Neuroprotection of Neonates in the NICU: From Survival to Thriving

Evidence-Based Strategies for Optimizing Neurodevelopmental Outcomes

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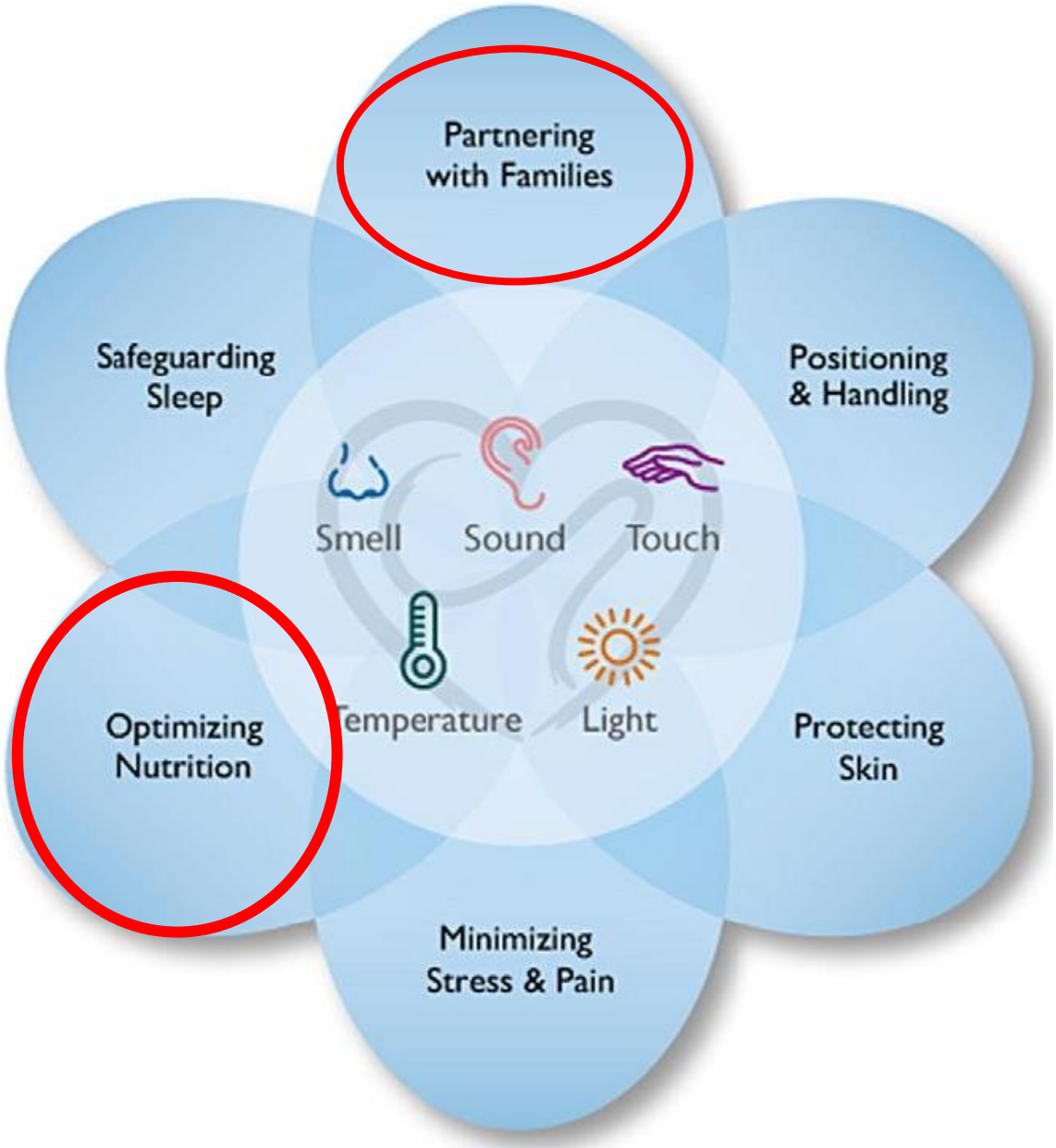

Partnering with Families
Positioning & Handling
Protecting Skin
Minimizing Stress & Pain
Optimizing Nutrition
Safeguarding Sleep
Smell
Sound
Touch
Temperature
Light

