

# Transitioning Premature Infants Supine: STATE OF THE SCIENCE

Sherri L. McMullen, PhD, RN, NNP-BC



## Abstract

Safe infant sleep has been the focus of two decades of research. Improving supine sleep position in infants has coincided with a reduction in sudden infant death syndrome (SIDS). Premature infants spend time prone while hospitalized to promote appropriate growth and development; however, after hospitalization, infants should be positioned supine to reduce the risk of SIDS. Research has not been conducted on the optimal timing of transitioning the premature infant supine prior to hospital discharge. Infants transitioned too early are at risk for developmental delays, and infants not transitioned prior to discharge are at risk for being positioned in a nonsupine position, thereby increasing the risk of SIDS. Parents can observe appropriate role modeling of their infant while hospitalized and potentially improve the rate of supine sleep after discharge to reduce the risk of SIDS. This review explores the current literature on transitioning the premature infant to the supine position prior to hospital discharge to improve evidence-based practice and potentially further reducing the SIDS rate.

**Key Words:** Infant, Premature; Prone position; Sudden infant death; Supine position.

Infant positioning is an important component of caring for an infant (Waitzman, 2007). In the neonatal intensive care unit (NICU), attempts are made to place the infant in a comfortable, yet developmentally supportive, flexed, and midline position. Throughout the hospital stay, a variety of positions may be appropriate depending upon the stage of the infant's illness (Aris et al., 2006).

Infants after hospital discharge should be placed supine to reduce the risk of sudden infant death syndrome (SIDS). SIDS is defined as an unexpected death of an

Premature infants spend the majority of their hospitalization nonsupine but must sleep supine after discharge to reduce the risk of Sudden Infant Death.



infant less than 1 year of age during sleep, which remains unexplained after a thorough postmortem exam, investigation of the circumstances of death, and review of the clinical history (Krous et al., 2004). However, survey research indicates a reluctance to position discharge-ready infants supine, with only 57% using the supine-only position in these infants (Grazel, Phalen, & Polomano, 2010). This is a concern because parents replicate hospital practices in the home (Vernacchio et al., 2003). By transitioning premature infants to the supine position prior to hospital discharge, infants have time to acclimate to this position.

## Background

Different positions provide specific benefits to the developing infant in the NICU. During initial stabilization, the supine position provides access to the infant, in particular the chest and anterior abdomen. Procedures such as cardiopulmonary resuscitation and intubation require the infant to be in the supine position. The abdomen can be accessed in the supine position for umbilical line placement and can be observed for bleeding.

The prone position improves oxygenation, compliance, and tidal volume, and during the acute stage of illness, can be an important nursing intervention to improve respiratory status (Saiki et al., 2009). During the convalescent stage of illness, the infant is managed in nonsupine positions (American Academy of Pediatrics [AAP], 2005; Aris et al., 2006).

After hospital discharge, infants must sleep supine to reduce the risk of SIDS. However, most premature infants have spent the majority of their time nonsupine while growing and preparing for discharge (AAP, 2005; Poets

& von Bodman, 2007); it has been recognized that a period of transition to the supine position is important during discharge preparation (AAP, 2000, 2008; Task Force on Infant Positioning and Sudden Infant Death Syndrome, 2011). Because parents have observed their infant in a variety of positions in the NICU, they may consequently put their infant at risk in a nonsupine position at home (Vernacchio et al., 2003).

The risk of SIDS is inversely related to gestational age and birthweight (Blair et al., & Group, 2006). Infants with the lowest gestational age and the lowest weight are positioned nonsupine for the longest duration and may have the most difficulty transitioning supine after discharge. If the infant is uncomfortable during this transition, it is possible that the infant may be placed nonsupine to improve the infant's comfort thereby increasing the risk of SIDS (Vernacchio et al., 2003). The author speculates that if transition happens well before discharge, the infant is more likely to be comfortably placed supine.

In 1992, the AAP began suggesting the supine position at discharge for all full-term infants (AAP, 1992). Two years later, the "Back to Sleep" campaign endorsed supine positioning after hospital discharge in full-term infants. In 1996, the AAP included premature infants in the recommendation (AAP, 1996). The AAP also began encouraging "tummy time" (or prone for play) for the infant while awake and being observed to reduce the risk of cranial deformities and improve upper trunk strength (AAP, 2000). In 2005, because of the increased risk of SIDS, the AAP eliminated the side-lying position for infants while sleeping (AAP, 2005). Beginning in 2008, the AAP recommends that premature infants be transitioned at 32 weeks postmenstrual age to become accustomed to this position prior to hospital discharge (AAP, 2008; Task Force on Infant Positioning and Sudden Infant Death Syndrome, 2011).

