Published in final edited form as:

Nurs Womens Health. 2018 August ; 22(4): 310–326. doi:10.1016/j.nwh.2018.05.003.

An Integrative Review of the Sleep Experiences of Mothers of Hospitalized Preterm Infants

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Abstract

Objective: To determine what is known about the sleep experiences of mothers of hospitalized preterm infants.

Data Sources: A literature search of PubMed and CINAHL was performed in February 2018. Additional articles were identified from reference lists.

Study Selection: Whittemore's integrative review methodology was used to synthesize existing literature; 17 articles met eligibility criteria.

Data Extraction: Data were reported in tabular format, including subjects, purpose, setting, interventions, sleep measurements, psychometric instruments, analyses, and results.

Data Synthesis: Overall, sleep is disrupted and of poor quality, and many mothers report insomnia with less total sleep time. Potential beneficial interventions include bright light therapy, relaxation guided imagery, and progressive muscle relaxation.

Conclusion: Although some interventions show promise, there are significant limitations. Future research should consider maternal/infant separation and milk expression.

Keywords

breastfeeding; bright light therapy; hospitalized infant; insomnia; NICU; preterm; progressive muscle relaxation; relaxation guided imagery; sleep

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The authors and planners of this activity report no conflicts of interest or relevant financial relationships. No commercial support was received for this learning activity

Sleep is essential for optimal wellbeing, including short- and longterm health outcomes. Short sleep durations are associated with cardiovascular disease, hypertension, higher cortisol levels, compromised immune function, depression, and lower health-related quality of life (Consensus Conference Panel et al., 2015). Women's sleep during the postpartum period is more fragmented, shorter, and less efficient than before pregnancy (Gay, Lee, & Lee, 2004; Hunter, Rychnovsky, & Yount, 2009; Montgomery-Downs, Insana, Clegg-Kraynok, & Mancini, 2010). Although most women anticipate sleep disturbance in the postpartum period, the impact of poor sleep during this vulnerable time is associated with compromised infant attachment (Tikotzky, 2016), daytime sleepiness (Filtiness, MacKenzie, & Armstrong, 2014), and daytime impairment (McBean & Montgomery- Downs, 2013).

Sleep Among Mothers of Hospitalized Preterm Infants

Postpartum sleep research has focused primarily on mothers of healthy newborns, with much less study of the maternal sleep experience of mothers of hospitalized preterm infants. Women who give birth to preterm infants experience more stress than mothers of healthy infants (Edéll-Gustafsson, Angelhoff, Johnsson, Karlsson, & Morelius, 2015). A mother of a preterm infant experiences the stress of having a critically ill child, separation from her infant, postpartum hormonal shifts, frequent breast milk expression, and prolonged exposure to artificial lighting in the NICU (Lee & Kimble, 2009). Depression and fatigue negatively influence sleep and are commonly experienced by mothers of preterm infants (Lee, Lee, Aycock, & Decker, 2010; Thomas & Spieker, 2016; Vigod, Villegas, Dennis, & Ross, 2010).

In one study, poor perceived sleep quality was associated with maternal anxiety and depression

Bedside NICU nurses and other clinicians who care for neonates and their families could overlook the importance of sleep hygiene, which includes healthful behaviors and practices needed for good sleep quality. An improved understanding of the sleep experiences of mothers of hospitalized preterm infants may lead to improved bedside strategies for nurses to educate parents about sleep hygiene.

Literature Review

Rationale

A review of the literature is needed to integrate studies that specifically examined the sleep experiences of mothers with preterm infants (<37 weeks) who are hospitalized. The objectives of this integrative review are to (a) determine what is known about sleep experiences of mothers of hospitalized preterm infants, and (b) identify factors that hinder or support optimal maternal sleep. To our knowledge, no such review is available for clinicians and researchers that is related to sleep in this high-risk population.

Protocolized Search Methods and Information Sources

In conducting this review, we were guided by Whittemore's methodology for conducting integrative reviews (Whittemore & Knafl, 2005). We chose this review methodology because it allows for the integration of various study types (e.g., experimental and nonexperimental). We conducted a literature search of PubMed and CINAHL in February 2018 using a combination of the terms *sleep*, *preterm*, *neonatal ICU*, *postpartum*, *NICU*, and *prematurity*. We reviewed reference lists from pulled articles to identify any additional relevant studies.

Eligibility Criteria

Studies were excluded if they (a) examined maternal sleep after birth of a healthy term infant, (b) examined maternal sleep after NICU discharge, (c) did not examine sleep among mothers who had a preterm infant, and/or (d) did not examine maternal sleep. Given the scarcity of literature available on this unique population, we relaxed inclusion criteria in three ways to optimize informative findings for this review: (a) we included studies that examined both parents (mothers and fathers), as long as mothers were included; (b) we included studies that also examined parents/mothers with term infants in the NICU, as long as preterm infants were examined as a subset; and (c) we did not impose a publication year limitation for inclusion.

Study Selection and Data Collection Process

After filtering for articles published in English, we reviewed a total of 2,819 abstracts. We reviewed all abstracts for relevance and excluded duplicates. Of these, 64 primary studies were reviewed for having inclusion criteria of examining maternal sleep. We excluded 47 of the 64 studies for the following reasons: (a) study did not examine mothers with preterm infants ($n = 6$); (b) study included preterm infants after hospital discharge ($n = 5$); (c) study examined maternal sleep after giving birth to a hospitalized term infant, excluding preterm infants ($n = 34$); or (d) maternal sleep was not examined ($n = 2$; see Figure 1). Eligible studies were closely examined, and data related to subjects, purpose, setting, interventions (if relevant), methods, subjective sleep measurements, objective sleep measurements, other

psychometric instruments, statistical analyses, and results were extracted and summarized in tabular format.

