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Infants in Drug Withdrawal: A National Description of Nurse Workload, Infant Acuity, and Parental Needs

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Abstract

Infants in drug withdrawal have complex physiological and behavioral states requiring intensive nursing care. The study objectives were to describe acuity, parental needs, and nurse workload of infants in drug withdrawal compared to other infants. The design was cross-sectional and involved secondary nurse survey data from 6,045 staff nurses from a national sample of 104 neonatal intensive care units. Nurses reported the care of 15,233 infants, 361 (2.4%) of whom were in drug withdrawal. Three-quarters of hospitals had at least one infant in drug withdrawal. In these hospitals, the mean number of infants in drug withdrawal was 4.7. Infant acuity was significantly higher among infants in drug withdrawal. Parents of infants in drug withdrawal required significantly more care to address complex social situations (51% vs. 12%). The number of infants assigned to nurses with at least one in withdrawal (mean = 2.69) was significantly higher than typical (mean = 2.51). Given infant acuity and parental needs, policies legislating patient-to-nurse ratios should permit professional discretion on number of patients to assign nurses caring for infants in drug withdrawal. Managers and charge nurses should consider the demands of caring for infants in drug withdrawal in assignment decisions and provide support and education.

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Keywords

Neonatal nursing; neonatal abstinence syndrome; Intensive Care Units; Neonatal; Nurses

It is not commonly recognized that a troubling aspect of the U.S. opioid epidemic¹⁻⁴ is drug use among pregnant women.² One out of five U.S. women in a study of 1.1 million women from 2000 to 2007, filled an opioid prescription while pregnant.⁵ Drug use among pregnant women increased from 19.5% in 2000 to 22.8% in 2007.⁵ In the past 10 years, increased maternal drug use has led to an increase in Neonatal Abstinence Syndrome (NAS).⁶ NAS occurs in infants who are exposed to licit or illicit drugs during pregnancy from the mother through the placenta.⁷ The National Institute of Health defines NAS as “a constellation of neurobehavioral features observed in a neonate following antenatal exposure to drugs including opioids, benzodiazepines, and selective serotonin reuptake inhibitors.”⁸ NAS most commonly occurs after in utero exposure to opioids.³

From 2004 through 2013, 2.0% of infants met diagnostic criteria for drug withdrawal in a U.S. study.³ Over this period, the frequency of neonatal intensive care unit (NICU) admissions for this infant cohort increased from 7 cases per 1000 admissions to 27 cases per 1,000 admissions.³ Length of stay in the NICU has also increased for infants in drug withdrawal.³ The median length of stay of infants with NAS increased from 13 days to 19 days in a 2015 study.³ Therefore, the phenomenon of NAS has increased in terms of admission prevalence and proportion of NICU days.

Neonatal nurses manage the complex physiological and behavioral states of infants in drug withdrawal, which begin to develop within 24 hours of birth.⁹ The most apparent signs of an infant in opioid withdrawal include irritability of the central nervous system along with autonomic instability and gastrointestinal tract dysfunction.⁹ Gastrointestinal dysfunctions, like vomiting and diarrhea, are often associated with poor weight gain and dehydration in infants.⁹ Other signs of NAS include tremors, fevers, feeding difficulty, continuous crying and rigidity or hypertonia.⁹ In this study, we use the term “infant in drug withdrawal” rather than NAS because the study survey measure used that term.

Additionally, neonatal nurses are responsible for supporting parents of infants in drug withdrawal. Data from 2015–2016 suggest that parental presence reduces the length of an infant’s opioid treatment.¹⁰ These parents may have more complex needs than other NICU parents. Therefore, it is important to ensure nurses have enough time to provide parental support and encourage involvement in care. However, in a 2014 study, mothers expressed several concerns regarding their experiences when observing their infant’s care in the neonatal unit.¹¹ The core concerns of mothers were: (1) understanding addiction, (2) perceiving a lack of NICU nurse preparedness to teach about addiction, (3) witnessing the infant in drug withdrawal, (4) feeling judged by nurses because of addiction, and (5) trusting the nursing staff to care for the infant.¹¹ Mothers expressed feelings of vulnerability and fear that their infant’s care might be jeopardized if they were to anger the nurse.¹¹ There is little knowledge about how the complex social needs of parents with infants in drug withdrawal differ from parents of other infants. If not prepared or having an appropriate workload, parental needs of infants in drug withdrawal may exceed the capabilities of the nurse.

