



**National  
Association of  
Neonatal  
Nurses**

## **RN Staffing in the NICU**

### **Position Statement #3074**

NANN Board of Directors  
September 2021

Appropriate staffing is required to deliver safe and effective care to NICU patients: vulnerable infants who are wholly dependent on their caregivers. A sufficient number and appropriate mix of qualified registered nurses (RNs) are needed in subspecialty NICUs (Levels II, III, and IV). However, evidence suggests understaffing is a substantial problem, one that puts patients at increased risk of missed or rationed care, medical incidents, disparities of care, and morbidity and mortality. As the professional voice of neonatal nurses, the National Association of Neonatal Nurses (NANN) recommends staffing be based on the acuity of the population served and that the principles of staffing and finance be shared with frontline nurses who then have a say in the development of staffing policies.

## Association Position

The delivery of safe and effective neonatal nursing care requires the assurance of a sufficient number and an appropriate mix of qualified registered nurses (RNs) to attend to the emergent and complex care requirements of critically ill and convalescent infants in subspecialty NICUs (Levels II, III, and IV).

## Background

The issue of staffing is not a new one. In *Notes on Nursing*, Florence Nightingale (1859) observed that “bad sanitary, bad architectural, and bad administrative arrangements often make it impossible to nurse” (p. 59). She went on to discuss what nursing is and is not, describing elements of care that we consider essential to modern nursing care and neonatal nursing care: attention to cleanliness, sanitation, warmth, and nutrition. More than 160 years later, health care has become increasingly complex, and nursing care remains the most essential component of that care.

Health care continues to evolve, and so do nursing services. The 2010 Patient Protection and Affordable Care Act, commonly called the Affordable Care Act (ACA), aims to provide comprehensive health care to citizens of the United States. With the enactment of the ACA have come inevitable changes in the delivery of nursing services as more citizens become eligible for affordable care. In 2011, the Institute of Medicine (IOM)—now the National Academy of Medicine—published *The Future of Nursing*, which addresses issues facing the profession, including staffing. There is evidence of a direct link between nursing care and higher quality of care, including improved patient safety.

According to the American Nurses Association (ANA), appropriate nurse staffing can be characterized as “an ever-present challenge of managing the delicate balance of the polarities of mission (improving population health and the quality and satisfaction for patients, clinicians, and staff) and margin (operations and per capita cost of health care)” (ANA, 2020, p. 5). Appropriate nurse staffing is defined as a match of registered nurse expertise with the needs of the recipient of nursing care services in the context of the practice setting and situation (ANA, 2020 p. 6).

In 2020, ANA revised its *Principles for Nurse Staffing*. The five principles are designed to help nurses at all levels develop and implement appropriate staffing plans. They are

- Characteristics and considerations of the healthcare consumer or patient
- Characteristics and considerations of registered nurses and other interprofessional team members and staff
- The context of the organization and workplace culture in which nursing services are delivered
- The overall practice environment that influences the delivery of care
- Evaluation of staffing plans, overall costs, effectiveness, and resources expended for nursing care (ANA, 2020, p. 65).

ANA also delineates seven core components of appropriate nurse staffing, including

- Registered nurses are full partners working with other healthcare professionals in the collaborative, interprofessional delivery of safe, quality health care.
- All settings should have well-developed staffing guidelines with measurable nurse-sensitive outcomes specific to that setting and healthcare consumer population that are used as evidence to guide daily staffing.
- Registered nurses at all levels within a healthcare system must have a substantive and active role in staffing decisions to assure the availability of the necessary time with patients to meet care needs and overall nursing responsibilities.
- Staffing needs must be determined based on an analysis of consumer healthcare status (eg. degree of stability, intensity, and acuity) and the environment in which the care is provided. Other considerations include professional characteristics, competencies, experience, and skillset; staff mix; and previous staffing patterns that have been shown to improve care outcomes.
- Appropriate nurse staffing should be based on allocating the appropriate number of competent practitioners to a care situation, meeting consumer-centered and organizational outcomes, pursuing quality of care indices, meeting federal and state laws and regulations, and assuring a safe, high-quality work environment.
- Cost-effectiveness is an important consideration in the delivery of safe, quality care. Nurse leaders must evaluate and balance patient care needs and the overall nursing care resources and costs expended for care.
- Reimbursement structures should not influence nurse staffing patterns or the level of care provided (ANA, 2020, p. 6).