Results

Ultimately, we identified 17 articles that examined 898 mothers of hospitalized preterm infants in six countries, with the largest number of studies conducted in the United States ($n = 11$). Other countries represented in this review include Sweden ($n = 2$), Norway ($n = 1$), Taiwan ($n = 1$), Iran ($n = 1$), and Jordan ($n = 1$). Gestational age at birth was not consistent across studies and ranged from 23 to 36 weeks. Six studies used actigraphy (48–72 hours) to examine sleep, and four of those six studies included sleep diaries to validate actigraphy sleep data. Seven studies used an intervention, including bright light therapy ($n = 5$), progressive muscle relaxation ($n = 1$), or relaxation guided imagery ($n = 1$). The remaining studies ($n = 10$) were observational and examined multiple dimensions of self-reported sleep measures, including sleep quality ($n = 5$), insomnia ($n = 1$), sleep disturbances ($n = 3$), sleep difficulty ($n = 1$), and/or sleep latency ($n = 1$).

There were two qualitative studies included in this review, but they did not have comparable objectives and only one of them explicitly examined sleep (Edéll-Gustafsson et al., 2015); therefore, we were not able to apply Whittemore's constant comparative method to examine qualitative themes. The location of sleep data collected is relevant to this review, given the potential influence of artificial lighting and hospital routines on sleep hygiene. Many of the studies do not include the location (home and/or hospital) of sleep data collection ($n = 5$). The remaining studies include data collection at home ($n = 9$) or in the hospital ($n = 3$).

Maternal Sleep Characteristics

Sleep time and activity rhythms.—The National Sleep Foundation recommends that adults sleep for at least 7 hours each night (2015). Additionally, impaired or fragmented sleep can compromise activity rhythms, which are associated with wakefulness and health (Germain & Kupfer, 2008). One study in this review included 51 mothers with a mean total sleep time of less than 6 hours (Lee & Hsu, 2012); this is comparable to total sleep time of a mother who is at home with her newborn. Lee and Lee (2007) examined sleep differences between mothers who birthed via cesarean and those who birthed vaginally. Although both groups had similar sleep disturbances, poor sleep quality, and daytime sleepiness, the women who had cesarean births experienced shorter total sleep time and more fragmented sleep than those who birthed vaginally (Lee & Lee, 2007).

When exploring daytime activity levels, Lee et al. (2012) dichotomized new mothers into high versus low activity levels as measured by wrist actigraphy and then applying a median split. This technique was used because of a scarcity of data that can be used as a guideline for this population. Although both groups experienced significant sleep disturbance and moderate fatigue, mothers in the high-activity group had fewer postpartum depression symptoms, whereas women in the low-activity group slept more during the daytime.

Perceived sleep quality.—Studies reviewed measured sleep using a variety of validated instruments that measure both subjective and objective sleep (see Table 1). Compromised

sleep (Hung & Chen, 2014) was found by authors of studies that included nonobjective sleep measures (Hill, Aldag, Chatterton, & Zinaman, 2005; Hung & Chen, 2014; Schaffer et al., 2013). Poor perceived sleep quality was associated with maternal anxiety and depression (Busse, Stromgren, Thorngate, & Thomas, 2013; Schaffer et al., 2013), with sleep quality deteriorating over 6 weeks of participation (Hill et al., 2005). Similarly, Gennaro, Grisemer, and Musci (1992) reported that about one third of new mothers sleep less and experience more tiredness at 1 week postpartum while their infant was hospitalized than at 4 weeks postpartum.

In a population of 2,830 mothers (of whom 145 birthed preterm), women who gave birth to preterm infants experienced worse sleep quality compared with mothers of term infants (DØrheim, Bondevik, Eberhard-Gran, & Bjorvatn, 2009). The cohort of mothers with preterm infants emerged in the logistic regression analysis as experiencing poor sleep quality. This was replicated in another study in which mothers of hospitalized preterm infants reported severe insomnia (Blomqvist, Nyqvist, Rubertsson, & Funkquist, 2017). Mothers were more likely to report more severe insomnia than fathers, but this disparity occurred only during the hospitalization. In contrast, Al Maghaireh, Abdullah, Chong, Chua, and Al Kawafha (2017) reported no significant difference in sleep disturbance between mothers and fathers while their infants were hospitalized. Cultural differences may explain this disparity, because this last study was conducted in Jordan, where care for hospitalized infants is transferred to the neonatal team. In contrast, the first study was conducted in Sweden, where mothers are expected to room in and practice skin-to-skin care.

Factors That Hinder or Support Maternal Sleep

Environmental impact on sleep.

Given the dearth of knowledge regarding sleep among mothers of preterm infants, we were surprised that out of the 17 included studies, in only two did researchers use a qualitative approach. One of the qualitative studies was also one of only two in which researchers examined the impact of environment on sleep (Edéll-Gustafsson et al., 2015). Using semistructured interviews to explore and describe how 20 parents (including eight mothers) with hospitalized infants perceive their sleep, four categories emerged: *Impact of Stress on Sleep*, *Environmental Effects on Sleep*, *Keeping the Family Together Improves Sleep*, and *How Parents Manage and Prevent Tiredness*. The authors recommend private spaces in the NICU for parents to keep the family together as a way to improve parental sleep.

Private spaces in the NICU for parents to keep the family together can improve parental sleep

The second qualitative study examined mothers' expectations of changes in their lifestyle from the time their infant is born until 6 months postpartum (Gennaro et al., 1992). Although this study did not explicitly examine sleep or tiredness, both of these lifestyle factors emerged as changes experienced by mothers with hospitalized preterm infants. At 1 week postpartum, mothers slept less than expected and more mothers felt more tired than they had anticipated. This study (Gennaro et al., 1992) was conducted in the United States in 1992, when the practice of room sharing was uncommon. The practice of cosleeping or room sharing is common in Sweden, where Blomqvist et al. (2017) conducted their study

examining insomnia among parents with hospitalized preterm infants. An interesting design aspect of this multicenter study was that one of the hospitals did not have amenities that allowed for room sharing. Despite differences in unit design, there were similar maternal levels of insomnia among hospitals. This finding—that poor sleep occurs regardless of the option to room share—highlights the anxiety and stress associated with parenting a critically ill infant.

