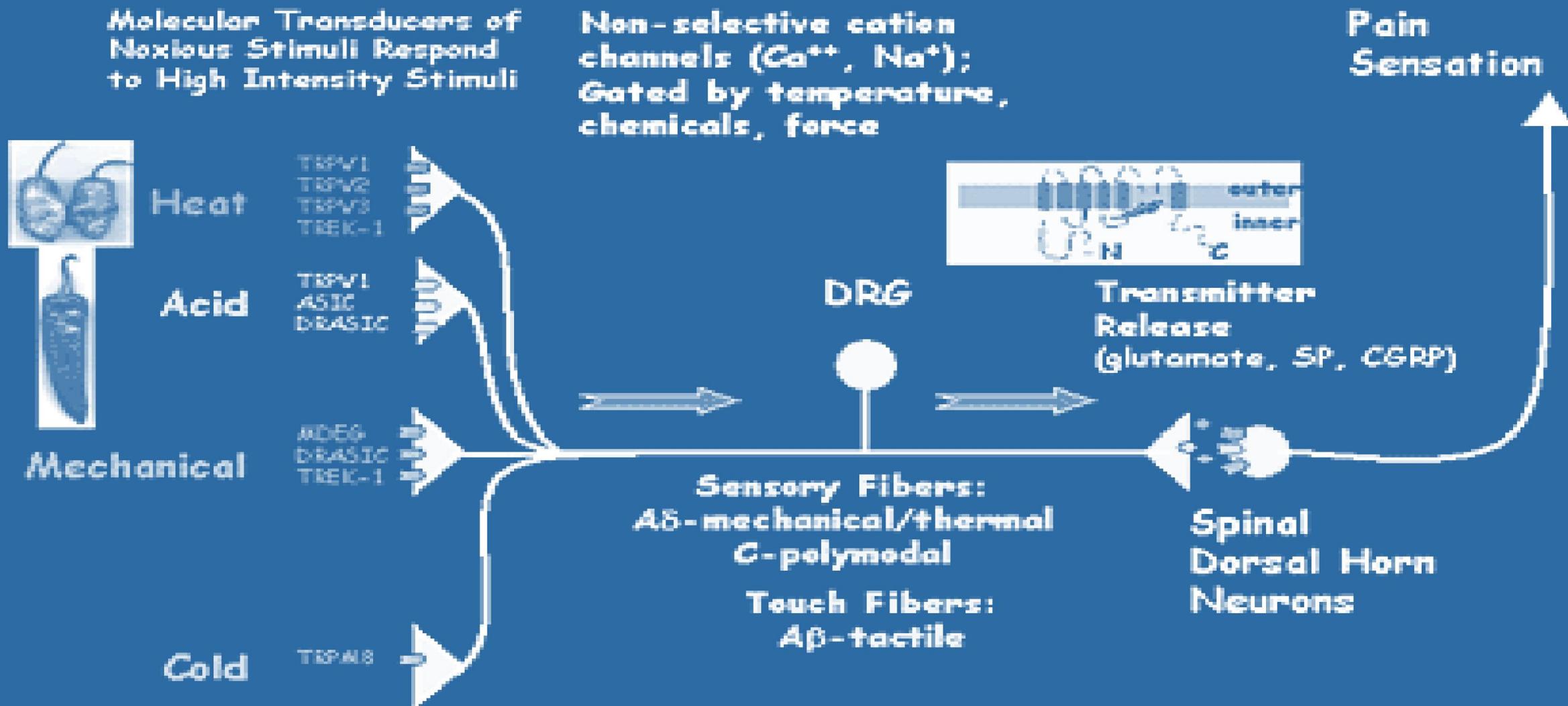


# **PAIN MANAGEMENT IN NEONATE**

Children's Hospital 2  
Neonatal Department

# Neural Mechanisms of Pain Transmission

## ◆ Physiological Detection of Pain



## ***Acute effects of neonatal pain***

- Loss of normal behaviors.
- Expression of abnormal behaviors.
- Reaction to touch.
- Physiological : increased HR and BP, decreased SpO<sub>2</sub>
- Hormonal and metabolic : increased plasma renin activity and adrenalin, noradrenalin, cortisol

## ***Long-term effects of neonatal pain***

- Alter the normal development of the central nervous system.
- Hyperalgesia.
- Impairs normal development of both excitatory and inhibitory synaptic function.
- Poorer cognitive and motor scores, impairments of growth, reduced white matter and subcortical gray matter maturation, and altered corticospinal tract structure.

