



**National
Association of
Neonatal
Nurses**

**National Association of
Neonatal Nurse Practitioners**

A division of NANN



The Impact of Advanced Practice Registered Nurses' Shift Length and Fatigue on Patient Safety

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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 patients, providers, and employers.

As the professional voice of neonatal nurse practitioners, NANNP recommends that, regardless of work setting and patient acuity, NNPs' maximum shift length in house 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. In addition, it is recommended that NNPs, their employers, and institutions collaborate to implement supportive risk-reduction strategies based on current evidence. This is in the best interest of patient safety and NNP health.

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. Based on current evidence, regardless of work setting and patient acuity, (1) NNPs' maximum in house 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 healthcare providers are susceptible to the negative effects of fatigue and sleep deprivation, NNPs are professionally accountable and, as such, are responsible for minimizing any patient and personal safety risk.

Background and Significance

A number of healthcare organizations, both nursing and other disciplines, have adopted strategies to address concerns related to shift lengths and fatigue as well as the connection with risks to patients and care providers. 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 (e.g., American Nurses Association [ANA], 2014; Texas Nurse Practitioners, n.d.; New York State Education Department Office of the Professions, 2021). NNPs have workflow patterns analogous to those of medical residents or fellows, flight nurses, and 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 both nursing practice and other healthcare disciplines to provide a foundation upon which to form recommendations for shift length for NNPs.

In 2003, the Accreditation Council for Graduate Medical Education (ACGME) began limiting shift length and duty hours of residents and fellows, with revisions in 2011 and 2017. The most recent ACGME program revision took effect in 2017 and was based on stronger evidence than the earlier versions. The revision incorporated new language: "clinical and educational work hours" in place of "duty hours." The limitation of no more than 80 hours per week, averaged over four weeks, was unchanged but clinical hour limits for first-year residents increased from 16 to 24 hours (ACGME, 2011 & 2017). The National Academy of Medicine (NAM), formerly known as the Institute of Medicine (IOM), has published guidelines and recommendations regarding nurses' roles in the protection of patient safety and improved patient outcomes (IOM, 2004). The Agency for Healthcare Research and Quality (AHRQ) contracted with the IOM to study key aspects of the work environment of nurses as it relates to patient safety. Some of the pertinent issues that have risen to the federal and state policy arenas are extended work hours, fatigue, and mandatory overtime (Page, 2008).

The nursing practice of the certified registered nurse anesthetist (CRNA) has some general similarities to that of the NNP. 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 Anesthesiology (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. AANA recommends shift-length guidelines based on variable settings, caseloads, and patient acuity (AANA, 2015). Included in a 2015 AANA document on the topic are considerations regarding minimum required sleep (7–9 hours), effect of circadian rhythm, scheduling in compliance with state and federal statutes and regulations, and the importance of monitoring safety recommendations from relevant organizations such as AANA, AHRQ, Institute for Healthcare Improvement, and NAM.

In the American College of Obstetricians and Gynecologists (ACOG) Committee Opinion “Fatigue and Patient Safety” (2018), a minimum of 5 hours of sleep per night was recommended to help physicians communicate effectively (e.g., during handoffs, to patients). Additional recommendations included training faculty and providers to recognize signs of fatigue and sleep deprivation and the importance of balancing continuity of care and the need for rest.

Another professional organization that has addressed the issues of fatigue and shift length is the American Nurses Association (ANA). In its 2014 position statement on the topic, 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 both on-call hours worked and 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. The American Academy of Nursing on Policy described health and safety risks related to shift work, long hours, and worker fatigue in a 2017 position statement.

NANNP conducted neonatal nurse practitioner workforce surveys in 2011, 2014, 2016, and 2020. The most recent data (2020) revealed that most NNPs still work either 24-hour shifts (41%) or 12-hour shifts with day-night rotation (37%), but these numbers decreased from the 2014 data: when 50% of NNPs worked 24-hour shifts and 46% worked 12-hours shifts with day-night rotation. Although the 2020 survey data reflected that NNPs prefer the 24-hour shift, 77% of those responding do not have protected downtime during those 24 hours. The average age of the NNP workforce is unchanged from 2014 data, with more than 50% older than 50 years of age.