In addressing the complex needs of parents of infants in drug withdrawal, the neonatal nurse must be knowledgeable and confident about the ethical and legal issues in the care of these infants and their parents. For example, nurses need to understand their state's specific legal regulations about the nurse's role in infants' care.¹² Political dialogue has resulted in a variety of positions regarding the legal rights of women who have abused substances during pregnancy and consequently the infants who are suffering from NAS.¹³ One legal concern is whether or not a fetus is considered a child and if the mother should be charged with child abuse.¹³ A review of 24 judicial opinions from 1977 to 2015 found that all court-based decisions relied on the classification of a fetus in that state.¹³ Laws regarding positive newborn drug screens and state regulations on when to refer to Child Protective Services, based on the Child Abuse Prevention and Treatment Act of 2010, vary by state.¹⁴

Given the gravity of such multifaceted physical, behavioral, parental, legal, and ethical complexities presented when caring for infants in drug withdrawal, it is sensible to investigate how infants in drug withdrawal compare to non-drug withdrawal infants to inform proper nurse assignments based on infant acuity and parental needs. Nurse workloads that account for infant acuity and increased parental needs could allow nurses to spend valuable time including addressing ethical and legal matters for parents. To date, no studies exist to compare the nurse assignment of infants in drug withdrawal as compared to nondrug withdrawal infants in consideration of infant acuity and parental needs. Despite the growing problem of NAS, there is insufficient evidence about how the parental needs for infants in drug withdrawal compare with those of other infants. The purpose of this study was to address these gaps by describing and comparing the acuity, parental needs and nurse assignment of infants in drug withdrawal as compared to infants not in drug withdrawal. In addition, to provide context for the demand for nursing care of this population, we also describe the prevalence and distribution across hospitals of infants in drug withdrawal in a national sample.

Methods

Design

The study was cross-sectional and involved secondary analysis of nurse survey data from 104 NICUs. The sample frame included all infants either in drug withdrawal or not in drug withdrawal infants in U.S. NICUs. For this study, inclusion criteria included all neonatal staff nurses who reported caring for infants on their last shift. Exclusion criteria included neonatal staff nurses who did not report caring for infants on their last shift. In the parent study from which data were derived, hospitals that participated were recruited in 2008 from the Vermont Oxford Network (VON), a voluntary network of hospitals in the U.S. that strive to ensure safe and high quality neonatal care.¹⁵ Purposive sampling for hospitals was employed to best represent NICUs based on the four U.S. regions: Northeast, Midwest, West, and South.

Data Collection

Institutional Review Board approvals were obtained in the parent study prior to data collection from Rutgers University, the University of Pennsylvania, the University of

Vermont, The Ohio State University, Dartmouth College, and all participating hospitals.¹⁶ Staff nurses submitted web-based surveys that included questions about their last shift worked and nurse demographic information. Nurses responded to questions about infants assigned on the most recent shift. Questions included number of assigned infants, each infant's acuity, notable events that occurred for each infant on the past shift such as admission, discharge, infant death, and whether the infant was in drug withdrawal, and if an infant's parents were present on the unit and needed additional nursing attention. Response rate for the nurse survey was 77%. Data from the American Hospital Association Annual Hospital Survey were used to describe characteristics of the hospital sample. Data from the Vermont Oxford Network were used to describe NICU level of care.

Measures

Infants assigned—To measure infants assigned to each nurse, the question stem was, “How many infants were assigned to you on your last shift? Please include all infants regardless of whether you were assigned to them the entire shift or only part of a shift.” Response options included indicating a number of infants ranging from one assigned (1) to six assigned (6), or choosing a response to indicate that more than six infants were assigned (7).

