



NEURODEVELOPMENTAL CARE: COMPONENTS, CONSIDERATIONS, CARE PLANNING, AND CONCLUSIONS

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DISCLOSURES

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OBJECTIVES:

Identify

Participants will identify the core standards of NICU neurodevelopmental care

Apply

Participants will apply individualized care planning during positioning and handling preterm infants to support musculoskeletal, aerodigestive tract, and sensory maturation

Assess

Participants will assess infant behavioral responses during handling techniques to reduce stress and improve motor skill development

COMPONENTS OF NEURODEVELOPMENTAL CARE

Frame of Reference

Components

Positioning/Handling

FRAMES OF REFERENCE

Neurodevelopmental Care: Any NICU intervention provided to improve neurodevelopment outcomes

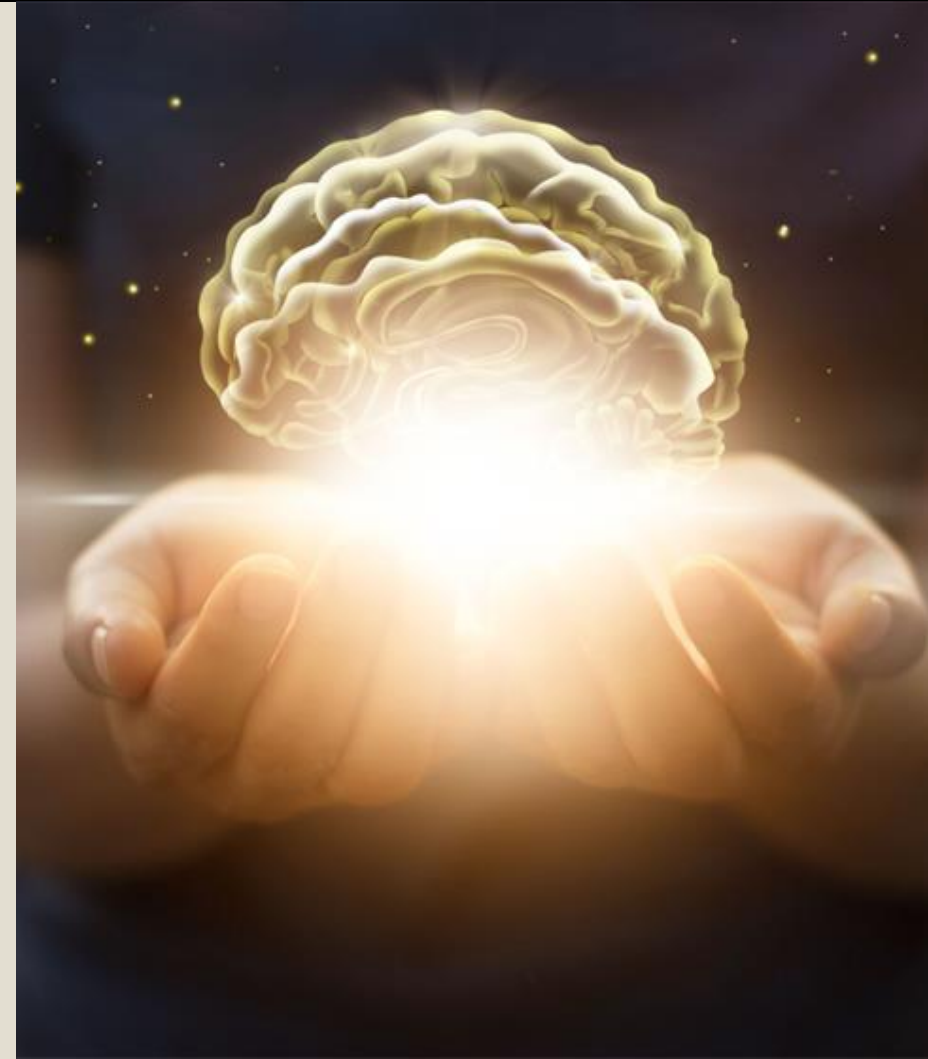
- NICU design, nursing routines, nursing care plans, feeding methods, parent involvement

Neuroprotective Developmental Supportive Cares

- Care interventions utilized to support optimal synaptic neural connections, promote age-appropriate brain development and offer sensory experiences that generate self regulation/motor output expected for age of infant

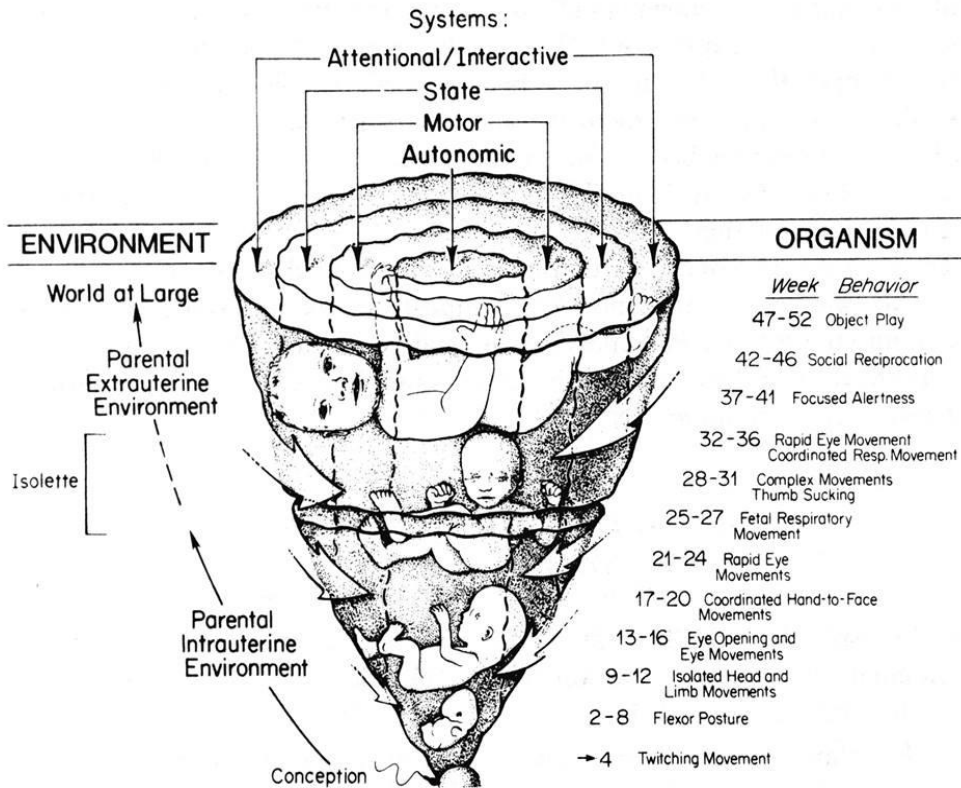
Trauma-Informed Age-Appropriate Care:

