



Using Evidence-Based Practice: A Review of Developmental Positioning and Containment Practices of Premature Neonates in the NICU

Tammy J. Anderson, RNC - NIC, PHN, MSN

CHOC Children's, Orange, CA



Background

Issue #1

Prematurity and Perinatal Mortality

- March of Dimes (2008) reports that every year more than half a million babies are born prematurely (before 37 weeks gestation) in the United States.
- Prematurity is the leading cause of newborn death and lifelong disability (Monterosso, 2001).
- The preterm birth rate has jumped by 20 percent since 1990 and costs the nation more than \$26 billion every year (Institute of Medicine, 2008).
- Premature infants experience a range of morbidity related to the immaturity of their organ systems and to concurrent disease states; which may be decreased with developmental positioning/care (de Goot et al., 1995).
- There is concern that an unfavorable environment in the neonatal intensive care unit may compound this morbidity; but the NICU means survival for this fragile patient population.
- More than 370,000 neonatal intensive care unit (NICU) patients in the United States each year rely on their caregivers to provide for all their basic needs to help them sustain life.

Issue #2

Providing a Developmentally Supportive Environment

- The environments we provide as nurses can help premature infants better cope in the extra-uterine life; modifications in the NICU could minimize the iatrogenic effects (Geofgieff & Bernbaum, 1986).
- Long-term studies following the development of infants showed that behavioral reactions, such as "disruptions in sleep, feeding patterns and maternal-infant interactions can persist long after the noxious stimuli has ended," demonstrating recall of pain (Rouzan, 2001, p.58).

Issue #2

Providing a Developmentally Supportive Environment (continued)

- The goal of the NICU is to provide a developmentally supportive environment for optimal growth which includes reduced noise levels, decreasing bright lights & light cycling, and clustering cares to allow for optimal sleep periods and positioning for optimal neuromuscular development and pain reduction (Sizun & Westrup, 2003).

Issue #3

Pain Management

- Recent studies show that NICU infants are not medicated prior to procedures for which adults are routinely medicated (Rouzan, 2001).
- Pain management differences also exist between neonatal and pediatric patients. For example, "66% of pediatric intensive care unit patients... [Compared to] 26% of NICU patients are likely to receive analgesia (Rouzan, 2001, p.59).
- Another study demonstrated that neonates "from 109 NICU's in the United States and 14 NICU's in Canada that underwent a variety of painful procedures did not receive pharmacological treatment or comfort measures" (Stevens, 2000, p.634).
- Untreated pain in NICU infants results in short and long-term complications. In the compromised NICU patient, pain inhibits the body's ability to fight infection, resulting in longer and more expensive hospital stays. Research shows that the infant's neurological ability to create long-term memories is well developed (Furdon, 1998).

Organizational Priority

This evidenced based practice project supports the organizational goal of a Specialized Premature/Very Low Birth Weight Unit within the NICU, which will provide optimal outcomes to this fragile patient population.

PICO Question

In the premature patient population, does implementation of developmental positioning and containment practice guidelines, optimize neuromuscular development and assist in pain management?

Synthesis of Evidence

Database searches for this review included CINAHL, PubMed and OVID, reviewed by Joanna Briggs Institute, American Academy of Pediatrics, National Clearinghouse a standard search strategy was used and combined with the following MeSH search terms: Posture, Positioning, Neuromuscular Development, Positioning, Development and Pain Reduction; Neonate; Premature; body positioning, kangaroo care, Skin-to Skin; Premature Infant.

- 36 randomized controlled trials involving four major groups of developmental care interventions, 19 subgroups and multiple clinical outcomes
- 2 Meta-analyses for each intervention where the same outcome measures and/or instruments were used within comparable time points
- 16 trials were identified
- 2 Meta-analyses for each intervention where the same outcome measures and/or instruments were used within comparable time points
- 9 Randomized cross-over controlled trials

Summary of Evidence

Developmental/Therapeutic positioning can positively affect the current medical stability of the premature neonate and assist in developmental milestones within the first 5 years of life (Hallsworth, et al., 1995; Young et al., 1996).