Breastfeeding/milk expression.—Breast milk is beneficial in preventing many prematurity-related complications. The National Association of Neonatal Nurses (2015) recommends that mothers with preterm infants pump milk at least once nightly, which is relevant to research that aims to understand the overall maternal NICU experience. Other authors have examined the breastfeeding experience of mothers of preterm infants and found that the central theme for a mother's NICU experience is *Coping*. Breast milk expression serves as a way to connect with the infant, even though the NICU environment, demanding expression schedule, and other breastfeeding difficulties interfere with this experience (Ikonen, Paavilainen, & Kaunonen, 2015). Unfortunately, the studies included in the Ikonen et al. review ignored the maternal sleep experience. Likewise, many of the studies included in the present literature review ignore the breastfeeding component, despite the recommended prioritization of human milk feeding in the NICU. Of the 17 studies included in this review, eight do not mention breastfeeding. Of the nine studies that do mention breastfeeding, four were conducted outside of the United States.

In Sweden, the cultural norm is to breastfeed, and this is illustrated by Blomqvist et al. (2017) finding that 92% of preterm infants in their sample were breastfed. Additionally, mothers' sleep was worst while their infants were hospitalized and was worse than the fathers' sleep as measured by the Insomnia Severity Index. The authors attribute this finding to nighttime breast milk expression; however, this relationship was not formally examined. Hill et al. (2005) assessed the relationship between maternal psychological distress and breast milk volume. In their study, which included a considerable sample size ($n = 193$, 95 preterm), the authors concluded that although the preterm cohort experienced worsening sleep over time, sleep difficulty was not related to breast milk volume. This study design included breast milk volume at 6 weeks, well past the critical window for milk volume maintenance. Additionally, 25% of the preterm cohort was at home during the time, which overlooks the sleep and breastfeeding experience of mothers whose infants were critically ill and/or separated because of hospitalization.

Birth experience.—Mode of birth appears to influence maternal sleep, with vaginal birth offering more protection from poor sleep compared with cesarean birth. In a study by Lee & Lee (2007), women who birthed vaginally experienced more nightly sleep, whereas those who birthed via cesarean experienced shorter total sleep time and more fragmented sleep (Lee & Lee, 2007). Although this study was the only one to explicitly examine mode of birth, Hung and Chen (2014) report that a dissatisfying birth experience is also associated with poorer sleep. These findings are shared, despite differences in postpartum time between the two studies. Lee and Lee (2007) examined women who had birthed approximately 4 days prior, and Hung and Chen (2014) also used a cross-sectional study design but captured women between 4 and 6 weeks postpartum. Preterm birth is often an unexpected and traumatic event and is associated with negative feelings including anger and distress (Ionio et al., 2016).

Depression symptoms.—Depression symptoms were also noted in the studies reviewed (Lee & Hsu, 2012; Lee & Kimble, 2009). Mothers of hospitalized preterm infants are stressed, depressed, fatigued, and at risk for poor overall physical and mental health (Lee & Hsu, 2012). Depression was associated with poor sleep, although this finding was in a study by authors who also included term infants and did not perform a subset analysis with a preterm cohort. Despite this, in the group with preterm infants, prematurity emerged as a factor associated with poorer sleep (DØrheim et al., 2009). Among a cohort of NICU mothers with singleton preterm infants, those with higher Edinburgh Postnatal Depression Scale scores experienced poorer sleep compared with those with lower depression scores (Shelton, Meaney-Delman, Hunter, & Lee, 2014). In this study, nearly 62% of new mothers reported depression symptoms, which is a rate much greater than rates in the general population of 11.7% to 20.4% (Brett, Barfield, & Williams, 2008). Although authors of this study dichotomized depression scores among NICU mothers into high versus *low*, neither group achieved the National Sleep Foundation recommendation of 7 hours of sleep. This

suggests that, regardless of depression status, mothers of hospitalized preterm infants experience compromised and fragmented sleep. Depression is closely linked to stress and anxiety, and there is a positive association between sleep disturbance and anxiety (Al Maghaireh et al., 2017; Busse et al., 2013) and mental distress (Schaffer et al., 2013).

Intervention Studies

Seven studies included interventions that were aimed to improve sleep quality among mothers of hospitalized preterm infants using progressive muscle relaxation (Karbandi et al., 2015), guided imagery (Schaffer et al., 2013), or bright light therapy (Lee, Aycock, & Moloney, 2013; Lee et al., 2012; Lee & Hsu, 2012; Lee & Kimble, 2009; Shelton, Meaney-Delman, Hunter, Lee, 2014). The gestational age for inclusion was different for each intervention study. Karbandi et al. (2015) studied muscle relaxation and included women who gave birth between 32 and 36 weeks gestation. Schaffer et al. (2013) studied guided imagery and included women who gave birth between 23 and 32 weeks. Lee, Aycock, and Moloney (2013) and Lee and Hsu (2012) studied bright light therapy and included women who gave birth to low-birth-weight infants, and Shelton et al. (2014) also included low-birth-weight infants.

In all seven studies, researchers found varying benefits of the interventions. Guided imagery and muscle relaxation were associated with improved sleep quality. Although not significant, bright light therapy was associated with improvements in total sleep time, fatigue, depression symptoms, and physical and mental quality of life. Of note, five of the intervention studies used objective sleep measures ($n = 6$ studies overall with objective sleep measures). Many of these studies appear to be iterations of the same cohort (Lee et al., 2013; Lee et al., 2012; Lee & Hsu, 2012; Lee & Kimble, 2009).

