Therapeutic Positioning in the NICU

About this Document

This document is a resource to the course: **Core Measure 3: Positioning & Handling**, Lesson*: Therapeutic Positioning in the NICU*.

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Therapeutic Positioning in the NICU

Introduction

Positioning is one of the earliest interventions for preterm infants in the NICU. Many positional deformations acquired during hospitalization in the NICU are preventable. Secure therapeutic positioning promotes improved rest, supports optimal growth and helps to normalize neurobehavioral organization. Neurodevelopmental positioning has been shown to have a direct effect on bone and joint development, promote self-regulation and sleep, reduce pain responses in preterm infants, and minimize long-term deleterious effects on sensory and motor development (Hunter, Lee, & Altimier, 2014; Dusing, Kyvelidou, Mercer, & Stergiou, 2009; Vaivre-Douret & Golse, 2007; Vandenberg, 2007).

NICU positioning is an excellent example of how evolving knowledge and advances in technology drive changes in developmental clinical practice. In the 1970s, few or no attempts were made to provide boundaries or positional support for infants in the NICU. In the 1980s, increased awareness of infant developmental vulnerability and environmental stressors resulted in the use of blanket rolls for boundaries, with variable effectiveness. Commercially available positioning aids became available in the 1990's, and increasingly replaced manually-made nests of blanket rolls and sheepskin; commercial positioning aids provided greater ease and consistency of positioning among NICU staff, but still with variable success in providing consistent boundaries without eliminating free movement. Therapeutic supportive positioning devices must allow spontaneous movement, provide tactile and proprioceptive containment, and displace infant body weight to the lower abdomen and pelvis when the infant is in the prone position. Providing ventral support while infants are in prone position makes it possible to keep their shoulders rounded and hips in a flexed position. When preterm infants are positioned in supine, prone or lateral positions, the combined use of a postural support along with containment aids has been shown to improve hip posture up to term-equivalent age (Picheansathian, 2007).

Despite the available and expanding body of research regarding gravity, posture, and motor development, the current state of positioning practices in the NICU lack consistency in adoption, application and utilization of effective therapeutic supportive positioning practices and positioning aids (Altimier & Phillips, 2013).

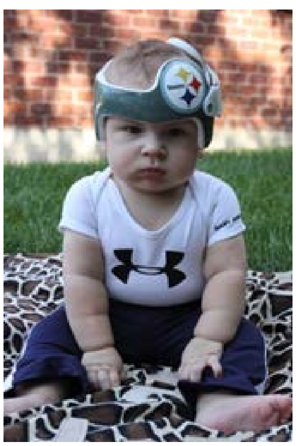
Benefits

Developmentally supportive positioning has also been shown to have an array of physical, social, and psychological benefits that last beyond the neonatal period. Healthcare providers, parents and consumers are no longer satisfied with minimum standards of care provision. Quality care with attention to comfort, developmental trajectory of the infant and family integration is the new standard of care in NICU's around the world.

Therapeutic positioning in the NICU is a fundamental mainstay and can influence not only neuromotor and musculoskeletal development, but also physiologic function and stability, skin integrity, thermal regulation, bone density, sleep facilitation and brain development (Hunter, 2010). Motor skill development begins with postural control which is demonstrated as the capacity to maintain body alignment and orientation during rest, body part displacement and during active, spontaneous movement. This foundational motor milestone requires tactile, vestibular, and proprioceptive input for development and maturation. Preterm infants left in unsupported extended positions frequently exhibit increased stress and agitation with decreased physiologic stability.

Incorrect body positioning can result in postural problems/deformities, such as hip abduction and external rotation, decreased posterior pelvic tilt, ankle eversion, retracted and abducted shoulders, neck hyperextension, shoulder elevation, and cranial molding. These deformities in turn can reinforce neurologic abnormalities and impede achievement of developmental milestones, including head control, rolling, sitting, crawling, and walking (Hunter, 2010).

Incidence of cranial molding (Positional Plagiocephaly) has increased over recent decades. Cranial molding is identified as a contributor for negative physical and psychosocial developmental effects (Collett, et al., 2005). Frequently, infants with flattening in the occipital area tend to position themselves preferentially on that side, which can lead to contractures of the neck muscles and torticollis (Hunter, 2010). Some children with positional plagiocephaly have shown evidence of restricted neck motion requiring physical therapy to improve range of motion (Stellwagen et al., 2008). Preventive measures such as developmentally appropriate positioning can minimize the risk of positional plagiocephaly and acquired torticollis. Infants who receive regular repositioning have statistically significant reductions of bilateral head flattening compared to infants who do not receive this intervention (Wielenga, et al., 2011). Oftentimes, orthotic (helmet) therapy is necessary to assist in reshaping the infant's head; which can be cumbersome and difficult financially for families. Insurance coverage of the helmet is often considered to be a barrier to obtaining this treatment because helmets can range from $1500 to $5000, and many insurance companies will not pay for the treatment (Lipiria et al., 2010; Roby et al., 2012). Children's heads grow most rapidly during the first year of life, and there is evidence that initiating helmet therapy as early as possible can reduce the amount of time required for helmet therapy (Kluba et al., 2013; Grigsby, 2009).



