



RISKS AND
BENEFITS OF
Swaddling
HEALTHY INFANTS
An Integrative Review

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Abstract

Background: Swaddling has been practiced since antiquity; however, there is controversy about its safety.

Objectives: The purpose of this review is to update and build upon previous reviews and synthesize evidence on risks and benefits of swaddling in healthy-term, near-term, or older infants.

Data Sources: MEDLINE (1960–May 13, 2016) and CINAHL (1963–May 13, 2016) searches were conducted, relevant articles retrieved, and citation lists reviewed for other references.

Synthesis Methods: A table summarizes study details. Selected older references and supporting literature are integrated into the synthesis to provide context.

Results: Swaddling calms infants and promotes sleep, but it is equally or less effective than other nonpharmacological methods in managing pain. There may be a slight risk for sudden infant death syndrome associated with supine swaddling, although the impact of confounding variables is unclear. Early skin-to-skin contact supports early breastfeeding, but swaddling does not have a negative impact on breastfeeding long term. Swaddling tightly around the hips is strongly associated with developmental dysplasia of the hip. More research is needed on the impact of swaddling on pain in term infants, infant vital signs, arousal thresholds, and a possible association between swaddling, vitamin D deficiency, and acute lower respiratory tract infection.

Limitations: The number of studies was small, with few randomized control trials, and researchers used different definitions of swaddling.

Conclusions: If a few precautions are taken, such as swaddling securely to minimize risk of unwrapping, avoiding overheating, placing infants to sleep supine, and discontinuing swaddling when infants first show signs of rolling over, swaddling presents minimal risk.

Clinical Implications: Maternity and neonatal nurses should model swaddling practices based on the evidence and promote informed decision-making among infant caregivers.

Key Words: Evidence-based practice; Infant; Review Literature; Risks and benefits.

It is widely acknowledged that swaddling of infants has been practiced since antiquity (Frenken, 2011, 2012; Lipton, Steinschneider, & Richmond, 1965; Moss & Solomons, 1979). Use of tight, traditional swaddling practices, which tended to immobilize infants in a mummy-like configuration, decreased dramatically in the Western world in the 18th century after being widely condemned by the medical establishment (Deweese, 1847). Traditional practices, however, have continued among some indigenous people (Chisholm, 1978; Wilson, 2000) and in other areas of the world including: Russia (Bystrova et al., 2007a, 2007b), Czechoslovakia (Beal & Porter, 1991), Turkey (Alparslan & Demirel, 2013; Yilmaz et al., 2012), Arabia (Abdulrazzaq, Kendi, & Nagelkerke, 2008), Japan (Yamamuro & Ishida, 1984), India (Iyengar, Iyengar, Martines, Dashora, & Deora 2008), and Asia (Li et al., 2000).

Over time the method used and popularity of swaddling have varied dependent on culture, although recently a renewed interest in swaddling has emerged worldwide. Swaddling has even been incorporated into a popular program designed to calm infants and promote longer sleep (Karp, 2015). However, debate continues among contemporary professionals as to whether or not swaddling is safe and should be recommended (Goodstein, Hauck, Darnall, Feldman-Winter, & Moon, 2016; Kennedy, 2013).

Search Strategy

The objectives of this literature review were to update and build upon previous reviews (Frenken, 2011, 2012; Lipton et al., 1965; Moss & Solomons, 1979; van Sleuwen et al., 2007), and summarize evidence on risks and benefits of swaddling for practicing maternity and newborn nurses. MEDLINE (1960–May 13, 2016) and CINAHL (1963–May 13, 2016) database searches were conducted using the key word swaddle. International and multidisciplinary human subject research (any level of design), retrospective analysis of human studies, or meta-analyses related to risks and benefits of swaddling in healthy full-term, near-term, or older infants were then identified, retrieved, and screened (Figure 1). No quality ratings were used to screen the resources retrieved. Citations describing incidence or type of swaddling in a region without making a comparison to nonswaddled infants, or reference to an outcome, were excluded. Citation lists were also reviewed to identify other potentially valuable material.

To synthesize the research, notes were taken on all full-text articles retrieved, and a summary table created with study details of all sources that met the inclusion criteria. Selected older seminal references and supporting literature were integrated into the evidential summary to provide needed context. Details of the studies included in this review may be found in Supplemental Digital Content 1, <http://links.lww.com/MCN/A38>.

Risks and Benefits of Swaddling

Psychological and Developmental Impact

Psychologist Frenken (2011) famously opined that the impact of swaddling on the “development of the self” can “only be negative” (p. 101). Although noting that there is sparse research evidence related to the psychological and developmental impact of swaddling, his expert opinion originates from the supposed passivity, sensory deprivation, and suppression of mother and infant communication that he believes swaddling promotes. Pediatrician Harvey Karp (2015) strongly disagrees with Frenken (2011). He suggests that swaddling is the “cornerstone of calming” and suggests that parents swaddle their infants during fussy periods and at times of sleep up to 4 to 5 months old (Karp, 2015, p. 100).

Based on recent research evidence, swaddling is equally effective in decreasing excessive crying after 1 week as is introduction of regularity, stimulus reduction, and uniformity into an infant’s daily care. Swaddling appears to offer a more immediate effect and larger decrease in crying among younger infants (Blom, van Sleuwen, de Vries, Engelberts, & L’Hoir, 2009; van Sleuwen et al., 2006). Early swaddling has also been found to decrease a mother’s responsiveness to her infant, positive affective involvement, and dyad mutuality and reciprocity at 1 year (Bystrova et al.,

2009). These effects may be because swaddling can somewhat limit interaction between mother and infant.

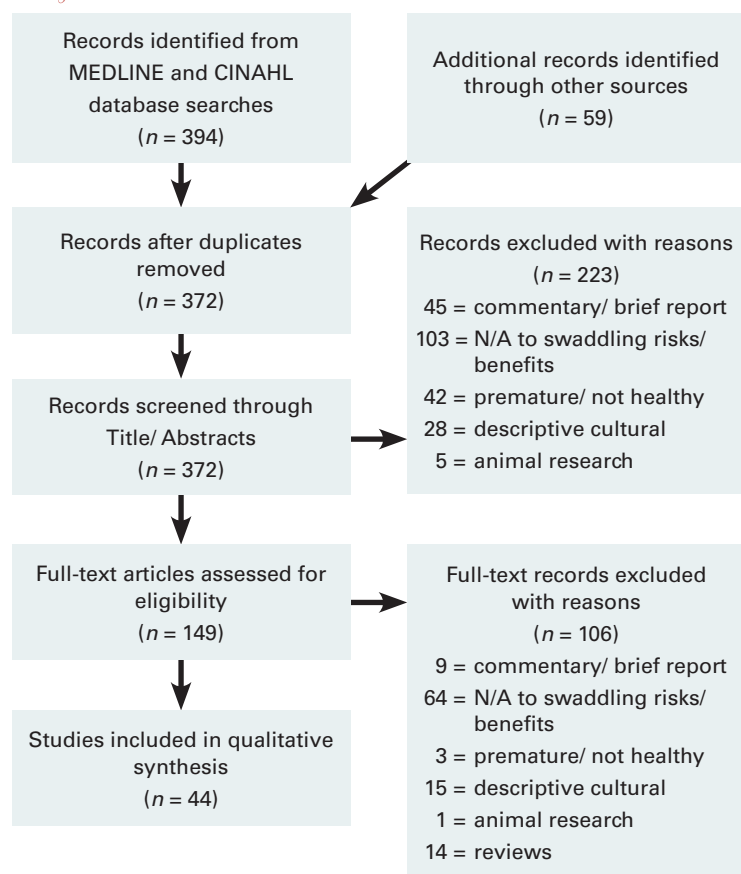
There is little research on the long-term physical and developmental impact of swaddling on infants. In an often cited observational study, Dennis and Dennis (1991) found that Hopi Indian children swaddled and restrained on a cradle board were no slower to walk than infants whose mothers did not use a cradle board. More recently, Manaseki-Holland et al. (2010) found no significant differences in mental and psychomotor development at 11 to 17 months of age between infants swaddled for 7 months and those who had not been swaddled. To date, the sparse evidence does not suggest that swaddling has a negative impact on infant psychological or physical development.