Discussion

We conducted this review to better understand the sleep experience of mothers with hospitalized preterm infants and what factors may hinder or benefit their sleep. Overall, mothers with hospitalized preterm infants experience disrupted sleep, high fatigue levels, and severe insomnia. Authors of studies that implemented an intervention reported improved maternal sleep, although the sample sizes were small. Despite the unique experience in the NICU of mothers of hospitalized preterm infants, as well as the importance of sleep for healing and bonding, there is limited research on sleep in this high-risk population.

Implications for Research

After our review, we noted that NICU-specific study design considerations were lacking. In other words, this population of critically ill infants and their mothers is distinctive, and it is essential that variables specific to these dyads be considered when designing future studies. A notable difference between studies was the definition of the term *preterm*. Although some studies included infants born before 31 weeks gestation (Hill et al., 2005; Karbandi et al., 2015; Schaffer et al., 2013), another defined preterm as less than 37 weeks gestation (Døhrheim et al., 2009). Finally, Lee et al. (2012), Lee and Hsu (2012), Lee and Lee (2007), and Shelton et al. (2014) included low-birth-weight infants weighing less than 2,500 g but

did not impose a gestational age cutoff. Others included infants based on birth weight (Gennaro, Fehder, Nuamah, Campbell, & Douglas, 1997; Lee et al., 2013), although all included mothers who gave birth before 37 weeks.

A poorly characterized definition of *preterm* may explain some of the conflicting results found among studies. Hill et al. (2005) reported that mothers of preterm infants experience worse sleep quality. In contrast, both Hung and Chen (2014) and Gennaro et al. (1997) reported no significant sleep differences between mothers of term or preterm infants. The study eligibility criteria in Gennaro et al. (1997) included very- low-birth-weight (<1,500 g) infants, whereas Hung and Chen (2014) imposed no definition of *preterm*. An accurate definition of *preterm* has implications when examining maternal sleep, because mothers of more critically ill infants report more compromised sleep experiences compared with mothers whose infants are term (Dørheim et al., 2009). Additionally, developmental milestones associated with improved acuity status, specifically feeding, occur over the course of the NICU stay, with functional sucking and swallowing occurring between 32 and 36 weeks (Newell, 2000). This is relevant to the current review and especially future research design considerations, because many studies included infants within this developmental window. Although prematurity has historically been defined on the basis of birth weight, gestational age is now considered a significant contributor to neonatal morbidity and mortality (Hughes, Black, & Katz, 2017).

Although we relaxed the inclusion criteria to also evaluate studies that included both preterm and term infants, we found that subgroup analyses on these cohorts were not always conducted. In other words, despite the inclusion of preterm infants, this cohort was not examined as a separate subset. (Dørheim et al., 2009). Despite this, the group with preterm infants emerged in the multiple regression analysis as having worse sleep quality. It is critical that future studies examine preterm cohorts separately, because this population has a distinct trajectory that is unlike the biological norm.

Implications for Nursing Practice

NICU nurses are uniquely positioned to provide care to both mothers and neonates during a vulnerable time. Findings from this review can be used at the bedside to help nurses better appreciate the stressful experience new mothers with hospitalized preterm infants face, particularly surrounding sleep. These mothers are experiencing compromised sleep, so it is critical that the bedside nurses ensure that mothers comprehend the care being delivered. If possible, sleeping options, including rooming in or nearby amenities, should be offered.

In the studies reviewed, mothers who birthed via cesarean experienced shorter total sleep time and more fragmented sleep compared with women who birthed vaginally. Nearly 71% of very-low-birth-weight infants are born via cesarean birth (Griffin, Lee, Profit, & Tancedi, 2015), making this finding especially relevant to the NICU population. Nurses should consider mode of birth and activity level when designing their care plans, which should incorporate sleep hygiene.

Breast milk provides protection against many complications, and the American Academy of Pediatrics (2012) recommends that all preterm infants receive human milk, with priority

given to a mother's own milk. When developing a care plan that includes sleep hygiene, NICU nurses may consider this, along with the clinical recommendations of the National Association of Neonatal Nurses (2015) that mothers of preterm infants express breast milk eight times daily and at least once nightly. The provision of maternal milk for preterm infants should remain a priority; however, it is essential that maternal well-being is concurrently optimized. As Shelton suggests, compromised sleep may inhibit a mother's ability to learn about and care for her infant in the NICU (Shelton et al., 2014).

Conclusion

The sleep experience of mothers of hospitalized preterm infants is often far from optimal. Future research should incorporate objective sleep measures to more accurately describe the sleep experience of this vulnerable population. When designing studies, researchers should also consider the NICU population examined, specifically the gestational age of infants. The provision of breast milk for preterm infants is critical to prevent NICU complications, including mortality. It is imperative that future sleep studies consider the unique need to express nighttime breast milk. Research that examines maternal sleep in this high-risk population should be a priority, because the findings have health implications for women and their infants. NICU nurses are well-positioned to contribute to improved sleep in this population and to assess maternal well-being by considering variables specific to this population, including mode of birth, activity level, gestational age, milk expression, and sleep hygiene. *nwh*

Acknowledgment

Funded by Targeted Research and Academic Training of Nurses in Genomics (T32 NR00975911), Ruth L. Kirschstein National Research Service Award (F32 NR01711301A1), and Sleep Disordered Breathing, Pregnancy, and Obesity Study (5R01HL12035403).