Movement

Movement occurs in concert with tactile, vestibular, and proprioceptive input. The central and peripheral nervous systems must differentiate between vestibular signals imposed by the external world and those that result from spontaneous, self-directed actions. The critically ill and/or premature infant in the NICU receives vestibular input primarily through an external source (i.e., the parent or clinician) and is consequently vulnerable to sensory distress and excessive motor movements in an effort to stabilize and orient to a fixed surface during vestibular disturbances. Providing supportive proprioceptive input in the way of containment, thereby imitating the spatial limitations of the womb, has been demonstrated to positively influence neuromotor and neurosensory maturation (Hunter, Lee, & Altimier, 2014).

The hospitalized critically ill and/or premature infant has limited energy stores and a high-energy expenditure, which is complicated by severity of illness that persists over the hospital course. Pritcher et al. (2011) revealed that motor activity played a key role in energy expenditure and suggested the implementation of developmental care strategies such as supportive positioning, minimal handling and containment to protect energy for growth. Understanding the developmental progression of movement within the context of the intrauterine environment, energy demands during the postnatal period and the musculoskeletal/neurosensory vulnerabilities of the critically ill and/or preterm infant is requisite for the NICU clinician providing an evidence based reference point for developmentally supportive positioning practices.

Containment

One of the first important concepts to discuss is that of body containment, which increases the infant's feelings of security and self-control and decreases stress. Infants who are contained tend to be calmer, require less medication, and gain weight more rapidly. Containment is provided through the use of blanket rolls or positioning aids to surround the infant snugly with a three-dimensional boundary. The infant's head, sides, and feet should be contained by this boundary.

Applying the principle of activity-dependent development to body posture and movement suggests that neuronal pathways supporting extremity flexion and symmetrical body alignment are constantly reinforced in the womb. Arching with excessive neck and trunk hyperextension often evolves from strong active extension, postural asymmetry as gravity and primitive reflexes pull the head out of midline, positional pull of medical equipment, and agitation

When birth occurs before optimal fetal musculoskeletal and neurologic maturation, it places early-born infants at risk for atypical motor development (Sweeney & Gutierrez, 2002; Vaivre-Douret, Ennouri, Jrad, Garrec, & Papiernik, 2004; Waitzman, 2007). All positioning (correct and incorrect), affects neurobehavioral organization, musculoskeletal development, neuromotor functioning, and feeding performance of NICU infants. Some adverse consequences of inadequate positioning, such as arching or lateral skull flattening, may be apparent during hospitalization. Other unfavorable outcomes are not evident until after hospital discharge. Preterm infants left in unsupported extended positions frequently exhibit increased stress and agitation with decreased physiologic stability. Persistent and extreme extensor posturing can increasingly interfere with caregiving and with an infant's ability to attend and interact appropriately within the environment. Secure therapeutic positioning promotes improved rest and neurobehavioral organization, and an infant will be calmer, more interactive, and easier to care for.

Preferential head-turning, usually to the right about 70 – 80% of the time in supine preterm and term infants is linked to (Hunter, 2010):

- Asymmetrical postures
  - Infants are held, placed in carriers, or kept supine
- Asymmetrical skull deformations (flattened occiput on preferred side)
- Functional or Structural torticollis
- Difficulty with visual tracking
- Difficulty with balanced head control
- Premature development of right had preference
  - The right hand is constantly in the baby's visual field
- Development of lateral trunk curvature
- Asymmetrical gait with increased rotation of the left lower extremity

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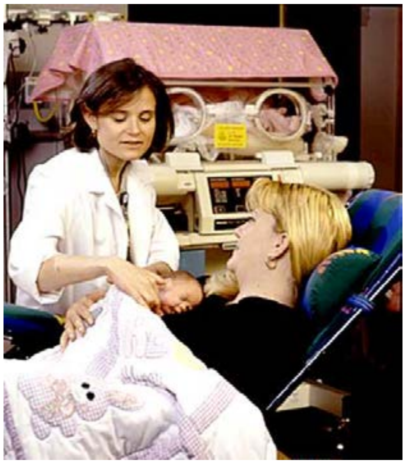


Kangaroo Care (KC) is also a neuroprotective intervention facilitating appropriate positioning for the neonate. Outward coil of the chest is limited when an infant lies supine. When an infant is more upright, the contents of the abdominal cavity can shift away from the upper abdomen, creating an increase in the negative subdiaphragmatic pressure, favoring the outward recoil of the chest (Ammari et al., 2009). VaeBen et al. (2010) found that during KC, there was no increase in apneic attacks and bradycardic episodes and no difference in respiratory rate, breathing pattern, oxygen saturation, episodes and duration of desaturation compared to prone and supine positioned preterm infants. Additionally, there were no significant KC-mediated changes in quality and quantity of desaturations or in body temperature compared to preterm infants placed in a prone position.