## **Significance**

The significance of safe and appropriate staffing in the NICU cannot be understated. The breadth of this population is substantial, ranging from the most immature, small, and/or medically complex patients to infants who are growing and convalescing. What differentiates the NICU population from most other populations is that 100% of the NICU population is 100% dependent upon their caregivers for all care and activities of daily life. There is evidence that understaffing relative to national guidelines is a substantial problem. Rogowski et al. wrote in 2013 that “in 2009, 55% of units understaffed at least 25% of their infants and 16% understaffed at least 50% of their infants” (p. 447). This is a substantial risk to the care of these very high-risk infants. The neonatal population is also particularly vulnerable to events requiring emergency measures, including metabolic disturbances, respiratory emergencies, and cardiovascular events. The need for resuscitation can occur at any time during hospitalization, and adequate and appropriate staffing is required for the necessary care to be provided.

## **Missed Care/Rationing Care**

Nurses' ability to deliver highly reliable care to their patients is critical for sustaining and improving the quality of care. Missed care interferes with the ability to improve the care that is delivered and, therefore, the outcome. Hart et al. (2019) define *nursing workload*

as the time that nurses devote to direct and indirect patient care, workplace activity as well as professional development. Care that is either omitted or delayed is commonly theorized to be an outcome of high nursing workload (Tubbs-Cooley et al., 2019). This high nurse workload can be the result of more assigned patients, higher acuity scores of the individual patients, or higher subjective ratings of workload. In the 2019 study conducted by Tubbs-Cooley et al., missed care was reported at the end of a shift, resulting in less than 1% missing data. Missed care was reported in 98.2% of the nursing shifts. Nurses had patient loads as high as 1:4 (nurses:patients); the mean nursing ratio was 1:2. In 24% of corresponding infant-nurse shifts (2,502 of 10,428 infant shifts), missed care was reported. Nurses most commonly reported missing hourly checks of IV lines and adherence to CLABSI bundles. Interestingly, this study measured subjective workload using the NASA Task Load Index (NASA-TLX) and found that nursing ratios were not the only driver of missing care and that subjective assessment of workload needs was a largely unmeasured and yet predictive aspect of nursing care that led to missed care.

### **Medical Incidents**

Within the context of a study evaluating overtime utilization, nursing provision, and unit occupancy rate, Beltempo et al. (2018) evaluated medical incidents, mortality, or major morbidity among very preterm infants born at less than 29 weeks gestational age or a weight of less than 1000 grams. In this study, the rate of medical incidents was assessed as an indicator of quality of care. *Medical incidents* were defined as “observable errors in the process of care with or without direct consequences on the patient’s health” (Beltempo et al., 2018, p. 176). They found medical incidents occurred on days with lower median nursing provision ratios.

### **Disparity in Care**

The National Academy of Medicine found that “bias, stereotyping, prejudice and clinical uncertainty on the part of healthcare providers may contribute to racial and ethnic disparities in healthcare” (Horbar et al., 2019, p. 459). In the United States, being Black and having low socioeconomic status are major risk factors for preterm birth and are often linked to inadequate access to prenatal care (Engelhardt et al., 2018). A systematic review on racial and ethnic health disparities found that very low birth weight (VLBW) infants born in high-black concentration hospitals have higher rates of infection, discharge without breast milk, and nurse understaffing (Lake et al., 2015). These structural barriers likely translate to higher risk-adjusted VLBW infant mortality and morbidity rates (Sigurdson et al., 2018). *Structural racism* refers to policies, laws, and regulations that systematically result in different access to opportunities based on race. Structural racism paired with social determinants of health can result in healthcare inequities (Johnson, 2020).

Infants born in hospitals with a high concentration of black babies experienced significantly higher patient-to-nurse ratios and had worse outcomes (Sigurdson et al., 2019; Lake et al., 2018). This is concerning as inadequate staffing leads to missed care which can negatively impact outcomes. Nurses in NICUs with a high percentage of

black babies missed 50% more activities than in NICU's with a low percentage of black infants, which were a result of a higher patient-to-nurse ratio (Lake et al., 2018).

Having a global understanding of how healthcare systems operate, including the dissimilar settings in which healthcare professionals and their patients live and work is imperative in understanding how residential segregation impacts access to care and quality of the health-care system and provider (Bailey et al., 2017). The patient-to-nurse ratios and missed care in minority-serving hospitals were much higher than in other hospitals, suggesting that improving staffing and workloads would improve quality of care at minority-serving hospitals (Beck et al., 2020).

### **Morbidity and Mortality**

Beltempo et al. (2018) found that in infants born at less than 29 weeks gestational age or less than 1000 grams weight, the risk of developing the composite outcome of mortality or major morbidity is lower for infants who had high nursing provision ratios. This is true for the infants' first day, first week, and entire NICU hospitalization. Because critically ill infants are a high-risk and unique population for which nurses provide continuous care, the consequences of errors or missed care can be substantial. In addition, fragile neonates who are exposed to adverse events are more likely to experience long-term morbidity (Hart et al., 2019).