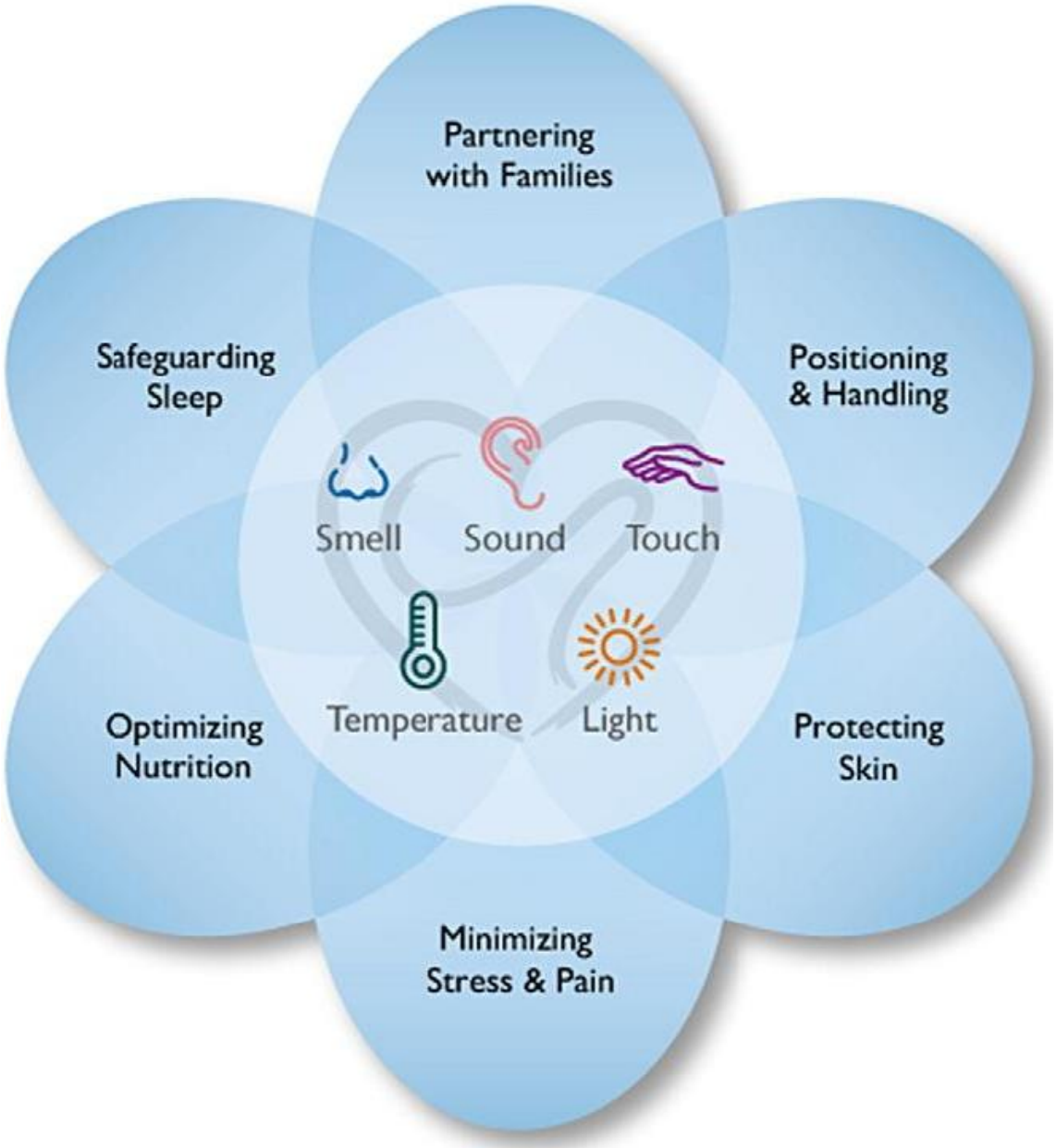
Optimising nutrition

Neonatal nutritional strategies would optimise neurodevelopment and not only growth

- Breast milk from mother /donor breast milk from a similar gestation
- Attachment and bonding
- In extreme preterm babies with gut immaturity – parenteral nutrition
- IV dextrose from birth
- IV amino acids from day 1 – essential AA
- IV lipids from day 1- essential fatty acids
- Micronutrients -Vitamins and minerals – Ca/phosphate to prevent osteopenia
- Iron supplementation – Anaemia of prematurity