- Developmental concept that recognizes the physiological, neurobiological and psychoemotional effects associated with early life trauma (NICU admission and separation from mother)



NIDCAP: NEWBORN INDIVIDUALIZED DEVELOPMENTAL CARE AND ASSESSMENT PROGRAM

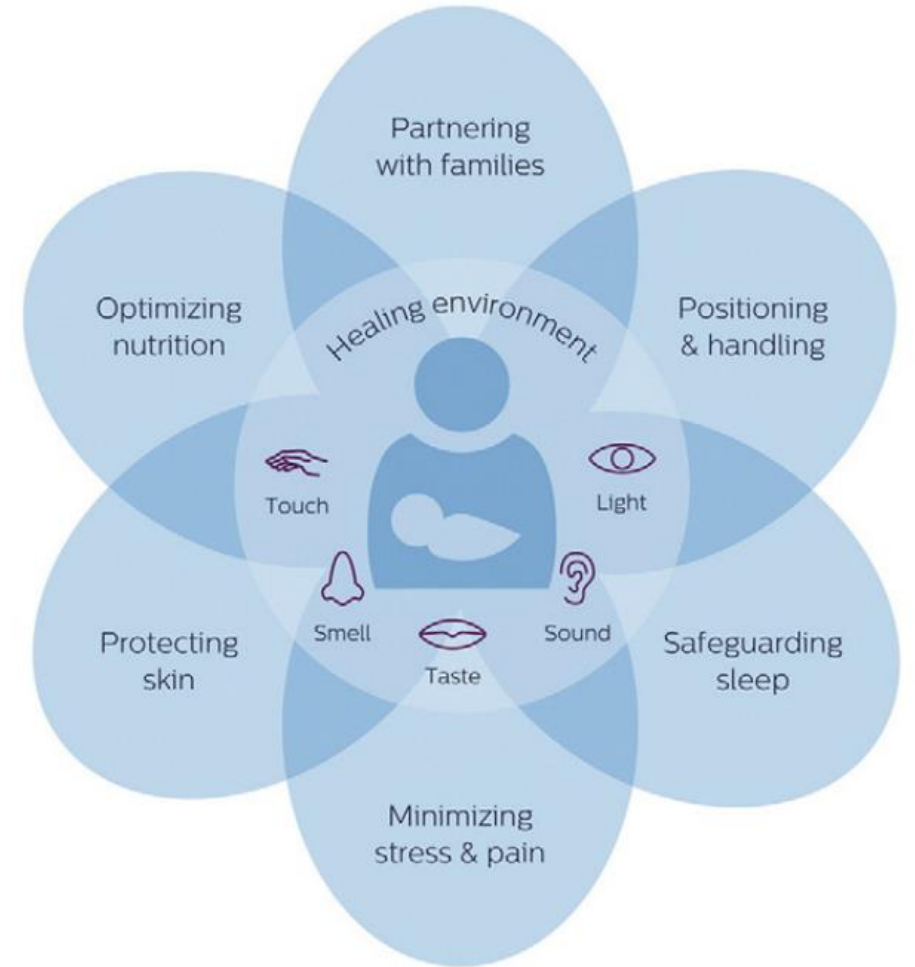
MODEL OF THE SYNACTIVE ORGANIZATION OF BEHAVIORAL DEVELOPMENT



- Dr. Heidelise Als created the Synactive Theory of Development which is the foundation for NIDCAP
- NIDCAP was created in 1984
- Core principles
 - Infants are considered individuals
 - Parents are primary nurturers
 - Healthcare team is a partner in the process
- Understanding infant behavior and the appropriate response promotes brain protection and development

NEONATAL INTEGRATIVE DEVELOPMENTAL CARE MODEL

- Outlines 7 core measures for Neuroprotective family-centered development care
 - Partnering with Families
 - Positioning and Handling
 - Safeguarding Sleep
 - Minimizing Pain and Stress
 - Protecting Skin
 - Optimizing Nutrition
 - Healing Environment
- The mother/infant dyad is at the center, surrounded by the Healing Environment with consideration for the fragile developing sensory system of the infant
- Wee Care Neuroprotective NICU Program provides training and education to teams



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Fig. 1. Neonatal Integrative Developmental Care Model.

