NEUROPROTECTIVE CARE: BRIDGING THE GAP BETWEEN WOMB & NICU

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We have no relevant financial or nonfinancial relationships in the products or services described in this presentation.

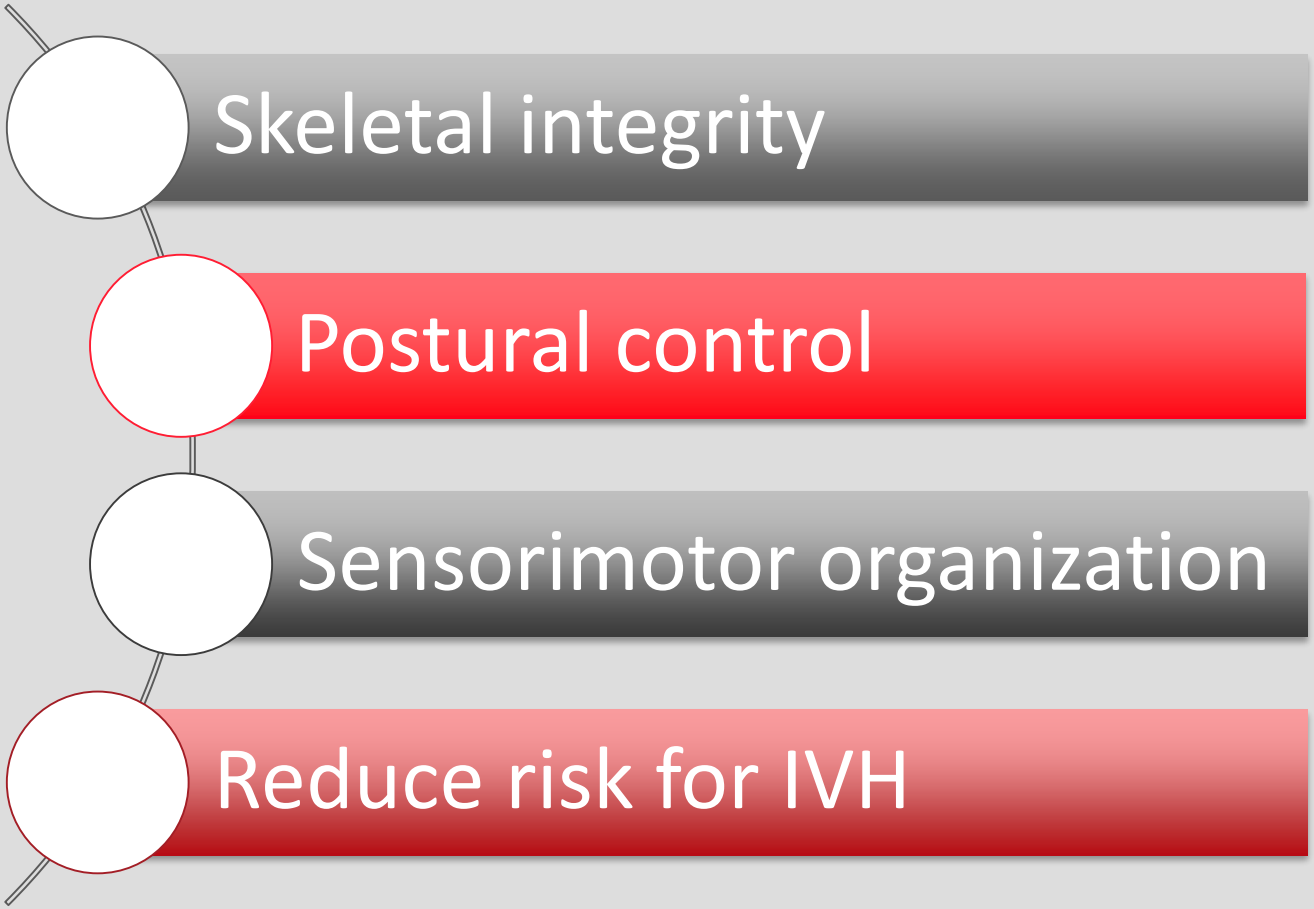
PREMATURE BIRTH THE STATS

- 15 million preterm infants born annually worldwide according to the World Health Organization
- 10% of premature babies will develop a permanent disability(lung disease, cerebral palsy, blindness or deafness)
- 50% of babies born before 26 weeks are disabled.
  - 22% severe disability (defined as cerebral palsy but not walking, low cognitive scores, blindness, profound deafness)
  - 24% moderate disability (defined as cerebral palsy but walking, IQ/cognitive scores in the special needs range, lesser degree of visual or hearing impairment)
  - 34% mild disability (defined as low IQ/cognitive score, squint, requiring glasses)
- Sensory integration disorders, impaired memory, delayed language, learning disabilities, ADD, ADHD, Autism, Anxiety, Depression etc.
- **We can help reduce this just by the care we provide!**

