

# IN THE NAME OF GOD



# Prevention and Management of Pain in the Neonate



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# Wath's pain or stress?



## Pain:

☞ An unpleasant somatic or visceral sensation associated with actual or potential tissue damage

## Stress :

☞ A disturbance of the dynamic equilibrium between an infant and his/her environment that results in a physiologic response by the infant.



## Stress or pain response:

The individual's physiologic response to pain or stress that is characterized primarily by changes in four domains:

- ❧ endocrine-metabolic
- ❧ autonomic
- ❧ immunologic
- ❧ and/or behavioral responses



## Analgesia :

☞ Absence or reduction of pain in the presence of stimuli that would normally be painful.

## Pain control :

☞ Reduction in the intensity and/or duration of pain.



☞ **The prevention of pain** in neonates should be the **goal of all caregivers**, because repeated painful exposures have the potential for deleterious consequences and neurodevelopmental impairment .



These **short term consequences** include:

- ⌘ Altered **pain sensitivity** (which may last into adolescence)
- ⌘ Permanent **neuroanatomic abnormalities**
- ⌘ Permanent **behavioral abnormalities**



The **long-term consequences** of repeated pain in vulnerable neonates may also include:

- ❧ Emotional disabilities
- ❧ Behavioral disabilities
- ❧ Learning disabilities



# pain-prevention program



- œ Strategies for routinely assessing pain
- œ Minimizing the number of painful procedures
- œ Using transcutaneous measurements when possible.
- œ Using **pharmacologic** and **nonpharmacologic** therapies for the prevention or eliminating of pain

# ASSESSMENT OF PAIN AND STRESS



- ❧ Single assessment tool has **not been universally adopted** because each tool was developed and validated for selected populations and clinical settings.
- ❧ In our practice , we assess pain using the PIPP-R

# ASSESSMENT OF PAIN AND STRESS



The pain-assessment tool including:

☞ measurements for **physiologic indicators**

☞ measurements for **behavioral indicators**

because neonates cannot self-report.

# Physiologic indicators of pain



changes in :

- ❧ heart rate
- ❧ respiratory rate
- ❧ blood pressure
- ❧ oxygen saturation
- ❧ palmar sweating
- ❧ intracranial pressure
- ❧ skin color
- ❧ pupillary size
- ❧ plasma cortisol concentrations
- ❧ plasma catecholamine concentrations

# Behavioral indicators



changes in:

- ❧ Crying patterns
- ❧ Facial expressions
- ❧ Hand and body movements
- ❧ Muscle tone
- ❧ Sleep patterns

but these may be absent in some neonates who are **neurologically impaired** or **pharmacologically paralyzed**.

# Nonpharmacologic pain prevention



1. Breastfeeding
2. Non-nutritive sucking
3. Skin- to-skin contact “kangaroo care”
4. Swaddling including facilitated tucking
5. Sensorial saturation :Use of:

☞ touch

☞ massage

☞ voice

☞ smell, and taste

# Nonpharmacologic pain prevention



These measures have been shown :

- ❧ To be useful in preterm and term neonates
- ❧ Reducing pain from:
  - ❧ a heel stick
  - ❧ venipuncture
  - ❧ subcutaneous injections
  - ❧ endotracheal suctioning

These measures are generally more effective when used in combination than when used alone.

# Pharmacologic pain control



- ❧ Oral sucrose
- ❧ Local analgesia
- ❧ Systemic analgesia



# Oral sucrose



- ❧ The mechanism of pain relief by sucking oral sucrose is not known for certain.
- ❧ **The intraoral administration** of sucrose to preterm infants without suckling **is effective**, intragastric administration is not.
- ❧ Current data indicates that sucrose is not effective after **three months of age**.

# Oral sucrose



- ∞ The dosage range of sucrose for reducing pain in neonates is **0.012 to 0.12 g (0.05– 0.5 mL of 24% solution)**.
- ∞ Some authors have suggested that multiple doses for a procedure (**2 minutes before and 1-2 minutes after**) are more effective than a single dose.