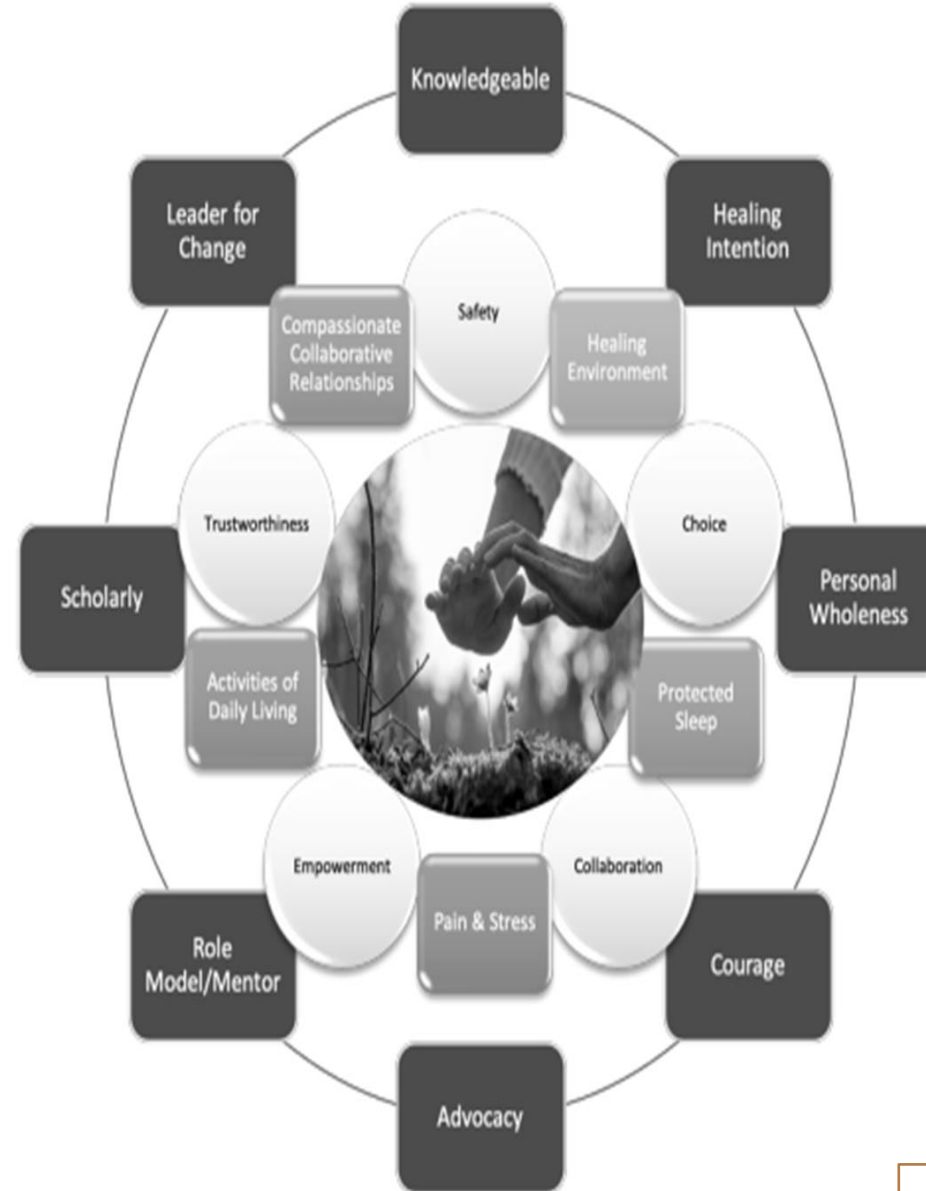
Altimier, 2016

TRAUMA INFORMED CARE

Trauma informed developmentally supportive care creates a culture of care that focuses on the human experience.

Maternal separation is the most significant trauma experienced by all newborn mammals and preterm and/or critically ill newborns are no exception to this reality

The trauma experienced in this setting is not limited to the baby but encompasses the family and the clinicians who bear witness to the lived trauma of both baby and family.



Endorsed by the NIDCAP Federation International, the National Association of Neonatal Nurses, the Council of International Neonatal Nurses and the National Association of Perinatal Social Workers, the program combines online and virtual/live education to support clinicians in developing competence across the eight attributes of the *Trauma Informed Professional*. (Learn more: <https://www.caringessentials.net/>).

CORE DEVELOPMENTAL CONSIDERATIONS FOR SMALL BABY UNIT

1. Family Centered Care
 - Kangaroo Care
 - Nurturing Touch
2. Protect Sleep
 - Infant Driven Cares
3. Manage the development of skin
4. Limit pain/stress
 - Facilitated tuck
 - Hand Hugs/containment
5. Neuroprotection
 - Environment Modifications as Neurosensory appropriate
6. Positioning/Handling
 - 2-person Cares
7. Protect Skull Shape
8. Early Extubation

POSITIONING AND HANDLING

In-Utero Fetal capabilities

Replicate the in-utero environment

Neuroprotection and Neuromaturation

FETAL CAPABILITIES



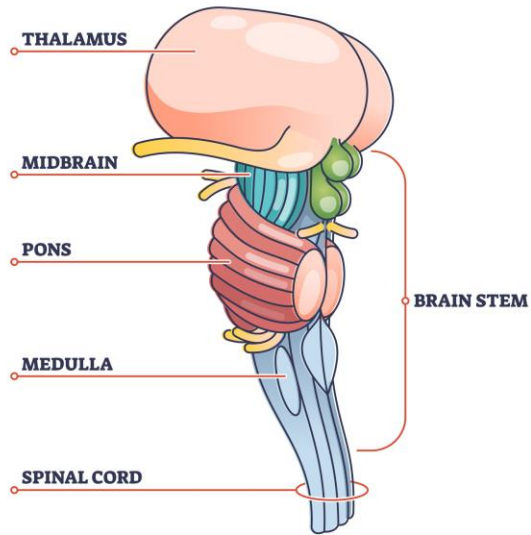
Motor-Sensory Paradigm for In-Utero Development

- Guided by Central pattern generators: in-utero motor activation in the absence of sensory input
- General movements
 - Start as lateral head/neck and trunk flexion
 - Move to rhythmic/cyclical movements of extremities
 - Trunk utilizes movement on a rotational axis in the aquatic environment
- Fetal breathing movements
- Suck/swallow

Rest in Physiological flexion

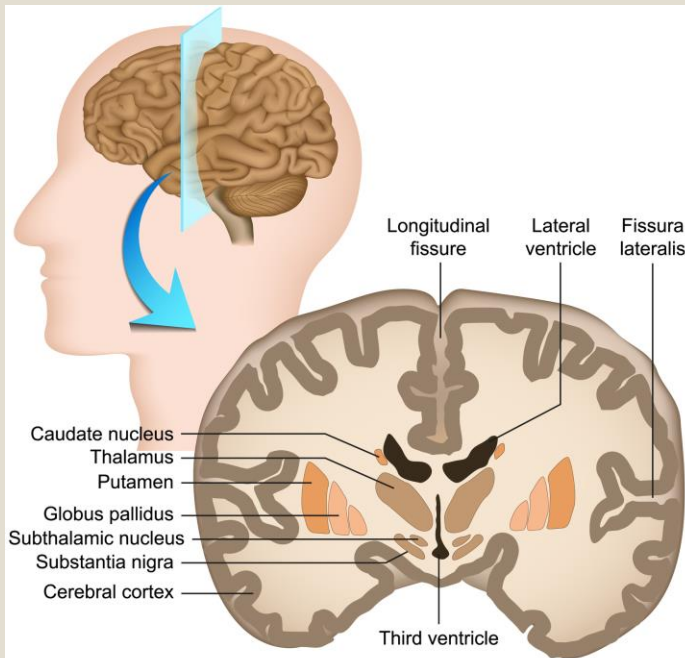
- With growth there is increased in-utero crowding, maturation of sensory skills to transition to sensory-motor system