Infant acuity—The question stem to measure infant acuity was, “Please indicate the acuity of each infant assigned to you during your last shift.” The following five categories served as response options for indicating infant acuity: (1) continuing care, (2) requiring immediate care, (3) requiring intensive care, (4) requiring multi-system support, and (5) unstable, requiring complex critical care.¹⁶ Definitions of these acuity levels have been published.¹⁶ A panel with expertise in neonatal care, including a neonatologist and neonatal nurse specialist, developed the infant acuity measure used in this study.¹⁶ Using guidelines from Landis and Koch (1977)¹⁷, inter-rater reliability for this infant acuity classification measure was found to be acceptable ($k = 0.79$).¹⁶

Parental presence and needs—Nurses reported whether parents of each infant were present less than or more than half of the shift or not present. Nurses were also asked, “Did the presence of this infant's family require additional time beyond what would have been required had the family not been present?” Response options were either yes or no. To measure parental needs, the question stem was, “Please indicate which of the following factors or activities required your time in caring for this infant's family.” For each infant assigned, options included indicating language or cultural needs, complex social situations (e.g. drug use or addiction, housing), limited parenting skills, breast feeding support, emotional support to parents, routine bedside teaching, parent teaching beyond routine bedside teaching, formal teaching or training sessions (i.e. CPR) and, other specified needs.

Data Analysis

Data were analyzed using Stata 15.0. Hospital, NICU, and nurse characteristics were summarized with descriptive statistics. The presence or absence of an infant in drug withdrawal for each sample NICU was depicted in a map. The percent of infants in drug withdrawal overall, the mean frequency of infants in drug withdrawal, and the percent

distribution of infant acuity, parental presence, need for additional nurse time, and presence of complex social needs were calculated from the infant data. The frequency of infants in drug withdrawal was aggregated to the hospital level and displayed in a graph. Mean and SD for nurse workload for both infants in drug withdrawal and non-drug withdrawal infants were calculated from the nurse data. Statistical significance of the comparisons of infant acuity and parental needs distributions was evaluated with Chi Square tests. Statistical significance of the comparisons of nurse workload for infants in drug withdrawal and non-drug withdrawal infants was determined through an unequal variances one-sample t-test.

Results

Characteristics of Hospitals and Nurses

There were 104 hospitals in the sample. The majority of hospitals were located in the South (31%), followed by the Midwest, Northeast, and West (see Table 1). The majority of NICUs (57%) were capable of performing major surgery. Across the 104 hospitals, nurse respondents ($n = 6,045$) reported about the care of 15,233 infants. Sample nurses were highly experienced (15 or more years), 32% held specialty certification, and over half had a BSN degree. The characteristics of the typical nurse caring for an infant in drug withdrawal were similar to those of other sample nurses (results not shown).

Infant Drug Withdrawal Prevalence

Of 15,233 infants, 361 (2.4%) were in drug withdrawal (Table 2). There were no infants reported to be in drug withdrawal for 27 of the 104 hospitals. There was at least 1 NICU with an infant in drug withdrawal in 34 out of 36 states in this sample (Figure 1). Pennsylvania and California had disproportionately more NICUs with drug-withdrawal infants (7 and 6 respectively). Three quarters of hospitals ($n = 77$) had a report of at least one infant in drug withdrawal. Among these hospitals, the number of infants in drug withdrawal ranged from 1 to 22. The mean number of infants in drug withdrawal across the 77 hospitals was 4.7.

Infant Acuity and Parental Needs

Infants in drug withdrawal had a statistically significantly higher acuity than non-drug withdrawal infants ($\chi^2 = 9.67$, $p < 0.05$) (Table 2). Seventeen percent of infants in drug withdrawal were in the two highest acuity categories (“requiring multi-system support” and “unstable, requiring complex critical care”) as compared to 12% of non-drug withdrawal infants. Almost half of infants had a parent present on the most recent shift, which did not differ among the two subgroups of infants ($\chi^2 = 3.4$, $p = 0.18$) (Table 2). However, among parents present, a significantly larger fraction of infants’ in drug withdrawal had parents who required additional nurse time (83% vs. 76%; $p < .05$), compared to parents of non-drug withdrawal infants. Among parents who required additional nurse time, a significantly larger fraction of infants’ in drug withdrawal had parents with a complex social situation (51% vs. 12%; $p < .001$) (Table 2). When considering all needs of parents who required extra nurse time, the percentage of time needed to address complex social needs was greater for infants in drug withdrawal as compared to non-drug withdrawal infants (20% vs. 6%) (Figure 2a and 2b).