# Oral sucrose



The dosage range of sucrose for reducing pain in neonates:

- ↻ 24 to 26 weeks PCA - 0.1 mL
- ↻ 27 to 31 weeks PCA - 0.25 mL
- ↻ 32 to 36 weeks PCA - 0.5 mL
- ↻ 37 to 44 weeks PCA - 1 mL
- ↻ 45 to 60 weeks PCA - 2 mL

# LOCAL ANALGESIA



- ∞ Lidocaine-prilocaine mixture 2.5%: **EMLA** in a cream base
- ∞ Tetracaine 4% in a cream or gel base
- ∞ liposomal lidocaine 4 or 5% in a gel base

# LOCAL ANALGESIA



## EMLA

- ☞ To attain adequate local anesthesia, 1 to 2 g of EMLA cream should be applied and covered with an occlusive dressing for 40 to 60 minutes.
- ☞ The safety of repeated doses, up to four times a day, has been suggested.

# Common side effects of EMLA



- ☞ Mild, transient skin irritation
- ☞ Methemoglobinemia

Methemoglobinemia is a serious side effect, more likely to occur in patients with **G6PD deficiency**, following its use on **inflamed skin** or **inappropriately excessive doses**.

# LOCAL ANALGESIA



- ❧ EMLA cream in addition to the administration of oral **sucrose** reduce pain associated with:
  - ❧ Venous, arterial, and lumbar punctures
  - ❧ Intravenous or arterial catheter insertio
- ❧ EMLA is not effective in reducing pain from heelsticks

# LOCAL ANALGESIA



## Lidocaine

Reduce the pain associated with:

- ❧ venous or arterial puncture
  - ❧ percutaneous venous or arterial catheter placement
  - ❧ lumbar puncture
  - ❧ circumcision
- ❧ It is usually administered as either a **0.5%**(**5 mg/mL**) or **1%** solution (**10 mg/mL**) at a maximum dose of **3 to 5 mg/kg.**



# SYSTEMIC ANALGESIA



## ∞ Nonopioid analgesics:

∞ [acetaminophen](#)

1. Nonsteroidal anti-inflammatory agents(NSAID)

2. Opioid analgesics

∞ [morphine](#)

∞ [Fentanyl](#)

3. Sedatives

∞ [midazolam](#)

# Acetaminophen



- It is used in the management of mild to moderate procedural and postoperative pain.
- Single **oral** doses are **10 to 15 mg/kg** given every six to eight hours, and **20 to 25 mg/kg** given **rectally** at the same time intervals.

# Acetaminophen



- ∞ intravenous dosing of acetaminophen in neonates:
  - ∞ Loading dose of 20 mg/kg.
  - ∞ Maintenance doses starting six hours after the initial dose, and every six hours thereafter.
  - ∞ Recommended **total daily** doses are based on gestational and postnatal age :
    - ∞ 24 to 30 weeks gestation – 20 to 30 mg/kg/day
    - ∞ 31 to 36 weeks gestation – 35 to 50 mg/kg/day
    - ∞ 37 to 42 weeks gestation – 50 to 60 mg/kg/day
    - ∞ 1 to 3 months postnatal – 60 to 75 mg/kg/day

# Morphine



## Postoperative and procedural pain control:

- ☞ morphine is safe and effective in **reducing postoperative pain** in neonates.

## Birth asphyxia:

- ☞ morphine **analgesia** may be beneficial in term infants following birth asphyxia.

# Fentanyl



- ⌘ Fentanyl provide **rapid analgesia** with minimal hemodynamic effects
- ⌘ Fentanyl often used for achieving analgesia **prior to tracheal intubation** in preterm and term newborns
- ⌘ Associated potential side effects :
  - ⌘ bradycardia
  - ⌘ chest wall rigidity

# Fentanyl



Indications of administration include :

❧ **Postoperative pain** (particularly following **cardiac surgery**)

❧ **Primary pulmonary hypertension**

❧ **Pulmonary hypertension secondary to:**

❧ Meconium aspiration

❧ Diaphragmatic hernia

❧ Congenital heart disease

# step-wise approach



1- facilitated **tucking** or **skin-to-skin contact** be used to improve analgesia for any painful procedure, when feasible.

2- For neonates undergoing a brief needlestick (heelstick, venipuncture) recommend oral **sucrose**, alternatives include **breastfeeding, breast milk, or glucose**.

# step-wise approach



3- For neonates undergoing a more prolonged or painful skin-breaking procedure (arterial puncture, arterial or venous line placement, or lumbar puncture), in addition to oral **sucrose**, suggested the use of a topical anesthetic cream (**EMLA**).



# step-wise approach



4- For neonates who undergo more invasive procedures, such as central line placement, suggested that **nonpharmacologic** measures be combined with **local/topical anesthesia** and/or **systemic analgesia** to provide adequate analgesia.

THANKS FOR YOUR  
ATTENTION



“GOOD LUCK”