Watson et al. (2016) studied the effect of one-on-one care in a tertiary-level NICU. This study found an increased mortality rate in this NICU when a decreased proportion of intensive care days was provided as one-on-one care. Utilizing their estimation of decreased mortality rate, they estimated that the cost of providing this level of care per life saved was the equivalent of \$16,678 (in 2016 dollars). Hart et al. (2019) evaluated insufficient staffing in the NICU and determined that it is associated with missed nursing care. When important and necessary nursing care is missed in the NICU, adverse events and poor patient outcomes are more likely. Neuraz et al. (2015) assessed the impact of the patient-to-nurse ratio and workload on ICU mortality, noting that the risk of death is increased significantly the higher the number of patients allocated to each nurse. Lake et al. (2020) found that 49% of nurses missed at least one nursing care activity with increased acuity load compared to only 27% with low acuity workload. *Missed nursing care* is defined by the study as "required nursing care that is omitted or delayed" (Lake et al., 2020, p. 451). The authors stated that "any missed nursing care has the potential to compromise infant health outcomes in the hospital and in the future as infants grow and develop" (Lake et al., 2020, p. 451).

Reducing the incidence of morbidity is possible and carries with it substantial benefit to the infant, the family, and society as a whole. The likelihood of good long-term health and neurodevelopment is greater than 90% if a VLBW infant is discharged to home without any major morbidity (Kaempf et al., 2019). Major morbidities, as described below, are sensitive to nurse staffing and represent a significant burden.

## *Infection*

Neonatal sepsis is a preventable morbidity associated with increased mortality, increased length of stay, and neurodevelopmental impairment. Appropriate nurse staffing in the NICU is associated with decreased rates of central line-associated bloodstream infections (Cimiotti et al., 2006).

Rogowski et al. (2013) measured understaffing in a variety of units relative to acuity-based guidelines; their data suggested substantial NICU nurse understaffing relative to national guidelines, an understaffing that is higher among high-acuity infants. In this large data set, consisting of 67 hospitals and more than 10,000 infants over 2 years, understaffing was associated with an increased risk of nosocomial infections. They predicted that the infection rate in a unit with no understaffing was 9% compared to 14% at a unit at the median understaffing rate; at the 90th percentile of understaffing, the predicted infection rate rose to 21% (Rogowski et al., 2013).

Hospitals have often used overtime to improve staffing during periods of insufficient staffing. Beltempo et al. (2017) studied nursing staffing, overtime, and unit occupancy, and these factors' effects on hospital-acquired infections. They found increased odds of infection following days of increased overtime utilization, even when controlling for unit confounders. This is consistent with evidence from adult populations, where increased use of overtime is associated with greater fatigue and lower task performance. Fatigue is an important issue for nursing in all clinical areas and beyond the scope of this statement.

## *ROP*

Retinopathy of prematurity (ROP) is a vasoproliferative disorder that has been associated with oxygen exposure in premature infants (Higgins, 2019). Efforts to reduce ROP rates and severity have focused on tight oxygen targeting. Until recently, the optimal oxygen saturation levels were not known. The Surfactant, Positive Pressure, and Oxygenation Randomized Trial (SUPPORT trial) and Benefits of Oxygen Saturation Targeting (BOOST II trial) resulted in findings of increased mortality when infants were managed at the low oxygen target level. In the case of the BOOST trial, it resulted in halting the study early. In a recent meta-analysis, the lower SpO<sub>2</sub> target range was associated with a higher risk of death and necrotizing enterocolitis but a lower risk of ROP treatment (Askie et al, 2018).

Episodes of oxygen desaturation are common in preterm infants and must be responded to promptly to maintain appropriate oxygenation levels in these vulnerable infants. Automated adjustment of oxygen is available only as an experimental device (Waitz et al., 2015) that is unlikely to soon be available for general use. Thus, nurses must be available to respond efficiently to out-of-range alarms. Response to out-of-range events and the effect it has on ROP has been evaluated as part of quality improvement studies. Gentle et al. (2020) evaluated the use of monitor histograms to alert nursing staff to the duration of time infants spent out of range; the study documented an increase in the amount of time spent in the target zone (48.7% to

57.6%) and a decrease in the rate of the outcome “death or severe ROP” (32.1% to 18%).