Nurse Workload

There were 343 nurses assigned to care for at least one of the 361 infants in drug withdrawal. The mean patient load for nurses caring for at least one infant in drug withdrawal was 2.69, which was significantly higher than for other nurses' mean patient load of 2.51 infants ($t = 3.5$, $p < 0.001$) (Table 3).

Discussion

We were motivated to explore the needs of infants in drug withdrawal to better inform nurse staffing guidelines based not only on number of infants assigned, but parental complexities and infant acuity. The purpose of this study was to describe the nurse assignments, acuity, and parental needs for infants in drug withdrawal as compared to other infants. Our major findings are that 1) nurses caring for infants in drug withdrawal have higher workloads, 2) infants in drug withdrawal are higher acuity, and 3) parents of infants in drug withdrawal require more time and manifest more complex social needs. These findings should alert nurse managers and NICUs administrators to recognize that nurses caring for infants in drug withdrawal may be overloaded and that more nurse staffing or time are required to address the complexities of this population.

The low but widespread prevalence of infant drug withdrawal across the United States suggest that neonatal nurses must have adequate time to uphold their ethical and legal responsibilities in the care of this vulnerable, complex population. Nurses in all regions across the U.S. might not be prepared for a vulnerable population who have unique challenges due to infrequent cases. Nevertheless, neonatal nurses hold a variety of ethical expectations as detailed in the American Nurses Association Code of Ethics¹⁸ and therefore must be prepared to meet the challenges of caring for infants in drug withdrawal. Ethical principles drive the nurse's motivation and actions when caring for the patient, especially in the context of infants in drug withdrawal.¹⁸

Neonatal nurses caring for infants in drug withdrawal may face a significant amount of moral and ethical challenges.¹⁸ Such ethical issues that NICU nurses face were illuminated in a qualitative study.¹⁸ The results detailed the two primary moral principles of beneficence and nonmaleficence that caused NICU nurses to feel most challenged.¹⁸ NICU nurses struggled with beneficence as they felt their obligation to do good was not being fulfilled when they could not calm the infant or effectively communicate with the parents.¹⁸ Nonmaleficence was exhibited in the nurses' anxiety of releasing the infant from the NICU to a possibly unstable home.¹⁸ In addition to the ethical principles of beneficence and nonmaleficence, justice and autonomy are moral principles that could be difficult for neonatal nurses to uphold when caring for patients with NAS and their parents.¹⁹ In the neonatal nursing context, justice can be defined as treating the patient outside the context of social, racial and economic factors and autonomy can be defined as the right of the patient to do as she chooses to her body.¹⁹

Nurse managers can deploy resources to support their nurses facing ethical dilemmas. These resources include another care professional such as a social worker, patient advocate, or hospital chaplain. If the hospital has a patient care ethics committee, the manager may invite

a representative to hold a session with the staff on how to deal with the distress the nurses may feel or to hold “care rounds” on such patients. Workshops, or nursing education modules, can educate staff about the legal implications in their state for a mother of an infant in drug withdrawal. The responsibilities of nurses for mandatory reporting of illegal substance use by the mother vary by state.²⁰ Given the staff nurse’s understanding of mothers with substance abuse issues gleaned from caring for the infant in a therapeutic relationship, nurses should also know the hospital policy for how to facilitate the best care and protection for the mother and baby.

Our data revealed that infants in drug withdrawal required significantly more nurse time for parents who had more complex social needs compared to parents of other infants. The neonatal nurse must ensure that the parents of the infant are prepared to care for the child after discharge, and unaddressed complex social needs could be detrimental. Our finding that parents require more time to address complex social needs is consistent with qualitative findings about the concerns of mothers of infants in drug withdrawal who struggled with understanding addiction.¹¹ Specifically, they expressed their concern that neonatal nurses were unprepared to provide care due to their lack of education on addiction.¹¹ Second, mothers struggled with watching the infant in drug withdrawal.¹¹ Third, mothers often feel negatively judged by the nursing staff because of their addiction.¹¹ Literature suggests that the treatment of addiction as a crime is not an effective method for treating the problem of opioid addiction in mothers.²¹ The focus should be on collaborating with the mother to develop a treatment plan. Lastly, mothers struggle with trusting the nursing staff to care for their infant.¹¹ Nurses should encourage parental presence, which has been associated with better infant health outcomes such as reduced drug withdrawal symptoms and reduced total time required for drug treatment.¹⁰