## Physiologic Underpinnings Determine Positioning

The physiologic underpinnings, as opposed to a theoretical basis, determine the decision regarding infant positioning during hospitalization and after discharge. Positioning of the infant depends on the stage of illness, tolerance of the position, and the risk for musculoskeletal deformities. There are NICU cultural differences and nurses' individual biases that affect positioning.

## Literature Search Strategy

In September 2011, there were no articles found when supine transition and premature infant search words were used in combination within the databases of CINAHL, PubMed, and MEDLINE. Consequently, a search was performed using the following keywords in combination: premature infant, supine positioning, prone positioning, sudden infant death, which yielded 18 articles. Premature infant, supine position, prone position, oxygen (and oximetry) yielded eight articles. The search was limited to literature after the year 2000. Due to the author's limitations, the search was limited to the English language.

## Clinical Implications for Positioning the Premature Infant

- Nurses should promote the supine position for sleep when medically stable and before the time of discharge (by expert consensus the American Academy of Pediatrics recommends 32 weeks postmenstrual age)
- Nurses should promote supine sleep and actively discourage nonsupine position for sleep after discharge and for the first year of life
- Through role modeling and educating parents, nurses can make an important impact on sleep position after hospital discharge
- Nurses should promote prone position daily while awake to improve development after discharge

The research articles chosen include physiologic (oxygenation) or neurodevelopmental advantages and disadvantages to the prone or supine positions of premature infants. Statement articles published by the AAP were reviewed as well. Reference lists of each article were reviewed to obtain relevant articles. Additional references were obtained for background on premature infant development.

Three published studies refer to transitioning the premature infant to the supine position. Two studies surveyed NICU nurses' knowledge and practice of SIDS risk reduction strategies in the United States; both surveys show that the practice of transitioning the premature infant supine varies greatly (Aris et al., 2006; Grazel et al., 2010). Aris et al. (2006) surveyed 252 NICU nurses about their perception of appropriate time for supine positioning with a 49% response rate. Respondents reported infants were ready to sleep supine: anytime (29%), close to discharge (13%), when they could maintain an adequate temperature in an open crib (25%), between 34 and 36 weeks postmenstrual age (15%), after 37 weeks postmenstrual age (13%), and when the infant's respiratory status was stable (6%) (Aris et al., 2006). Aris et al. (2006) also report those institutions with a unit policy were four times more likely to promote supine sleep at discharge. Grazel and colleagues (2010) surveyed 430 NICU nurses, with a 40% response rate, and found nurses positioned infants supine: when in an open crib (50%), at 34 weeks postmenstrual age or greater (48%), 1 week prior to discharge (16%), a few days prior to discharge (7.4%), at discharge (7.4%), and never (6%) (Grazel et al., 2010). In both studies, nurses could choose more than one response.

The third survey study was in the UK. Two hundred seventeen neonatal units were surveyed (with a 90% response rate) to assess the effectiveness of a national campaign entitled "Time to get back to sleep" comparing a 2006 survey to a recent survey (Dattani, Bhat, Rafferty, Hannam, & Greenough, 2011). The recommendation in the UK is for infants to sleep supine at least 1 to 2 weeks prior to hospital discharge. The results show that supine sleep rate recommendations of transitioning 1 to 2 weeks prior to hospital discharge across neonatal units in the UK are stable at 80% (78% vs. 83%, not statistically

different). These are the only published studies found addressing the issue of transitioning the premature infant prior to hospital discharge.

## The Benefits of the Supine Position and Risk of Prone Position

The movement to supine sleep position after discharge improved the rate of supine sleep and lowered the rate of SIDS significantly (AAP, 2005). Although the rate of supine positioning improved, it was found that infants were being changed from nonprone to prone at 3 months when the risk of SIDS is highest (Vernacchio et al., 2003). Smaller infants are at the greatest risk for being placed in the prone position and being changed into the prone position. Infants with birthweights of less than 1,500 g were most likely to be placed prone as compared to infants between 1,500 and 2,499 g (Vernacchio et al., 2003). The reasons given by mothers for the nonsupine position were infant preference and advice from medical professionals, family, and friends (Vernacchio et al., 2003).

### The Concerns About Supine Positioning

Research demonstrates that primary care providers' concerns that supine position will increase apnea, bradycardia, and desaturations have been unfounded (Bhat et al., 2006; Keene, Wimmer, & Mathew, 2000). More recently, when sleep state is controlled in premature infants, it has been found that postmenstrual age and residual respiratory disease have more of an impact on oxygen saturations than sleep position (Elder, Campbell, & Galletly, 2011).