Posttest

1. What is true of women's sleep experience during the postpartum period?
 - a. It is more efficient than before pregnancy.
 - b. It is more fragmented than before pregnancy.
 - c. It is roughly the same as before pregnancy.
2. Which of the following was one of the sleep interventions studied in the articles reviewed?
 - a. Melatonin
 - b. Mindfulness meditation
 - c. Progressive muscle relaxation
3. In the study by Lee and Lee (2007), which group of women had longer total sleep time?
 - a. Women with cesarean birth

- Author Manuscript

- Author Manuscript

- Author Manuscript

- c. Muscle relaxation and bright light therapy
- 9. What is something the authors recommend that a NICU nurse can offer in a plan of care?
 - a. Breastfeeding support with a lactation consultant
 - b. Referral to a sleep specialist
 - c. Rooming in or nearby amenities where parents can sleep
- 10. Which of the following are some of the factors that the authors recommend nurses consider when assessing maternal well-being?
 - a. Mode of birth, gestational age, and milk expression
 - b. Mode of birth, activity level, and use of over-the-counter sleep medication
 - c. Sleep hygiene, mental health, and gestational age

References

- Al Maghaireh DF, Abdullah KL, Chong MC, Chua YP, & Al Kawafha MM (2017). Stress, anxiety, depression and sleep disturbance among Jordanian mothers and fathers of infants admitted to neonatal intensive care unit: A preliminary study. *Journal of Pediatric Nursing*, 36, 132–140. 10.1016/j.pedn.2017.06.007 [PubMed: 28888494]
- American Academy of Pediatrics. (2012). Breastfeeding and the use of human milk. *Pediatrics*, 129(3), e827–e841. 10.1542/peds.2011-3552 [PubMed: 22371471]
- Blomqvist YT, Nyqvist KH, Rubertsson C, & Funkquist EL (2017). Parents need support to find ways to optimise their own sleep without seeing their preterm infant's sleeping patterns as a problem. *Acta Paediatrica*, 106(2), 223–228. 10.1111/apa.13660 [PubMed: 27925691]
- Brett K, Barfield W, & Williams C (2008). Prevalence of self-reported postpartum depressive symptoms—17 States, 2004–2005. *Morbidity and Mortality Weekly Report*, 57(14), 361–366.
- Busse M, Stromgren K, Thorngate L, & Thomas KA (2013). Parents' responses to stress in the neonatal intensive care unit. *Critical Care Nurse*, 33(4), 52–60. 10.4037/ccn2013715 [PubMed: 23908169]
- Consensus Conference Panel Watson, Badr NF, Belenky MS, Bliwise G, Buxton DL, Tasali OM, E. (2015). Joint consensus statement of the American Academy of Sleep Medicine and Sleep Research Society on the recommended amount of sleep for a healthy adult: Methodology and discussion. *Sleep*, 38(8), 1161–1183. 10.5665/sleep.4886 [PubMed: 26194576]
- DØrheim SK, Bondevik GT, Eberhard-Gran M, & Bjorvatn B (2009). Sleep and depression in postpartum women: A population-based study. *Sleep*, 32(7), 847–855. 10.1093/sleep/32.7.847 [PubMed: 19639747]
- Edéll-Gustafsson U, Angelhoff C, Johnsson E, Karlsson J, & Mörelius E (2015). Hindering and buffering factors for parental sleep in neonatal care. A phenomenographic study. *Journal of Clinical Nursing*, 24(5–6), 717–727. 10.1111/jocn.12654 [PubMed: 25041598]
- Filtress AJ, MacKenzie J, & Armstrong K (2014). Longitudinal change in sleep and daytime sleepiness in postpartum women. *PLOS One*, 9(7), e103513 10.1371/journal.pone.0103513 [PubMed: 25078950]
- Gay CL, Lee KA, & Lee S-Y (2004). Sleep patterns and fatigue in new mothers and fathers. *Biological Research for Nursing*, 5(4), 311–318. 10.1177/1099800403262142 [PubMed: 15068660]
- Gennaro S, Fehder W, Nuamah IF, Campbell DE, & Douglas SD (1997). Caregiving to very low birthweight infants: A model of stress and immune response. *Brain, Behavior, and Immunity*, 11(3), 201–215. 10.1006/brbi.1997.0502