Neuroprotective Care= Developmental Care

- Developmental Care has been described as a philosophy of care that requires rethinking the relationships among infants, families and health care professionals.
- Developmental Care minimizes the stress and shock of the environment for the premature baby in order to maximize their long term outcomes.
  - Promotes calm environment
  - Helps protect the rapidly developing brain
  - Protects sleep
  - Decreases stress
  - May decrease need for pharmacologic interventions

IMPORTANCE OF DEVELOPMENTAL CARE



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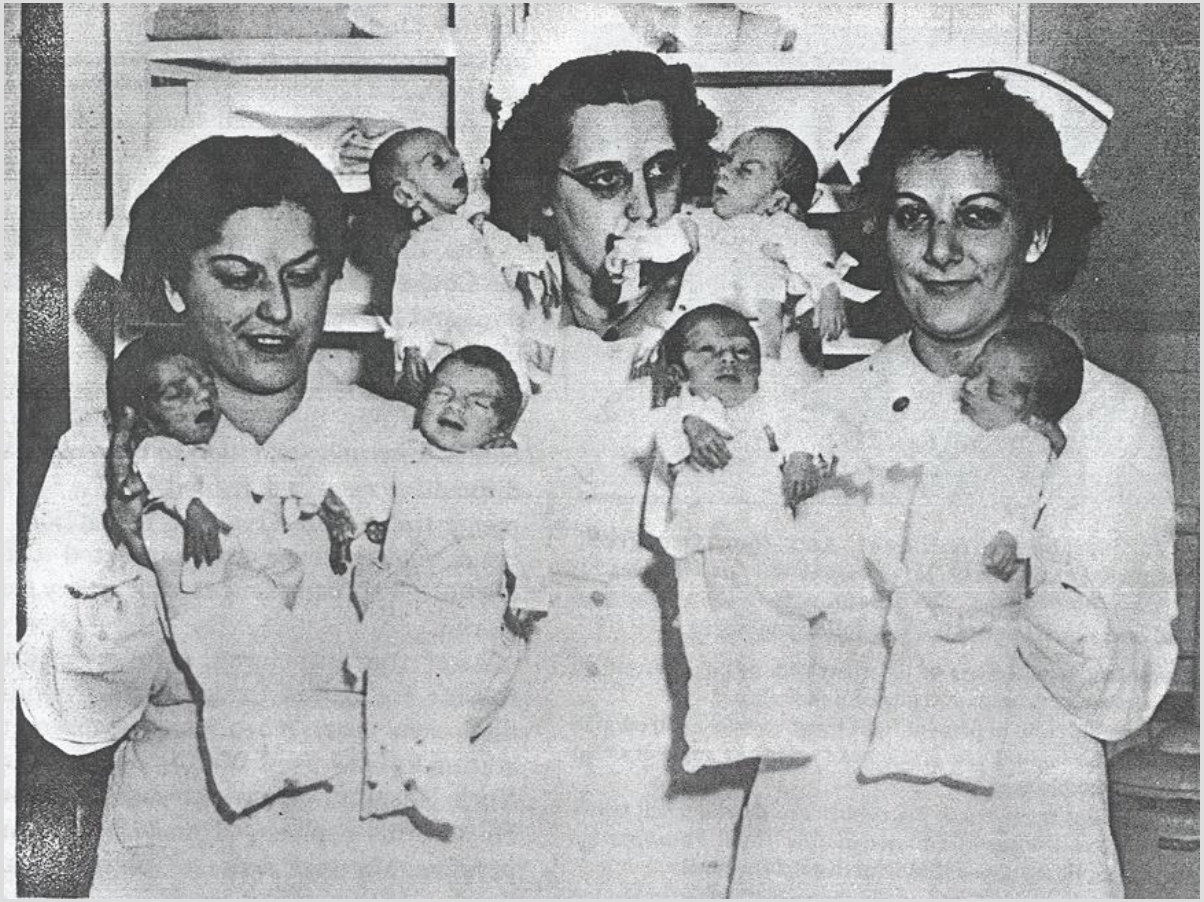
WHAT HAPPENS IF WE DON'T PROVIDE PROPER NEUROPROTECTIVE CARE?