BRAIN STEM



NEUROSTRUCTURAL DEVELOPMENT OF BRAIN

- The fetal brain undergoes a 20-fold increase in brain development and tissue expansion between 20 weeks gestation and term (38-40 weeks)
 - 18-27 weeks is critical window for cerebellum and midbrain development
 - 27-33 weeks is critical window of development for white matter (peaking at 28-29 weeks)
 - 33-39 weeks is critical window for development of grey matter
- Critical Window: time of rapid development for growth of neuronal structures; it is during this time that the brain is vulnerable to environment insults or injury




IN-UTERO EXPERIENCE: WEEKS 22-37



- Critical Developmental Experiences for the Infant:
 - Neuromuscular Development (Motor)
 - Shape and Alignment of the musculoskeletal system is directly affected by the positions WE put them in
 - Development of muscle tone: Occurs caudal to cephalic with flexion
 - Lower Extremities: 28 weeks
 - Trunk: 30-32 weeks
 - Upper Extremities: 30-32 weeks
 - Anti-Gravity recoil
 - BLE: 33-35 weeks
 - BUE: 35-37 weeks

Einspieler, 2021

MOTOR: NEUROPROTECTION AND NEUROMATURATION 22-32 WEEKS



What do we see here...more importantly, what don't we see?

- Muscle Tone
 - Predominantly Fast twitch (Type I, white fibers) muscle fibers that fatigue quickly: THUS...low tone
 - Maturation process to transition to equal distribution of fast/slow twitch by term equivalent
- Alignment
 - Due to low tone: poor skeletal alignment
 - Energy consuming/compensatory movement vs energy efficient movement for the infant
 - Reduce joint capsule alignment: poor mechanoreceptor development for proprioception
- Function
 - If not properly positioned, unable to self regulation or self soothe and poor anti-gravity movement

MOTOR: 32-40 WEEKS MOTOR MODULATION AND EXPERIENCE

- Muscle Tone
- Alignment
 - Preference to physiological flexion
 - Symmetrical extremity alignment
 - Hip flexion and external rotation
 - Knee flexion; ankle neutral and dorsiflexion
 - Hands to midline/face, elbow flexion, scapular abduction
 - Posterior pelvic tilt, slight neck flexion
- Function
 - Anti-gravity movement (recoil) when supine
 - Reduction of positioning equipment
 - Postural control facilitation for core muscle development



IN-UTERO EXPERIENCE: WEEKS 22-37

Critical Developmental Experiences for the Infant:

- Self Regulation (Sensory/Cognitive)
 - Controlled auditory input: maternal sounds of heart rate, digestion, respiration, maternal voice
 - Consistent tactile experience: warm temperature, aquatic environment, no affects of gravity, emerging skin development for sensory input and development
 - State transition: sleep/wake cycles emerge, vestibular input from mother



EX-UTERO NICU EXPERIENCE:

The three "E's" lead to development of the four "A's"

In-turning phase of development (22-32 weeks)

- Environment: external influence of infant internal response
- Experience (Sensation): The immediate response of our sensory stimulators to touch, light, sound, smell, and taste
- Encoding (Perception): The process by which the brain organizes, processes, and interprets the sensory information.

Out-turning phase of development (32 weeks and older)

- Arousal (state regulation)
- Attention (attunement and attachment)
- Affect (emotional connection to behavior)
- Action (motor skills that are goal-directed)

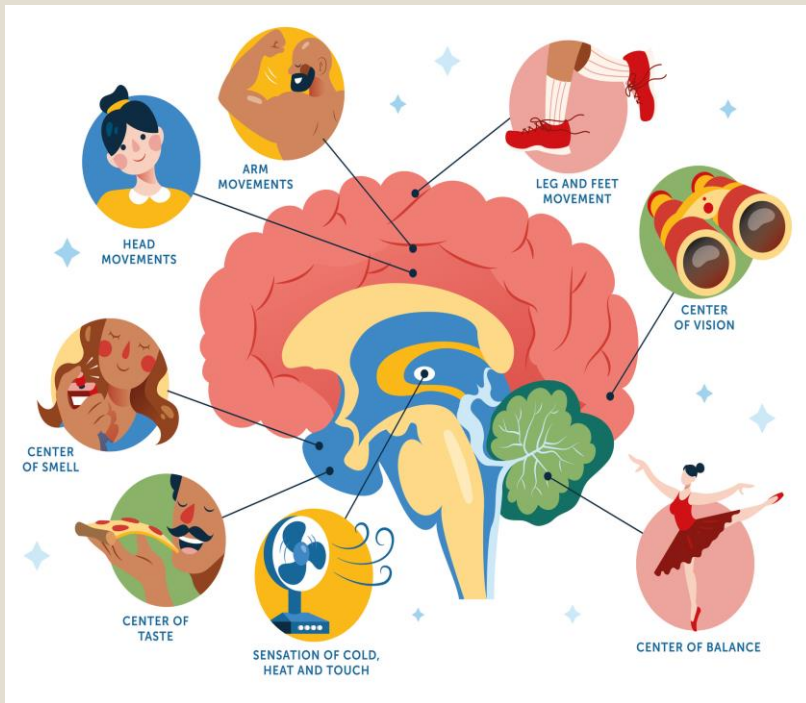


"E's": Environment,
Experience and
Encoding

"A's": Arousal, Attention,
Affect, Action



SENSORY: 22-32 WEEKS NEUROPROTECTION AND NEUROMATURATION



- Tactile: Sense of Touch
 - Skin-Brain axis: during embryological development the skin and brain develop from the ectoderm cell levels thus creating a biological connect between tactile sensation and brain perception
 - “When we touch the skin, we influence the brain”
 - Younger infants have reduced adipose for peripheral nerve insulation and reduce skin thickness, so every touch has a profound impact on development
- Vestibular: Sense of balance “rhythm of movement”
 - Rhythmic Vestibular In-utero stimulation (primarily maternal walking, 5000 steps per day) provides vestibular exposure
 - Ex-utero horizontal positioning does not mimic this experience, creating sensory deprivation and “vestibular storm” response with A/B event if moved too quickly
- Kinematic: Sense of proprioception “where my body is in space”
 - Reduce in-utero cramping does not allow for development of mechanoreceptors in joints that perceive speed and direction of movement
 - Allowance of free movement during cares, and supported flexion to midline during movement

SENSORY: 32-40 WEEKS

SENSORY MODULATION AND EXPERIENCE



- Tactile
 - Integrate skin movement during touch (infant massage, strokes) at a slow rate of 3mL per 10 seconds
- Vestibular
 - Provide rhythmic rocking with paired auditory input, slow input with head to heel rocking most calming
- Kinematic
 - Opportunities for free movement and progress to gentle resistance to support muscle fiber transition
 - Flexion swaddling, but not too tight

