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 (NNP) often work present potential safety risks for both providers and patients.

Several healthcare organizations have adopted strategies to address these concerns. In 2003 the Accreditation Council for Graduate Medical Education (ACGME) began limiting shift length and duty hours of residents and fellows (ACGME, 2010), which was followed by additional limitations in 2011 (ACGME, 2011). The Institute of Medicine (IOM) published guidelines and recommendations regarding nurses’ roles in the protection of patient safety and improved patient outcomes (IOM, 2004).

As the unifying voice of NNPs, NANNP recommends that shift length be limited as described in this document and further recommends that NNPs, their employers,
and institutions collaborate to implement supportive risk-reduction strategies based on existing evidence.

**Association Position**
NANNP recognizes that research addressing sleep deprivation, fatigue, and patient outcome is limited in the nursing profession and, specifically, in NNP practice. In addition, the uniqueness of the patient population and NNP responsibilities further complicate the delineation of strict scheduling limitations.

NNPs, like other healthcare providers, are susceptible to the negative effects of fatigue and sleep deprivation. It is the position of NANNP that NNPs are professionally accountable and as such are responsible for minimizing any patient and personal safety risk.

**Summary of Recommendations**
- Maximum shift length should be 24 hours, regardless of work setting and patient acuity.
- A period of protected sleep time should be provided following 16 consecutive hours of working.
- The maximum number of working hours per week should be 60 hours.

**Background and Significance**
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 an NNP workforce survey conducted by NANNP (personal communication, P. Timoney, 2011) reveal that among 679 respondents the majority of NNPs work either 24-hour shifts (35%) or shifts with day-night rotation (36%). Day-night rotating shifts tend to be 12 hours. Job satisfaction did not vary with shift length. The highest patient load was associated with night shift or 24-hour shifts.

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 there are no data to support 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. NNPs have workflow patterns analogous to those of medical residents or fellows, flight nurses, or air medical staff (AMS) (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 based on other healthcare disciplines, as well as nursing practice, to provide a foundation upon which to form recommendations for shift length as it relates to NNPs.

In December 2011, The Joint Commission published a Sentinel Event Alert dealing with healthcare worker fatigue and patient safety. They acknowledge the research to date linking extended-duration worked shifts, fatigue, and impaired performance and safety. The Joint Commission has suggested several actions to help mitigate the risks of fatigue that result from extended work hours (The Joint Commission, 2011).

In 2003, the ACGME responded to evidence in the literature suggesting a potential threat to patient safety and resident quality of life and health related to excessive duty hours. Their recommendation was to limit work hours for all residents and fellows. Reports by Landrigan and colleagues (2004) and Lockley and colleagues (2004) suggested reduced incidences of attentional failures and serious medical errors among interns working an interventional schedule with shorter shift lengths compared with those interns working a traditional schedule with extended shift lengths. These findings supported subsequent ACGME regulations.

Patient outcome data evaluating the effect of the 2003 work-hour regulations for residents have been mixed. Outcome studies have shown no evidence of prolonged hospital stays (Silber et al., 2009), changes in mortality (Volpp et al., 2007a; Shetty & Bhattacharya, 2007; Volpp et al., 2009), differences in hospital readmission rates (Press et al., 2011), changes in failure to rescue (Volpp et al., 2009), or changes in morbidity or mortality for specific surgical procedures (Yaghoubian et al., 2010). Volpp and colleagues (2007b) found a significant decrease in mortality for common medical conditions. Bailit and Blanchard (2004) examined the quality of obstetric and gynecologic care after resident work-hour reform. They found a significant reduction in postpartum hemorrhage and the need for neonatal resuscitations but no difference in a number of other obstetric indicators. Frakes and Kelly (2007) examined shift length, sleep patterns, sleep debt, and technical performance of AMS personnel (LoSasso, 2011). They suggested that AMS who worked 24-hour shifts had little sleep debt, which was attributed to their ability to nap while on duty (Frakes & Kelly).

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. 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 (Johnson).
Professional organizations and regulatory bodies have addressed the issues of fatigue and shift length. The American Nurses Association recommended shift length for nurses of no more than 12 hours in a 24-hour period or 60 hours in a 7-day period (ANA, 2006a, 2006b). A New Jersey law imposes penalties for reckless driving if the driver is experiencing sleep deprivation (LoSasso, 2011). There are data demonstrating that task performance, after approximately 17 hours of wakefulness, is comparable to that seen in people with blood alcohol levels of 0.05 or who are under the influence (Buus-Frank, 2005; Lockley et al., 2007; LoSasso, 2011).

In the opinion of the New York State Office of the Professions, nurses who voluntarily work more than 16 hours must be able to demonstrate competence to fulfill professional duties. Working beyond 16 hours will be considered as a factor in determining willful disregard for patient safety and could result in charges of unprofessional conduct (New York State Nurses Association, 2009).

Nursing research suggests that shift length impacts vigilance and safety. Scott, Rogers, Hwang, & Zhang (2006) and Rogers, Hwang, Scott, Aiken, & 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 described the relationship between nurses' work schedules, sleep duration, and drowsy driving (2007).

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 NNPs and 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, 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). The potential consequences of altered alertness may include delayed 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 waking increases beyond 17 hours (Berger & Hobbs, 2006).

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 have been associated with decreased levels of alertness and vigilance of nurses in critical care settings (Scott, Rogers, Hwang, & Zhang, 2006).