Pain Management

Researchers have investigated the efficacy of swaddling to comfort infants in pain. Pillai Riddell et al. (2011) in a meta-analysis concluded that there is enough evidence to recommend swaddling and facilitated tucking to mediate pain reactivity in preterm but not in full-term infants. However, swaddling has been found to have some effect on full-term infants in pain. For example, Morrow, Hiding, and Wilkinson-Faulk (2010) found that pain scores for infants receiving a heel lance were significantly lower in infants swaddled and held in an upright position than infants in the standard care position. However, Wisdorf-Houtkooper (1997) found no difference in behavioral state, crying duration, or facial expression during or after immunization when comparing pacifier, rocking, swaddling, or control groups.

*Swaddling
soothes infants
and promotes
sleep.*

Figure 1. FLOW DIAGRAM OF ARTICLE SELECTION



Breastfeeding and kangaroo mother care have also been found to be more effective in decreasing immediate procedural pain than swaddling (Fallah, Naserzadeh, Ferdosian, & Binesh, 2016; Hashemi, Taheri, Ghodsbin, Pishva, & Vossoughi, 2016). In addition, heart rate and crying have been found to decrease more among newborns given a pacifier along with oral glucose following a heelstick than in those given oral glucose and swaddled (Leng et al., 2016). Finally, pain has been found to decrease following a heelstick more rapidly among infants given a pacifier than in those swaddled (Campos, 1989). Evidence to date suggests although swaddling can have a calming effect on full-term infants in pain, it may not be superior to other nonpharmacological measures.

Sudden Infant Death Syndrome (SIDS)

Evidence on swaddling and associated SIDS risk is equivocal. Avoidance of the prone or side infant sleeping positions and placing infants supine to sleep is now a widely accepted recommendation to reduce risk of SIDS (American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome, 2011, 2016). However, some parents report not placing their infants to sleep supine because of the perception that their infants are more comfortable prone (Colson et al., 2006, 2005). Parents who swaddle their infants have been found to be more likely to place

their infants in the supine rather than prone position for sleep (Oden et al., 2012). Even older infants unaccustomed to swaddling accept supine sleeping when swaddled. Perhaps because swaddling is calming, it may help infants accept the supine sleep position (Gerard, Harris, & Thach, 2002). Swaddling may thus indirectly decrease SIDS risk by promoting supine sleeping. Finally, the soothing and warming effect of swaddling has raised concern among some experts who fear that swaddling may increase SIDS risk because decreased arousal and overheating are theorized to be implicated in SIDS etiology (Kleemann, Schlaud, Poets, Rothämel, & Tröger, 1996; Richardson, Walker, & Horne, 2009). Evidence related to these hypotheses is presented in the following sections.

Infant Arousability, Sleep, and Vital Signs

Swaddled infants experience reduced spontaneous awakening and arousability, greater quiet sleep, decreased time awake, and increased sleep efficiency (Franco et al., 2005; Meyer & Erler, 2011; Richardson et al., 2009, 2010). Franco et al. (2005) however found that swaddled infants required less intense auditory stimuli to induce cortical arousal, whereas Richardson et al. (2009, 2010) found increased arousal thresholds, decreased spontaneous arousability, and heart rate variability in 3-month-old infants naïve to swaddling but not in routinely swaddled infants.

Franco, Scaillet, Groswasser, and Kahn (2004) found that swaddling decreased heart rate, but only in the supine position. Gerard et al. (2002) found that only a tight, traditional swaddle as compared with a looser swaddle caused heart rates to lower. Tight swaddling caused infant respiratory rates to increase during quiet sleep, although PaO₂ level were unchanged. Richardson et al. (2009, 2010) found that respiratory rate increased with swaddling although they report no change in baseline heart rate, temperature, or oxygen saturation (Gerard et al., 2002). In contrast, Narangerel, Pollock, Manaseki-Holland, and Henderson (2007) found although the respiratory rate of habitually swaddled infants was lower than in those habitually nonswaddled, swaddling had no significant clinical effect on SaO₂ in healthy 9- to 10-week old infants. Research about the impact of swaddling on arousability and vital signs is unclear, and further research is needed.

Thermoregulation

Bystrova et al. (2003) found prolonged skin-to-skin contact between mother and infant beginning soon after birth was more effective than swaddling in supporting transitional newborn thermoregulation. Risk of overheating related to swaddling however, is the concern related to SIDS risk. Bundling infants in two blankets and a hat has been found to significantly increase skin but not rectal temperature when compared with unwrapped

infants (Grover et al., 1994). A rise in body temperature into the febrile range however, has been documented in newborn infants extremely overwrapped in five blankets and a hat (Cheng & Partridge, 1993), suggesting it is possible to overheat an infant through excessive swaddling. Fleming et al. (1990) found that overheating with heavy wrapping in clothes and bedding of >10 tog (thermal value) were independently associated with an increased risk of SIDS (RR 1.14 per tog above 8 tog), especially in infants aged 70 days or greater, and those sleeping prone. Also, Ponsonby, Dwyer, Gibbons, Cochrane, and Wang (1993) found that swaddled infants sleeping prone had a 12-fold increased SIDS risk. This may be because infants sleeping prone experience less heat loss than nonprone sleeping infants (Tuffnell, Petersen, & Wailoo, 1995).

Ill infants are at particular risk for hyperthermia. Those over 70 days old with a viral infection and clothing/bedding with a tog value of greater than 10 togs have been reported to have an increased risk of death (odds ratio of 51.1) (Gilbert et al., 1992), perhaps because infants older than 3 months are more likely to experience an increase in metabolic rate and become febrile at night than younger infants (Fleming, Howell, Clements, & Lucas, 1994).

Inadvertent head covering is also a concern associated with swaddling and an important consideration in relation to hyperthermia and SIDS risk. In a meta-analysis of 10 population-based, age-matched, controlled studies reporting on head covering among SIDS victims, Blair, Mitchell, Heckstall-Smith, and Fleming (2008) found the population-attributable risk was 27.1%, indicating that head covering is a SIDS-related risk for infants. They theorized that an infant's head is a major source of heat production and loss, and may contribute to hyperthermia, especially in the prone position (Fleming, Azaz, & Wigfield, 1992; Fleming, Levine, Azaz, Wigfield, & Stewart, 1993).