There is an increase in desaturations in infants in the supine position, but only in oxygen-dependent infants (Bhat et al., 2003). Some of those infants require more oxygen in the supine position; therefore, it is recommended that oxygen dependent infants be adequately monitored in the supine position prior to discharge (Bhat et al., 2003). Elder, Campbell, and Doherty (2005) also endorse the supine position for patients with and without chronic lung disease who are preparing for discharge. The supine position is endorsed prior to discharge so parents are comfortable caring for infants in this position (Elder et al., 2005).

Kassim et al. (2007) compared oxygen saturations in premature infants ( $n = 41$ ) placed supine and prone after 32 weeks postmenstrual age. No difference in oxygen saturation was found in the two positions (Kassim et al., 2007)). This study provides preliminary evidence for the safety of the supine position for infants placed supine at 32 weeks postmenstrual age.

There is a concern among providers regarding infants with reflux being positioned supine due to the concern of aspiration. The most common reason reported by nursing for positioning infants in a nonsupine position was reflux and aspiration (Aris et al., 2006; Grazel et al., 2010). However, the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition state that the benefits of the



supine position outweigh the risk of a nonsupine position in most cases (Vandenplas et al., 2009).

There is some concern regarding infant neurodevelopment in premature infants in the supine position. The premature infant does not have the flexor muscle tone or strength available to the full-term infant (Nightlinger, 2011). Because flexor muscle tone is not developed in the premature infant, they lie abducted when unsupported. The older the gestational age at birth, the more flexion tone the infant will possess (Waitzman, 2007). Without supportive positioning, and because of reduced flexor tone and strength, the premature infant is prone to skeletal and muscular deformities in the supine position (Jones, 2003; Waitzman, 2007). Plagiocephaly is a deformity that can be improved with positioning (AAP, 2005). Muscular deformities such as torticollis, shoulder retractions, lateral rotation of legs, and everted feet are caused by either lengthening or shortening of muscles as a result of inadequate position changes in the NICU.

Hospital staff are reluctant to place infants supine and continue to endorse nonsupine positions (AAP, 2005). Supine positioning advice is unlikely to be followed if parents witness noncompliance in the hospital (Stastny, Ichinose, Thayer, Olson, & Keens, 2004). Nurses are models for parents; thus, infants should be supine at the earliest stage possible (Jones, 2003). Parents are likely to imitate positioning practices seen during the hospital stay, and efforts should be made to role model practices that are consistent with the AAP guidelines (Stastny et al., 2004).

## Critical Appraisal of the Evidence

For over a decade, the supine sleep position for premature infants has been recommended to reduce the risk of SIDS. Many clinicians are not promoting the supine position for sleeping and are not 100% compliant with promoting supine sleep at the time of hospital discharge (Aris et al., 2006; Grazel et al., 2010). Nurses should promote supine sleeping and actively discourage nonsupine sleeping after discharge. They also should encourage the practice of prone position while the infant is awake to promote normal development in infants.

The recommendation to position premature infants supine at 32 weeks gestation by the AAP is not based on research, and many clinicians will remain reluctant to change practice until further research can be completed on the safety and efficacy of this practice as well as research on the benefits of role modeling this practice. It is also unknown whether a standard gestational age is the best recommendation or if earlier gestations require a different length of transition.

## Synthesis of the Evidence

Based on the review of the literature, it is unclear when is the ideal time to transition to the supine position. Currently, there is no research on an ideal time to transition to the supine position, and therefore no standard of practice exists regarding this transition. The two nursing surveys have consistent results indicating much variability in when nurses feel supine transition is

appropriate and practiced (Aris et al., 2006; Grazel et al., 2010). The survey of neonatal units in the UK demonstrates the importance and relevance of the topic, but not the impact of supine transition on the infant (Dattani et al., 2011). The evidence remains unclear on when to transition the premature infant in the NICU from nonsupine to supine position to prepare for discharge. Some authors recommend the supine position after the acute stage of illness and others recommend 1 week to a few days before discharge. None of these recommendations are based on research.

The benefits of prone positioning while hospitalized in neonatal care are documented in infants fewer than 32 weeks gestation. Prone positioning improves oxygenation, lung compliance, and tidal volume in infants, and also promotes flexion.

The benefits of the supine position after discharge are well documented especially as related to the reduction in SIDS rate, and when sleep state is controlled for, there appears to be no difference in saturations between supine and prone positions. For most infants with gastroesophageal reflux, the benefits of the supine position outweigh the risk of a nonsupine position.