The most recent NNP workforce survey also revealed that 63% of respondents worked more than their scheduled hours (up from 33% in the 2014 survey) and that most NNPs have other duties in addition to those related to patient load during their night shifts. These other duties include 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 averaged 3 hours per shift in 2014 (Kaminski et al., 2015). Less downtime was reported in Level IV neonatal intensive care units (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) (Snapp et al., 2021).

The NNP role is a mainstay staffing option for many NICUs. Shift lengths for NNPs vary and are uniquely related to the dynamics of each NICU. Actual time spent providing patient care during prolonged shifts may vary, as do anticipated periods of rest (Snapp & Reyna, 2019). 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. There is limited data examining mandatory overtime, but it is clear that mandatory overtime presents a higher risk for work-related injury (e.g., needlesticks), illness, and missed shifts (Caruso, 2014). Only 18 of 50 states have legislation against mandatory overtime for registered nurses (WorkforceHub, 2018).

In December 2011, The Joint Commission (TJC) published a Sentinel Event Alert on the connection between healthcare workers' fatigue and patient safety. It acknowledged research linking extended-duration shifts, fatigue, and impaired performance and safety. TJC suggested evidence-based actions to help mitigate the risks of fatigue resulting from extended work hours (2011), including

- assessing the organization for fatigue-related risks, especially during patient handoff
- inviting staff input into designing work schedules to minimize potential for fatigue
- implementing a fatigue management plan that includes scientific strategies for fighting fatigue.
- educating staff about sleep hygiene and the effects of fatigue on patient safety
- providing opportunities for staff members to express concern about fatigue and taking actions to address those concerns
- encouraging teamwork as a strategy to support staff who work extended shifts or hours and to protect patients from potential harm
- considering fatigue as a potential contributing factor when reviewing adverse events
- assessing the environment provided for sleep breaks to ensure it fully protects sleep.

In 2018, TJC issued an addendum to the 2011 document that adds a new resource, *Fatigue and Patient Safety* from American College of Obstetricians and Gynecologists (ACOG), and the 2017 ACGME updated program requirements. Some of the updated TJC suggestion actions were assessment of off-shift hours, handoffs, and staffing (2018).

The IOM (now NAM) has published papers on patient and personal safety as they relate to resident duty hours. In *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, 2009). Additionally, prolonged work hours may result in harm to the provider and others. 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.

It is known that sleep deprivation slows reaction time and decreases the ability to concentrate, retain, and learn (Caruso, 2014). Another example is found in a New Jersey law that imposes penalties for reckless driving if the driver is experiencing sleep deprivation (LoSasso, 2011). The Centers for Disease Control and Prevention (CDC) reports that shift work is a cause of drowsy driving and that “being awake for at least 18 hours is the same as someone having a blood alcohol content (BAC) of 0.05%. Being awake for at least 24 hours is equal to having a BAC of 0.10%. This is higher than the legal limit (0.08% BAC) in all states” (CDC National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health, 2017).

Nursing research suggests that shift length affects vigilance and safety. Scott, Rogers, Hwang, & Zhang (2006) and Rogers, Hwang, Scott, Aiken, and Dingnes (2004) conducted descriptive self-report studies and found statistically significant increases in errors and near errors when staff nurses worked shifts of 12.5 hours or longer. Caruso (2014) found that risks are 15% higher for evening shifts and 28% higher for night shifts when compared to day shifts. When compared with 8-hour shifts, 10-hour shifts increased the risk by 13% and 12-hour shifts increased the risk by 28%. Risk increased by 17% for the third consecutive night shift and 26% for the fourth. In 2011, Trinkoff et al. found a significant relationship between nurse work schedules and patient mortality. Scott et al. (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); NNPs 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).

Circadian rhythm disruptions, 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 (i.e., sleep disorders, medications), environmental issues (i.e., 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; Caruso, 2014). 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, and the majority of errors were medication errors (Phillips & Moffett, 2013).

