</tr>
<tr>
<td><strong>Quality of Sleep</strong></td>
<td>1. Falls asleep easily</td>
</tr>
<tr>
<td></td>
<td>2. Falls asleep with difficulty</td>
</tr>
<tr>
<td></td>
<td>3. Frequent, spontaneous arousals, independent of nursing, restless sleep</td>
</tr>
<tr>
<td></td>
<td>4. Sleepless</td>
</tr>
<tr>
<td><strong>Quality of contact with nurses</strong></td>
<td>1. Smiles, attentive to voice</td>
</tr>
<tr>
<td></td>
<td>2. Transient apprehension during interactions with nurses</td>
</tr>
<tr>
<td></td>
<td>4. Refuses to communicate with nurses. No interpersonal rapport. Moans without stimulation.</td>
</tr>
<tr>
<td><strong>Consolability</strong></td>
<td>1. Quiet, total relaxation</td>
</tr>
<tr>
<td></td>
<td>2. Calms down quickly in response to stroking or voice, or with sucking</td>
</tr>
<tr>
<td></td>
<td>3. Calms down with difficulty</td>
</tr>
<tr>
<td></td>
<td>4. Disconsolate. Sucks desperately</td>
</tr>
</tbody>
</table>
Fact or Myth

There are known safe and effective medications for managing neonatal pain.

A. True
B. False
Neonatal Pain Interventions

Non-pharmacological
• Modifying the environment
• Providing physical support
• Providing emotional support

Pharmacological
• Use of analgesic or anesthesia for reduction of pain
Swaddling/Facilitative tucking
Sucrose/NNS

Oral Sucrose administered by:

• Pacifier
• Parent finger
• Emptied breast
Environmental Stress
Breastfeeding
Pharmacological Local Anesthesia

- Superficial infiltration
- Topical include EMLA cream
  - must be applied 1 hour before procedure
  - Should be used with caution when other agents capable of causing methemoglobin are co-administered (acetaminophen or sulfonamides).
  - Should not be given repeatedly.
  - Studies show ineffective for heel stick pain.
  - Approved for infants > 37 weeks. Not recommended for premature infants.
Pharmacological Local Anesthesia

- Superficial infiltration
- Subcutaneous include lidocaine and bupivacaine
  - Used at insertion site.
  - Should be used with caution because they are metabolized in the liver.
  - Safety and efficacy data is limited.
Pharmacological Opioids

Fentanyl VS. Morphine

Fentanyl
- Best used in continuous drip to avoid glottic and chest wall rigidity.
- Less histamine release and hemodynamic instability
- Increased clearance noted with maturity
- More effective for short term pain relief
- Rapid onset, short duration

Morphine
- Can be given as bolus or continuous drip with same adverse affects.
- Less rapid tolerance with less withdrawal potential
- May provide greater sedation
- Slower clearance and longer elimination time in preterm infants
- More effective for long term pain relief
- Has a “ceiling”
Pharmacological Opioids

- Respiratory depression is most common side effect.
- The risk of adverse effect is related to the dose, rate, and combination of other CNS depressing drugs.
- Resuscitation equipment and personnel trained in resuscitation procedures should be present when administering opioids.
- Must be weaned gradually to avoid withdrawal symptoms.
Epidurals

- Mostly Post Op
- Bupivacaine – most commonly used caudal block
- Epidural catheters have been successfully used after many major neonatal surgical procedures that require laparotomy or thoracotomy
Pharmacological Opioids

- Meperidine - not recommended for use because of the possibility of accumulation of toxic metabolites capable of causing seizures (Armstrong, Bersten, 1986)

- Methadone - longer acting IV or oral medication that can be tapered for gradual withdrawal of opioids. Not studied adequately for premature infants.
Pharmacological Nonsteroidal Anti-inflammatory

- NSAIDS – not recommended for pain management in neonates
- Acetaminophen
  - Used to treat less intense pain
  - Immaturity of the liver may protect the neonate from the production of toxic metabolites (glucuronide) reducing the risk of liver toxicity.
  - May be used in adjunct to reduce the total dose of more potent analgesics such as opioids.
Medication WARNING!!

Sedatives (midazolam) or paralytics (vecuronium) should never be given without opioids for pain management.
Decreasing Painful Events

AAP recommends reducing the overall pain episodes. Some strategies suggested:
- Clustering care
- Eliminating unnecessary lab and x-rays
- Using transcutaneous measurements when possible
- Minimizing repeat attempts after failure
Long-term Effects of Pain

- Increased somatic pain
- Lower pain threshold
- Increased reaction to anticipated pain
Future Research in Neonatal Pain

• Use of near-infrared spectroscopy to evaluate pain.
• Co-bedding of twins
• Spectral analysis of HR
Future Research in Neonatal Pain

- Salivary cortisol
- Skin conductivity
- Pupillometry
- Pediatric specific pain medications
Fact or Myth

Treating neonatal pain requires a thorough assessment of the neonate, the pain indicators, the situation and the consequences of treatment.

A. True
B. False
Conclusion

• There is not “gold standard” for pain assessment in neonates, especially premature infants. However, some behavioral and physiological cues can guide professional judgement.

• Pain medications should be given with consideration to the infant’s current status, medication list and level of discomfort.
Conclusion

Regardless of the difficulty of assessing neonatal pain, it is our ethical duty to provide pain management for all neonates, including pharmacological interventions for procedures known to cause pain.