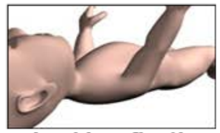
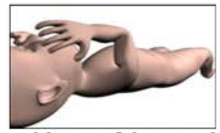
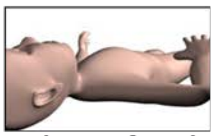
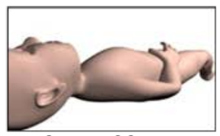
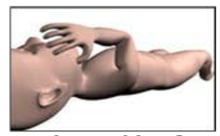
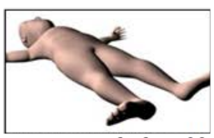
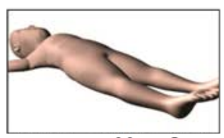
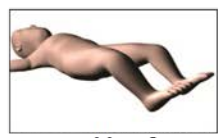
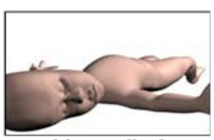
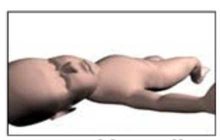
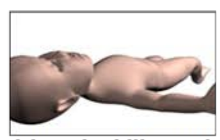
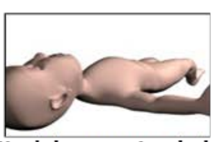
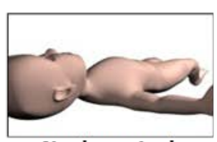
The Infant Positioning and Assessment Tool (IPAT)

The IPAT, Infant Positioning Assessment Tool, (Koninklijke Philips Electronics NV) was developed to standardize best positioning practice in NICU (Coughlin, Lohman, & Gibbins, 2010). The IPAT is a reliable, easy to use pictorial directory of appropriate positioning for preterm infants. Objective and measureable assessments of infant positioning is warranted to improve consistency in nursing practice; which affects neonatal developmental outcomes (Liu, 2007). Using the IPAT tool, paired with one to one bedside education can improve positioning consistency across shifts and experience (Jeanson, 2013). Throughout the course of a single day the NICU nurse interacts with and repositions the infant potentially eight to twelve times. Infants typically rest for two to three hours between care episodes and misaligned positioning persisting over a two to three hour period and perhaps an entire 12 hour shift can create pain and decrease the quality of sleep. (Hunter, 2010). Proper positioning must account for gestational age, medical fragility and high-tech interfaces. Educating multigenerational and experiential staff to implement proper positioning with each set of cares while still accomplishing the many medical tasks mandated has proven difficult. The application of optimal body positioning is consistently inconsistent in everyday practice.

The IPAT evaluates posture at the head, neck, shoulders, hands, hips, knees/ankles/feet. A two point scoring system is used with a score of 2 for appropriate positioning, a 1 for acceptable alternative positioning and a 0 for unacceptable positioning. A full score of 12 was indicative of perfect positioning according the IPAT. A score of 9 to 12 was acceptable as it accommodated for the asymmetry of positioning often needed when technology interfaces are present. Scores of 8 or lower indicate a need for repositioning. Picture representation for scoring comparison is provided with the IPAT. Integrating consistent positioning practices requires standardization which is provided by the IPAT, which has yielded favorable results (Coughlin, Lohman, & Gibbins, 2010).

Example IPAT tool:

Patient's Name:	Corrected Gestational Age:
Clinician's Name:	Date/Time of Assessment:

Indicator	0	1	2	Score
Shoulders	 Shoulders retracted	 Shoulders flat/in neutral	 Shoulders softly rounded	
Hands	 Hands away from the body	 Hands touching torso	 Hands touching face	
Hips	 Hips abducted , externally rotated	 Hips extended	 Hips aligned & softly flexed	
Knees, ankles, feet	 Knees extended, ankles & feet externally rotated	 Knees, ankles, feet extended	 Knees, ankles, feet are aligned & softly flexed	
Head	 Rotated laterally (L or R) greater than 45° from midline	 Rotated laterally (L or R) 45° from midline	 Positioned midline to less than 45° from midline (L or R)	
Neck	 Neck hyperextended, flexed	 Neck neutral	 Neck neutral, head slightly flexed forward 10°	
			Total Score	

Ideal Cumulative Score = 10-12

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