



**National  
Association of  
Neonatal  
Nurses**

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**National Association of  
Neonatal Nurse Practitioners**   
*A division of NANN*

# **The Impact of Advanced Practice Nurses’ Shift Length and Fatigue on Patient Safety**

## **Position Statement #3064**

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The National Association of Neonatal Nurse Practitioners (NANNP) and its members are committed to providing safe, ethical, and professionally accountable care. All healthcare professionals are affected by the challenges associated with role expectations and human performance factors. NANNP recognizes that fatigue, sleep deprivation, and the extended shift lengths or hours that neonatal nurse practitioners (NNPs) often work present potential safety risks for providers, employers, and patients.

As the professional voice of neonatal nurse practitioners, the National Association of Neonatal Nurse Practitioners recommends that, regardless of work setting and patient acuity, NNPs’ maximum shift length be 24 hours, that a period of protected sleep time be provided following 16 consecutive hours of working, and that the maximum number of working hours per week be 60 hours. It further recommends that NNPs, their employers, and institutions collaborate to implement supportive risk-reduction strategies based on existing evidence.



## **Association Position**

Research addressing sleep deprivation, fatigue, and patient outcomes as related to nurses, and specifically NNPs, is limited. In addition, the uniqueness of the patient population and NNP responsibilities further complicate the delineation of strict scheduling limitations. Nevertheless, sufficient research is available to suggest that, regardless of work setting and patient acuity, (1) NNPs' maximum shift length should be limited to 24 hours, (2) a period of protected sleep time should be provided to NNPs following 16 consecutive hours of working, and (3) the maximum number of working hours per week for NNPs should be 60 hours.

Furthermore, although NNPs, like other healthcare providers, are susceptible to the negative effects of fatigue and sleep deprivation, they are professionally accountable and as such are responsible for minimizing any patient and personal safety risk.

## **Background and Significance**

A number of healthcare organizations and state boards of nursing have adopted strategies to address concerns related to nurses' shift lengths and fatigue and the connection with risks to patients and care providers. In 2003 the Accreditation Council for Graduate Medical Education (ACGME) began limiting shift length and duty hours of residents and fellows (ACGME, 2010), and ACGME published additional limitations in 2011 (ACGME, 2011). The Institute of Medicine (IOM) has also published guidelines and recommendations regarding nurses' roles in the protection of patient safety and improved patient outcomes (IOM, 2004).

The NNP role is a mainstay staffing option for many neonatal intensive care units (NICUs). Shift lengths for NNPs vary and are uniquely related to the dynamics of each NICU. Staffing patterns may include shift lengths of 24 hours or longer. Actual time spent providing patient care during prolonged shifts may vary, as do anticipated periods of rest. In addition, NNPs may be directed to work beyond their scheduled shift lengths to meet unexpected patient care needs or to satisfy organizational or practice expectations.

Recent data from the 2014 Neonatal Nurse Practitioner Workforce Survey conducted by NANNP (2015) revealed that the majority of NNPs work either 24-hour shifts (50%) or shifts with day-night rotation (46%). Day-night rotating shifts tend to be 12 hours. The highest patient load was associated with night shifts or 24-hour shifts. Most NNPs have other duties in addition to those related to patient load during their night shifts: delivery room coverage, 77%; ER emergencies, 47%; Level I consultations, 37%; maternal health consultations, 36%; and transports, 26%. Few NNPs who work night shifts get guaranteed downtime. For those who do, the downtime averages 3 hours per shift (NANNP, 2015). Less downtime was reported in Level IV NICUs. Forty-seven percent of NNPs report that their practice does not have enough staff. Ninety percent of NNPs spend more than 75% of their clinical practice time in the NICU, and the average work week is 37 hours (this number is higher in Level IV practices).

These results corroborate findings of earlier surveys. Cusson and colleagues (2008) found that 94% of the NNP respondents attending an advanced practice conference worked in Level III nurseries caring for the most acutely ill neonates. A subsequent publication reporting responses from NANNP members revealed that the most common NNP shift length was 24 hours, followed by 12-, 10-, and 8-hour shifts, respectively (Hoffman, 2009).

Although no data exist to support an optimal shift length for the NNP, the safety of extended provider work hours for both the patient and the provider has been questioned in light of concerns raised by healthcare organizations and regulatory bodies (American Nurses Association [ANA], 2014; Texas Nurse Practitioners, n.d.; Vermont State Board of Nursing, 2012; York, 2014). NNPs have workflow patterns analogous to those of medical residents or fellows, flight nurses, or air medical staff (LoSasso, 2011). These healthcare providers are involved in direct patient care but not necessarily during their entire shift. Therefore, it is acceptable to examine published data from other healthcare disciplines, as well as nursing practice, to provide a foundation upon which to form recommendations for shift length for NNPs.