## Recommendations for Future Research and Clinical Implications

The potential for research opportunities on this topic are abundant. There is only survey research to determine what position infants are placed in the NICU, and observational data would be superior. There remains a gap in knowledge on the developmental effects of the prone versus supine positioning in the premature infant. Randomized controlled trials need to be completed on supine transitioning with developmental assessment outcomes for recommendations to be made for clinical practice. This is an important area of investigation because of the potential inherent risk associated with the timing of transition. Research is needed to determine when supine transitioning is occurring and the physiologic effects on growth and development. Randomized trials will help determine the ideal timing of the transition; however, nurses are uniquely positioned to do clinical intervention research on what affects that transition, regardless of when it is done. Role modeling proper supine positioning is one intervention that could be tested, but it is likely multifaceted. The overall goal is reducing the number of infants being changed to nonsupine position after discharge; it is expected that with further reduction in nonsupine positioning after discharge, the SIDS rate will be further reduced.

In addition, nurses need to promote supine positioning exclusively at the time of discharge, and research is needed to improve compliance. Research also is needed on how to educate nurses about the evidence, promote exclusively supine position for sleep after discharge, and improve the opportunity for “tummy time” while awake for developmental outcomes. Additional research is needed on the duration of “tummy time” while awake and whether this intervention also should be initiated while the infant is still hospitalized.

Because there is little research completed on transitioning supine, few recommendations can be offered at this time. The recommendation by the AAP of stable infants being positioned supine at 32 weeks postmenstrual age seems appropriate. Parents should be taught the importance of the exclusively supine position for sleep as well as the prone position daily while awake and being observed to promote normal development. The NICU staff needs to educate parents that infants in the NICU while ill may benefit from nonsupine positions, but after discharge, the infant should sleep supine to reduce the risk of SIDS. By promoting a period of supine transition prior to hospital discharge, nurses can demonstrate to parents their infant is comfortable and safe in the supine position and promote supine exclusively after discharge. Nurses should explore with parents their sleep position intentions and eliminate any unfounded concerns. Nurses should also institute a policy on supine sleep while infants are hospitalized to promote a more consistent practice. A time period of supine transition while hospitalized can assist the infant in becoming accustomed to this position and can also provide the opportunity for nurses to model and reinforce appropriate positioning. ❖

*Sherri L. McMullen is a Neonatal Nurse Practitioner at St. Joseph's Hospital, Syracuse, NY. She can be reached via e-mail at sherri.mcmullen@gmail.com*

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## References

- American Academy of Pediatrics. (1992). Positioning and SIDS. *Pediatrics*, 1120, 1120-1126.
- American Academy of Pediatrics. (1996). Positioning and sudden infant death syndrome (SIDS): Update. *Pediatrics*, 98(6 Pt 1), 1216-1218.
- American Academy of Pediatrics. (2000). Changing concepts of sudden infant death syndrome: Implications for infant sleeping environment and sleep position. *Pediatrics*, 105(3 Pt 1), 650-656.
- American Academy of Pediatrics. (2005). The changing concept of sudden infant death syndrome: Diagnostic coding shifts, controversies regarding the sleeping environment, and new variables to consider in reducing risk. *Pediatrics*, 116(5), 1245-1255. doi: 10.1542/peds.2005-1400
- American Academy of Pediatrics. (2008). Hospital discharge of the high-risk neonate. *Pediatrics*, 122(5), 1119-1126. doi: 10.1542/peds.2008-2174
- Aris, C., Stevens, T. P., LeMura, C., Lipke, B., McMullen, S., Cote-Arsenault, D., & Consenstein, L. (2006). NICU nurses' knowledge and discharge teaching related to infant sleep position and risk of SIDS. *Advances in Neonatal Care*, 6(5), 281-294. doi:10.1016/j.adnc.2006.06.009
- Bhat, R. Y., Hannam, S., Pressler, R., Rafferty, G. F., Peacock, J. L., & Greenough, A. (2006). Effect of prone and supine position on sleep, apneas, and arousal in preterm infants. *Pediatrics*, 118(1), 101-107. doi:10.1542/peds.2005-1873
- Bhat, R. Y., Leipala, J. A., Singh, N. R., Rafferty, G. F., Hannam, S., & Greenough, A. (2003). Effect of posture on oxygenation, lung volume, and respiratory mechanics in premature infants studied before discharge. *Pediatrics*, 112(1 Pt 1), 29-32.
- Blair, P. S., Platt, M. W., Smith, I. J., Fleming, P. J., CESDI SUDI Research Group. (2006). Sudden infant death syndrome and sleeping position in pre-term and low birth weight infants: An opportunity