HANDLING: SENSORY SUPPORT AND DYNAMIC INPUT

GOALS FOR HANDLING SMALL BABIES:



Co-regulated Caregiving: Aimed at providing cares that allow the infant to sustain regulated behaviors and physiology



1. Make smooth state transitions from sleep to awake that are gestationally appropriate



2. Infant able to complete self calming behavior response to pain or stress

- bring hands to mouth
- pacing respirations
- grasping a finger



3. Infant sustain quiet/alert state, as gestationally appropriate for age

GOALS FOR HANDLING

1. Make a plan BEFORE touching the infant
2. Communicate the plan within the 2-person caregiving team
3. Create an alternative plan (BEFORE touching the infant) if the infant demonstrates a stress response to movement
4. Consider infant skin and where your hands will be placed on the infant
5. Determine caregivers role when handling: NURTURING TOUCH vs PROCEDURAL TOUCH
6. NUTURING TOUCH: Must have warm hands. Provide containment “hand hug”. Hands are STATIC on the infant skin
7. When handling infant goals for flexion, containment, and alignment
8. Move younger infants SLOWER: emerging brain stem control over vestibular input
9. Once in position, resume containment to allow self regulation



GOALS OF HANDLING: "PASSIVE RECIPIENT VS ACTIVE PARTICIPANT"

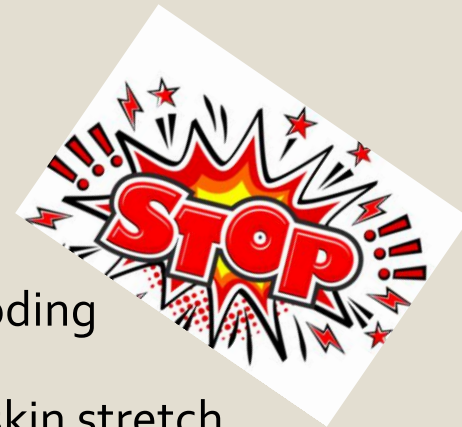


GOAL:

- Co-regulated experience
 - The merging of Intentional Caregiving and Infant Self regulation to allow the experience to be mutually beneficial (improved infant development and reduced caregiver trauma)
 - Transition for the infant to become an active participant versus passive recipient thus promoting neuromaturation and sensory modulation

Approach: STOP

- **S**afety: stability of lines, tubes, drains
- **T**actile input with consideration for experience/encoding
- **O**pportunities for movement: speed of movement/skin stretch
- **P**ositioning for sleep protection and alignment



S: SAFETY

Securement of lines, tubes and drains

- Intubated infants: Risk of unintentional extubation
 - 2-person cares for tube securement, ventilator circuit management
 - Oral cares before movement
 - Stripping ventilator circuitry to reduce risk of lavage prior to movement, placement of dependent loop for ventilator circuitry
 - Arranging tubing to be placed in the direction of movement
- Multi-Hub lines:
 - off-loading weight of lines to improve infant extremity active movement to midline



T: TACTILE INPUT TYPES OF TOUCH



"When we touch the baby, everything changes" - Dr. Cathie Smith

Procedural Touch: Task orientated

- Cares: diaper change, vitals, skin inspection
- Medical assessments
- Labs
- Treatments: respiratory, skin care, wound care

Nurturing Touch: Sensorimotor development

- Containment: hand hugs
- Still Touch: intentional hand positioning to reduce musculoskeletal workload; monitor weight of your hand
- Positive Touch: Skin to skin care
- Therapeutic Handling: positioning infant
- Massage: skin movement

NEONATAL TOUCH: THE ART AND SCIENCE

- Experience influences early neural brain development
- The ability of the brain to shape or mold itself through expansion or contraction of neuron processes is guided by electrical activity, chemical stimulation or injury
- Early sensorimotor experiences influence both motor behavior and neural cytological substrate formation
 - --brain volumes
 - --synaptogenesis
 - --apoptotic pruning process
 - --cellular migratory patterns / cortical layer striation formation



INFANT HANDLING: NEONATE AND NEWBORN CONSIDERATIONS



- Observational assessment of movement (allow for free movement)
 - In-turning vs Out-turning phase
 - Movement dominance: jittery jerky, smooth, emerging
- Static handling: (typically 22-29 weeks)
 - Intentional placement of both hands on specific key points on the infant body
 - Nurturing touch that is imposed: monitor for sensorimotor response

INFANT HANDLING: NEONATE AND NEWBORN CONSIDERATIONS

- Stabilization and Facilitation Handling (Typically 29-36 weeks)
 - One hand provides static input for sensory regulation to allow for state control (therapist uses a “whole-hand approach” to provide this input)
 - One hand provides guided movement to the infant for neuromotor facilitation and control. The goal of neuro-assisted movement to provide a neuroplastic change
 - Initial inclusion of additional sensory information (auditory) to engage state regulation

Examples: Postural control development while in the crib, swaddled infant prior to transfer out of crib



INFANT HANDLING: NEONATE AND NEWBORN CONSIDERATIONS

- Dynamic Handling: (typically 36 weeks and older)
 - Initial static input or imposed touch to allow for sensory regulation, but this is not consistent during the interventions
 - Gradual reduction (grading of activity) of static input to allow therapist use of both hands for dynamic tasks
 - Gradual increase in multi-modal sensory input (auditory, vestibular, visual) to allow for state regulation

Example: Diapering tolerance, safe sleep, transfer out of crib without swaddling



INFANT STRESS CUES TO TOUCH

- Signs of stress: Mild
 - Yawning
 - Gaze aversion
 - Hiccups
 - Grimacing
 - Closing eyes
 - Tongue thrusting
 - Slack jaw
 - Gape face
 - Sneezing
 - coughing



INFANT STRESS CUES TO TOUCH

Moderate

- flushing
- Mottling
- Sighing
- Regurgitation
- Finger splaying
- Extension of arms
- Jitteriness/jerky movements
- Limp/flaccid

Severe

- Cyanosis
- Bradycardia
- Tachypnea
- Apnea
- Decreased SpO₂
- Pallor
- Arrhythmias
- bradycardia