- Gennaro S, Grisemer A, & Musci R (1992). Expected versus actual life-style changes in mothers of preterm low birth weight infants. *Neonatal Network*, 11(3), 39–45. [PubMed: 1574044]
- Germain A, & Kupfer DJ (2008). Circadian rhythm disturbances in depression. *Human Psychopharmacology*, 23(7), 571–585. 10.1002/hup.964 [PubMed: 18680211]
- Griffin IJ, Lee HC, Profit J, & Tancedi DJ (2015). The smallest of the small: Short-term outcomes of profoundly growth restricted and profoundly low birth weight preterm infants. *Journal of Perinatology*, 35(7), 503–510. 10.1038/jp.2014.233 [PubMed: 25590218]
- Hill PD, Aldag JC, Chatterton RT, & Zinaman M (2005). Psychological distress and milk volume in lactating mothers. *Western Journal of Nursing Research*, 27(6), 676–700. 10.1177/0193945905277154 [PubMed: 16157942]
- Hughes MM, Black RE, & Katz J (2017). 2500-g low birth weight cutoff: History and implications for future research and policy. *Maternal and Child Health Journal*, 21(2), 283–289. 10.1007/s10995-016-2131-9 [PubMed: 27449779]
- Hung HM, & Chen CH (2014). Sleep quality in postpartum women: Exploring correlation with childbirth experience and household work. *The Journal of Nursing Research*, 22(1), 20–27. 10.1097/jnr.000000000000015 [PubMed: 24517896]
- Hunter LP, Rychnovsky JD, & Yount SM (2009). A selective review of maternal sleep characteristics in the postpartum period. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 38(1), 60–68. doi.org/10.1111/j.1552-6909.2008.00309.x
- Ikonen R, Paavilainen E, & Kaunonen M (2015). Preterm infants' mothers' experiences with milk expression and breastfeeding: An integrative review. *Advances in Neonatal Care*, 15(6), 394–406. 10.1097/ANC.0000000000000232 [PubMed: 26536173]
- Ionio C, Colombo C, Brazzoduro V, Mascheroni E, Confalonieri E, Castoldi F, & Lista G (2016). Mothers and fathers in NICU: The impact of preterm birth on parental distress. *Europe's Journal of Psychology*, 12(4), 604–621. 10.5964/ejop.v12i4.1093
- Karbandi S, Hosseini SM, Masoudi R, Hosseini SA, Sadeghi F, & Moghaddam MH (2015). Recognition of the efficacy of relaxation program on sleep quality of mothers with premature infants. *Journal of Education and Health Promotion*, 4, 97. 10.4103/2277-9531.171811 [PubMed: 27462639]
- Lee S-Y, Aycok DM, & Moloney MF (2013). Bright light therapy to promote sleep in mothers of low-birth-weight infants: A pilot study. *Biological Research for Nursing*, 15(4), 398–406. 10.1177/1099800412445612 [PubMed: 22593231]
- Lee S-Y, Grantham CH, Shelton S, & Meaney-Delman D (2012). Does activity matter: An exploratory study among mothers with preterm infants? *Archives of Women's Mental Health*, 15(3), 185–192. 10.1007/s00737-012-0275-1
- Lee S-Y, & Hsu HC (2012). Stress and health-related well-being among mothers with a low birth weight infant: The role of sleep. *Social Science & Medicine*, 74(7), 958–965. 10.1016/j.socscimed.2011.12.030 [PubMed: 22342365]
- Lee S-Y, & Kimble LP (2009). Impaired sleep and well-being in mothers with low-birth-weight infants. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 38(6), 676–685. 10.1111/j.1552-6909.2009.01064.x
- Lee S-Y, & Lee KA (2007). Early postpartum sleep and fatigue for mothers after cesarean delivery compared with vaginal delivery: An exploratory study. *The Journal of Perinatal & Neonatal Nursing*, 21(2), 109–113. 10.1097/01.JPN.0000270627.73993.b0 [PubMed: 17505230]
- Lee S-Y, Lee KA, Aycok D, & Decker M (2010). Circadian activity rhythms for mothers with an infant in ICU. *Frontiers in Neurology*, 1, 155. 10.3389/fneur.2010.00155 [PubMed: 21212829]
- McBean AL, & Montgomery-Downs HE (2013). Timing and variability of postpartum sleep in relation to daytime performance. *Physiology & Behavior*, 122, 134–139. <https://doi.org/10.1016/j.physbeh.2013.09.003> [PubMed: 24041725]
- Montgomery-Downs HE, Insana SP, Clegg-Kraynok MM, & Mancini LM (2010). Normative longitudinal maternal sleep: The first 4 postpartum months. *American Journal of Obstetrics & Gynecology*, 203(5), 465.e1–465.e7. 10.1016/j.ajog.2010.06.057 [PubMed: 20719289]

- National Association of Neonatal Nurses. (2015). The use of human milk and breastfeeding in the neonatal intensive care unit [Position statement no. 3065]. Retrieved from http://nann.org/uploads/About/PositionPDFS/1.4.3_UseofHumanMilkandBreastfeedingintheNICU.pdf
- National Sleep Foundation. (2015). National Sleep Foundation recommends new sleep times. Retrieved from sleepfoundation.org/press-release/national-sleep-foundation-recommends-new-sleep-times/page/0/1
- Newell SJ (2000). Enteral feeding of the micropremie. *Clinics in Perinatology*, 27(1), 221–234. 10.1016/S0095-5108(05)70015-4 [PubMed: 10690573]
- Schaffer L, Jallo N, Howland L, James K, Glaser D, & Arnell K (2013). Guided imagery: An innovative approach to improving maternal sleep quality. *The Journal of Perinatal & Neonatal Nursing*, 27(2), 151–159. 10.1097/JPN.0b013e3182870426 [PubMed: 23618936]
- Shelton SL, Meaney-Delman DM, Hunter M, & Lee S-Y (2014). Depressive symptoms and the relationship of stress, sleep, and well-being among NICU mothers. *Journal of Nursing Education and Practice*, 4(8), 70–79. 10.5430/jnep.v4n8p70
- Thomas KA, & Spieker S (2016). Sleep, depression, and fatigue in late postpartum. *The American Journal of Maternal Child Nursing*, 41(2), 104–109. 10.1097/NMC.0000000000000213 [PubMed: 26909724]
- Tikotzky L (2016). Postpartum maternal sleep, maternal depressive symptoms and self-perceived mother-infant emotional relationship. *Behavioral Sleep Medicine*, 14(1), 5–22. 10.1080/15402002.2014.940111 [PubMed: 25127316]
- Vigod SN, Villegas L, Dennis CL, & Ross LE (2010). Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: A systematic review. *BJOG: An International Journal of Obstetrics and Gynaecology*, 117(5), 540–550. 10.1111/j.1471-0528.2009.02493.x [PubMed: 20121831]
- Whittemore R, & Knafl K (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, 52(5), 546–553. 10.1111/j.1365-2648.2005.03621.x [PubMed: 16268861]

CLINICAL IMPLICATIONS

- In studies of maternal sleep, most researchers have focused on mothers of healthy term infants, with fewer focusing on mothers of hospitalized preterm infants.
- Mothers of hospitalized preterm infants are stressed, depressed, fatigued, and at risk for poor overall physical and mental health.
- In the studies reviewed, mothers who birthed via cesarean experienced shorter total sleep time and more fragmented sleep compared with women who birthed vaginally.
- NICU nurses are well-positioned to help sleep-deprived mothers of hospitalized preterm infants by assessing maternal well-being and considering factors such as mode of birth, activity level, gestational age, milk expression, and sleep hygiene.
- Although the provision of maternal milk to preterm infants should remain a priority, it is essential that maternal well-being is concurrently addressed and optimized.

