

**Reliability and Effectiveness of an Infant
Positioning Assessment Tool to Standardize
Developmentally Supportive Positioning
Practices in the Neonatal Intensive Care Unit**

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Although developmentally supportive positioning is acknowledged as a key element of care in the neonatal intensive care unit, the definition and standardization of what constitutes evidence-based positioning practices is nonexistent in a formalized format. As postural stability is a foundational milestone for motor development and premature infants are unable to exhibit postural stability without support, standardizing the definition of optimal positioning will lead to consistency in practice. This article introduces a positioning tool to be used as a resource for standardization and education on developmentally supportive positioning practice goals.

Keywords: Developmental Care; supportive positioning; postural stability; standardization

Developmentally supportive family-centered care is a practice strategy used in the neonatal intensive care unit (NICU) aimed at minimizing the potential short and long term complications associated with the hospital experience. Developmentally supportive positioning has been a practice mainstay associated with developmental care. Over the past three decades, empirical evidence to support developmental care and supportive positioning has moved intuitive neonatal nursing practice towards a unique body of scientific inquiry. However, despite reported benefits, there has been inconsistent adoption and implementation of developmentally supportive positioning practices world-wide.

Although developmentally supportive positioning is acknowledged as a key element of care in the newborn intensive care unit, the definition and standardization of what constitutes evidence-based positioning practices is non-existent in a formalized format. As postural stability is a foundational milestone for motor development and premature infants are unable to exhibit postural stability without support, standardizing the definition of optimal positioning will lead to consistency in practice.

Background

Motor skill development is a cephalocaudal, proximodistal process that is the nexus for future developmental milestones. The earliest activity an infant must perform is to maintain a stable posture against the influence of gravity. Postural stability is influenced not only by gravity but by neurosensory input, specifically, vestibular, tactile, and proprioceptive. The development of vestibular ascending and descending pathways is essential for the development of postural control and subsequent locomotor functions.¹

For the hospitalized premature infant or critically ill term infant, the majority of vestibular input is imposed by the external world, either by the healthcare professional or the parent and confounded by the influence of gravity, underdeveloped visual acuity and inconsistent tactile and proprioceptive supports.² Providing proprioceptive input with containment has been demonstrated to positively influence neuromotor and neurosensory maturation.³ During routine caregiving,⁴ highlighted the need for premature infants to be contained and positioned in flexion, as a protective maneuver in order to mitigate excessive motor activity. Van der Fits et al⁵ described the development of postural adjustments in preterm infants, contrasted to their term counterparts. The authors suggest that the excessive postural activity elicited by this population may impede processing of sensory information which may have long-term deleterious effects and recommend the use of 'nest-like' body supports.⁵ Vaivre-Douret et al (2004)⁶ demonstrated the importance of frequent position changes and functional postural support enabling spontaneous motor activity for normal neuromuscular and osteoarticular function in low-risk preterm infants aged 31–36 weeks gestational age.⁷ Monterosso et al,⁸ after a comprehensive review of the literature pertaining to positioning very

From the Carney Hospital, Dorchester, MA; Sunrise Hospital, Las Vegas, NV; Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada; The Hospital for Sick Children, Toronto, Ontario, Canada. Address correspondence to Mary Coughlin, CCRN, MS, 2100 Dorchester Avenue, Dorchester MA 02124. E-mail: Mary.Coughlin2@caritaschristi.org.

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Table 1. Infant Position Assessment Tool

Patient's name:				
Clinician performing assessment:				
Date/time of Assessment:				
Infant position (circle): supine side-lying prone				
Indicator	0	1	2	Total 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 and softly flexed	
• Knees, ankles, feet	Knees extended, ankles and feet externally rotated	Knees, ankles, feet extended	Knees, ankles and feet are aligned and softly flexed	
• Head	Head rotated laterally (L or R) greater than 45° from midline	Head rotated laterally (L or R) 45° from midline	Head positioned midline to less than 45° from midline (L or R)	
• Neck	Neck hyperextended	Neck neutral but poorly aligned with spine	Neck in neutral position, slightly flexed forward and aligned with spine	
				Cumulative score
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low-birth-weight infants, concluded that appropriate postural interventions could have a positive impact on infant neuro-motor development. In a subsequent study, the combined use of postural support rolls and postural support nappy improved hip posture in very preterm infants.⁹ Sweeney and Gutierrez¹⁰ present a very eloquent overview of musculoskeletal maturational processes and highlight supportive positioning interventions during the NICU experience that can minimize musculoskeletal abnormalities.

These studies demonstrate the postural developmental challenges faced by the preterm infant population, their proprioceptive needs and the developmental benefits derived from supportive positioning strategies and practices.

The Study

The aim of this study was twofold: (1) to develop an infant position assessment tool to standardize best practices in neonatal positioning and (2) evaluate its effectiveness in teaching consistent positioning practice. The Infant Position Assessment Tool (IPAT) (Table 1, ©Copyright 2007-2010 Koninklijke Philips Electronics N.V. All rights reserved.) is a six-item tool with cumulative scores ranging from 0 to 12. It was developed as a teaching tool to standardize developmentally supportive positioning practices in the NICU and provide a method for evaluation of those positioning practices. Content validity of the IPAT was based on research evidence and opinions from both clinical experts and researchers in developmental care. Reliability was established by having 4 independent reviewers compute IPAT scores for 5 infants.