O: OPPORTUNITIES FOR MOVEMENT



PMA	Unswaddled movement		Position Changes		Vestibular Input: rocking
23	2 min	1x per day: stretching and free movement	2 positions	2x/day	Not appropriate
24	2 min	1x/day	2 positions	2x/day	Not appropriate
25	2 min	1x/day	2 positions	2x/day	Not appropriate
26	2 min	1x/day	2 positions	2x/day	Not appropriate
27	2 min	1x/day	2 positions	2x/day	Not appropriate
28	2 min	2x/day	2 positions	2x per day	Not appropriate
29	2 min	2x/day	2 positions	2x/day	Not appropriate
30	2 min	3x/day	3 positions	2x/day	Not appropriate
31	2 min	3x/day	3 positions	2x/day	Not appropriate

O: OPPORTUNITIES FOR MOVEMENT



PMA	Unswaddled movement		Position Changes		Vestibular Input: rocking
32	2 min	3x/day	3 positions	2x/day	Rocking during holding for 2-3 minutes
33	2 min	Every diaper change; at least 3x per day	3 positions	2x/day	Rocking during holding for 2-3 minutes
34	2 min	Every diaper change	3 positions	2x/day	Rocking during holding for 3-7 minutes
35	2 min	Every diaper change	3 positions	2x/day	Rocking during holding for 3-7 minutes
36	2 min	Every diaper change	3 positions	2x/day	Rocking during holding at least 7 minutes
37 and older	2 min	Every diaper change	3 positions	2x/day	Rocking during holding at least 7 minutes

P: POSITIONING



Goal: Consistent and predictable static support to promote sleep and alignment

- ✓ Flexed, midline, and contained
- 🧠 Head/neck in midline and flexed
- 👉 Shoulders protracted (rounded) to promote hand to midline
- ← Thoracic spine flexed and posterior pelvic tilt: "C" curve of spine and hips
- 📐 symmetrical hips and legs in flexion and neutral rotation
- 👣 foot support for bracing and ankle dorsiflexion



P: POSITIONING

MULTI-SYSTEM IMPACT OF POSITIONING



Activity Dependent Development is the foundation for “Therapeutic Positioning”

- Influence of repetition in the formation of neural connections and pathways
- During the third trimester neural connections that support flexion, midline orientation and symmetry of movement are reinforced by
 - Increased uterine crowding
 - Active fetal general movements for stretching, kicking, extension patterns but are supported with a return to flexion/midline due to maternal uterine wall support and the aquatic environment



P: POSITIONING



- Critical Neurodevelopmental Intervention: Transition away from “Developmental Positioning” to “Therapeutic Positioning”
- Muscle tone, posture, and movement progression must adapt to gravity before tone has developed to control the movement: considerate of bone density and risk for contracture formation
- Without the uterus for supported positioning, the infant will become
 - Flat positioning with spinal extension
 - Extended extremities
 - Asymmetric joint forces
 - Head preferences (turned to one side)
 - Abducted extremities
 - Externally rotated
- Variety of positioning options provides the joints and muscles with differing sensory experiences to prepare the brain to learn a wider variety of coordinated movements

CONSEQUENCES: LONG TERM AFFECTS OF POOR POSITIONING

- Decreased active hand to mouth skills
- poor shoulder/neck development for prone prop which is required for head control, rolling and crawling
- Poor swallow coordination
- poor rotational movements to move in/out of prone/sitting
- poor hip stability for crawling
- wide base support gait
- Excessive toe walking
- delayed rolling
- pronation in standing: immature flat foot pattern with poor heel strike patterns
- delayed walking



CORE CONCEPTS: SIDE LYING

SIDE LYING

Segmental Spine Support

- Cervical: “30 to 30” rule to allow for airway alignment and pharyngeal muscle activation
- Thoracic: C-curve from T2-T12; posterior ribcage movement, hands to midline for scapula alignment
- Lumbar: Slight flexion and neutral with posterior pelvic tilt
- Altering right to left side lying, as the weight bearing ribcage will not have lateral expansion only the unweighted ribcage. Need to prevent asymmetry for future intercostal development
- Appropriate size nesting device
- Right vs Left side lying
 - Pulmonary and GI interplay



SIDE LYING

- Nesting support to spine, consider rib insertion at spinal column and need for stabilization
- Facilitated tuck: posterior pelvic tilt to support diaphragm and lower abdominals in flexion for activation
 - **CRITICAL for PAIN MANAGEMENT control**
- Hip/LE flexion to provide static support to lateral diaphragm
- Proprioception/containment support with weighted device: but not directly on ribcage as that can reduce expansion and alter blood gases





SIDELYING

- Fold Velcro tabs of multi-purpose roll in
- Position infant in sidelying
- Multi-purpose roll position from T2-lumbosacral spine
- Use wings to support BUE at midline
- Use of swaddler for 360 degrees support



CORE CONCEPTS: PRONE

PRONE POSITIONING

- Provides the best thoracoabdominal synchrony and rib cage movement, best length-tension relationship for diaphragm
- Prone support is critical to provide this stability and allow for gravity assisted diaphragmatic movement and secondary posterior chest wall excursion
- Use of prone support for proper alignment, hand to mouth, reduce scapular restriction of ribcage movement
- Use of foot bracing device
- Hough, J et al. 2013: Lung volume for ventilated infants
 - Posterior lung fills earlier than anterior lung
 - Right lung filled before the left lung



PRONE POSITIONING



- Monitoring of cervical spine and ETT (if applicable) positioning
 - Neck flexion of 15-30 degrees does not cause airway obstruction; greater than 45 degrees of flexion can occlude airway
 - Monitor hyperextension
 - Greater than 45 degrees can occlude airway
 - Compensatory response and need more support or position change
- Infection present
 - Secretion management and tube stabilization

PRONE POSITIONING



- Fold the hood down to allow visualization of infant face
- Place Multi-purpose roll to support infant head, face, and sternum
- Use of wing to promote hands to face, not too tight to limit posterior chest wall movement

- Use of second multi-purpose roll to promote posterior pelvic tilt in prone
- Secure swaddler for 360 degrees support



Elevate infant from surface, prone plus



Twist the Froggy Arm

- Biomedical International Products:
 - Prone on Prone Plus, use of Snuggle Up for Nesting, Scapular support strap (not too tight to limit posterior chest wall movement), lower strap at crest of pelvis for posterior pelvic tilt

- Biomedical International Products:
 - Prone on Froggy: fill the “arms” of the Froggy 1/3 of beans, flip the Froggy to create a twist that allows for floating of the CPAP device to reduce pressure injury to nose/upper lip