Results of a meta-analysis of four case-control studies judged to be of good quality based on the Newcastle-Ottawa Scale (Wells et al., 2014) found an increased risk of SIDS with increasing age, and greatest risk among swaddled infants 6 months or older (Pease et al., 2016). They also found that the prone or side-lying position greatly increased SIDS risk among swaddled infants. Being swaddled and placed to bed supine, however, was still found to be associated with "a small but significant risk" when compared with controls (Pease et al., p. 6). The authors acknowledged many

limitations to their analysis including variability in prevalence of swaddling between studies, a lack of a precise definition of swaddling, and inability to adjust for significant factors associated with SIDS risk such as bed-sharing. Thus, it cannot be definitively concluded that swaddling independently increases SIDS risk, although the evidence is clear that swaddled infants should always be placed to sleep supine and hyperthermia should be avoided.

Breastfeeding

Swaddling newborns is often discouraged by breastfeeding experts due to concerns that it may interfere with early maternal-infant interactions, feeding cues, breastfeeding opportunities, and milk production (Mohrbacher, 2010). Newborns placed skin-to-skin during the first 2 hours after birth rather than being swaddled have been found to have higher mean sucking competence during the first breastfeeding and to breastfeed sooner (Moore & Anderson, 2007). Also, early bathing followed by swaddling has been found to decrease the demonstration of infant feeding cues (Jansson, Mustafa, Khan, Lindblad, & Widström, 1995). Finally, traditional swaddling at birth has been correlated with decreased infant "wakefulness" during a breastfeeding 4 days after birth and a rougher maternal affective response (Dumas et al., 2013, p. 322).

Despite the short-term impact of skin-to-skin contact on breastfeeding neither swaddling nor skin-to-skin contact have been found to independently predict differences in breastfeeding outcomes, problems, recovery of infant weight loss postbirth, milk production, or duration of nearly exclusive breastfeeding for the first 12 months (Bystrova et al., 2007a, 2007b; Moore & Anderson, 2007). A full-term breastfeeding initiation rate of 91.2% within 1 hour of birth, and average breastfeeding duration of 19 months, has been reported among refugee women in Thailand. In this culture moderately snug swaddling, breastfeeding, and rooming-in are widely practiced and supported (White et al., 2012), suggesting swaddling does not necessarily have a negative impact on breastfeeding within a strongly supportive environmental context.



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Evidence on the impact of swaddling on infant arousal thresholds and vital signs is unclear.

Developmental Dysplasia of the Hip

The correlation between swaddling and an increased risk of developmental dysplasia of the hip (DDH) is clear (Loder & Skopelja, 2011). This association is strongly supported by findings that DDH is high among

swaddled infants in cultures where they use various forms of swaddling that are tight around the hips such as in Turkey (Akman et al., 2007; Dogruel, Atalar, Yavuz, & Sayli, 2008; Guner et al., 2013; Kutlu, Memik, Mutlu, Kutlu, & Arslan, 1992), Saudi Arabia (Abd El-Kader Shaheen, 1989; Kremli, Alshahid, Khoshhal, & Zamzam, 2003), and Japan (Ishida, 1977). The independent association between DDH and swaddling is supported by the dramatic effectiveness of campaigns to change these traditional infant care practices in decreasing hip abnormalities (Chaarani, Mahmeid, & Salmon, 2002; Ishida, 1977). See Supplementary Digital Content 1, <http://links.lww.com/MCN/A3> for study details.

The prevailing view for decades has been that tight swaddling likely does not “cause” DDH rather that it might worsen the condition in those infants who are genetically predisposed (Salter, 1968). This view is supported by the almost nonexistent incidence of DDH in populations such as the African country of Malawi, where infants are not swaddled, but rather “back carried” from 2 to 6 weeks until 18 to 24 months of age (Graham, Manara, Chokotho, & Harrison, 2015). The back-carrying practice promotes infant hip flexion and abduction, rather than the hip adduction caused by tight swaddling.

In a study using sonographic technology using a group of infants being treated for DDH, Harcke, Karatas, Cummings, and Bowen (2016) objectively demonstrated that tight swaddling limited hip flexion/abduction and even dislocated one unstable hip. When safe hip-healthy swaddling (loose around the hips) was used, there was no limitation of hip flexion and abduction, and no change in hip stability. This suggests, not all swaddling techniques place infants at an increased risk of DDH.

Respiratory Infection, Vitamin D Deficiency, and Rickets

Other potential swaddling risks currently under investigation are an increased risk of acute respiratory infection (ARI) and vitamin D deficiency (rickets). In one large descriptive study in Turkey where tight swaddling is still common, Yurdakok, Yavuz, and Taylor (1990) found babies swaddled for a minimum of 3 months were four times more likely to develop pneumonia and ARI than babies who were not swaddled, perhaps because tight swaddling promotes shallow breathing and restricts lung expansion.

An alternative explanation for an association between tight swaddling and ARI is that ARI in swaddled infants may be related to decreased sun exposure and associated subclinical vitamin D level (rickets). Acute lower respiratory infection (ALRI) has been found to be associated with rickets in Indian children in the first 4 months of life, especially among infants swaddled when exposed to sunlight (Wayse, Yousafzai, Mogale, & Filteau, 2004). Mean vitamin D concentrations have also been shown to be lower in a group of infants admitted to a neonatal unit for ALRI than in control infants (Karatekin, Kaya, Salihoğlu, Balci, & Nuhoglu, 2009).

Most studies demonstrate that vitamin D has a protective effect against respiratory tract infections in adults and school age children (Bergman, Lindh, Björkhem-Bergman, & Lindh, 2013; Gröber, Spitz, Reichrath, Kisters, & Holick, 2013; Laaksi, 2012). Rickets have been found to be strongly associated with pneumonia in studies conducted in the developing world (Lubani et al., 1989; Muhe, Lulseged, Mason, & Simoes, 1997). However, Urnaa et al. (2006) found no association between duration of swaddling and rickets or bone properties of school age children. Current evidence does not suggest a direct link between swaddling and ARI and development of rickets; however, more research is needed on a possible association between swaddling, vitamin D deficiency, and ALRI.



Providing skin-to-skin care postbirth rather than swaddling promotes early breastfeeding, but swaddling has no long-term negative impact on breastfeeding.

Swaddling Safety and Professional Safe Infant Sleep Recommendations

In 2011, the American Academy of Pediatrics (AAP) published recommendations for a *Safe Infant Sleeping Environment* (AAP Task

Force on SIDS, 2011), which were recently updated (AAP Task Force on SIDS, 2016). In the latest report “Level A” recommendations (U.S. Preventive Services Task Force, 2014), based on consistent results from well-done studies, include: back to sleep for every sleep (supine sleep positioning), use of a firm sleep surface, breastfeeding, room-sharing without bed-sharing, keeping soft objects and loose bedding out of the crib, and avoiding overheating (AAP Task Force on SIDS, 2016, p. 2). Within these guidelines AAP addresses swaddling and safe infant sleep.