A nursing practice similar to NNP practice is the certified registered nurse anesthetist (CRNA) practice; professionals in the two groups share the hospital work setting, the need for immediate response time when on call, and long shift lengths. The American Association of Nurse Anesthetists (AANA) is responsible for protecting and facilitating CRNA professional practice and patient safety. Anesthesia care requires continuous services and at times involves high acuity and intensity of care, which are known contributors to provider fatigue. The AANA recommends shift-length guidelines based on variable settings, caseloads, and patient acuity (AANA, 2013).

In December 2011, the Joint Commission published a *Sentinel Event Alert* dealing with the connection between healthcare workers' fatigue and patient safety. It acknowledged the research to date linking extended-duration shifts, fatigue, and impaired performance and safety. Furthermore, the Joint Commission suggested several evidence-based actions to help mitigate the risks of fatigue that result from extended work hours (Joint Commission, 2011). These included (1) assessing the organization for fatigue-related risks, especially during patient hand-offs, (2) inviting staff input into designing work schedules to minimize the potential for fatigue, (3) implementing a fatigue management plan that includes scientific strategies for fighting fatigue, (4) educating staff about sleep hygiene and the effects of fatigue on patient safety, (5) providing opportunities for staff members to express concern about fatigue and taking actions to address those concerns, (6) encouraging teamwork as a strategy to support staff who work extended shifts or hours and to protect patients from potential harm, (7) considering fatigue as a potential contributing factor when reviewing all adverse events, and (8) assessing the environment provided for sleep breaks to ensure that it fully protects sleep.

Frakes and Kelly (2007) examined shift length, sleep patterns, sleep debt, and technical performance of air medical staff personnel. They suggested that air medical staff members who worked 24-hour shifts had little sleep debt, which was attributed to their ability to nap while on duty.

The IOM has published papers on patient and personal safety as they relate to resident duty hours. In its 2008 report, *Resident Duty Hours: Enhancing Sleep, Supervision, and Safety*, the IOM cites prolonged wakefulness, shifts longer than 16 consecutive hours, the variability of shifts, and the volume and acuity of patient load as factors that increase the risk of harm to patients (IOM, 2008). The risks of being involved in a motor vehicle accident after working more than 24 hours were explored by Johnson (2011). Residents who worked more than 24 hours had a 16% higher risk of having a motor vehicle accident post-call.

A rarely considered factor requiring healthcare providers to be alert relates to emerging technologies such as electronic health records and computerized physician order entry. These technologies improve patient care but require added time and proficiency (Emergency Nurses Association [ENA], 2013).

Professional organizations and regulatory bodies have also addressed the issues of fatigue and shift length. In its 2014 position statement on the topic, the ANA recommends that registered nurses in all care settings perform no more than 40 hours of professional nursing work (paid or unpaid) in a 7-day period. In addition, employers should limit shifts (including mandatory training and meetings) to a maximum of 12 hours in a 24-hour period, including on-call hours worked in addition to actual work hours. The ANA document was written for registered nurses and employers but states that it is relevant to other healthcare providers who collaborate to create and sustain a healthy interprofessional work environment. Another example is found in a current New Jersey law that imposes penalties for reckless driving if the driver is experiencing sleep deprivation (LoSasso, 2011). Research data demonstrate that task performance after approximately 17 hours of wakefulness is comparable to that seen in people who have blood alcohol levels of 0.05 or who are under the influence of alcohol (Buus-Frank, 2005; Lockley et al., 2004; LoSasso, 2011).

Nursing research suggests that shift length affects vigilance and safety. Scott, Rogers, Hwang, and Zhang (2006) and Rogers, Hwang, Scott, Aiken, and Dinges (2004) conducted descriptive self-report studies and found statistically significant increases in errors and near errors when staff nurses worked shifts 12.5 hours or longer. Trinkoff and colleagues (2011) found a significant relationship between nurse work schedules and patient mortality. Scott and colleagues (2007) found a relationship between nurses' work schedules, sleep duration, and drowsy driving that raised concerns for the safety of the nurses and the public.

Insufficient sleep is the critical link between work and fatigue (Akerstedt et al., 2004). Sleep deprivation, resultant fatigue, and interruptions in circadian rhythm

are commonly experienced by nurses performing shift work (Peate, 2007), and NNPs are part of the group of nurses who commonly do shift work (LoSasso, 2011). Variable working shift patterns have been suggested to affect performance, learning, and memory function (Peate, 2007). Fatigue can be predicted by several additional factors, including high work demands, female sex, the supervisor role, and advanced age (Akerstedt et al., 2004).