FIGURE 1.
ARTICLES EXAMINED FOR REVIEW

TABLE 1

SUMMARY OF STUDIES REVIEWED

Author(s), Year	Sample Size, Gestational Age, and Country	Purpose	Methods	Intervention	Outcomes
Subjective sleep studies					
Blomqvist, Nyqvist, Rubertsson, & Funkquist (2017)	86 mothers 84 fathers Singleton pregnancies birthed between 28 and 33 weeks Sweden	To describe how parents perceive their own and their infants' sleep during NICU admission and after discharge To explore the infants' sleeping location at home.	ISI Question about infant sleep location Question about perceived infant sleep problems Questions about breastfeeding	None	Insomnia is more severe in mothers than fathers, although this was significant only during infant hospitalization. Parents with high ISI during infant hospitalization continued to report high ISI at 2 and 12 months corrected age. Mothers with high ISI also reported infant sleep problems. Breastfeeding/milk expression may contribute to high ISI.
Busse, Strongren, Thorngate, & Thomas (2013)	27 parents of preterm infants <37 weeks United States	What are the relationships among parental sources of stress? What are the relationships among parental responses to NICU stress? What is the relationship of NICU parent stress with anxiety, depression, fatigue, and sleep disruption?	Sleep disturbance: PROMIS self-reported health Parental Stressor Scale	None	Anxiety, depression, and fatigue are associated with sleep disturbance. Infant behavior/appearance and parental role alteration are associated with sleep disturbance. Compared with national values, sample sleep disturbance and fatigue (median scores) exceed population means.
Dorheim, Bondevik, Eberhard-Gran, & Bjorvatn (2009)	145 preterm infants <37 weeks Norway	To describe the prevalence of and risk factors for postpartum sleep problems and depression symptoms To identify factors independently associated with either condition To explore associations between specific postpartum sleep components and depression	PSQI EPDS Four questions from a Norwegian population study to obtain history of sleep problems	None	More than half experienced sleep problems (PSQI > 5). Depression in 16.5% of sample. Prematurity associated with poor sleep.
Edéll-Gustafsson, Angelhoff, Johnsson, Karlsson, & Mörelus (2015)	8 mothers 4 fathers NICU infants (including multiples) born between 29 and 39 weeks Sweden	To explore and describe how parents of preterm and/or sick infants in neonatal care perceive their sleep	12 qualitative, semistructured interviews Parents interviewed individually (20–45 minutes)	None	Four categories were uncovered: • Impact of Stress on Sleep • Environment Effects on Sleep • Keeping Family Together Improves Sleep • How Parents Manage and Prevent Tiredness Anxiety, uncertainty, and powerlessness negatively influence sleep. Private space for parents is recommended.
Gennaro, Grisemer, & Musci (1992)	60 preterm VLBW infants 28–34 weeks United States	To examine the changes in mothers' lifestyles from the times their infants are born until they are 6 months old To examine how well mothers' expectations of lifestyle changes matched their experiences	8 interviews, including 1 week postpartum	None	Half of mothers expected less sleep, and nearly half expected no change in tiredness. Mothers got less sleep than expected, and more mothers felt tired than anticipated. Mothers reported more sleep during infant hospitalization than after discharge.

Author(s), Year	Sample Size, Gestational Age, and Country	Purpose	Methods	Intervention	Outcomes
Gennaro, Fehder, Nuamah, Campbell, & Douglas (1997)	25 preterm 25 term Preterm VLBW not defined United States	To examine changes in anxiety and depression and in health behaviors, as well as lymphocyte proliferation and natural killer cell activity in mothers of preterm VLBW infants compared with mothers of healthy term infants	Sleep-Wake Activity Inventory Multiple Affect Adjective Checklist 4-week physical activity questionnaire 24-hour food recall	None	No significant differences in hours slept or awakenings between term/preterm.
Hill, Aldag, Chatterton, & Zinaman, 2005	95 preterm 98 term Preterm: <31 weeks or <1,500 g Term: >37 weeks United States	To compare psychological distress as measured via self-reported perceived stress, sleep, and fatigue levels in lactating mothers of a term infant and mothers of a preterm infant To determine whether the addition of psychological distress to a previous model predicts milk volume at Postpartum Week 6 by gestation group	Richards-Campbell Sleep Questionnaire Perceived Stress Visual Analogue Scale Fatigue Visual Analogue Scale	None	Women with term infants decided to breastfeed before birth, and most of them gave birth vaginally. Perceived stress was consistently greater in mothers with preterm infants. The sleep of mothers with preterm infants worsened over time. Perceived stress, sleep difficulty, and fatigue during the first 6 weeks postpartum were not related to milk volume. Sleep of mothers with preterm infants deteriorated over time.
Hung & Chen (2014)	40 preterm Preterm not defined South Taiwan	To explore the impact of specific demographic and obstetric factors on the subjective sleep quality of postpartum women	PSQI Item 14 (subject sleep quality)	None	No difference in sleep between mothers who gave birth at term and versus preterm Dissatisfying birth experience was associated with poorer sleep.
Karbandi et al. (2015)	$n = 60$ Infants born 32–26 weeks Iran	To identify the efficacy of a relaxation program on sleep quality of mothers with premature infants	PSQI Relaxation self-reported checklist Perceived Stress Scale Cognitive-Somatic Anxiety Questionnaire Situational Anxiety Questionnaire	Progressive muscle relaxation: 30–45 minutes with audio CD and written guide (daily) Control: received training but not asked to perform daily	Mean sleep quality score was higher and there was a significant difference in sleep quality in the intervention group compared with the control group. Pulse, situational anxiety, perceived stress, and cortisol levels all decreased in the intervention group.
Al Maghaireh, Abdullah, Chong, Chua, & Al Kawatha (2017)	155 mothers 155 fathers Preterm infants < 36 weeks Jordan	To investigate the stressors and stress levels among Jordanian parents of infants in the NICU and their relationship to three factors: anxiety, depression, and sleep disturbance	Parental Stressor Scale: NICU PROMIS: Sleep Disturbance	None	There was a positive association between stress level and anxiety and sleep disturbance among parents. Mothers' sleep disturbance was not more significant than fathers' sleep disturbance.
Schaffer, Ialio, Howland, James, Glaser, & Arnell (2013)	20 23–32 weeks United States	To examine the relationship of an 8-week RGI on sleep quality and the association between sleep quality and maternal distress in mothers of hospitalized preterm infants	PSQI Center for Epidemiological Studies Depression Scale State-Trait Anxiety Inventory Perceived Stress Scale Duke Functional Social Support Questionnaire Neonatal Medical Index (illness severity) Semistructured interviews to measure usefulness of RGI	8-week RGI intervention 20-minute tracks (3 times daily)	Higher mean RGI use is inversely correlated with sleep scores. PSQI scores are positively associated with stress, depression, and anxiety. Sleep quality is negatively affected by mental distress and may be improved by a guided imagery intervention.