CORE CONCEPTS: SUPINE

SUPINE: SAFE SLEEP POSITION (SSP)

- American Academy of Pediatrics 2011: “Preterm infants are at increased risk of SIDS, and the association between prone sleep position and SIDS among low-birth-weight infants is equal to, or perhaps even stronger than, the association among those born at term. Preterm infants and other infants in the NICU should be placed in the supine position for sleep as soon as the infant is medically stable and significantly before the infant’s anticipated discharge, by 32 weeks postmenstrual age.....”
- “Positioning devices are incompatible with a safe home sleep environment and, although the AAP encourages transitioning to a safe sleep environment at 32 weeks’ postmenstrual age, not all infants will have achieved positional stability by this age, resulting in wide interpretation at the bedside.” Goodstein, 2021

COORDINATED TEAM PLAN

- Gelfer, P., Cameron, R., Masters, K., & Kennedy, K. A. (2013). Integrating “Back to Sleep” recommendations into neonatal ICU practice. *Pediatrics*, 131(4), e1264-e1270.
- Clinical Practice:
 - Use of crib cards with therapeutic positioning information and transition plan for Safe Sleep Positioning
 - Varied positioning as age appropriate with consideration for skull shape, transition to active Tummy Time, upright holding, and variation of parent holding techniques

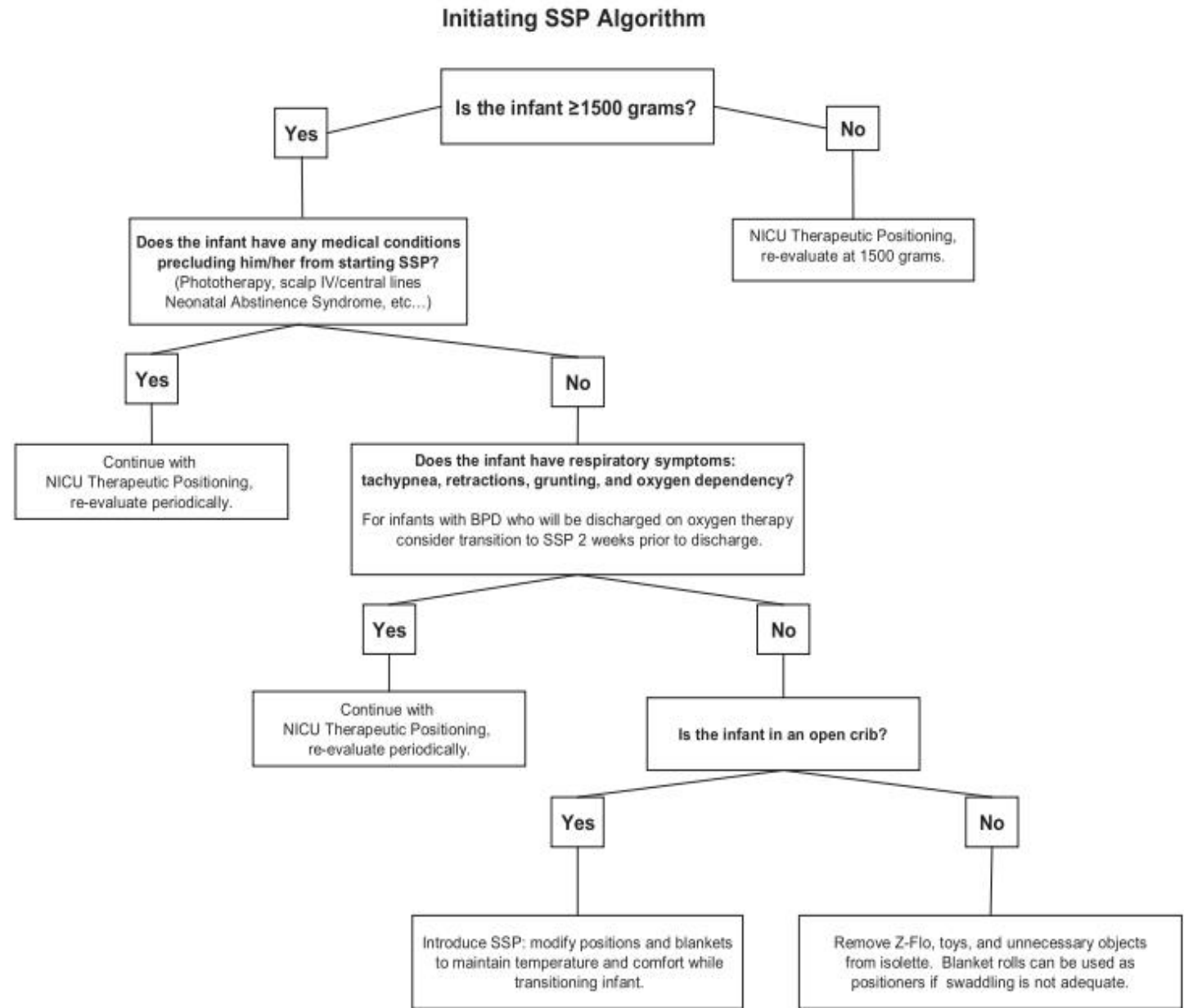


FIGURE 1
Algorithm to determine when an infant is ready to begin SSPs. BPD, bronchopulmonary dysplasia.