Disruptions in circadian rhythm, fatigue, and sleep deprivation may affect the NNP's clinical performance during night and extended shifts, with specific impact on levels of alertness (Lee et al., 2003). Additional fatigue factors include time awake, health factors (sleep disorders, medications), environmental issues (light, noise), and workload (Lerman et al., 2012). The potential consequences of altered alertness may include delayed identification or lack of identification of critical markers of clinical deterioration. Effects of fatigue on patient safety include delayed reaction time, delayed processing of information, diminished memory, failure to respond at the appropriate time, impaired efficiency, and inappropriate responses (Dingley, 1996). These alterations in functioning have been summarized as "increased errors of omission and commission" (Lim & Dinges, 2008). Patient safety is threatened when nurses work long and unpredictable hours, especially when the duration of prior awake time increases beyond 17 hours (Berger & Hobbs, 2006). Errors are increased with long shifts: in one study the number of errors was three times higher with more than 12.5 consecutive hours of nursing practice; the majority were medication errors (Phillips & Moffett, 2014).

The relevance of these findings should be considered in relation to work hours and executive functioning necessary for the role and responsibilities of NNPs. Reduction in the occurrence of adverse events among patients requires NNPs to recognize important information from a variety of sources, to integrate complex processes and signs into a sensible thought and decision-making process, and to formulate an accurate, appropriate set of actions or reactions. Extended work shifts for nurses in critical care settings have been associated with decreased levels of alertness and vigilance (Scott et al., 2006). In addition to compromising patient safety, sleep deprivation compromises the well-being of providers who work extended hours. Extended work days can have significant effects on homeostatic balance and circadian rhythm (Johnson, 2011). An increased prevalence of physical and psychiatric disorders—including but not limited to cardiovascular and gastrointestinal disturbances, diminished immunological response, infertility, spontaneous abortions, the birth of premature and low-birth-weight infants, sleep apnea, obesity, miscarriage, mood disorders, and depression—have been reported (National Sleep Foundation, 2008; Peate, 2007). Cognitive difficulties have been cited, as well as long-term consequences of fatigue for nurses (Phillips & Moffett, 2014). Increasing age compounds the physiological and cognitive effects of fatigue (Dean, Scott, & Rogers, 2006). Although research specific to the NNP role in relation to fatigue and shift length is needed, current knowledge of the science of sleep deprivation and fatigue, research from nursing and medicine, and outcome data related to shift length

and patient safety provide a foundation for the following recommendations.

It is important to note the discrepancy in the literature regarding the definition of extended hours. The most common definitions of extended hours are shifts longer than 12, 16, or 24 hours. Recommendations in this document are based on the definition of extended hours as shifts lasting 16 or more hours.

## **Recommendations**

Existing literature supports the concern that fatigue has a negative impact on both recipients and providers of health care. It is prudent to consider that NNPs are affected by fatigue in the same way that other healthcare providers are affected. Therefore, while acknowledging the lack of data clarifying the impact of fatigue on NNPs specifically and recognizing that these professionals are subject to some degree of fatigue-related sequelae, NANNP provides the following recommendations in the areas of education, fatigue management, and system management.

### *Education*

1. Education should be a key component in the recognition and management of fatigue.
2. NNPs must implement fatigue-reduction and fatigue-management strategies. Clinicians may have difficulty assessing their own levels of fatigue and may underestimate the degree of their fatigue (Dorrian, Lamond, & Dawson, 2000; Gaba & Howard, 2002). Thus education of the entire healthcare team is essential to fatigue management.
3. Educational programs should include the issues of sleep physiology and sleep inertia (grogginess upon awakening), personal and professional performance limitations, and identification of fatigue and fatigue-mitigating strategies. Sleep applications for smartphones should be considered as a way of facilitating better sleep practices. Applications can assist with difficulty falling asleep or staying asleep, relaxation, and best awakening time based on sleep-wake cycles (Phillips & Moffett, 2014). However, electronic sleep-tracking tools do rely on Internet data tracking, and security risks must be kept in mind.
4. Educational programs should address the individual's responsibility to be adequately rested and fit to deliver optimal patient care.

### *Fatigue Management*

1. Fatigue-related risks should be alleviated by research-based strategies. One important aspect of fatigue management is observance of good sleep habits and routines. Sleep-hygiene measures should include monitoring sleep hours on both working and nonworking days and nights (Dean et al., 2006). To avoid chronic sleep deprivation, healthy adults should obtain approximately 8 hours of sleep per day (Dean et al., 2006).