- Longer NICU Stays
- Increased Respiratory Support
- Delayed Head Control
- Long Term Psychiatric conditions
- Long Term need for physical and occupational therapy.

HISTORY OF DEVELOPMENTAL CARE

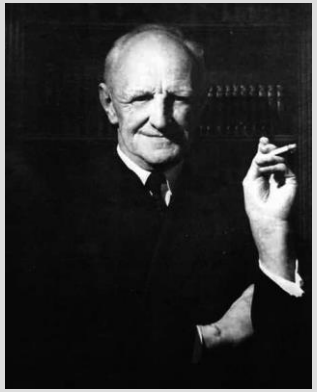


HISTORY OF DEVELOPMENTAL CARE

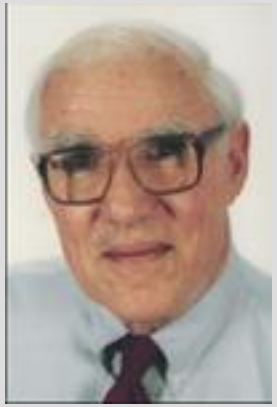
- **Dr. Martin A. Courney**- 1860-1950

History of Developmental Care

- **Donald Winnicott**- British Pediatrician and Psychoanalyst- 1896-1971- Holding Theory



- **Marshall Klaus**- US Neonatologist 1960's First to open the NICU to parents.



History of Developmental Care

Berry Brazelton- Neonatal Behavioral Assessment Scale 1973

History of Developmental Care

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- Behavioral Organization
- Synactive Theory of Infant Development
  - Motor
  - Autonomic
  - States
  - Attention/ Interaction
  - Self Regulatory

History of Developmental Care

Kangaroo Care

Early Developmental Care 1980's-

minimal handling, clustering care, decreasing lights.

WHAT DOES IN UTERO LIFE OFFER VS NICU LIFE?

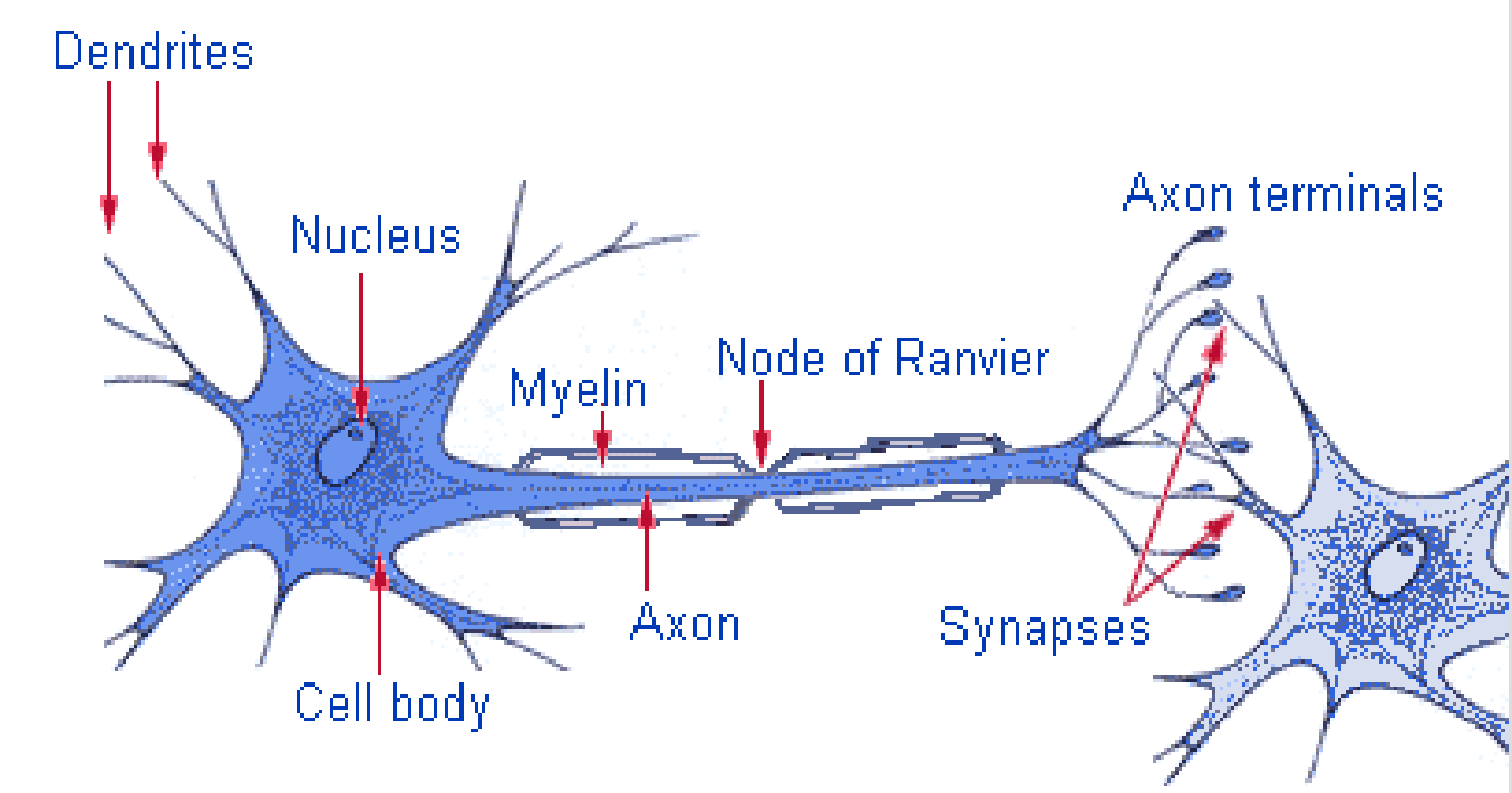
WOMB	NICU
Gravity Free	Force of Gravity
Unrestricted Movement	Medical Equipment
Defined Boundaries	No Boundaries
+ Stimuli	- Painful Stimuli
Developmentally Appropriate stimulation	OVERSTIMULATION: Light Noise, Touch

