

## Mitigating Procedural Pain in High-Risk Infants: Challenges and Opportunities



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## Objectives:

1. Discuss the challenges of identifying and addressing pain in infants.
2. Describe two or more negative consequences associated with repeated episodes of unmitigated pain in hospitalized infants.
3. Identify at least two strategies to mitigate procedural pain in high-risk infants.

Nothing to Disclose, No Conflict of Interest

## Background

- Infants born <32 weeks gestation and <1500g at birth were exposed to up to 10 invasive, painful procedures per day.
- Infants born between 25-42 weeks gestation underwent an average of 14 painful procedures per day during their first 2 weeks of life in the NICU.
- 23 week 560 gram infant experienced 488 painful procedures during NICU stay.

## General Principles for Guiding Pain Management in Newborns and Infants

- Pain in newborns is often unrecognized and under treated. Neonates do feel pain, and analgesia should be prescribed when indicated during their medical care.
- If a procedure is painful in adults, it should be considered painful in newborns, even if they are preterm.
- Compared with older age groups, newborns may experience a greater sensitivity to pain and are more susceptible to the long-term effects of painful stimuli.



## Short Term Consequences of Pain

- Decreased O<sub>2</sub> sats
- Increased HR
- Increased BP
- Increased metabolic demand
- Increased CR demand
- Increased ICP

## Long Term Consequences of Untreated or Unmanaged Pain

- ↓ Immune function
- Stress ulcers
- Paralytic ileus
- Structural changes in brain and spinal cord
- Increased or decreased sensitivity
- Impaired healing and growth
- Prolonged hospital stay
- Memory
- Personality development and psychologic outcomes

### Infant Responses to Pain

| Physiological changes   | Behavioral changes   | Hormonal changes   | Autonomic changes                               | Body movements   |
|---|--|--|---|--|
| <b>Increase in:</b><br>•Heart rate<br>•Blood pressure<br>•Respiratory rate<br>•Oxygen consumption<br>•Mean airway pressure<br>•Muscle tone<br>•Intracranial pressure<br><br><b>Decrease in:</b><br>•Oxygen saturation | <b>Change in facial expression:</b><br>•Grimacing<br>•Eye bulge<br>•Nasal flaring<br>•Deep nasolabial groove<br>•Curving of the tongue<br>•Quivering of the chin | <b>Increased release of:</b><br>•Cortisol<br>•Catecholamine<br>•Glucagon<br>•Growth hormone<br>•Renin<br>•Aldosterone<br>•Antidiuretic hormone<br><br><b>Decreased secretion of:</b><br>•Insulin | •Mydriasis<br>•Sweating<br>•Flushing<br>•Pallor | •Finger clenching<br>•Thrashing of limbs<br>•Writhing<br>•Arching<br>•Head banging |

- ### Differences in Pain Perception and Expression of Premature Infants
- Preemies can detect and transmit impulses but have difficulty organizing a response
  - Preemies have increased pain sensitivity due to increased numbers of peripheral receptors and decreased quantity modulating neurotransmitters
  - Preemies have less capacity for recovery- stores depleted more quickly
  - Preemies habituate to pain more readily
  - 50% of premies don't cry after a painful procedure

- ### Commonly Performed Procedures: Mild Invasiveness
- Physical Exam
  - Insertion of gavage tube
  - UAC/UVC placement
  - NP cultures
  - Bladder catheterization
  - Eye culture
  - Hearing screen

- ### Commonly Performed Procedures: Moderate Invasiveness
- Arterial Puncture
  - Venapuncture
  - Heelstick
  - Tracheal suctioning
  - Tracheal Intubation
  - Intramuscular Injection
  - CVL removal
  - Thoracentesis
  - Surfactant Administration
  - Suture Removal
  - Tracheal Extubation
  - Percutaneous Ventricular Tap

### Commonly Performed Procedures: Severe Invasiveness

- Arterial/Venous Cutdown
- Arterial Catheterization
- Circumcision
- Lumbar Puncture
- Eye Exam for Retinopathy
- Bronchoscopy or Endoscopy
- Suprapubic Bladder Tap
- CVL Placement
- Chest Tube Placement

### Principles of Pain Intervention

- Environmental and behavioral interventions are the foundation of pain management for infants.
- Pharmacologic pain intervention is additive.
- Combination of non-pharmacologic with pharmacologic interventions minimizes pain/stress & maximizes infant's self-regulatory capacities.

### Pain Reduction Strategies

#### Environmental

- Reduce harsh lighting
- Reduce noise
- Reduce frequency of handling
- Limit painful procedures

### Pain Reduction Strategies

#### Behavioral

- Soft voices, pleasant smells
- Non nutritive sucking
- Sucrose
- Breastmilk
- Facilitated tucking
- Skin-to-skin contact
- Massage
- Vibration?

