Guidelines on Neonatal Pain Assessment and Management

1. Introduction

- The International Association for the study of pain has defined pain as ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage’
- From 24 weeks post-conceptional age, all neurotransmitters and receptors associated with pain modulation are present and responsive; thus, the fetus and newborn can feel pain
- Sick newborn infants are subjected to many invasive procedures whilst on the NICU as part of their ongoing care and management
- The prevention and alleviation of pain in neonates, particularly preterm infants, is important not only because it is ethical but also because exposure to repeated painful stimuli early in life is known to have short- and long-term adverse sequelae. These sequelae include physiologic instability, altered brain development, and abnormal neurodevelopment, somatosensory, and stress response systems, which can persist into childhood

2. Type of Pain

1- Acute pain: Skin-breaking procedures or tissue injury caused by diagnostic or therapeutic interventions

2- Established pain: Occurs after surgery, localized inflammatory conditions, birth-related trauma

3- Prolonged pain: Results from severe diseases e.g. NEC, meningitis.

4. Effects of Pain

1- physiologic effects:

- Tachycardia
- Blood pressure changes (↑ or ↓)
- Increase O2 consumption
- Hypoxemia
- Decrease cerebrovascular autoregulation
- Increase intracranial pressure
- Temperature changes
- Pallor, flushing, sweating
- Reduced tidal volume
- Increase in mean airway pressure
- Increase in muscle tone
- Abnormal respirations (shallow breathing, tachypnea, apnea)
- Prolonged catabolism
- Pupillary dilatation
2- Behavioral Change:

- Change in facial expression:
  - grimace
  - brow bulge
  - eye squeeze
  - deepening nasolabial furrow
  - nasal flaring
  - tongue curving or quivering
- Crying
- Whimpering
- ‘Silent’ cry (intubated babies)
- Decreased sleep
- Heightened responses

3- Body Movement:

- Fisting
- Tremulousness
- Thrashing limbs
- Limb withdrawal
- Writhing
- Arching back
- Head banging
- Finger splaying
- Cycling

5. Assessment of Pain

- Babies are unable to report pain. Appropriate and accurate assessment of pain is necessary and routine element in deciding the need for effective management of the infants pain, through non-Pharmacological and where appropriate pharmacological intervention

- Pain should be assessed within one hour of admission and reassessed daily once per shift or according to each infant needs to detect for the presence of pain and to evaluate the effectiveness of treatment

- For any infant about to undergo a painful procedure, they must be assessed using the NIPS pain assessment tool for 15 seconds prior to the potentially painful event and then assessed again 30 seconds immediately following the painful procedure and score must be documented on the observation chart

- Post operatively pain should be assessed hourly for first 8 hr, then 4-hrly until 48 hr (more frequently if signs of distress/discomfort)

- Infant’s whose pain scores remain high, scoring >4, despite appropriate management should be reviewed.
### 6. Neonatal Infant Pain Scale (NIPS):

The Neonatal Infant Pain Scale (NIPS) is a behavioral assessment tool for measurement of pain in preterm and full-term neonates.

<table>
<thead>
<tr>
<th>variable</th>
<th>finding</th>
<th>points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial expression</td>
<td>- Relaxed (restful face, neutral expression)</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>- Grimace (tight facial muscle, furrowed brow, chin, jaw)</td>
<td>-1</td>
</tr>
<tr>
<td>cry</td>
<td>- No cry (quiet, not crying)</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>- Whimper (mild moaning, intermittent)</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>- Vigorous crying (loud scream, shrill, continuous)</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>If baby intubated, score silent cry based on facial movement</td>
<td></td>
</tr>
<tr>
<td>Breathing pattern</td>
<td>- Relaxed (usual pattern for this infant)</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>- Change in breathing (irregular, faster than usual, gagging, breath holding)</td>
<td>-1</td>
</tr>
<tr>
<td>Arms</td>
<td>- Relaxed (no muscular rigidity, occasional random arm movements)</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>- Flexed/extended (tense, straight arms, rigid and/or rapid extension, flexion)</td>
<td>-1</td>
</tr>
<tr>
<td>legs</td>
<td>- Relaxed (no muscular rigidity, occasional random leg movements)</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>- Flexed/extended (tense, straight legs, rigid and/or rapid extension, flexion)</td>
<td>-1</td>
</tr>
<tr>
<td>State of Arousal</td>
<td>- Sleeping/awake (quiet, peaceful, sleeping, or alert and settlede)</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>- Fussy (alert, restless and thrashing)</td>
<td>-1</td>
</tr>
<tr>
<td>Heart rate</td>
<td>- Within 10% of base line</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>- 11-20% of base line</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>- &gt;20% of base line</td>
<td>-2</td>
</tr>
<tr>
<td>O2 saturation</td>
<td>- No additional O2 needed to maintain O2 saturation</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>- Additional O2 required to maintain O2 saturation</td>
<td>-1</td>
</tr>
</tbody>
</table>

Neonatal Infant Pain Scale (NIPS) = SUM (points for the parameters)

**Interpretation:**
- minimum score: 0
- maximum score: 10

**Limitations:** A falsely low score may be seen in an infant who is too ill to respond or who is receiving a paralyzing agent.
7. Guidelines for pain management:

7.1. Prevent or minimize pain:

- Reduce number of needle punctures by drawing blood tests at one time if feasible.
- Use indwelling venous or arterial catheters when appropriate.
- Avoid invasive monitoring when possible.
- Select most competent staff to perform invasive procedures.
- Use minimal amount of tape and remove tape gently.
- Ensure proper premedication before invasive procedures.
- Use appropriate equipment (smallest gauge needle).
- Decrease environmental stimuli (light, noise, abrupt movements).