BRAIN DEVELOPMENT

THE FOUNDATION

- Nervous system development begins about 18 days after fertilization
- Neural plate – neural grove – neural tube
- Neuronogenesis – migration – organization – myelinization
- Form lower level of function to higher level of function

YOU HAVE SOME NERVE…



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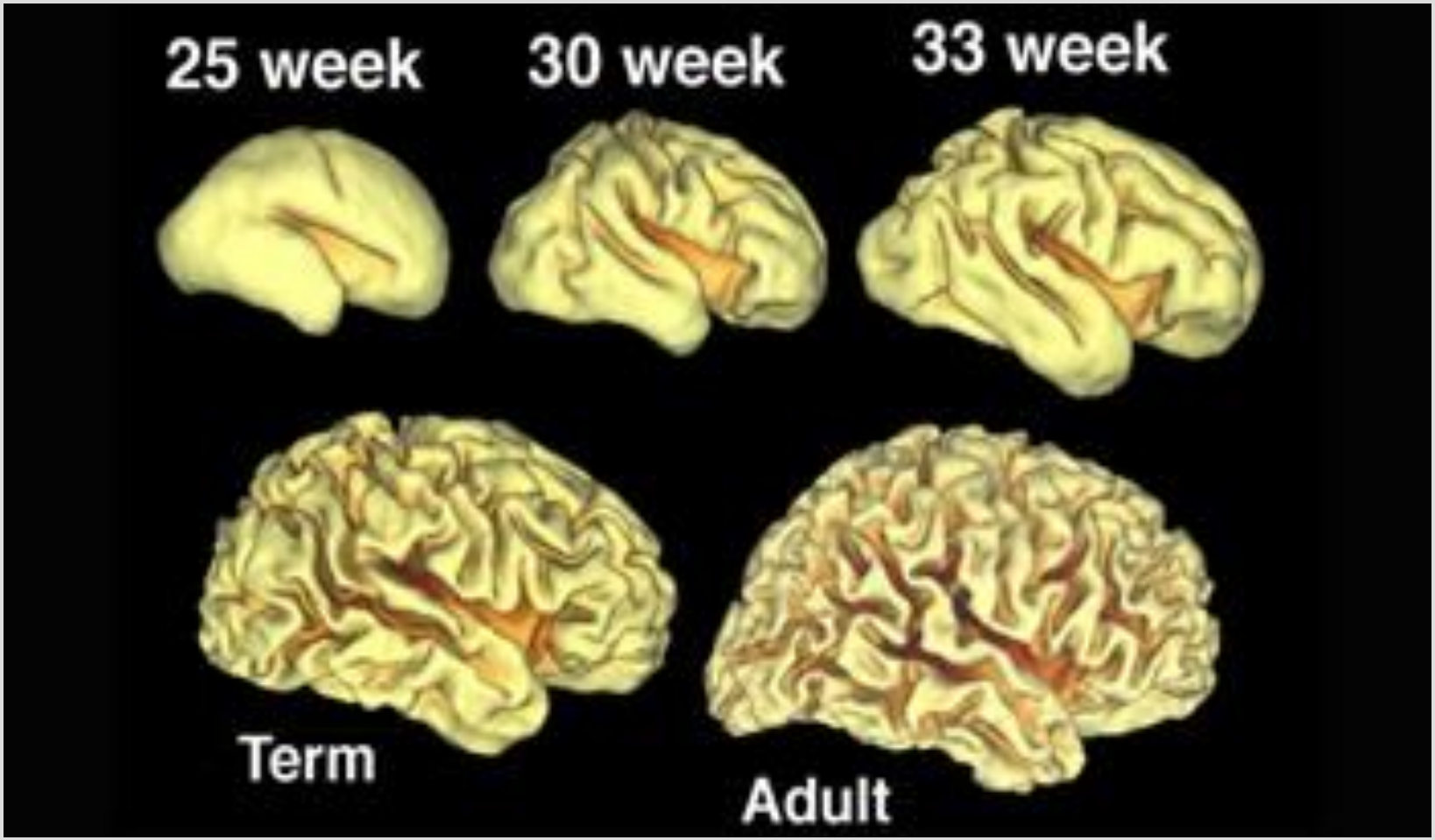
DEVELOPMENT DURING OUR CARE