The AAP Task Force on SIDS (2016) position on swaddling is that “there is no evidence to recommend swaddling as a strategy to reduce the risk of SIDS” (p. 7).

Table 1. SUMMARY OF EVIDENCE FOR SWADDLING RISKS AND BENEFITS

Risk or Benefit	Level of Evidence
Developmental impact	<ul style="list-style-type: none"> • One randomized control trial (RCT) found swaddling equally effective as uniformity of care in managing crying (Blom et al., 2009; van Sleuwen et al., 2006) • One RCT found a negative effect of swaddling on the early mother–infant relationship at 1 year when compared with early skin-to-skin contact (Bystrova et al., 2009) • One observational study found no difference between swaddled and nonswaddled infants related to walking (Dennis & Dennis, 1991), and one RCT found no impact on mental/psychomotor development (Manaseki-Holland et al., 2010) • Some experts have expressed concern swaddling may negatively impact development of a self-concept, whereas others praise the calming/soothing effect of swaddling (Frenken, 2011; Karp, 2015)
Pain management	<ul style="list-style-type: none"> • A finding from meta-analysis of RCTs concluded that there is enough evidence to recommend the use of swaddling for pain management in preterm infants, but not full-term infants (Pillai Riddell et al., 2011) • RCTs suggest swaddling is somewhat useful in pain management for full-term infants, equally effective or less effective than other nonpharmacological measures (Campos, 1989; Fallah et al., 2016; Hashemi et al., 2016; Leng et al., 2016; Morrow et al., 2010; Wisdorf-Houtkooper, 1997)
Sudden infant death syndrome	<ul style="list-style-type: none"> • A meta-analysis of four case-control studies found a significant increase in SIDS risk associated with age, and the prone or side-lying sleep position. A slight increase was associated with swaddling and supine sleeping, although all confounding variables were not accounted for (Pease et al., 2016) • A nonexperimental and a quasi-experimental study suggest swaddling may support supine sleeping (Gerard et al., 2002; Oden et al., 2012) <p>Infant Arousability/Vital Signs/Sleep</p> <ul style="list-style-type: none"> • RCT and quasi-experimental studies report swaddling improves sleep efficiency although impact on arousability and vital signs remains unclear, and changes in PaO₂ levels have not been reported (Franco et al., 2004, 2005; Meyer & Eler, 2011; Narangerel et al., 2007; Richardson et al., 2009, 2010) • Some experts question whether decreased arousability among swaddled infants may increase SIDS risk (Richardson et al., 2009) <p>Thermoregulation</p> <ul style="list-style-type: none"> • One RCT supports early use of skin-to-skin versus swaddling for infant thermoregulation (Bystrova et al., 2003) • One randomized, prospective study found that swaddling increased skin temperature but not rectal temperature (Grover et al., 1994) • A quasi-experimental study suggests that extreme overwrapping can cause abnormal increases in temperature (Cheng & Partridge, 1993) • Case-control, prospective cohort, and descriptive studies suggest that older infants placed prone, overwrapped, and/or experiencing a fever are at increased risk of SIDS (Fleming et al., 1990; Gilbert et al., 1992; Ponsonby et al., 1993) • A meta-analysis of population-based controlled studies concluded that head covering constitutes a significant SIDS risk (Blair et al., 2008) • Some experts question whether swaddling-associated hyperthermia may increase SIDS risk (Kleemann et al., 1996)
Breastfeeding	<ul style="list-style-type: none"> • RCTs and descriptive studies report swaddling negatively impacts short-term breastfeeding outcomes (Dumas et al., 2013; Moore & Anderson, 2007), though it has no independent, long-term negative impact (Bystrova et al., 2007a, 2007b; Jansson et al., 1995; Moore & Anderson; White et al., 2012) • Experts suggest swaddling may interfere with maternal–infant interactions, feeding cues, breastfeeding opportunities, and milk production (Mohrbacher, 2010)
Developmental hip dysplasia	<ul style="list-style-type: none"> • Quasi-experimental and descriptive studies have consistently reported that tight swaddling is strongly associated with DDH (Abd El-Kader Shaheen, 1989; Akman et al., 2007; Dogruel et al., 2008; Guner et al., 2013; Kremlı et al., 2003; Kutlu et al., 1992) • Two large quasi-experimental studies demonstrated a steady decrease in hip abnormalities with an educational intervention (Chaarani et al., 2002; Ishida, 1977) • One quasi-experimental pilot study found tight swaddling limited hip flexion/abduction and that “hip-healthy” swaddling did not (Harcke et al., 2016)
Respiratory infection/Rickets	<ul style="list-style-type: none"> • One large descriptive study found pneumonia/upper respiratory infection more likely in tightly swaddled infants (Yurdakok et al., 1990) • Evidence from case-control studies does not support a direct causal link between swaddling and rickets (Urnaa et al., 2006) although subclinical vitamin D deficiency has been found to be a significant risk factor for ALRI (Wayse et al., 2004)

SUGGESTED CLINICAL IMPLICATIONS

- Swaddling may be used as a means to calm and soothe infants and promote sleep
- Hyperthermia should be avoided through securely swaddling with a single blanket of low tog value, using swaddling with caution in infants with a fever, and always placing swaddled infants to sleep in the supine position
- Swaddling may be used between periods of skin-to-skin care when an infant is placed for safety on their own sleep surface to help maintain infant thermoregulation and comfort
- Swaddling should always be “hip healthy” and allow for hip abduction
- Swaddled infants who are breastfeeding may need to be awakened at appropriate intervals if not spontaneously awaking until an adequate feeding pattern is established
- The American Academy of Pediatrics safe infant sleep recommendations should be followed for all infants
- Swaddling should be discontinued when infants first show signs of rolling over

They further recommend if swaddling is used, the infant should always be placed supine to sleep, swaddling should be snug around the chest but allow room for movement around the hips and knees [related to the risk of hip dysplasia], and swaddling should be discontinued when infants first show signs of rolling over (AAP Task Force on SIDS, 2016, p. 7).

The AAP Task Force on SIDS (2016) recommendation on when to discontinue swaddling is related to the recent publication by McDonnell and Moon (2014) who retrospectively reviewed cases of 10 infant deaths related to wearable blankets or swaddle wraps, and 12 deaths related to swaddling in blankets reported to the Consumer Product Safety Commission between 2004 and 2014. One of these deaths was attributed to hyperthermia, one was placed prone to sleep, and six rolled into the prone position while swaddled. These findings highlight risks associated with placing swaddled infants prone and swaddling older infants. It should be noted among deaths associated with swaddling only one was not related to environmental risks such as blankets, pillows, and bumper pads, supporting importance of always adhering to *Safe Infant Sleeping Environment* guidelines (AAP Task Force on SIDS, 2016).

Risk of DDH associated with swaddling has been addressed through a joint statement from AAP, Pediatric Orthopaedic Society of North America (POSNA), International Hip Dysplasia Institute (IHDI), and American Academy of Orthopaedic Surgeons that recommends “hip-healthy swaddling” if parents chose to swaddle their infants (POSNA, 2015). This type of swaddling allows the infant’s legs “to bend up and out at the hips” and not “tightly wrapped straight down and pressed together” (IHDI, *Are You Swaddling Your Baby Properly?*, para. 3–4). The IHDI recommends sleep sacks only if they have a “loose pouch or sack” for the infant’s legs and feet, which allow hip movement (IHDI, *What about sleepsacks and commercial products*, para. 1).