7.2. Treatment guidelines:

Assess each infant on an individual basis. Using the NIPS, the nurse and the medical team determine a pain score and the appropriate intervention for pain management.

7.2.1 Nonpharmacologic Treatment Strategies:

1. Swaddling combined with positioning, facilitated tucking (holding the infant in a flexed position with arms close to the trunk) with or without parental assistance, nonnutritive sucking, and massage.

2. Skin-to-skin care (SSC), with or without sucrose or glucose administration.

3. Breastfeeding or EBM via a pacifier or syringe.

4. Sensorial stimulation (SS), a method of gently stimulating the tactile, gustatory, auditory, and visual systems simultaneously. SS is achieved by looking at and gently talking to the infant, while stroking or massaging the face or back.
7.2.2 Pharmacologic Treatment Strategies:

Analgesics are the mainstay of pharmacologic treatment of pain.

1. Sucrose and Glucose

- Oral sucrose is commonly used to provide analgesia to infants during mild to moderately painful procedures. Sucrose should only be used in infants of 32 weeks gestational age (actual/corrected) or above.

- An oral dose of 0.1 to 1 mL of 24% sucrose to be administered at least 2 minutes before the invasive procedure. Do not administer for longer than 8 minutes before the procedure as the sucrose will become ineffective. Maximum of 10 doses of sucrose in a 24 hour period is recommended.

- If the painful procedure is likely to be prolonged, for example a difficult cannulation, then the dose can be divided and administered at regular intervals during the invasive procedure, at 1-2 minute intervals.

- 20% to 30% glucose could be used as an alternative to sucrose solutions, although, glucose may not be effective for longer procedures (ophthalmologic examinations).

- Sucrose/glucose should be used with other non-pharmacological methods.

- The use of a pacifier to deliver sucrose/glucose promotes non-nutritive sucking (NNS) and induces feelings of calm. It can also elevate the pain threshold and help infants to self-soothe.

Sucrose/glucose should be used with caution in:

- Infants at high risk of developing necrotising enterocolitis (NEC)
- Infants with hyperglycaemia
- Infants who are intubated
- Newborn infants of opiate-dependent mothers – these infants may have altered endogenous opioid systems reducing the analgesic effect of oral sucrose

Sucrose/glucose should not be given to:

- Infants less than 32 weeks of gestation at the time of proposed administration
- Infants with known fructose or sucrose intolerance
- Infants with teeth as sucrose/glucose can bind to the enamel and cause tooth decay
- Infants who are muscle relaxed

Note: till sucrose be available use glucose
2. Opioids

- fentanyl or morphine to be used for persistent pain
- Respiratory depression and/or arrest may occur with opioid agents as well as with benzodiazepine particularly when these agents are given in combination.
- Careful and appropriate monitoring of infants receiving these agents is essential, especially when the patients are not receiving mechanical ventilation.

3. Paracetamol

- PR, Oral or intravenous

4. Topical Anesthetic Agents

- Eutectic Mixture of Local Anesthetics (EMLA) to be used during venipuncture, percutaneous central venous catheter insertion, peripheral arterial puncture and lumbar puncture

8. Pain Management according to NIPS:

<table>
<thead>
<tr>
<th>Pain score</th>
<th>Mild 0-3</th>
<th>Moderate 4-6</th>
<th>Severe 7-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>management</td>
<td>-Non Pharmacologic</td>
<td>-Non pharmacological</td>
<td>-Pharmacologic opioid infusion</td>
</tr>
<tr>
<td></td>
<td>-Pharmacologic Paracetamol</td>
<td>-Pharmacologic opioid bolus</td>
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</table>
9. Post-operative pain management:

- **Major surgery** *(e.g., thoracotomy, abdominal laparotomy)*
  
  Morphine/ fentanyl infusion for at least 24h after the operation.

- **Minor Surgery** *(e.g., hernia repair)*
  
  Paracetamol is usually adequate. If pain not controlled opioids bolus
  
- **Simple surgical procedures**:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Analgesia</th>
<th>Analgesia</th>
<th>Analgesia</th>
<th>Analgesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal drain insertion</td>
<td>-Lidocaine SC*</td>
<td>-Paracetamol (oral/rectal/IV)</td>
<td>-Paracetamol (oral/rectal/IV)</td>
<td>-Paracetamol (oral/rectal/IV)</td>
</tr>
<tr>
<td>ICD insertion</td>
<td>-Opioid bolus/infusion</td>
<td>-Sucrose/glucose</td>
<td>-Sucrose/glucose</td>
<td>-Paracetamol (rectal/IV)</td>
</tr>
<tr>
<td>Central line insertion</td>
<td>-Lidocaine SC*</td>
<td>-EMLA cream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wound dressing/drain removal</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Application of silo bag for gastroschisis</td>
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</tbody>
</table>

Note: Opioid should be given 5 min before procedure unless it is a dire emergency
*1% lidocaine solution without epinephrine

10. Weaning of Opiate analgesics:

- Weaning from morphine/ fentanyl should be done if the agents have been given routinely for more than 3 days.

- Method of weaning depends upon length of opiate therapy:

  1. **Short term therapy (<1 week)**: Initially reduce dose by 20%. Then reduce dose by 10% q6-8h.
  
  2. **Long term therapy (>1 week)**: Reduce dose by 20% over first 24h. Then reduce dose by 10% q12h as tolerated. Drug can usually be discontinued when it is at about 20% of original dose, although subsequent small doses may be needed.
Reference:


2- Nottingham Neonatal Service – Clinical guidelines. Oral Sucrose for the management of procedural pain. Ratification Date: 28th June 2016. Review date: June 2019


Dr. Mona Khalaf, November 2017

Review date: November 2020