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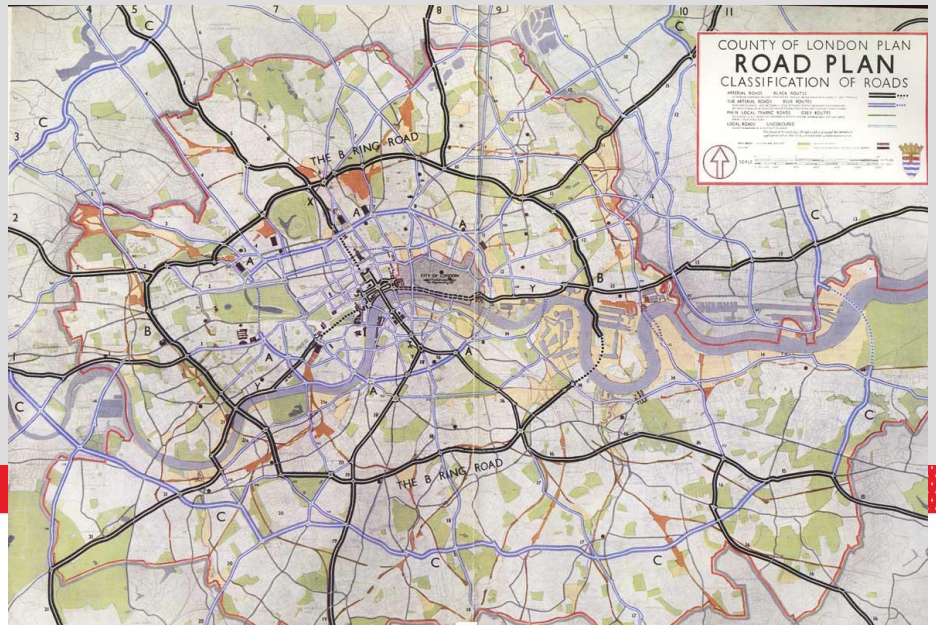
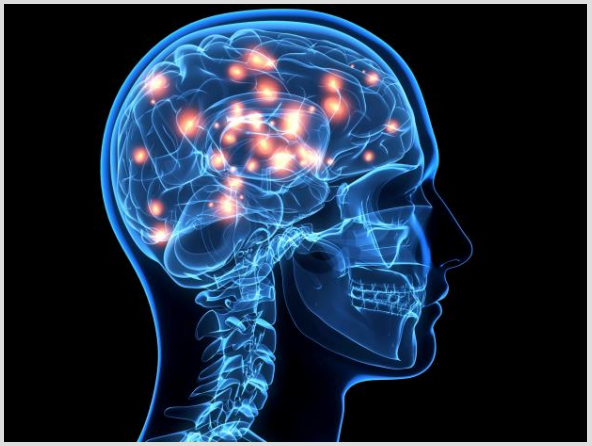
LAYING THE GROUNDWORK