In addition to patient safety, sleep deprivation compromises the well-being of providers working extended hours. Extended work days can have significant effects on homeostatic balance and circadian rhythm (Johnson, 2011). There are reports of an increased prevalence of physical and psychiatric disorders, including but not limited to cardiovascular and gastrointestinal disturbances, diminished immunological response, infertility, spontaneous abortions, premature birth and low-birth-weight infants, sleep apnea, obesity, miscarriage, mood disorders, and depression (Peate, 2007; National Sleep Foundation, 2008). 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 that there is 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 considerations of extended hours as shifts lasting 16 or more hours.

**Recommendations**

Existing literature shows 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 manner as other healthcare providers. Therefore, in acknowledgment that there are no data clarifying the impact of fatigue on NNPs specifically and in recognition 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 should be aware that increasing fatigue may result in altered clinical performance and an increased likelihood of committing an error, which may affect patient safety (Dawson & McColloch, 2005). Successful implementation of fatigue-reduction and fatigue-management strategies is dependent on supportive and knowledgeable healthcare team members and institutions.
3. Healthcare professionals should be able to recognize signs of fatigue and be willing to institute appropriate interventions. Researchers have found that clinicians have difficulty assessing their own levels of fatigue and may underestimate the degree of fatigue (Dorrian, Lamond, & Dawson, 2000; Gaba & Howard, 2002), thus educating the entire healthcare team becomes essential.

4. 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.

5. The individual’s responsibility to be adequately rested and fit to deliver optimal patient care should be addressed.

**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 (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 to experience fatigue and related physiological and cognitive effects that may impact performance (Reid & Dawson, 2001).

4. Opportunities for rest should be incorporated as dictated by the work environment. Fatigue can occur anytime throughout a 24-hour period. Napping is an effective non-pharmacologic 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 to allow for naps of adequate length (Caldwell, 2001).

5. Individuals should observe caution with their consumption of caffeine. The utilization 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 depending on individual tolerance (Dean et al., 2006). With the increased consumption of caffeine, there is potential for interruption of restorative sleep. Various pharmacologic stimulants are available, but there is very limited information regarding long-term side effects, tolerance, and potential for abuse (Caldwell, 2001). Behavioral and/or 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 whenever possible and of using fatigue-mitigating strategies.

**System Management**
1. Systems or processes should be designed to prevent errors associated with fatigue in the clinical setting. The success or failure of a policy regarding fatigue management depends on a collaborative effort among NNPs, their employers, and institutions.
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 length of 24 hours regardless of work setting and patient acuity
   b. development of a relief-call system to provide coverage for NNPs who feel impaired by fatigue
   c. provision for a period of protected sleep time following 16 consecutive hours of working.
3. Team-based care models (VanEatton, Horvath, & Pelligrini, 2005) are other systems approaches that should be used in fatigue management. Rather than viewing patient care as the responsibility of a single individual NNP, those who subscribe to team-based concept consider patient care to be a shared responsibility. Key aspects of this model include
   a. timely and accurate communication of information among team members
   b. appropriate workload distribution
   c. use of information and documentation systems.

McAllister (2006) proposed that continuity of care is a “process that optimizes our use of people, information, and management strategies” (p. 300). An inherent value of team-based care is the greater conciseness and accuracy in communicating information from one clinician to another, thus ensuring safer sign-offs at the end of shifts.
4. Employers and institutions should prioritize the education of NNPs and all other caregivers to ensure they understand
   a. the responsibility to be adequately rested and fit to deliver optimal patient care
   b. the effects of fatigue and sleep deprivation
   c. strategies to mitigate fatigue and maintain alertness.

**Conclusions**
Workplace fatigue remains a critical issue in health care. NNPs should be professionally accountable to ensure they are fit to provide patient care and to 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 of fatigue threats to patient and personal safety.
References
Accreditation Council for Graduate Medical Education (ACGME). (2011). ACGME
duty hours. Retrieved January 16, 2012, from
www.acgme.org/acWebsite/dutyHours/dh_index.asp.

Accreditation Council for Graduate Medical Education (ACGME). (2010). Common
Program Requirements. Retrieved August 15, 2011, from www.acgme-
2010standards.org.

Akerstedt, T., Knutsson, A., Westerholm, P., Theorell, T., Alfredsson, L., &
Psychosomatic Research, 57(5), 427–433.

American Nurses’ Association and the Congress on Nursing Practice & Economics.
(2006a). Assuring patient safety: The employers’ role in promoting healthy
nursing work hours for registered nurses in all roles and settings. Retrieved on
January 16, 2011, from
http://ana.nursingworld.org/MainMenuCategories/HealthcareandPolicyIssues/
ANAPositionStatements/All-Position-Statements.aspx.

American Nurses’ Association and the Congress on Nursing Practice & Economics.
(2006b). Assuring patient safety: Registered nurses’ responsibility in all roles
and settings to guard against working when fatigues. Retrieved January 16,
2011, from
http://ana.nursingworld.org/MainMenuCategories/HealthcareandPolicyIssues/
ANAPositionStatements/All-Position-Statements.aspx.

Arora, V., Dunphy, C., Chang, V. Y., Ahmad, F., Humphrey, H. J., & Meltzer, D.
Annals of Internal Medicine, 144(11), 792–708.


hours on the quality of obstetric and gynecologic care. Obstetrics
and Gynecology, 103(4), 613–616.

wakeup call for patients and providers. Advances in Neonatal Care, 5(2), 55–61.


beneficiaries in the first 2 years following ACGME resident duty hour reform. *Journal of the American Medical Association, 298*(9), 975–983.