### **BPD**

An association between staffing and the specific outcome of bronchopulmonary dysplasia (BPD) has not been studied. However, in a study by Beltempo et al. (2018), the composite outcome of death from all causes and major morbidity was associated with lower nursing provision ratios. The authors state that “association of the nursing provision with the composite outcome was mainly related to the bronchopulmonary dysplasia rates, the two being inversely related” (Beltempo et al., 2018, p. 177 ). The data support the need for a nurse’s workload to be aligned with each patient’s unique needs; in this case, the nurse must be able to comply with meticulous respiratory or BPD practice guidelines.

Oxygen targeting issues that affect ROP rates also affect BPD rates. Additionally, the SUPPORT trial (2010) found that the use of noninvasive ventilation or continuous positive airway pressure (CPAP) is associated with the reduction in rate of BPD. This strategy requires increased nursing time because this population requires meticulous monitoring of physiologic status to prevent undesirable outcomes such as pneumothorax or nasal trauma (Roberts, 2011).

### **Feeding**

One of three major tasks a premature or sick infant must accomplish to be discharged from the NICU is feeding. Preterm infants at term equivalent age are more likely to have feeding difficulties than term infants. They may experience

poor arousal, poor tongue positioning, suck–swallow–breathe discoordination, inadequate sucking bursts, tonal abnormalities, discoordination of the jaw and tongue during sucking, lack of positive engagement or discomfort, signs of aspiration, difficulty regulating breathing, and inability to maintain an appropriate state and complete the feeding (Pineda et al., 2020, p. 650).

Late-preterm infants, who may be physiologically stable, may require considerable attention related to enteral feeding. Supporting breastfeeding throughout all infant gestations also can be time intensive (McGrath et al., 2010).

A diet of maternal breast milk has been associated with a decreased risk of necrotizing enterocolitis. In a study evaluating the use of quality improvement methods to reduce NEC, Gephart and Quinn (2019) found that maternal lactation support is paramount to the delivery of NEC prevention practices. Education, instruction, support, and encouragement from skilled nursing staff are essential components to ensuring breastfeeding success which protects the health of babies and their mothers.

In a study evaluating NICU work environments, Hallowell et al. (2016) found that NICUs with better work environments, better educated nurses, and more infants who receive breastfeeding support from nurses have higher rates of VLBW infants discharged home

on human milk. All of these factors contribute to feeding success in convalescent infants in the NICU and require available staff to accomplish this important milestone for discharge,

### **Acuity Scoring**

Rogowski et al. (2015) identified the NICU as a setting with a high nurse-to-patient ratio and determined that in this highly intensive setting, these staffing patterns may not optimize patient outcomes. They found that infant acuity was the sole determinant of nurse workload. The presence of other members of the care team was not associated with nurse-to-infant ratios, and nurse education, experience, and specialty certification were not reflected in nurse-to-infant ratios. Identifying the determinants of nurse staffing based on acuity measurement was an important first step in understanding how outcomes can be improved through adequate nurse staffing levels.

Al-Dweik and Ahmad (2019) stated that “linking nursing shift assignments to patients’ acuity scores may increase the workload balance, achieve equitable nursing assignments, and nurses’ satisfaction” (p. E34). Their utilization of a patient acuity score showed significant improvement in balanced work assignments, potentially improving satisfaction in the areas of workload and standards of nursing care. By using a data-driven acuity-based approach to staffing, nursing care performance can be measured at the individual patient level to customize care while optimizing staffing practices (Welton, 2017).

Utilizing an evidence-based approach, NICU nurses must participate in all levels of staffing within an organization in order to support the high acuity and low volume fluctuations experienced. There is no standardized risk assessment tool or established clinical indicators that allow for the clear identification of equitable assignment distribution that ensures safe delivery of nursing care. Rather than utilizing traditional nurse-to-patient ratio-based assignments, nurses have an extensive interest in operationalizing a process to achieve staffing effectiveness and a healthy work environment.

Proper technologies are needed to support, capture, and communicate patient assignments and patient workload in order to balance economics and quality outcomes. Addressing unique ICN patient needs and the varying needs of patients with different acuity levels can be done by utilizing scoring as a vehicle to determine patient requirements. Ingram and Powell (2018) stated assigning a level of care according to patient needs addresses issues of unbalanced assignments and allows nurses to influence decision-making as stakeholders while building a standard of care. Al-Dweik and Ahmad’s 2019 evidence suggests acuity-based assignments affect patient safety, productivity, patient outcomes, and quality of care—identifying communication, fair distribution, and assignment transparency as key elements.



Nursing workload is an important aspect of NICU nursing that remains largely unmeasured despite the potential for significant intervention (Tubbs-Cooley et al., 2019).