- 20 – 24 weeks and beyond
- Organization begets connection
- Interaction of genes and the environment
- Synaptic connections are critical for transfer of information and learning
- Myelinization increases speed of nerve impulse

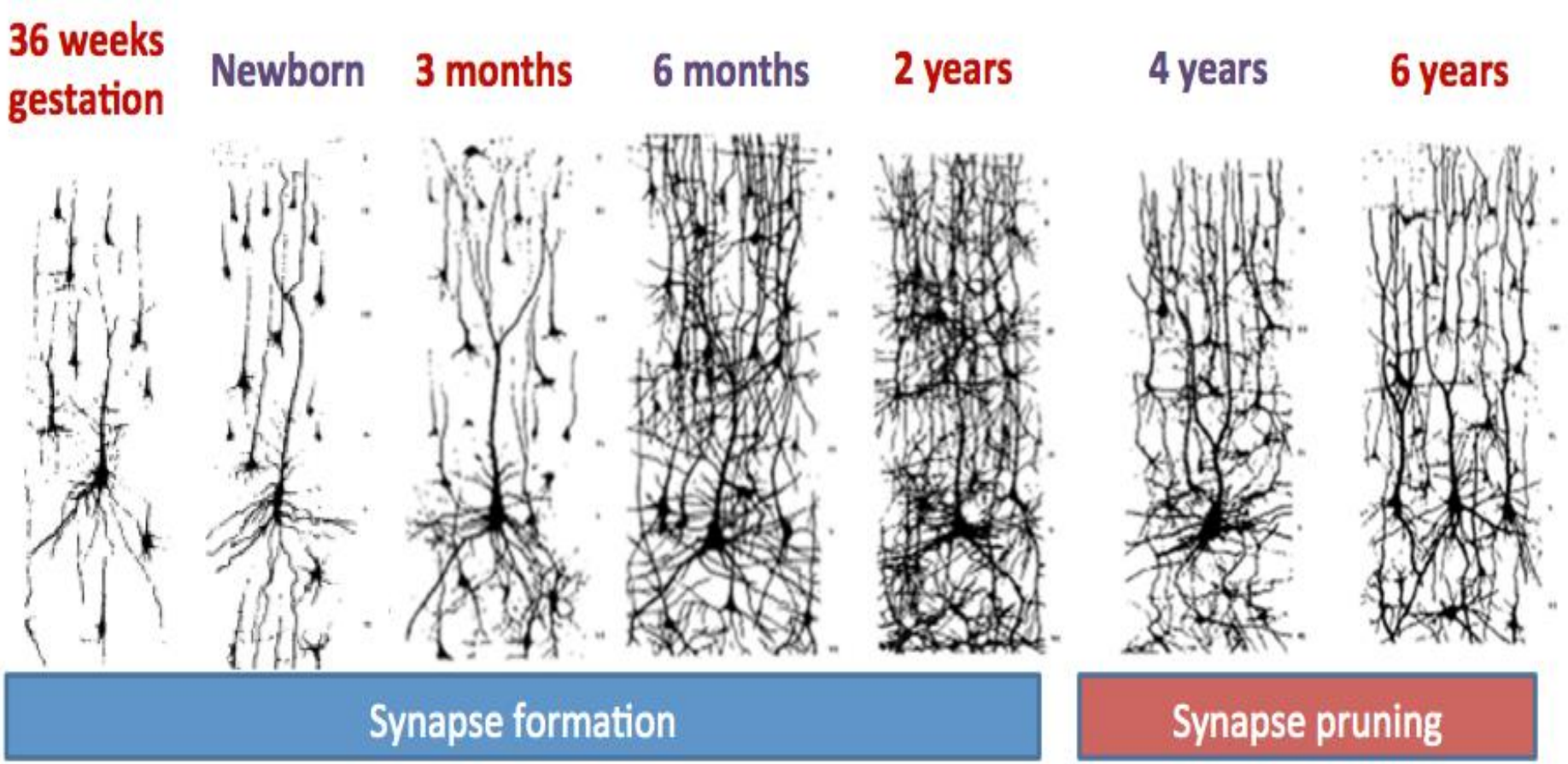


NEURAL PLASTICITY



- Ability of a neuron to change structure and function often due to external input
- Development is partly genetics and partly a product of the environment
- Experience-expectant and experience-dependent plasticity
- **Improper or untimely sensory input can alter long term development**

SYNAPTIC PRUNING



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SENSORY PROCESSING

- The neonate is readily capable of receiving sensory input
- Ability to process and respond is limited
- Increasing age allows input modulation development
  - Adaptation, habituation, inhibition
- Balance based on developmental stage of the neonate is key

SENSORY DEVELOPMENT

Sensory Development

What is sensory integration?