Partnering with families

- Parent–new-born interactions
- Kangaroo care
- Link with families to support parenting roles and relationships
- Reduce level of stress, anxiety and depression among parents
- Screening assessments including the General Movement Assessment with the help of families
- Early intervention – family centred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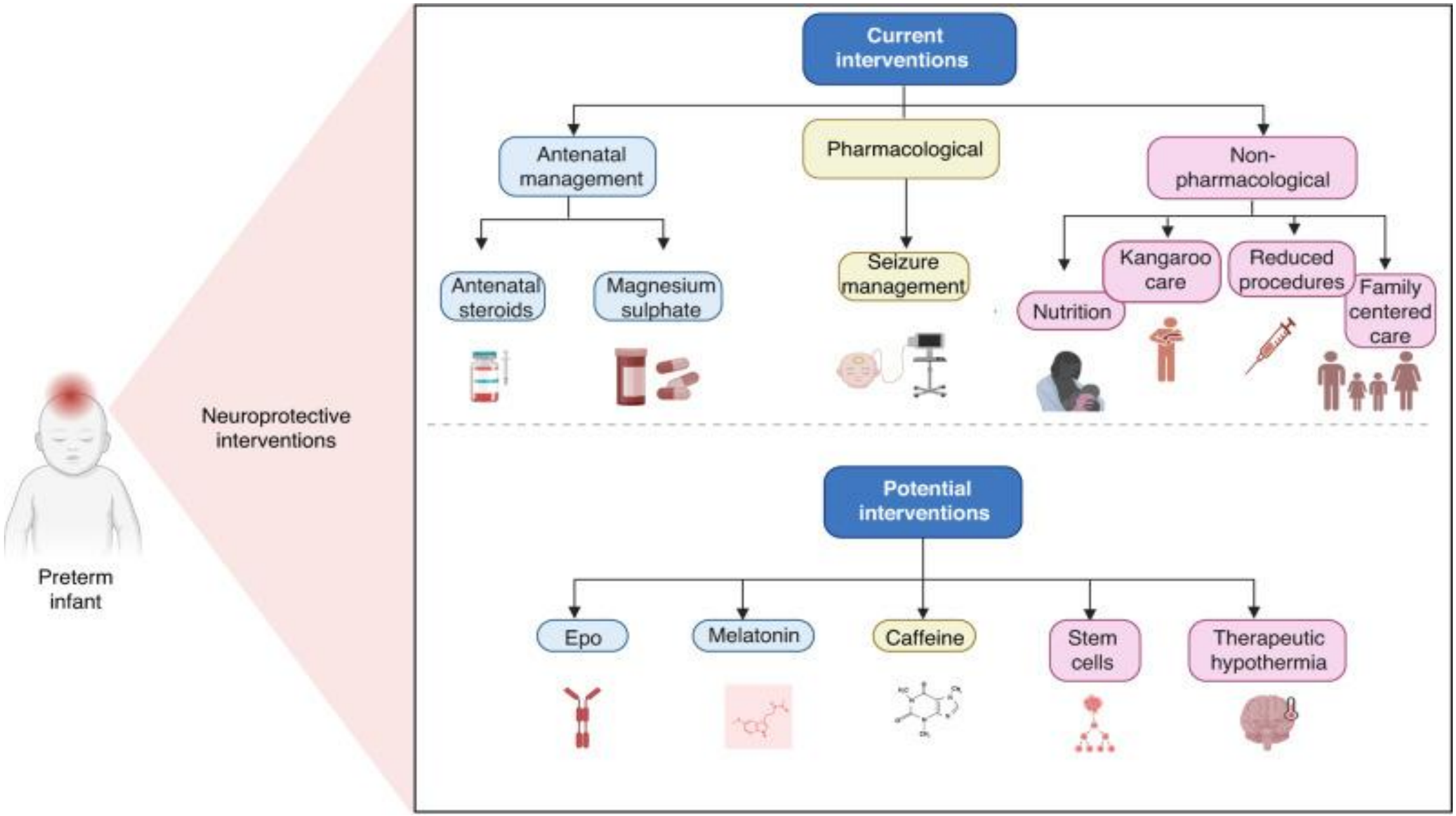
Preterm infant
Neuroprotective interventions
Current interventions
Antenatal management
Antenatal steroids
Magnesium sulphate
Pharmacological
Seizure management
Non-pharmacological
Nutrition
Kangaroo care
Reduced procedures
Family centered care
Potential interventions
Epo
Melatonin
Caffeine
Stem cells
Therapeutic hypothermia

Why Neuroprotection ?

- Prematurity and intrapartum complications account for a significant proportion of neonatal deaths worldwide
- Even with current treatments, disability rates among survivors can be high .
- *Key Concept*: Brain damage following an insult (e.g., hypoxia-ischemia, infection) is not a fixed, immediate event. Injury processes, including inflammation and apoptosis, can persist for months.
- **The Goal**:

To interrupt these secondary injury cascades and support the brain's inherent plasticity to achieve "intact survival"

Neuroprotection Vs Neuropromotion

- **Neuroprotection**

Protecting the brain from specific, direct injuries (e.g., hypoxic-ischemic injury, intraventricular haemorrhage).

These are often reactive or preventative medical interventions.

- **Neuropromotion**

Actively creating an environment and providing experiences that nurture and support the developing brain's architecture and connectivity.

NICU STRESS CUES QUICK REFERENCE

If you see these signs, STOP, CONTAIN, and PROTECT:

🟥 Autonomic (Life Functions):

- Hiccups, sneezes, spit-ups
- Drop in O2, tachypnoea, apnoea
- Mottled/pale skin
- Tremors/startles

🟧 Motor (Movement):

- Finger splaying
- Arms/legs stiffly extended
- Arching back
- Hypertonia
- Hypotonia

🟨 State (Consciousness):

- Panicked look
- Gaze aversion (looking away)
- Diffuse/light sleep with twitching
- Crying/irritable

✅ Stability Cues

- Flexed, tucked posture
- Hands to mouth
- Smooth breathing, stable colour
- Deep sleep or quiet alert state

Key take home messages

- Neuroprotection is a continuum: It starts antenatally and extends long after discharge.
- We must embrace both Neuroprotection AND Neuropromotion Protect from injury while actively building a better brain through developmental care.
- The NICU environment matters: Sound, light, sleep, and positioning are powerful modulators of brain development.
- Families are essential partners: Kangaroo care and nurturing touch are critical neuroprotective interventions