## Recommendations

It is clear that staffing rates matter. Data show that improvement in staffing improves outcomes on multiple levels. This supports stronger staffing ratios. It also is clear that minimal staffing ratios and optimal staffing ratios are different.

We believe that every infant under our community of care should have staffing based on their physiological and psychosocial needs. We, as a community, must work to eliminate inequities where they exist. Inequities in care delivery are unacceptable.

When minimum staffing ratios are set by states, they must be followed, but minimum staffing ratios are just that: minimums. Exceeding minimum staffing ratios is allowable and may be required.

NANN makes the following recommendations regarding appropriate RN staffing of subspecialty NICUs (Levels II, III, and IV).

1. *ANA's Principles for Nurse Staffing* (3rd Ed.) should inform decisions about RN staffing in units where care is given to critically ill and convalescent newborns.
2. Staffing guidelines should be based upon the acuity of the population served. There are few acuity tools developed for NICUs and their applicability from unit to unit has not been established. Nonetheless, the principles of measuring and accounting for acuity are applicable. We recommend each unit evaluate their acuity in a standardized manner with the goal of evaluating nurse-centered outcomes and care delivery, not resource utilization. The goals of any acuity assessment are to allocate an appropriate number of staff to meet unit and organizational goals, pursue quality indices, meet regulatory requirements, and assure a safe, high-quality work environment. Skillset, staff mix, experience, and competencies all play a role in staffing and should be considered when assessing adequacy of any safe staffing plan. Family care, teaching, and support also must be considered in acuity assessment.
3. Because populations and care trends change, we recommend periodic evaluation of the effectiveness of the individual strategy or tool used for measuring acuity. Additionally, we recommend evaluating the unit staffing adequacy to determine if units are meeting staffing goals and patient needs on an ongoing basis. Evaluation of staffing plans should include real-time capturing of missed care. When missed-care events occur, they should be evaluated in sum as an opportunity to discern patterns. When patterns are found, staffing plans should be adjusted or systems should be created to mitigate the frequency of missed care.
4. Development of staffing policy should include formal input from frontline staff in collaboration with nursing administration. The frontline staff's role and proximity to the patient and family provide a unique perspective that must be considered. This

should be a goal for all phases of staffing: planning, implementation, problem solving, and evaluation of effectiveness. Staff participation in staffing-policy development is an important expectation of appropriate staffing, one of six components of a healthy work environment as defined by the American Association of Critical Care Nurses (Blake, 2015).

5. Staff nurses at all levels involved in staffing decisions should learn about principles of staffing and finance. Financial stewardship is a balance between judicious use of resources and appropriate allocation of resources. Both frontline providers and hospital administration have a responsibility in this regard. A financially exhausted healthcare system serves no one's needs. Increasingly, the concept of "value" is cited in making decisions about resource utilization. *Value* has been defined as "providing the optimal outcome per health dollar spent. Improving the value of health care for patients and healthcare organizations requires an understanding and evaluation of the costs and benefits" (Fischer & Duncan, 2020, p. 972). This requires that facilities be transparent regarding factors influencing budgets for staffing. We recommend that facilities utilize existing technologies to evaluate drivers of acuity and support capture of staffing issues, missed care, and adverse outcomes. The goal is to develop strategies to assist staff with these clinical situations. In some instances, nurse extenders may augment but not replace nurses if permitted by local regulations.
6. Census and acuity fluctuations occur; therefore, staffing needs must be tailored to create an equitable and effective method of responding to these changes in order to support a healthy work environment for staff while providing quality patient care. A staff-driven initiative which addresses reserve capacity as well as established and effective float guidelines for staffing will ensure a consistent practice environment. Each unit must develop a process to identify, optimize, and utilize staffing resources. These guidelines will provide a flexible staff floating policy and an order of staff reduction as needed for low census. In units with low patient volumes, a sufficient quantity of staff must be available to immediately respond to emergencies. This means they must be immediately available although they can have other responsibilities, activities that can be temporarily abandoned without consequence, that allow them to respond if and when an emergency occurs. An established list of projects, educational modules, quality initiatives, unit policies and guidelines, chart reviews, and clinical practice updates will leave staff available to respond to emergency situations in times of low census while improving the clinical practice environment and promoting organizational success.
7. Situations involving neonatal specialty care for fewer than six intermediate-care patients or four or fewer intensive care patients require a minimum of two RNs with neonatal expertise and training.
8. Though research about nurse staffing and outcomes in the neonatal population has increased over the past decade, the issue of how to measure acuity and apply it to the NICU environment continues to need attention. This population, like others, is rapidly changing; smaller and less mature infants are becoming more

commonplace. As the population and technology evolve, we must continue to do the same.

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