# ***Procedural Pain and Brain Development in Premature Newborns***

- Cohort study :24 to 32 weeks GA, from 7/2006 to 1/2009 / III NICU at Children's and Women's Health Centre of British Columbia.
- Greater neonatal procedural pain was associated with reduced white matter FA (b  $\frac{1}{4}$  0.0002, p  $\frac{1}{4}$  0.028) and reduced subcortical gray matter NAA/ choline (b  $\frac{1}{4}$  0.0006, p  $\frac{1}{4}$  0.004).
- Early procedural pain in very preterm infants may contribute to impaired brain development.

# ***The frequency of painful procedures in neonatal intensive care units in South Korea***

- The number of painful procedures increased as the gestation period became shorter and birthweight decreased . This prospective study was done with all newborns admitted to the NICUs between 1 October and 20 November 2010.
- Neonates in two NICUs in Republic of Korea during the first 14 days of admission. A total of 15 313 of painful procedures were performed with an average of 105.6 painful procedures per baby and 7.5 per day per baby.

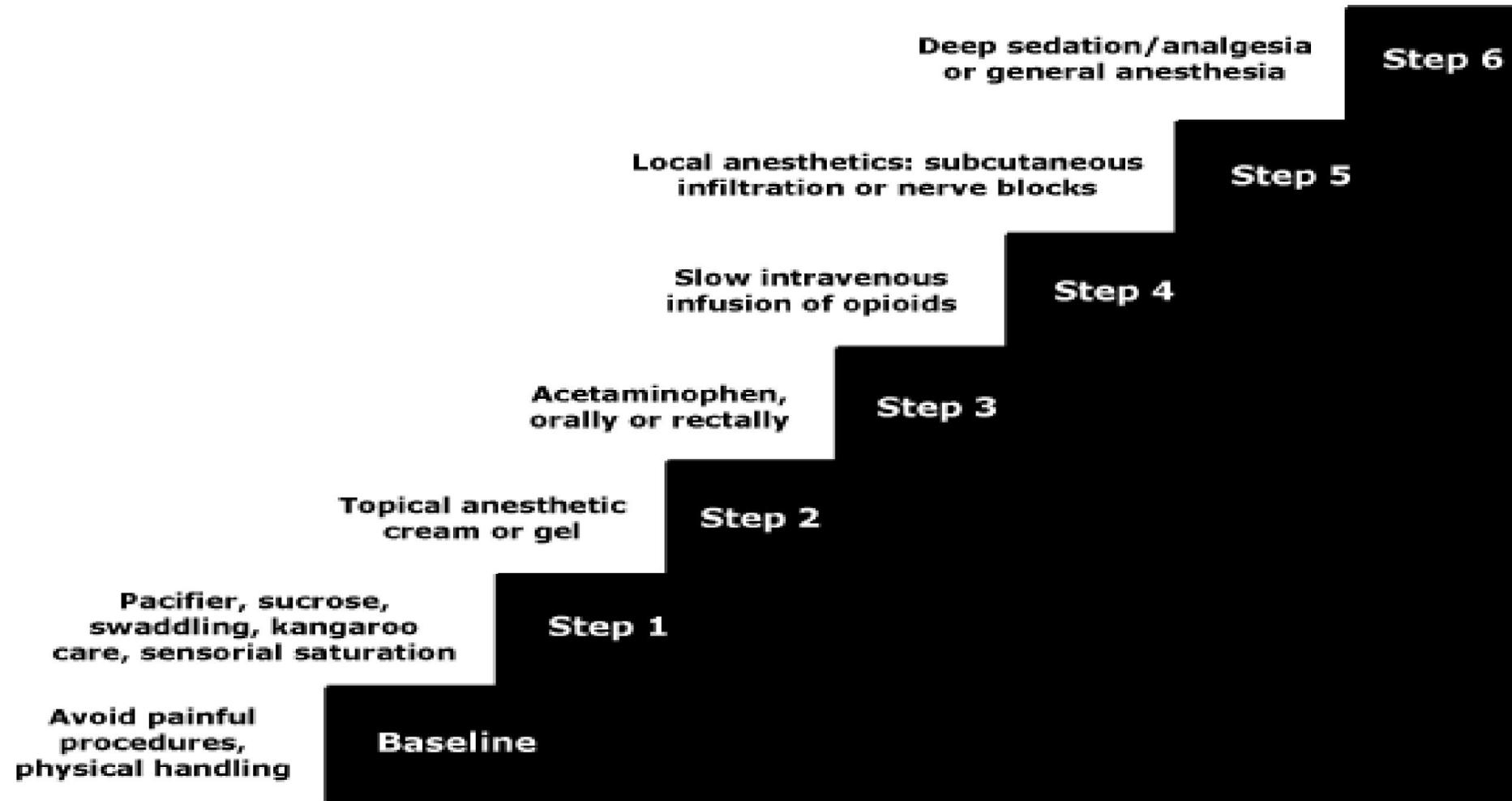
# ***A Prospective Study of Pain Experience in a Neonatal Intensive Care Unit of China***