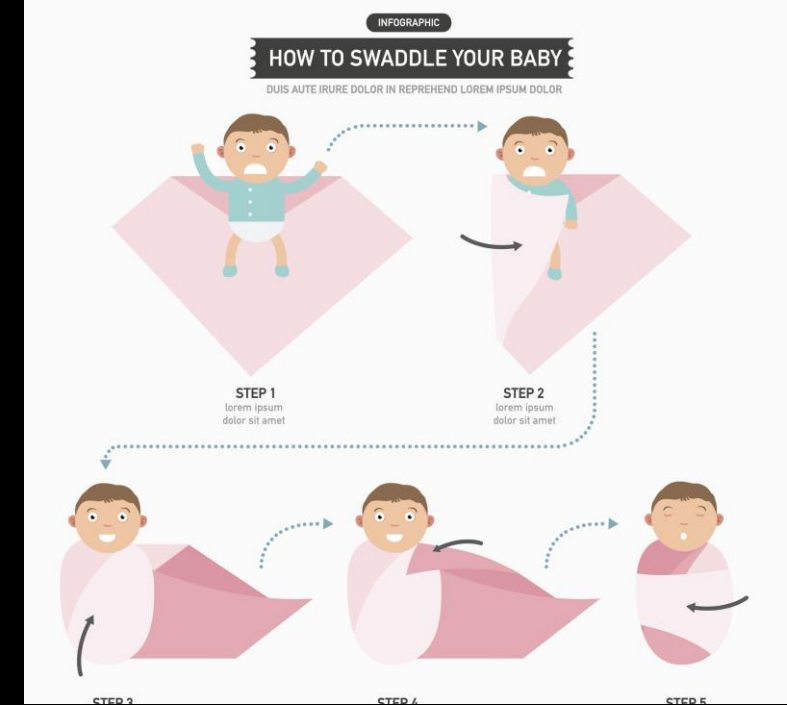
SUPINE

Segmental Trunk Control and Development

- Cervical spine: 10-15 degrees of flexion, chin tuck
- Thoracic spine: hands to face to improve scapular alignment
- Lumbar spine: hip flexion, knee flexion ankle dorsiflexion with posterior pelvic tilt
- Appropriate use of nesting device: does the infant tolerate this device
- Consideration of upper extremity support and chest wall movement
- Monitor chest/abdominal movement for breathing patterns

Flexion Swaddling: "Hip-Safe Swaddling"

SCENT: Schifsky Consulting and Education for Neonatal Therapists





DANDLE LION PRODUCTS: DANDLE- ROO

- Supine positioning
 - Use of wings to promote hands to midline
 - Fisted hands under chin for infants intubation or on CPAP
 - Use of multi-purpose roll under ischial tuberosity to promote posterior pelvic tilt, hip/knee flexion, and external rotation of hips
 - 360 degrees support with stretchable fabric as the swaddler. Don't make it too tight, allow for free movement





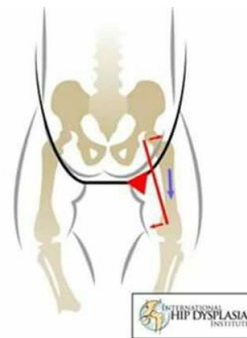
MODIFICATION TO SUPINE

- If infant requires medical team visualization of the abdomen (UVC/UAC or temperature probe)
 - Twist the wings and use them to support the elbows in flexion to promote hands to face
 - Roll the ends of the swaddler approximately half the distance of its length and then use the Velcro to secure it in place
 - Ensure the abdomen is kept open to allow for medical management

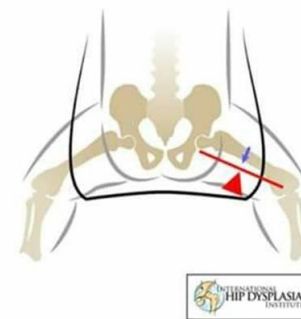


FLEXION SWADDLING

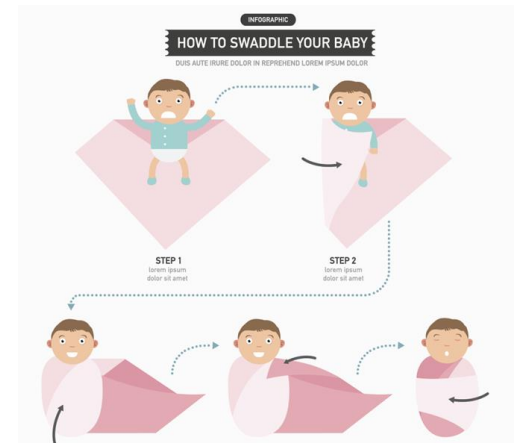
Swaddling infants with the hips and knees in an extended position increases the risk of hip dysplasia and dislocation. It is the recommendation of the International Hip Dysplasia Institute that infant hips should be positioned in slight flexion and abduction during swaddling. The knees should also be maintained in slight flexion. Additional free movement in the direction of hip flexion and abduction may have some benefit. Avoidance of forced or sustained passive hip extension and adduction in the first few months of life is essential for proper hip development.



Thigh NOT supported to the knee joint. The resulting forces on the hip joint may contribute to hip dysplasia.



Thigh is supported to the knee joint. The forces on the hip joint are minimal because the legs are spread, supported, and the hip is in a more stable position.



FLUIDIZED POSITIONING DEVICES

- Fully conformable to individual infant positioning needs
- Maintains its shape; variety of sizes
- Less sleep disturbance during positioning adjustments
- Create a trough for the medical lines, ETT, ventilator circuit. Need to create a dependent loop to reduce risk of lavage to the infant
- Mold the center of the mattress to provide support to the head and cheek
- Measure the infant from chin to xiphoid and create a built-up support for their trunk
- Create a trough on either side of the built-up trunk support for each arm



DIAPERING

- Can be stressful for infant, 2-person cares
- Position during diapering
- Encourage self regulation
- Ensure proper size
- Parent/caregiver involvement
- Skin protection
- Adjustment of diaper for hip/pelvis support
 - Stretch to elastic
 - Soften the inguinal region padding



OUTCOMES

Integration of neurodevelopmental care principles has been demonstrated in numerous studies to

- Reduction in days on ventilator
- Reduction in O₂ needs
- Reduced co-morbidities of prematurity
- Younger infants discharging home
- Improved weight gain
- Improved maternal bonding
- Improved parental confidence in caring for their infant
- Improved Bayley scores at 9 months corrected age for Mental and Psychomotor Development Index

Ohlsson, 2013



SUMMARY



- Neurodevelopmental care utilizes a theoretical basis with evidenced based research to promote infant/family centered care to optimize motor, sensory, and cognitive outputs for NICU survivors
- Transition in care from developmental positioning to therapeutic positioning as this encompasses the physiological and neurological considerations of infant motor development
- Understanding the impact of the three “E’s” (environment, experience, encoding) on mid-brain wiring during positioning/handling supports the infant's cortical development of the four “A’s” (arousal, attention, affect, action)
- Using the STOP (Safety, Tactile input, Opportunity for movement, Positioning) approach during routine cares allows the infant motor and sensory maturation for self regulation
- Therapeutic positions of supine, prone, and side lying provide the infant with sensory/motor opportunities for neurological and musculoskeletal skill development while maintaining physiological stability

FINAL THOUGHTS...

*In the NICU, where technology is at its most complex and densest and infants and families are at their most vulnerable, there is the greatest obligation for transformation and change. To be successful we must become fully present, attuned and accountable to each infant and each family, and effective in supporting optimal development of all infants, families and staff. —
Heidelise Als, 2019 New Zealand*



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