- for targeted intervention. *Archives of Disease in Childhood*, 91(2), 101-106. doi:10.1136/adc.2004.070391
- Dattani, N., Bhat, R., Rafferty, G. F., Hannam, S., & Greenough, A. (2011). Survey of sleeping position recommendations for prematurely born infants. *European Journal of Pediatrics*, 170(2), 229-232. doi:10.1007/s00431-010-1291-7
- Elder, D. E., Campbell, A. J., & Doherty, D. A. (2005). Prone or supine for infants with chronic lung disease at neonatal discharge? *Journal of Paediatrics & Child Health*, 41(4), 180-185. doi:10.1111/j.1440-1754.2005.00584x
- Elder, D. E., Campbell, A. J., & Galletly, D. (2011). Effect of position on oxygen saturation and requirement in convalescent preterm infants. *Acta Paediatrica*, 100(5), 661-665.
- Grazel, R., Phalen, A. G., & Polomano, R. C. (2010). Implementation of the American Academy of Pediatrics recommendations to reduce sudden infant death syndrome risk in neonatal intensive care units. *Advances in Neonatal Care*, 10(6), 332-342. doi:10.1097/ANC.0b013e3181f36ea0
- Jones, M. W. (2003). The other side of "back to sleep". *Neonatal Network*, 22(4), 49-53.
- Kassim, Z., Donaldson, N., Khatriwal, B., Rao, H., Sylvester, K., Rafferty, G. F., ..., Greenough, A. (2007). Sleeping position, oxygen saturation and lung volume in convalescent, prematurely born infants. *Archives of Disease in Childhood. Fetal & Neonatal Edition*, 92(5), F347-F350. doi:10.1136/adc.2006.094078
- Keene, D. J., Wimmer, J. E., Jr., & Mathew, O. P. (2000). Does supine positioning increase apnea, bradycardia, and desaturation in preterm infants? *Journal of Perinatology*, 20(1), 17-20.
- Krous, H. F., Beckwith, J. B., Byard, R. W., Rognum, T. O., Bajonowski, T., Corey, T., ..., Mitchell, E. A. (2004). Sudden infant death syndrome and unclassified sudden infant deaths: A definitional and diagnostic approach. *Pediatrics*, 114(1), 234-238. doi:10.1542/peds.114.1.234
- Nightlinger, K. (2011). Developmentally supportive care in the neonatal intensive care unit: An occupational therapist's role. *Neonatal Network*, 30(4), 243-248. doi:10.1891/0730-0832.30.4.243
- Poets, C. F., & von Bodman, A. (2007). Placing preterm infants for sleep: First prone, then supine. *Archives of Disease in Childhood. Fetal & Neonatal Edition*, 92(5), 331-332. doi:10.1136/adc.2006.113720
- Saiki, T., Rao, H., Landolfo, F., Smith, A. P., Hannam, S., Rafferty, G. F., & Greenough, A. (2009). Sleeping position, oxygenation, and lung function in prematurely born infants studied post term. *Archives of Disease in Childhood. Fetal & Neonatal Edition*, 94(2), F133-F137. doi:10.1136/adc.2008.141374
- Stastny, P. F., Ichinose, T. Y., Thayer, S. D., Olson, R. J., & Keens, T. G. (2004). Infant sleep positioning by nursery staff and mothers in newborn hospital nurseries. *Nursing Research*, 53(2), 122-129.
- Task Force on Infant Positioning and Sudden Infant Death Syndrome. (2011). SIDS and other sleep-related infant deaths: Expansion of recommendations for a safe infant sleep environment. *Pediatrics*, 128(5), e1341-e1367. doi:10.1542/peds.2011-2284
- Vandenplas, Y., Rudolph, C. D., Di Lorenzo, C., Hassal, E., Liptak, G., Mazur, L., ..., Wenzl, T. G. (2009). Pediatric gastroesophageal reflux clinical practice guidelines: Joint recommendations of the North American Society of Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGAN) and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGAN). *Journal of Pediatric Gastroenterology and Nutrition*, 49(4), 498-547.
- Vernacchio, L., Corwin, M. J., Lesko, S. M., Vezina, R. M., Hunt, C. E., Hoffman, H. J., ..., Mitchell, A. A. (2003). Sleep position of low birth weight infants. *Pediatrics*, 111(3), 633-640. doi:10.1542/peds.111.3.633
- Waitzman, K. A. (2007). The importance of positioning the near-term infant for sleep, play, and development. *Newborn & Infant Nursing Reviews*, 7, 76-81. doi:10.1053/j.nainr.2007.05.004

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