The AAP has also published a report related to safe sleep and skin-to-skin for healthy-term newborns in hospitals and birthing centers (Feldman-Winter, Goldsmith, Committee on Fetus and Newborn, & Task Force on SIDS, 2016). Recommendations are offered for improving safety while rooming-in and decreasing risk infant falls and sudden unexpected postnatal collapse, mostly related to suffocation or entrapment. These recommendations include: nurse-to-mother–baby couplet ratios that permit routine monitoring based on level of risk, education related to the risks of bed-sharing, and available assistance to transition newborns to a safe sleep location as needed when the mother is not awake and alert (Feldman-Winter et al.). During the newborn period in the hospital, swaddling an infant and placing them in their own bed may be appropriate.

Specific guidelines are also available related to swaddling outside of the home environment. The AAP along with the National Resource Center for Health and Safety in Child Care and Education, and the American Public Health Association, published the third edition of their safety guidelines for child-care settings (2011). These guidelines state that, “In childcare settings swaddling is not necessary or recommended” (para. 1), and “If swaddling is used, it should be used less and less over the course of the first few weeks and months of an infant’s life” (para. 3). The panel expressed concern that older children in child care with multiple caregivers, learning to roll over, are more difficult to swaddle safely (AAP, 2013). This clarification suggests that all swaddling guidelines need to be considered within the appropriate context.

Discussion and Implications for Practice

There are a number of important limitations to any integrative review on infant swaddling. There are few studies and no large randomized control trials; thus, the level of evidence related to risks and benefits is generally not strong (Table 1). The exception is evidence related to DDH, although primarily descriptive, has consistently suggested a strong association between DDH and swaddling that is tight around the hips.

Another limitation of this body of work is that researchers use vastly different definitions of “swaddling;” therefore, any summary of evidence must be viewed with caution. Some of the most serious potential risks of swaddling such as an increased rate of ARI and DDH seem to only be associated with tight swaddling. However, the degree of tightness that puts infants at risk is uncertain. Overall, it is logical that quality of caregiving provided, individual characteristics of the infant, degree of swaddling tightness, number of hours a day an infant is swaddled, and length of time swaddling is continued, all influence the relative risk-benefit ratio of swaddling.

Despite limitations of the swaddling literature, there are important clinical practice implications from this review. These are summarized in Suggested Clinical Implications. Maternity and neonatal nurses in the clinical setting should strive to model swaddling best practices, derived from current evidence, and provide evidence-based education for caregivers. A variety of sources are available in print and online that offer instructions for safe, secure infant

swaddling. One is the Down-Up-Down-Up “DUDU” wrap technique described by (Karp, 2004, 2015, pp. 114–117). A video demonstrating three “hip healthy” ways to swaddle is available on the IHDI Web site: <http://hipdysplasia.org/developmental-dysplasia-of-the-hip/hip-healthy-swaddling/>. All healthcare professionals and family members should understand the importance of adhering to the AAP guidelines for safe infant sleep (AAP Task Force on SIDS, 2016; Feldman-Winter et al., 2016).

Finally, the evidence does not suggest that swaddling has an independent, long-term negative impact on breastfeeding, and judicious use of swaddling does not preclude skin-to-skin time between mother and infant. Whether or not an infant is swaddled, attention should be paid to the number of times an infant is feeding per day, infant output, and weight gain (Wambach & Riordan, 2016). This may mean that swaddled infants, who do not regularly wake on their own to feed, may need to be awakened at appropriate intervals until an adequate growth pattern has been established. Evidence that mothers of colicky infants report breastfeeding for a shorter duration than those of noncolicky infants may indirectly suggest if swaddling can calm a colicky infant it may prolong breastfeeding in some infants (Howard, Lanphear, Lanphear, Eberly, & Lawrence, 2006).

More research is needed on the impact of swaddling on infant arousal and vital signs, effectiveness of swaddling to mediate pain responses in healthy-term newborns, and a possible association between swaddling, vitamin D deficiency and ALRI. This review is an evidence-based summary of the risks, benefits, and recommendations related to swaddling as available in current literature. Through modeling swaddling best practices and providing evidence-based teaching, nurses are in a position to foster informed decision-making among caregivers and promote health and well-being of child-bearing families. ❖

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References

- Abd El-Kader Shaheen, M. (1989). Mehad: The Saudi tradition of infant wrapping as a possible aetiological factor in congenital dislocation of the hip. *Journal of the Royal College of Surgeons of Edinburgh*, 34(2), 85-87.
- Abdulrazzaq, Y. M., Kendi, A. A., & Nagelkerke, N. (2008). Child care practice in the United Arab Emirates: The ESACCIPS study. *Acta Paediatrica*, 97(5), 590-595. doi:10.1111/j.1651-2227.2008.00758.x
- Akman, A., Korkmaz, A., Aksoy, M. C., Yazici, M., Yurdakök, M., & Tekinalp, G. (2007). Evaluation of risk factors in developmental dysplasia of the hip: Results of infantile hip ultrasonography. *The Turkish Journal of Pediatrics*, 49(3), 290-294.