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 jeopardizes the well-being of providers who work extended hours. Extended workdays 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 (Caruso, 2014; National Sleep Foundation, 2008; Peate, 2007). Cognitive difficulties have been cited, as well as long-term consequences of fatigue for nurses (Phillips & Moffett, 2013). Increasing age compounds the physiological and cognitive effects of fatigue (Dean, Scott, & Rogers, 2006). Older individuals are also more likely to experience sleep problems (33% of women aged 18-24 vs. 48% of women aged 55-64; Caruso, 2014).

Research specific to the NNP role in relation to fatigue and shift length is needed. However, a foundation for the following recommendations is provided by 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. 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 healthcare provider fatigue has a negative impact on both healthcare recipients and providers. NNPs are affected by fatigue the same way 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. NNP program education should include the recognition and management of fatigue regardless of shift length (AANA, 2015). Study areas should include sleep physiology and sleep inertia (grogginess upon awakening), personal and professional performance limitations, and identification of fatigue and fatigue-mitigating strategies.
2. NNP employer education should be aimed at recognition of the relationship between extended working hours and fatigue and burnout. The unique critical care working environment, workload, and scheduling of NNPs should be included in this discussion. Education of the entire healthcare team, hospital administration, and private employers is essential to fatigue management. Workload has been identified by NNPs as a key factor in fatigue on the job (Welch-Carre, 2018; Dye, 2017).
3. NNP self and continuing education should address the individual's responsibility to be adequately rested and fit to deliver optimal patient care. Most employment contracts state that the NNP's responsibility is to come to work "rested and ready for work."

Fatigue Management

4. 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).
5. Disruption of the circadian rhythm should be reduced by providing the NNP with an opportunity or designated time to sleep in the afternoon before working overnight (Landrigan et al., 2004). Working long, irregular hours, particularly at night, can disrupt the circadian rhythm even when an individual is adequately rested (Rogers, 2019). Additional fatigue mitigation strategies include minimizing shift rotations and optimizing rest time between scheduled shifts.
6. NNPs who are older 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 51 years old (Snapp et al., 2021), this increased risk is highly relevant to NNPs. For NNPs older than 50, night-shift hours should be optional (NANN, 2018). NNPs who have worked extended shifts for more than 20 years have an increased risk of health problems and illness (Clendon &

Walker, 2013) and should have the opportunity to work 8-12-hour shifts at their current position and institution.

7. Opportunities for rest should be incorporated as required by the work environment. Tools for tracking and reporting rest should be utilized. Fatigue can occur anytime in a 24-hour period. Napping is an effective non-pharmacological 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, 2013). Any on-call communication device should be handed off with sign-out to a colleague during this protected rest time. Personal phones should be put in Do Not Disturb mode.
8. Individuals should be cautious about consuming caffeine, especially 4–7 hours prior to planned sleep time (AANA, 2015). 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). Increased consumption of caffeine can interrupt 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.
9. Education is essential and should cover the dangers of fatigue, the causes of drowsiness on the job, and the importance of sleep and proper sleep hygiene. NNPs should assume personal responsibility to avoid excessive fatigue and use fatigue-mitigating strategies whenever possible. NNPs have a responsibility to recognize and address their fatigue before it becomes a safety concern (Salmon, 2013). Moonlighting (i.e., working a second job) and overtime hours are the responsibility of the employer and employee and need to be tracked and reported. Primary and secondary employers should be informed of any moonlighting hours by the employee.
10. Nutrition and adequate meal breaks are needed, along with respite time, to reduce fatigue (AANA, 2015).
11. Sleep applications for smartphones should be considered to facilitate 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, 2013). However, electronic sleep-tracking tools rely on Internet data tracking, so security risks must be kept in mind. Screen time on electronic devices during rest times is discouraged and use prior to sleep likely decreases ability to fall asleep, further contributing to fatigue (AANA, 2015).