- “ Sensory Integration is the Neurological process that organizes sensation from ones own body and the environment and makes it possible to use the body effectively in the environment” (Ayers, 2005, pg 5).

Sensory Development

- Tactile System (Touch)
  - Touch, Temperature, Pain and Proprioception.
  - Starts to develop at 7.5 weeks---Fully Developed at 24 weeks gestation.
  - Develops in a cephalo to caudal manner.
  - Most developed of the senses in the neonatal period
  - Interventions: Utilize Gentle Human Touch, swaddling, nesting, containment, maternal touch, infant massage, kangaroo, gentle firm pressure and foot bracing.

Sensory Development

- Gustatory System (Taste)
  - Functional by 24 weeks of age.
  - Interventions: Oral Care with Breast Milk, Nuzzling at the breast, medication delivery.

Sensory Development

- Auditory System (Hearing)
  - Fully Functional at 32 weeks
  - Term- Infants have preference for sounds.
  - Preterm Infants- Very sensitive
  - < 45 decibels recommended by American Academy of Pediatrics
  - Interventions: Decrease sound, private rooms, signs to indicate quiet is needed, lullabies, parent voices and books.

Sensory Development

- Visual System
  - Primitive at the time of birth
  - Visual Functioning not necessary for a fetus
  - Interventions: Protect eyes from light, parent faces, mirrors, mobiles and cycled lighting.

Sensory Development

- Olfactory System (Smell)
  - Functional at 28 weeks gestation
  - Interventions: Unscented cleaning products and laundry, maternal Scent Cloths, Nuzzling at breast, no perfumes and no foreign smells near infants head.

NEUROPROTECTIVE CARE AT TEXAS CHILDREN'S HOSPITAL NICU

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MINDFUL OF PREEMIES

- "MINDFUL" of Preemies Protocol

Maintain supine and midline position during the first week of life

Incline head of bed elevated by 30 degrees

Never position infant with head rotated to the side as it can disrupt cerebral blood flow

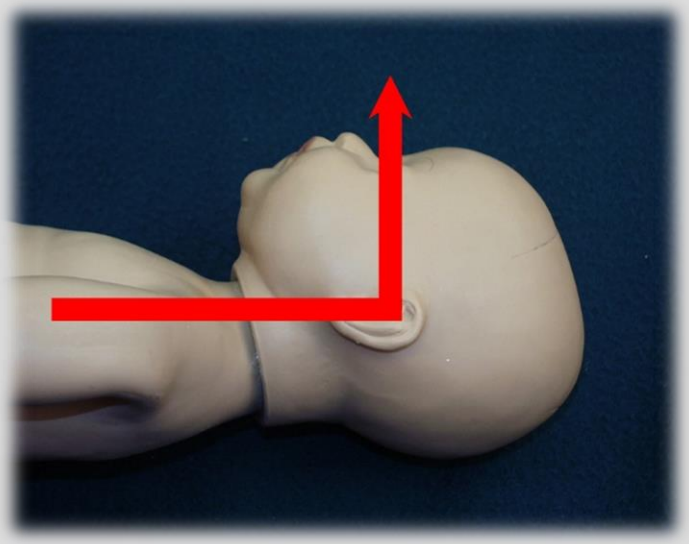
Do not place prone during the first week of life, unless instructed otherwise by a physician/practitioner

Family can perform kangaroo care with a hemodynamically stable early preterm, VLBW infant, however, maintain neutral head positioning while holding

Use gentle techniques for procedures (ex: placement of CPAP) to avoid sudden, abrupt movements of the head

Log roll technique should be utilized when repositioning infant

NEURODEVELOPMENTAL POSITIONING



MUSCLE DEVELOPMENT

- Muscle cells fully achieved by 38 weeks
- Premature birth prevents the chance to experience and develop pathways for flexion
- Goal is to mimic the intrauterine experience for proper environmental input