- Alparslan, Ö., & Demirel, Y. (2013). Traditional neonatal care practices in Turkey. *Japan Journal of Nursing Science*, 10(1), 47-54. doi:10.1111/j.1742-7924.2012.00209.x
- American Academy of Pediatrics. (2013). *Swaddling: Is it safe?* Retrieved from <https://healthychildren.org>
- American Academy of Pediatrics, American Public Health Association, & National Resource Center for Health and Safety in Child and Early Education. (2011). Chapter 3: Health promotion and protection Standard 3.1.4.2: Swaddling. In *Caring for our children: National health and safety performance standards; Guidelines for early care and education programs* (3rd ed.). Retrieved from <http://cfoc.nrckids.org/StandardView/3.1.4.2>
- American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome. (2011). SIDS and other sleep-related infant deaths: Expansion of recommendations for a safe infant sleeping environment. *Pediatrics*, 128(5), 1030-1039. doi:10.1542/peds.2011-2284
- American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome. (2016). SIDS and other sleep-related infant deaths: Updated 2016 recommendations for a safe infant sleeping environment. *Pediatrics*, 138(5), 1-12. doi:10.1542/peds.2016-2938
- Beal, S., & Porter, C. (1991). Sudden infant death syndrome related to climate. *Acta Paediatrica Scandinavica*, 80(3), 278-287.
- Bergman, F., Lindh, A. U., Björkhem-Bergman, L., & Lindh, J. D. (2013). Vitamin D and respiratory tract infections: A systematic review and meta-analysis of randomized controlled trials. *PLoS one*, 8(6), e65835, 1-6. doi:10.1371/journal.pone.0065835
- Blair, P. S., Mitchell, E. A., Heckstall-Smith, E. M., & Fleming, P. J. (2008). Head covering—A major modifiable risk factor for sudden infant death syndrome: A systematic review. *Archives of Diseases in Childhood*, 93(9), 778-783. doi:10.1136/adc.2007.136366
- Blom, M. A., van Sleuwen, B. E., de Vries, H., Engelberts, A. C., & L'Hoir, M. P. (2009). Health Care interventions for excessive crying in infants: Regularity with and without swaddling. *Journal of Child Health Care*, 13(2), 161-176. doi:10.1177/1367493509102476
- Bystrova, K., Ivanova, V., Edhborg, M., Matthiesen, A. S., Ransjö-Arvidson, A. B., Mukhamedrakhimov, R., ..., Widström, A. M. (2009). Early contact versus separation: Effects on mother-infant interaction one year later. *Birth*, 36(2), 97-109. doi:10.1111/j.1523-536X.2009.00307.x
- Bystrova, K., Matthiesen, A. S., Widström, A. M., Ransjö-Arvidson, A. B., Welles-Nyström, B., Vorontsov, I., & Uvnäs-Moberg, K. (2007a). The effect of Russian Maternity Home routines on breastfeeding and neonatal weight loss with special reference to swaddling. *Early Human Development*, 83(1), 29-39. doi:10.1016/j.earlhumdev.2006.03.016
- Bystrova, K., Widström, A. M., Matthiesen, A. S., Ransjö-Arvidson, A. B., Welles-Nyström, B., Vorontsov, I., & Uvnäs-Moberg, K. (2007b). Early lactation performance in primiparous and multiparous women in relation to different maternity home practices. A randomised trial in St. Petersburg. *International Breastfeeding Journal*, 2, 9-22. doi:10.1186/1746-4358-2-9
- Bystrova, K., Widström, A. M., Matthiesen, A. S., Ransjö-Arvidson, A. B., Welles-Nyström, B., Wassberg, C., ..., Uvnäs-Moberg, K. (2003). Skin-to-skin contact may reduce negative consequences of “the stress of being born”: A study on temperature in newborn infants, subjected to different ward routines in St. Petersburg. *Acta Paediatrica*, 92(3), 320-326.
- Campos, R. G. (1989). Soothing pain-elicited distress in infants with swaddling and pacifiers. *Child Development*, 60(4), 781-792.
- Charani, M. W., Al Mahmeid, M. S., & Salman, A. M. (2002). Developmental dysplasia of the hip before and after increasing community awareness of the harmful effects of swaddling. *Qatar Medical Journal*, 11(1), 40-43.
- Cheng, T. L., & Partridge, J. C. (1993). Effect of bundling and high environmental temperature on neonatal body temperature. *Pediatrics*, 92(2), 238-240.
- Chisholm, J. S. (1978). Swaddling, cradleboards and the development of children. *Early Human Development*, 2(3), 255-275.
- Colson, E. R., Levenson, S., Rybin, D., Calianos, C., Margolis, A., Colton, T., ..., Corwin, M. J. (2006). Barriers to following the supine sleep recommendation among mothers at four centers for the women, infants, and children program. *Pediatrics*, 118(2), e243-e250.
- Colson, E. R., McCabe, L. K., Fox, K., Levenson, S., Colton, T., Lister, G., & Corwin, M. J. (2005). Barriers to following the back-to-sleep recommendations: Insights from focus groups with inner-city caregivers. *Ambulatory Pediatrics*, 5(6), 349-354.
- Dennis, W., & Dennis, M. G. (1991). The effect of cradling practices upon the onset of walking in Hopi children. 1940. *The Journal of Genetic Psychology*, 152(4), 563-572.
- Deweese, W. (1847). *A treatise in the physical and medical treatment of children* (9th ed.). Philadelphia, PA: Lea & Blanchard. Retrieved from <http://catalog.hathitrust.org/Record/008887700>
- Dogruel, H., Atalar, H., Yavuz, O. Y., & Sayli, U. (2008). Clinical examination versus ultrasonography in detecting developmental dysplasia of the hip. *International Orthopaedics*, 32(3), 415-419. doi:10.1007/s00264-007-0333-X