Aims of supportive positioning/developmental positioning are:

- Stimulate active flexion of the trunk and limbs
- Achieve more rounded heads and active head rotation
- Encourage balance between extension and flexion
- Promote more symmetrical postures
- Enhance mid-line orientation, which contributes to eye, hand
- and mouth control
- Prevent deformities
- Decrease pain from endotracheal suctioning and heal sticks
- Enhance comfort and reduce stress (Hallsworth, 1995; Young, 1996)

Best practice positioning for the premature infant is:

- Arms and legs should be curled up, with knees and elbows tucked towards the middle of the body. The spine should be curved and head should be tucked slightly forward.
- Due to each infant severity of illness; medical conditions and responses to cares and painful procedures each infant will need a combination of different positions as indicated.

Neonatal supportive positioning/developmental positioning can maximize physiologic stability, muscle tone and movement patterns while in the NICU. Such positioning can decrease pain and stress associated with the infant's capacity for self-regulation and organization. Table 1 describes the advantages and disadvantages to different developmental positions (Fox, 1996).

Position	Advantages	Disadvantages
Supine	<ul style="list-style-type: none"> • Easier to access infant, avoid repositioning events • Increases social face to face contact between caregiver and infant • Recommended position for SIDS reduction (AAP, 2005) 	<ul style="list-style-type: none"> • Decreases arterial oxygen levels, lung compliance, and tidal volume • Increased reflux, increased energy expenditure • Greater risk of aspiration • Prone infants sleep less and cry • Encourage extension rather than flexion
Prone	<ul style="list-style-type: none"> • Improves oxygenation & ventilation - despite increased breathing work or without ventilator support • Improves gastric emptying and reduction in reflux • Decreases episodes of tachypnea, hypoxemia and sleep apnea, risk of aspiration, energy expenditure • Facilitates development of flexor tone & hand-to-mouth activity for self-feeding (www.nichd.nih.gov/cocoon/03bq02a) 	<ul style="list-style-type: none"> • More difficult to access, examine & perform procedures and have face to face social contact • Agitation/very active may self-actuate • Increased risk of SIDS (AAP, 2005) • Can produce "FROGGED LEGS" (www.nichd.nih.gov/cocoon/03bq02a)
Sidelying	<ul style="list-style-type: none"> • Right side: better gastric emptying than supine or left sidelying • Unilateral lung disease will have better oxygenation with good lung positioned dependent • Can be used to treat PNE by placing affected lung in dependent position • Encourage midline orientation of head and extremities • Neutralize external rotation of limbs and promotes flexion and adduction • Facilitates hand-to-mouth activities (www.nichd.nih.gov/cocoon/03bq02a) 	<ul style="list-style-type: none"> • L/R: Decreased gastric emptying & increased reflux • May contribute to atelectasis of dependent position • Difficulty to maneuver with NICU • May be difficult to maintain a flexed sidelying position with active, mobile, and/or hyperactive extended infant (www.nichd.nih.gov/cocoon/03bq02a)
Midline Head Position	<ul style="list-style-type: none"> • Head in midline may decrease intracranial pressures and intraventricular hemorrhage when placed on the flat back table in premature infants • HOB elevated 30 degrees may increase intracranial pressures • Head in midline may improve shape of head • Midline positioning reduced postural asymmetry and encourages development of amblyopia flexion (Poon et al., 2008) 	<ul style="list-style-type: none"> • Midline is not practical in prone position (Poon et al., 2008)
Facilitative Tucking	<ul style="list-style-type: none"> • Provides comfort and assist in self-feeding • Reduces stress when used with careful procedure (e.g. heelsticks & endo tracheal suctioning) (Ward-Lawson et al., 2004) 	<ul style="list-style-type: none"> • May take two individuals to complete properly (Ward-Lawson et al., 2004)

Next Steps

- Develop Educational Program for the Nursing Staff
- Develop and Developmental Monitoring Tool
- Comparison Study of the Pre and Post-education with the nurses adaptation/use of developmental positioning in their practice as compared to the NICU Neonatal Outcome of Mortality and Morbidity

Literature Cited

References available upon request from tander-son@choc.org

Acknowledgments

- The Evidence-Based Scholars Program was supported by a grant from the Walden and Jean Young Shaw Foundation.
- Vicky R. Bowden, DNSC, RN Azusa Pacific University EBP Scholars Program Mentor
- Children's Hospital of Orange County Nursing Administration