Author(s), Year	Sample Size, Gestational Age, and Country	Purpose	Methods	Intervention	Outcomes
Objective sleep studies					
Lee & Lee (2007)	21 Mothers of NICU infants, including preterm (gestational age not defined) United States	To describe sleep and fatigue during the first week of postpartum recovery To compare women after cesarean birth with women after vaginal birth while their infants were hospitalized in the NICU	Objective measures: Wrist actigraphy for 48 hours Event marker for bedtime/wakeup Subjective measures: GSDD 2-day sleep diary Fatigue: Numerical Rating Scale	None	Cesarean births: TST shorter, more fragmented sleep, WASO:33% 10% sleep during daytime Vaginal births: 2 hours more sleep nightly WASO: 14.3% <3% of daytime asleep Both groups had similar sleep disturbances, poor sleep quality, and daytime sleepiness.
Lee & Kimble (2009)	20 Infant weight < 2,500 g and gestational age < 37 weeks United States	To explore relationships between impaired sleep and well-being in mothers with LBW infants in the NICU	Objective measures: Wrist actigraphy for 48 hours Event marker for bedtime/wakeup 1- minute sample 4 intervals used to calculate TST and WASO Subjective measures: GSDD 2- day sleep diary Fatigue: Numerical Rating Scale EPDS Medical Outcomes Short Form-36 Questionnaires after sleep data collected	Bright light therapy	Clinically significant sleep disturbance and fatigue severity Actigraphy showed an average nighttime TST < 7 hours. Total daytime sleep > 1 hour Moderate depression symptoms Maternal well-being is 1 SD less than mean scores of age-matched women in the United States.
Lee, Grantham, Shelton, & Meaney- Delman (2012) ^a	51 LBW preterm (gestational age not defined) United States	To describe maternal daytime activity levels during the second week postpartum To explore associations between activity levels and sleep and maternal well-being	Objective measures: Wrist actigraphy for 48 or 72 hours CAR Light exposure Subjective measures: GSDD LFS EPDS Medical Outcomes Short Form-36, version 2	Bright light therapy	More than half scored > 3 on GSDD. Moderate fatigue in both a.m./p.m. High activity was correlated with fewer postpartum depression symptoms. Better CAR was associated with longer nocturnal TST. Low-activity women slept more during the day than high-activity women.
Lee & Hsu (2012) ^b	55 LBW preterm (gestational age not defined) United States	To investigate the association of maternal stress with health-related well-being, including depression, fatigue, and health-related quality of life To focus on the mediating role of sleep disturbance in linking stress to health-related well-being	Objective measures: Wrist actigraphy for 48 or 72 hours Auto sleep scoring system TST Percentage of WASO Sleep deviation index Subjective measures: ^ Sleep diary: bedtimes and wakeups GSDD Perceived Stress Scale Impact of Events Scale LFS EPDS Health-related quality of life	Bright light therapy	Most women were stressed, depressed, fatigued, and at risk for poor physical/ mental health. Poor perceived sleep quality was associated with stress, fatigue, and quality of life. More than half had disturbed sleep. Mean EPDS was > 13, indicating that many women experienced depression symptoms. Mean TST was 6 hours, comparable to having newborn at home.
Lee, Aycock, & Moloney (2013)	<i>n</i> = 30 LBW infants < 2,500 g United States	To examine the effectiveness of a 3-week bright light therapy intervention on sleep and health outcomes of mothers with LBW infants in the NICU	Objective measures: Wrist actigraphy TST CAR Subjective measures: GSDD 3-day sleep diary LFS EPDS Medical Outcomes Short Form-36, version 2	Bright light therapy	No significant findings. Trends were toward improved TST, fatigue, depression symptoms, physical- and mental health-related quality of life among mothers in the intervention group.

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Author(s), Year	Sample Size, Gestational Age, and Country	Purpose	Methods	Intervention	Outcomes
Shelton, Meaney- Delman, Hunter, & Lee (2014)	55 <2,500 g preterm (gestational age not defined) United States	To compare the level of selfreported perceived global and situational stress, sleep disturbance, and level of wellness between mothers with an infant in the NICU who are categorized as having high or low depression symptoms	Family Support Scale Perceived Stress Scale Objective measures: Wrist actigraphy for 48–72 hours TST WASO Subjective measures: GSDS PSS Impact of Events Scale LFS Medical Outcomes Short Form-36, version 2, Physical and Mental subscales	Parent study included bright light therapy intervention This cohort not examined separately	Mothers who reported greater depression symptoms also reported greater stress and poorer sleep.

Note. CAR = circadian activity rhythm; EPDS = Edinburgh Postnatal Depression Scale; GSDS = General Sleep Disturbance Scale; ISI = Insomnia Severity Index; LBW = low birth weight; LFS = Lee's Fatigue Scale; PROMIS = ^a ^b wake after sleep onset.