- Dumas, L., Lepage, M., Bystrova, K., Matthiesen, A. S., Welles-Nyström, B., & Widström, A. M. (2013). Influence of skin-to-skin contact and rooming-in on early mother-infant interaction: A randomized controlled trial. *Clinical Nursing Research*, 22(3), 310-336. doi:10.1177/1054773812468316
- Fallah, R., Naserzadeh, N., Ferdosian, F., & Binesh, F. (2016). Comparison of effect of kangaroo mother care, breastfeeding and swaddling on Bacillus Calmette-Guerin vaccination pain score in healthy term neonates by a clinical trial. *The Journal of Maternal-Fetal & Neonatal Medicine*, published online June 30, 2016. doi:10.1080/14767058.2016.1205030
- Feldman-Winter, L., Goldsmith, J. P., Committee on Fetus and Newborn, & Task Force on sudden infant death syndrome. (2016). Safe sleep and skin-to-skin care in the neonatal period for healthy term newborns. *Pediatrics*, 138(3), e1-e10. doi:10.1542/peds.2016-1889
- Fleming, P. J., Azaz, Y., & Wigfield, R. (1992). Development of thermoregulation in infancy: Possible implications for SIDS. *Journal of Clinical Pathology*, 45 (11 Suppl.), 17-19.
- Fleming, P. J., Gilbert, R., Azaz, Y., Berry, P. J., Rudd, P. T., Stewart, A., & Hall, E. (1990). Interaction between bedding and sleeping position in the sudden infant death syndrome: A population based case-control study. *British Medical Journal*, 301(6743), 85-89.
- Fleming, P. J., Howell, T., Clements, M., & Lucas, J. (1994). Thermal balance and metabolic rate during upper respiratory tract infection in infants. *Archives of Disease in Childhood*, 70(3), 187-191.
- Fleming, P. J., Levine, M. R., Azaz, Y., Wigfield, R., & Stewart, A. J. (1993). Interactions between thermoregulation and the control of respiration in infants: Possible relationship to sudden infant death. *Acta Paediatrica. Supplement*, 82(Suppl. 389), 57-59.
- Franco, P., Scaillet, S., Groswasser, J., & Kahn, A. (2004). Increased cardiac autonomic responses to auditory challenges in swaddled infants. *Sleep*, 27(8), 1527-1532.
- Franco, P., Seret, N., Van Hees, J. N., Scaillet, S., Groswasser, J., & Kahn, A. (2005). Influence of swaddling on sleep and arousal characteristics of healthy infants. *Pediatrics*, 115(5), 1307-1311. doi:10.1542/peds.2004-1460
- Frenken, R. (2011). Psychology and history of swaddling. Part one: Antiquity until 15th century. *The Journal of Psychohistory*, 39(2), 84-114.
- Frenken, R. (2012). Psychology and history of swaddling. Part two: The abolishment of swaddling from the 16th century until today. *The Journal of Psychohistory*, 39(3), 219-245.
- Gerard, C. M., Harris, K. A., & Thach, B. T. (2002). Physiologic studies on swaddling: An ancient child care practice, which may promote the supine position for infant sleep. *The Journal of Pediatrics*, 141(3), 398-403. doi:10.1067/mpd.2002.127508
- Gilbert, R., Rudd, P., Berry, P. J., Fleming, P. J., Hall, E., White, D. G., ..., Evans, J. A. (1992). Combined effect of infection and heavy wrapping on the risk of sudden unexpected infant death. *Archives of Disease in Childhood*, 67(2), 171-177.
- Goodstein, M. H., Hauck, F. R., Darnall, R. A., Feldman-Winter, L., & Moon, R. Y. (2016). Swaddling is not contraindicated in the newborn period. *Journal of Perinatology*, 36(2), 160. doi:10.1038/jp.2015.182
- Graham, S. M., Manara, J., Chokotho, L., & Harrison, W. J. (2015). Back-carrying infants to prevent developmental hip dysplasia and its sequelae: Is a new public health initiative needed? *Journal of Pediatric Orthopedics*, 35(1), 57-61. doi:10.1097/BPO.0000000000000234
- Gröber, U., Spitz, J., Reichrath, J., Kisters, K., & Holick, M. F. (2013). Vitamin D: Update 2013: From rickets prophylaxis to general preventive health-care. *Dermato-Endocrinology*, 5(3), 331-347. doi:10.4161/derm.26738
- Grover, G., Berkowitz, C. D., Lewis, R. J., Thompson, M., Berry, L., & Seidel, J. (1994). The effects of bundling on infant temperature. *Pediatrics*, 94(5), 669-673.
- Guner, S. I., Guner, S., Peker, E., Ceylan, M. F., Guler, A., Turktas, U., & Kaki, B. (2013). Are consanguineous marriage and swaddling the risk factors of developmental dysplasia of the hip? *The Journal of Membrane Biology*, 246(2), 115-119. doi:10.1007/s00232-012-9509-4
- Harcke, H. T., Karatas, A. F., Cummings, S., & Bowen, J. R. (2016). Sonographic assessment of hip swaddling techniques in infants with and without DDH. *Journal of Pediatric Orthopedics*, 36(3), 232-238. doi:10.1097/BPO.0000000000000446
- Hashemi, F., Taheri, L., Ghodsbin, F., Pishva, N., & Vossoughi, M. (2016). Comparing the effect of swaddling and breastfeeding and their combined effect on the pain induced by BCG vaccination in infants referring to Motahari Hospital, Jahrom, 2010-2011. *Applied Nursing Research*, 29, 217-221. doi:10.1016/j.apnr.2015.05.013
- Howard, C. R., Lanphear, N., Lanphear, B. P., Eberly, S., & Lawrence, R. A. (2006). Parental responses to infant crying and colic: The effect on breastfeeding duration. *Breastfeeding Medicine*, 1(3), 146-155.
- International Hip Dysplasia Institute. *Are you swaddling your infant properly?* Retrieved from from <http://hipdysplasia.org/>
- International Hip Dysplasia Institute. *What about sleepsacks and commercial products?* Retrieved from from <http://hipdysplasia.org/>
- Ishida, K. (1977). Prevention of the development of the typical dislocation of the hip. *Clinical Orthopaedics and Related Research*, (126), 167-169.
- Iyengar, S. D., Iyengar, K., Martines, J. C., Dashora, K., & Deora, K. K. (2008). Childbirth practices in rural Rajasthan, India: Implications for neonatal health and survival. *Journal of Perinatology*, 28(Suppl. 2), S23-S30. doi:10.1038/jp.2008.174
- Jansson, U. M., Mustafa, T., Khan, M. A., Lindblad, B. S., & Widström, A. M. (1995). The effects of medically-orientated labour ward routines on prefeeding behaviour and body temperature in newborn infants. *Journal of Tropical Pediatrics*, 41(6), 360-363.
- Karatekin, G., Kaya, A., Salihoğlu, O., Balci, H., & Nuhoğlu, A. (2009). Association of subclinical vitamin D deficiency in newborns with acute lower respiratory infection and their mothers. *European Journal of Clinical Nutrition*, 63(4), 473-477. doi:10.1038/sj.ejcn.1602960
- Karp, H. (2004). How to swaddle your baby. *Contemporary Pediatrics*, 21(2), 115-116.
- Karp, H. (2015). *The happiest baby on the block* (2nd ed.). New York, NY: Bantam Books.
- Kennedy, K. (2013). Unwrapping the controversy over swaddling. *AAP News*, 34(6), 1-2.
- Kleemann, W. J., Schlaud, M., Poets, C. F., Rothämel, T., & Tröger, H. D. (1996). Hyperthermia in sudden infant death. *International Journal of Legal Medicine*, 109(3), 139-142.
- Kremli, M. K., Alshahid, A. H., Khoshhal, K. I., & Zamzam, M. M. (2003). The pattern of developmental dysplasia of the hip. *Saudi Medical Journal*, 24(10), 1118-1120.
- Kutlu, A., Memik, R., Mutlu, M., Kutlu, R., & Arslan, A. (1992). Congenital dislocation of the hip and its relation to swaddling used in Turkey. *Journal of Pediatric Orthopedics*, 12(5), 598-602.
- Laaksi, I. (2012). Symposium 4: Vitamins, infectious and chronic disease during adulthood and aging Vitamin D and respiratory infection in adults. *Proceedings of the Nutrition Society*, 71, 90-97. doi:10.1017/S0029665111003351
- Leng, H. Y., Zheng, X. L., Zhang, X. H., He, H. Y., Tu, G. F., Fu, Q., ..., Yan, L. (2016). Combined non-pharmacological interventions for newborn pain relief in two degrees of pain procedures: A randomized clinical trial. *European Journal of Pain*, 20(6), 989-997. doi:10.1002/ejp.824
- Li, Y., Liu, J., Liu, F., Guo, G., Anme, T., & Ushijima, H. (2000). Maternal child-rearing behaviors and correlates in rural minority areas of Yunnan, China. *Journal of Developmental and Behavioral Pediatrics*, 21(2), 114-122.
- Lipton, E. L., Steinschneider, A., & Richmond, J. B. (1965). Swaddling, a child care practice: Historical, cultural and experimental observations. *Pediatrics*, 35(Suppl.), 519-567.
- Loder, R. T., & Skopelja, E. N. (2011). The epidemiology and demographics of hip dysplasia. *International Scholarly Research Network Orthopedics*, 2011, 1-46. doi:10.5402/2011/238607
- Lubani, M. M., al-Shab, T. S., al-Saleh, Q. A., Sharda, D. C., Quattawi, S. A., Ahmed, S. A., ..., Reavey, P. C. (1989). Vitamin-D-deficiency rickets in Kuwait: The prevalence of a preventable disease. *Annals of Tropical Paediatrics*, 9(3), 134-139.
- Manaseki-Holland, S., Spier, E., Bavusuren, B., Bayandorj, T., Sprachman, S., & Marshall, T. (2010). Effects of traditional swaddling on development: A randomized controlled trial. *Pediatrics*, 126(6), e1485-e1492. doi:10.1542/peds.2009-1531
- McDonnell, E., & Moon, R. Y. (2014). Infant deaths and injuries associated with wearable blankets, swaddle wraps, and swaddling. *The Journal of Pediatrics*, 164(5), 1152-1156. doi:10.1016/j.jpeds.2013.12.045
- Meyer, L. E., & Erler, T. (2011). Swaddling: A traditional care method rediscovered. *World Journal of Pediatrics*, 7(2), 155-160. doi:10.1007/s12519-011-0268-6
- Mohrbacher, M. (2010). Rethinking swaddling. *International Journal of Childbirth Education*, 25(3), 7-10.
- Moore, E. R., & Anderson, G. C. (2007). Randomized controlled trial of very early mother-infant skin-to-skin contact and breastfeeding status. *Journal of Midwifery & Women's Health*, 52(2), 116-125. doi:10.1016/j.jmwh.2006.12.002
- Morrow, C., Hiding, A., & Wilkinson-Faulk, D. (2010). Reducing neonatal pain during routine heel lance procedures. *MCN. The American Journal of Maternal Child Nursing*, 35(6), 346-354. doi:10.1097/NMC.0b013e3181f4fc53
- Moss, J., & Solomons, H. C. (1979). Swaddling then, there and now: Historical, anthropological and current practices. *Maternal-Child Nursing Journal*, 8(3), 137-151.
- Muhe, L., Lulseged, S., Mason, K. E., & Simoes, E. A. (1997). Case-control study of the role of nutritional rickets in the risk of developing pneumonia in Ethiopian children. *Lancet*, 349(9068), 1801-1804.
- Narangerel, G., Pollock, J., Manaseki-Holland, S., & Henderson, J. (2007). The effects of swaddling on oxygen saturation and respiratory rate of healthy infants in Mongolia. *Acta Paediatrica*, 96(2), 261-265. doi:10.1111/j.1651-2227.2007.00123.x
- Oden, R. P., Powell, C., Sims, A., Weisman, J., Joyner, B. L., & Moon, R. Y. (2012). Swaddling: Will it get babies onto their backs for sleep? *Clinical Pediatrics*, 51(3), 254-259. doi:10.1177/0009922811420714