KEY POSITIONING PRINCIPLES

- Promotes physiologic and behavioral stability
- Encourages sleep
- Self-regulation
- Mid-line alignment
- Flexion as basis for future movement
- Boundaries
- Symmetry

POSITIONING IN THE NICU

ENCOURAGE: flexed position with support from blankets/ boundaries, rotate baby in different positions to promote head shaping, gross motor strengthening, self-calming, and ability to participate in fine motor and developmental activities

Supervised Tummy Time

Side Lying

Back

AVOID: positioning without support/boundaries which can result in asymmetrical postures, skull deformations, delayed fine and gross motor development

"W" Position of Arms

"M" Position of Legs

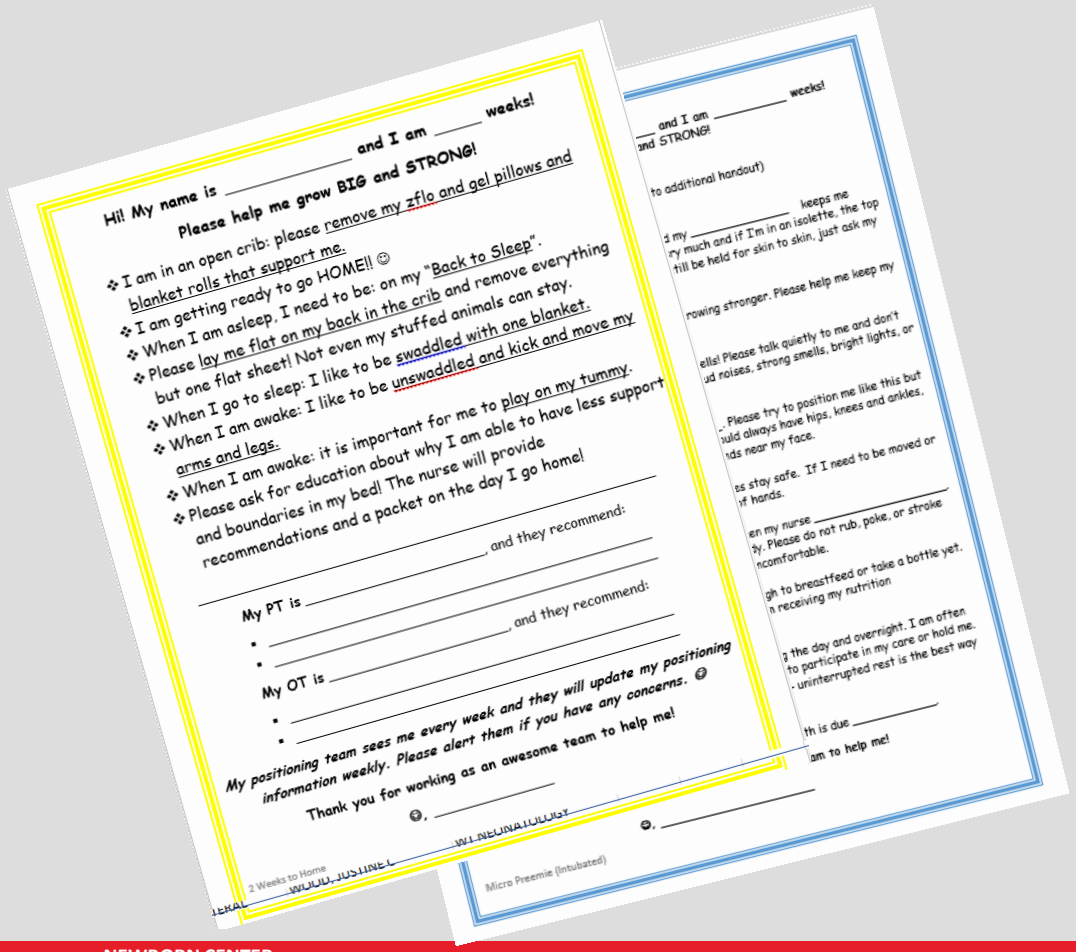
No Boundaries

Preferential Head Turning

Boundaries Too Small

IMPLEMENTATION OF DEVELOPMENTAL POSITIONING AIDS – THE TCH NICU STORY

DEVELOPMENTAL POSITIONING CARDS: INDIVIDUALIZING CARE



- Developmental Bedside Positioning Cards have been rolled out to engage Nursing, PT, OT, Child Life and Families to provide proper developmental care for each infant.
- 11 cards to cover each age and acuity.

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QUESTIONS???

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