The tool was used in conjunction with a system wide educational program focused on developmentally supportive care as a quality improvement initiative (Wee Care program, Philips Children's Medical Ventures, Monroeville, PA, USA). Using Fleiss's κ methodology, interrater reliability scores were above 90%. Three research assistants collected baseline IPAT scores (T1) on all NICU patients who were not receiving direct care at the time of the observation (n = 55). Following baseline data collection, all NICU staff at six urban tertiary care centers underwent the Wee Care program (Philips Children's Medical Ventures, Monroeville, PA, USA). Thirteen months later (T2), the same research assistants collected IPAT scores on all NICU patients who were not receiving direct care at the time of the observation (n = 50). Neonatal care providers were blinded to the timing of the follow-up data collection.

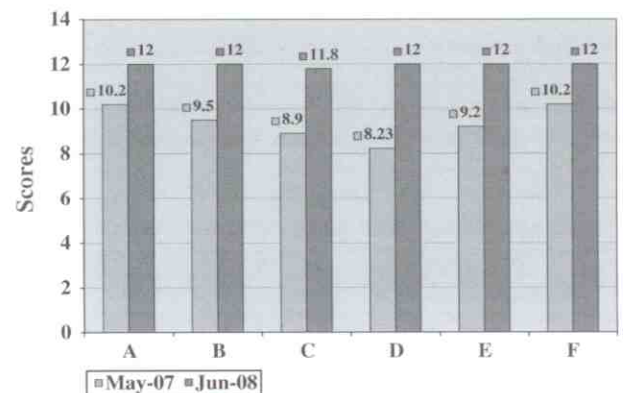


Fig 1. Pre and post IPAT scores by individual NICU sites IPAT score ranges from 0 to 12.

There were statistically higher IPAT scores at T2 ($P < .0001$) within each site (Fig 1).

Discussion

Developmentally supportive positioning in the NICU provides the foundation for motor skill development through postural support as well as proprioceptive input to orient the infant to his/her immediate environment. Attention to optimal body positioning, although not disputed as relevant in the care of the hospitalized infant, is consistently inconsistent in everyday practice. The application of developmentally supportive care has been demonstrated to enhance neurodevelopmental outcomes and reduce hospital costs.¹¹⁻¹³ The Institute for Healthcare Improvement recognizes the challenges faced by critical care professionals, acknowledges competing priorities in this environment, and urges change initiatives to integrate the principles of reliability science in order to effect sustained, reliable practice change.¹⁴

Integrating these principles requires standardization and testing before widespread adoption. The IPAT provides a consistent reference resource across clinicians within and between NICU sites. Standardizing positioning practices, as defined by the IPAT, has yielded favorable results regarding consistency in the definition of optimal positioning and the practice of developmentally supportive positioning in the NICU.

Conclusion

Utilization of a process improvement education program combined with defined and standardized developmentally supportive care positioning practices results in consistency in developmentally supportive positioning practices as measured by the IPAT. Further testing of the measure to examine its effectiveness on infant outcomes such as position-related morbidities, pain scores or clinical morbidities is required.

References

1. Clarec F, Vinay L, Cazalets J-R, Fady JC. Role of gravity in the development of posture and locomotion in the neonatal rat. *Brain Res Rev.* 1998;28:35-43.
2. Grenier IR, Bigsby R, Vergara ER, Lester BM. Comparison of motor self regulatory and stress behaviors of preterm infants across body positions. *Am J Occup Ther.* 2003;57:289-297.
3. Helders PJM, Cats BP, Van Der Net J, Debast SB. The effects of a tactile stimulation/range-finding programme on the development of very low birth weight infants during initial hospitalization. *Child Care Health Dev.* 1988;14:341-354.
4. Gaetan EM, Moura-Ribeiro MVL. Developmental study of early posture control in preterm and full term infants. *Arq Neuropsiquiatr.* 2002;60:954-958.
5. Van der Fits IBM, Flikweert ER, Stremmelaar EF, Martijn A, Hadders-Algra M. Development of postural adjustments during reaching in preterm infants. *Pediatr Res.* 1999;46:1-7.
6. Vaivre-Douret L, Ennouri K, Jrad I, Garrec C, Papiernik E. Effect of positioning on the incidence of abnormalities of muscle tone in low-risk, preterm infants. *Eur J Paediatr Neurol.* 2004;8:21-34.
7. Hill S, Engle S, Jorgensen J, et al. Effects of facilitated tucking during routine care of infants born preterm. *Pediatr Phys Ther.* 2005;17:158-163.
8. Monterosso L, Kristjanson L, Cole J. Neuromotor development and the physiologic effects of positioning in very low birth weight infants. *J Obst Gynecol Neonatal Nurs.* 2002;31:138-146.
9. Monterosso L, Kristjanson LJ, Cole J, Evans SF. Effect of postural supports on neuromotor function in very preterm infants to term equivalent. *J Paediatr Child Health.* 2003;38:197-205.
10. Sweeney JK, Gutierrez T. Musculoskeletal implications of preterm infant positioning in the NICU. *J Perinat Neonatal Nurs.* 2002;16:58-70.
11. Altimier L, Eichel M, Warner B, Tedeschi L, Brown B. Developmental care: changing the NICU physically and behaviorally to promote patient outcomes and contain costs. *Neonatal Intensive Care.* 2004;17:35-39.
12. Hendricks-Munoz KD, Prendergast CC, Caprio MC, Wasserman RS. Developmental care: the impact of the Wee Care developmental training on short-term infant outcome and hospital costs. *Newborn Infants Nurs Rev.* 2002;2:39-45.
13. Petryshen P, Stevens B, Hawkins J, Stewart M. Comparing nursing costs for preterm infants receiving conventional versus developmental care. *Nurs Econ.* 1997;15:138-145, 150.
14. Nolan T, Resar R, Haraden C, Griffin FA. Improving the reliability of health care: IHI Innovation Series white paper. Cambridge (Mass): Institute for Healthcare Improvement; 2004.