- Pease, A. S., Fleming, P. J., Hauck, F. R., Moon, R. Y., Horne, R. S., L'Hoir, M. P., ..., Blair, P. S. (2016). Swaddling and the risk of sudden infant death syndrome: A meta-analysis. *Pediatrics*, *137*(6), 1-9. doi:10.1542/peds.2015-3275
- Pediatric Orthopaedic Society of North America. (2015, April 28). *Swaddling and developmental hip dysplasia position statement*. Retrieved from www.posna.org/news/swaddlingpositionstatementapril2015.pdf
- Pillai Riddell, R. R., Racine, N. M., Turcotte, K., Uman, L. S., Horton, R. E., Din Osmun, L., ..., Gerwitz-Stern, A. (2011). Non-pharmacological management of infant and young child procedural pain. *Cochrane Database of Systematic Reviews*, (10). doi:10.1002/14651858.CD006275.pub2
- Ponsonby, A. L., Dwyer, T., Gibbons, L. E., Cochrane, J. A., & Wang, Y. G. (1993). Factors potentiating the risk of sudden infant death syndrome associated with the prone position. *The New England Journal of Medicine*, *329*(6), 377-382.
- Richardson, H. L., Walker, A. M., & Horne, R. S. (2009). Minimizing the risks of sudden infant death syndrome: To swaddle or not to swaddle? *The Journal of Pediatrics*, *155*(4), 475-481. doi:10.1016/j.jpeds.2009.03.043
- Richardson, H. L., Walker, A. M., & Horne, R. S. (2010). Influence of swaddling experience on spontaneous arousal patterns and autonomic control in sleeping infants. *The Journal of Pediatrics*, *157*(1), 85-91. doi:10.1016/j.jpeds.2010.01.005
- Salter, R. B. (1968). Etiology, pathogenesis and possible prevention of congenital dislocation of the hip. *The Canadian Medical Association Journal*, *98*(20), 933-945.
- Tuffnell, C. S., Petersen, S. A., & Wailoo, M. P. (1995). Prone sleeping infants have a reduced ability to lose heat. *Early Human Development*, *43*(2), 109-116.
- Urnaa, V., Kizuki, M., Nakamura, K., Kaneko, A., Inose, T., Seino, K., & Takano, T. (2006). Association of swaddling, rickets onset and bone properties in children in Ulaanbaatar, Mongolia. *Public Health*, *120*(9), 834-840. doi:10.1016/j.puhe.2006.05.009
- U.S. Preventive Services Task Force. (2014, October). *Grade Definitions*. Retrieved from www.uspreventiveservicestaskforce.org/Page/Name/grade-definitions
- van Sleuwen, B. E., Engelberts, A. C., Boere-Boonekamp, M. M., Kuls, W., Schulpen, T. E. J., & L'Hoir, M. P. (2007). Swaddling: A systematic review. *Pediatrics*, *120*(4), e1097-e1106. doi:10.1542/peds.2006-2083
- van Sleuwen, B. E., L'Hoir, M. P., Engelberts, A. C., Busschers, W. B., Westers, P., Blom, M. A., ..., Kuis, W. (2006). Comparison of behavior modification with and without swaddling as interventions for excessive crying. *The Journal of Pediatrics*, *149*(4), 512-517. doi:10.1016/j.jpeds.2006.06.068
- Wambach, K., & Riordan, J. (2016). *Breastfeeding and human lactation* (5th ed.). Burlington, MA: Jones & Bartlett Learning.
- Wayse, V., Yousafzai, A., Mogale, K., & Filteau, S. (2004). Association of subclinical vitamin D deficiency with severe acute lower respiratory infection in Indian children under 5 y. *European Journal of Clinical Nutrition*, *58*(4), 563-567. doi:10.1038/sj.ejcn.1601845
- Wells, G. A., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M., & Tugwell, P. (2014). *The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomized studies in meta-analyses*. Retrieved from www.ohri.ca/programs/clinical_epidemiology/oxford.asp
- White, A. L., Carrara, V. I., Paw, M. K., Malika, Dahbu, C., Gross, M. M., ..., McGready, R. (2012). High initiation and long duration of breastfeeding despite absence of early skin-to-skin contact in Karen refugees on the Thai-Myanmar border: A mixed methods study. *International Breastfeeding Journal*, *7*(1), 19-31. doi:10.1186/1746-4358-7-19
- Wilson, C. E. (2000). Cree infant care practices and sudden infant death syndrome. *Canadian Journal of Public Health*, *91*(2), 133-136.
- Wisdorf-Houtkooper, K. K. (1997). *The efficacy of pediatric pain management techniques for infants during inoculation procedures* (Doctoral dissertation). Retrieved from CINAHL. (UMI No. PUZ9732889.)
- Yamamoto, T., & Ishida, K. (1984). Recent advances in the prevention, early diagnosis, and treatment of congenital dislocation of the hip in Japan. *Clinical Orthopaedics and Related Research*, (184), 34-40.
- Yilmaz, A., Unsal, N., Celik, N., Karabel, M., Keskin, E., Tan, S., & Aldemir, S. (2012). A perspective from the practice of swaddling by Turkish mothers. *Hippokratia*, *16*(2), 130-136.
- Yurdakok, K., Yavuz, T., & Taylor, C. E. (1990). Swaddling and acute respiratory infections. *American Journal of Public Health*, *80*(7), 873-875.

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