2. Disruption of the circadian rhythm should be reduced by providing the individual with an opportunity to sleep in the afternoon before working overnight or encouraging the individual to do this (Landrigan et al., 2004). Even when an individual is adequately rested, working long, irregular hours, particularly at night, can disrupt the circadian rhythm (Ellis, 2008). Additional prevention strategies include minimizing shift rotations and optimizing rest time between scheduled shifts.
3. NNPs who are more than 40 years of age should be aware that they are at increased risk of experiencing fatigue and related physiological and cognitive effects that may affect performance (Reid & Dawson, 2001). Because the average NNP age is reported as 49 years old (NANNP, 2015), this increased risk is a highly relevant factor.
4. Opportunities for rest should be incorporated as dictated by the work environment. Fatigue can occur anytime in a 24-hour period. Napping is an effective nonpharmacologic technique for sustaining alertness (Caldwell, Caldwell, & Schmidt, 2008). Strategic naps of 10–60 minutes have been shown to decrease fatigue and sustain performance (Arora et al., 2006; Rosekind et al., 1995). To maximize the benefit of naps, it is important to provide protected, uninterrupted time so that naps are of adequate length (Caldwell, 2001). The environment must be quiet, secluded (away from the work area), and dimly lit (Phillips & Moffett, 2014).
5. Individuals should observe caution in their consumption of caffeine. The use of stimulants, most commonly caffeine, is a fatigue management strategy often used by clinicians to temporarily improve alertness. Its effectiveness as a stimulant to temporarily improve alertness varies according to individual tolerance (Dean et al., 2006). With the increased consumption of caffeine comes the potential for the interruption of restorative sleep. Various pharmacologic stimulants are available, but information regarding long-term side effects, tolerance, and potential for abuse is very limited (Caldwell, 2001). Behavioral and system counter-fatigue strategies are preferred over drug-based measures.
6. Education about the dangers of fatigue, the causes of sleepiness on the job, and the importance of sleep and proper sleep hygiene is essential. NNPs should assume personal responsibility in the areas of avoiding excessive fatigue and of using fatigue-mitigating strategies whenever possible. Nurses have a responsibility to ensure that their fatigue is recognized and addressed before it becomes a safety concern (Salmon, 2013).

### *System Management*

1. Systems or processes should be designed to prevent errors associated with fatigue in the clinical setting. Collaborative efforts should be made among NNPs, their employers, and institutions to enhance health, safety, and productivity through the development of a fatigue risk management system with periodic review (Lerman et al., 2012). Individual practices and settings should have a written, practice-specific guideline.
2. Scheduling is vitally important. Optimal scheduling patterns may vary depending on the setting; however, the following recommendations are offered with the goal of providing safe, effective patient care and protecting the well-being of NNPs:
  - a. Maximum shift lengths should be 24 hours regardless of work setting and patient acuity.
  - b. A relief-call system should be developed to provide coverage for NNPs who feel impaired by fatigue.
  - c. A period of protected sleep time following 16 consecutive hours of working should be provided.
  - d. A work assignment that compromises the availability of sufficient time for sleep and recovery from work should be negotiated or even rejected (ANA, 2014).
3. Team-based care models (VanEaton, Horvath, & Pelligrini, 2005) should also be used in fatigue management. Key aspects of this model include timely and accurate communication of information among team members, appropriate workload distribution, and use of information and documentation systems. Rather than viewing patient care as the responsibility of a single NNP, those who subscribe to a team-based model consider patient care to be a shared responsibility. Checks of medications, doses, and procedures should be requested as necessary (ENA, 2013).

An inherent value of team-based care is greater conciseness and accuracy in communicating information from one clinician to another, thus ensuring safer sign-offs at the end of shifts. McAllister (2006, p. 300) proposed that continuity of care is a “process that optimizes our use of people, information, and management strategies.”

4. Employers and institutions should prioritize the education of NNPs and all other caregivers to ensure their understanding of (1) the responsibility to be adequately rested and fit to deliver optimal patient care, (2) the effects of fatigue and sleep deprivation, and (3) strategies to mitigate fatigue and maintain alertness. Employers should conduct regular audits to ensure that scheduling policies are maintained and that meal and rest breaks are taken during work shifts (ANA, 2014).



5. Employers should provide fair and sufficient compensation and appropriate staffing to foster a safe and healthful environment (Phillips & Moffett, 2014). Furthermore, employers are responsible for using scheduling practices that align with research and evidence-based recommendations. Every nurse should be able to decline extra working hours or overtime without being penalized (ANA, 2014).

## Conclusions

Workplace fatigue remains a critical issue in health care. NNPs are professionally accountable for ensuring that they are fit to provide patient care, and they should be proactive in minimizing patient and personal safety risks. NNPs are encouraged to collaborate with colleagues and employers to create responsible staffing patterns and work models that use strategies designed to reduce the risk threats to patient and personal safety caused by fatigue.

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