System Management

12. 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 (including hospital risk management departments), 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 that includes maximum hours worked per week, maximum hours worked per month, maximum number of consecutive shifts, and guidelines and monitoring of moonlighting hours (Blum et al., 2011).
13. 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 wellbeing of NNPs:
 - a. Maximum shift lengths should be 24 hours, in-house, 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 rejected (ANA, 2014). NNPs must be vigilant in pacing their own schedules to avoid fatigue by overscheduling with overtime and moonlighting hours. NNPs must be aware of the consequences of overwork (work hours and patterns) and fatigue-related errors (AANA, 2015). Avoidance of day and night shift swings is important in scheduling of 8–16 hour shifts to avoid drastic changes to sleep patterns. If alternating day/night rotations, consider 1 month on days, then 1 month on nights.
14. Team-based care models (Van Eaton et al., 2005) should be used to manage fatigue. 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 having a single NNP responsible for patient care, team-based models make patient care a shared responsibility. Checks of medications, doses, and procedures should be requested as necessary (ENA, 2013).
15. An inherent value of team-based care is greater conciseness and accuracy in communicating information from one clinician to another, thus ensuring safer hand-offs at the end of shifts. McAllister (2006) proposed that continuity of care is a “process that optimizes our use of people, information, and management strategies.”

16. Employers and institutions should prioritize the education of NNPs and all other caregivers to ensure their understanding of the responsibility to be adequately rested and fit to deliver optimal patient care; the effects of fatigue and sleep deprivation; and 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). They must promote a work culture that allows the employee to express concern of fatigue (TJC, 2018).
17. Employers should provide fair and sufficient compensation and appropriate staffing to foster a safe and healthful environment (Phillips & Moffett, 2013). 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). Mandatory overtime or on-call time as a staffing strategy should be eliminated (ANA, 2014).
18. Extended commutes after long shifts should be discouraged or the NNP should be provided with an opportunity to rest prior to leaving the institution (ANA, 2012). Transportation should be offered to fatigued employees who have completed an extended work shift. Blum et al., (2011). recommend transportation after 24-hour shifts, but we suggest it after 16-hours or longer.
19. Employers must provide safe staffing patterns and patient loads consistently for safe patient care and to provide healthy work environments (Snapp et al., 2021; ANA, 2014).
20. Recruitment and retention of NNPs is dependent on the promotion of healthy work-life balance and on safe staffing patterns and workload. Providing an environment that attracts and retains the NNP workforce is a responsibility of employers and reduces fatigue that is caused by overwork, frequent new hire orientations, and burnout by seasoned NNPs (NANN, 2018).
21. Provider-to-provider handoff is a critical time for error after a long shift. Employers should have standardized electronic health records (EMR) with integrated patient information for the handoff process (Blum et al., 2011).
22. “Home call” should be incorporated into the overall hours worked at each institution and established guidelines for maximum hours worked with a work-relief system built in (Blum et al., 2011).

Future Recommendations

Future study and research areas identified in this position statement are directly related to NANNP’s mission to provide recommendations for patient safety and promote NNP health and wellness. There is a lack of evidence in the literature to answer critical questions about shift length for NNPs (i.e., 12- versus 24-hour schedules) and fatigue, burnout, and job satisfaction were identified as critical areas of question that were

lacking in evidence in the literature. Because the NICU is evolving with increased patient complexity, workload, and NNP responsibilities, research must be conducted to determine whether all healthcare organizations should consider limiting shift length to 12 hours in Level IV units or all practice level nurseries and NICUs by 2030. There is limited evidence regarding patient safety and overall NNP health, so it is recommended that future research grants or areas of study address these questions.

Conclusions

Workplace fatigue remains a critical issue in healthcare and patient safety. NNPs are professionally accountable for ensuring that they are fit to provide patient care, and they should be proactive in minimizing risks to patient and personal safety. NNPs are encouraged to collaborate with colleagues and employers to create responsible staffing patterns and work models that reduce the risk of threats to patient and personal safety caused by fatigue. Employers have a responsibility to limit NNP workloads and schedules to reasonable levels.

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