- Data performed on 108 neonates (term, 62; preterm, 46) recruited from admission to discharge in a NICU of a university-affiliated hospital in China between 2010-2011
- During hospitalization each preterm and term neonate was exposed to a median of 100.0 (range, 11 to 544) and 56.5 (range, 12 to 249) painful procedures, respectively. Preterm neonates, especially those born at 28 and 29 weeks' GA, experienced more pain than those born at 30 weeks' GA or later ( $P < 0.001$ ). Tracheal intubations was the most painful.

TOOL	PARAMETERS	SCORE	UTILITY
<b>PIPP</b>	Gestational age, behavioral state, heart rate, oxygen saturation, brow bulge, eye squeeze, nasolabial furrow	Total : 0-21 ≤6 minimal pain >12 moderate to severe pain	Procedural and postoperative pain
<b>FLACC</b>	Face, legs, activity, cry, consolability	Total : 0-10 >4 moderate pain >7 severe pain	Procedural and postoperative pain
<b>COMFORT scale</b>	Alertness, calmness, respiratory distress, movement, muscle tone, facial tension, blood pressure, heart rate	Total: 8–40 17–26 adequate sedation; ≥27 inadequate sedation/analgesia	Pain and sedation in NICU
<b>COMFORT behavior scale</b>	Alertness, calmness, respiratory response (ventilated neonate) or crying (not ventilated), movement, muscle tone, facial expression	Total: 8–30 >17 moderate pain requiring intervention	Postoperative pain in NICU
<b>NIPS</b>	facial expression, cry, breathing patterns, arms, legs, state of arousal	Total: 0-7 ≥4 moderate pain requiring intervention	Procedural pain
<b>NFCS</b>	Brow bulge, eye squeeze, deepening of nasolabial furrow, open lips, mouth stretch, tongue tautening, tongue protrusion, chin quiver	Total: 0-8 ≥3 moderate pain requiring intervention	Procedural pain
<b>N-PASS</b>	Crying irritability, behavior state, facial expression, extremities tone, vital signs ( HR, RR, BP, SaO2 )	Total: 0-10 >3 moderate pain requiring intervention	Procedural , ventilated and postoperative pain
<b>CRIS</b>	Crying, facial expression, sleeplessness, required oxygen to stay at > 95% saturation, increase vital signs	Total: 0-12 ≥4 moderate pain requiring intervention	Postoperative pain

## Proposed steps for neonatal analgesia

---



Procedure	Stepwise intervention	Comments
Gastric tube insertion	Step 1, consider Step 2	Perform rapidly, use lubricant, avoid injury
Heelstick	Step 1 + use mechanical lance	Venipuncture's more efficient,less painful; Step 2,3 + heel warming
Adhesive removal	Use solvent swab,consider Step 1 or 4	
Venipuncture	Step 1 + 2	Require less time + less resampling than heelstick
Removal of IV catheter	Solvent swab, consider Step 1	
Tracheal intubation	Step 4 or 6,use muscle relaxant oly if experienced clinician, consider atropine	Superiority of a specific drug regimen over the others has not been investigated
Tracheal extubation	Solvent swab, consider Step 1	Step 1 maybe use after procedure
Central line placement	Step 1,2,5 consider Step 4 or 6	Some centers prefer using general anesthesia
Umbilical catheterization	Step 1, avoid suture on skin	Cord tissue is not innervated, avoid injury to skin
Lumbar puncture	Step 1,2,5 carefull positioning	Consider Step 4 if patient is intubated/ventilated
PICC line placement	Step 1,2 consider Step 4,5	Some centers prefer using general anesthesia

# **CONCLUSION**

***Effective management of procedural pain in neonates is required to minimize acute physiological and behavioral distress and may also improve acute and long-term Outcomes !!!***