## SUCROSE

- 24% solution of disaccharide, consisting of glucose and fructose, administered via bullet or oral syringe
- **Goal** is for absorption in buccal cavity
- **Mechanism of Action**
- **Dosing**

## Sucrose Dosing

- Infants 30-39 wks **0.5ml loading** dose, 2 subsequent doses of 0.1ml during/after procedure
  - Infants 40 wks to 6 mths **1ml loading** dose, 2 subsequent doses of 0.1ml during/after procedure
- \*Can be repeated at the start of each additional procedure, up to 10x per day

## Sucrose

- **Onset** of action is 10 seconds
- **Peak** action is at 2 minutes
- **Duration** of action is 5-10 minutes



## SUCROSE

- Intubated infants **CAN** have sucrose!
- NPO infants **CAN** have sucrose for painful procedures but **NOT** for hunger/irritability!!!
- **Exclusions:** <30 weeks gestation, glucose instability, unrepaired TEF, paralyzed infants



## Facilitated Tucking

- Caregiver's hands are used to encompass infant and hold extremities flexed and contained close to the trunk



## Pain Reduction Strategies

### Pharmacologic

- Topical Lidocaine preparations
- Opioids
- Sedatives

## Topical Lidocaine Preparation Use (ie. LMX-4, Anecream)

- Contraindicated in infants <30 days of life and/or less than 30 weeks gestation corrected
  - Apply to intact skin and cover with Tegaderm
  - Leave on 20-30 minutes, but no greater than 1 hour
- Dosing**
- 1g Anecream= 5cm ribbon of cream
    - <5kg use 0.5g-1g
    - 5-10kg use 1g-2g
  - Maximum dose may be repeated in 2 hours
  - Cannot be applied more than 3 times in 24 hour period

## Consider Using Topical Lidocaine Preparations for the Following Procedures:

- Sub Q injections
- Immunizations
- LP's
- Venipuncture for lab draws for patients unable to have sucrose, and especially patients greater than 6 months of age
- Circumcisions

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## Procedure Support Protocol

### Phase I: Prior to the Procedure

- Dim lights and decrease ambient noise near infant's bed space.
- (Place topical lidocaine preparation if appropriate, considering procedure and gestational age.)
- Swaddle infant in a flexed, midline supine or side-lying position with hands near face. Blanket rolls and positioning aides may be used to facilitate and maintain positioning.
- Allow for a period of rest for infant prior to beginning procedure.
- Gather all necessary supplies.
- Identify 2<sup>nd</sup> caregiver to support infant during procedure. (2<sup>nd</sup> caregiver will be responsible for supporting infant only, ie. providing facilitated tucking/hands-on containment and supporting pacifier.
- Administer sucrose 2 minutes prior to beginning procedure. Consider pacifier dip in human milk if unable to administer sucrose based on gestational age.

## Procedure Support Protocol

### Phase II: During the Procedure

- Prepare infant for procedure with soothing voice and gentle touch.
- With hands and forearms, reinforce tucking. Infant's legs should be tucked up to belly, with back rounded. Promote hand clasping or grasping of your fingers.
- Continue to offer pacifier, and provide subsequent sucrose dosing as needed.
- Communicate baby's tolerance and endurance to provider throughout the procedure. Pace, as able, to infant's tolerance, using physiologic and behavioral indicators, such as HR > 20% above baseline, bradycardia, prolonged desaturations, prolonged intense crying, stress cues.

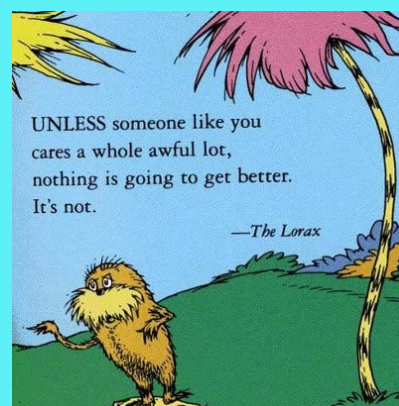
## Procedure Support Protocol

### Phase III: Following the Procedure

- If parent available, holding of infant for at least 30 minutes following procedure is preferable.
- If parent not available, assist infant's recovery by positioning in preferred position, continuing to support tucking of limbs to trunk, offering pacifier as desired. Continue to support infant in this fashion until return to baseline.
- Allow for at least 30 minutes of undisturbed rest; maintain minimization of lighting/noise.

## Take Home Points

- Despite challenges, healthcare professionals have the responsibility of assessing and managing pain in neonates and infants.
- The appropriate use of environmental, behavioral, and pharmacologic interventions can prevent, reduce, or eliminate neonatal pain in many clinical situations.
- Planning ahead and engaging team members is crucial!



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