In order to provide tailored care to support to mothers of infants in drug withdrawal, nurses must understand that mothers with drug addiction disorders are often trauma survivors.²² Neonatal nurses have an ethical responsibility to care for mothers with this consideration to prevent re-traumatization.²² One example of this would be to consider emotional needs of the mother first before implementation of broad unit policies, such as restrictions on visitation hours. Making an exception for a mother of an infant in drug withdrawal to spend additional time with the infant in the context of visitation restrictions would be one effort to deliver trauma-informed nursing care.²²

Neonatal nurses caring for infants in drug withdrawal manage multiple responsibilities and demands due to these infants’ symptoms, increased acuity and complex parental needs of this population.^{23,24} Therefore, it is concerning that nurses who cared for infants in drug withdrawal were given higher workloads, as revealed in our data. In addition to the stress of caring for infants in drug withdrawal, their nurses are at increased risk for compassion fatigue²⁵ due to their higher workloads. Compassion fatigue is the inability to express empathy due to mental and physical exhaustion from overwork.²⁶ Charge nurses should recognize the potential for a nurse caring for an infant in drug withdrawal to develop compassion fatigue and intervene. Further, charge nurses could implement a teamwork philosophy of care, which incorporates the needs and capabilities of individual staff nurses, when determining patient assignments.²⁵

Infants in the drug withdrawal cohort were significantly more acute than infants who were not in the drug withdrawal. Given the greater acuity of infants in drug withdrawal, it is important for each NICU that treats infants in drug withdrawal to be prepared to care for this vulnerable population. However, there is a lack of consistency in nursing interventions across NICUs.²³ Nurses are challenged significantly due to the lack of clear clinical practice guidelines.²³ One study found that nurses underrate the level of knowledge, patience and commitment to newborns needed to care for infants in drug withdrawal.²⁴ Increases in infants' length of stay and the lack of consistent guidelines for NICU nurses creates ongoing nursing challenges, and increases the amount of resources, support and funds used over this extended period of time.²³ Nursing care challenges could be better resolved by addressing what is encompassed in nurse education and specific nursing practice guidelines.^{23,24}

Given the acuity and parental complexities involved, neonatal nurses must rapidly recognize and communicate signs of drug withdrawal to physicians for an appropriate diagnosis, care plan, and treatments.²³ Infants in drug withdrawal require nurse specific interventions including methods for drug-use identification, bedside interventions to address drug withdrawal symptoms, and tracking withdrawal symptoms often using the Finnegan Scoring System (FSS).²³ The FSS measures variables such as sleep disturbances, startle reflex, and the presence of tremors disturbed and undisturbed providing a comprehensive overview of the infant's signs of drug withdrawal.²⁷

Many factors are taken into account in present recommendations for determining NICU nurse to patient ratios including the assessment of the infant, nursing staff, nursing unit characteristics and acuity.²⁸ In one study, it was found that nurse workloads in NICUs was principally based on infant acuity, while nurse education, experience and specialty certification were not influential to nurse staffing ratios.¹⁶ Our study builds upon these findings by revealing that the specific staffing needs of infants in drug withdrawal need to account for parents' complex social needs in addition to infant acuity.

Our findings extend the theoretical idea of considering nurse competencies and specific infant needs for better patient outcomes (i.e. the American Association of Critical Care Nurses Synergy Model).²⁹ Complex parental needs, legal and ethical challenges, and nurse readiness to meet these challenges must be considered when assigning nurses to care for infants in drug withdrawal. Data from other nurse staffing and infant acuity research indicates that nurse staffing has not accounted for infant acuity optimally.¹⁶ More research is needed about NICU nurses caring for infants in drug withdrawal and their specific knowledge and readiness to address complex legal and ethical needs of parents with infants in drug withdrawal. Future research could also generate further guidance for the creation of patient-to-nurse staffing ratio policies that consider professional discretion to assign fewer patients and well-prepared nurses to care for an infant in drug withdrawal whose parents may have complex social needs.

The 2008 data may not fully represent current situation. However, it is well know that opioid addiction has increased in the interim. Recent literature notes that opioid use disorder among pregnant women is at an epidemic level in the United States.³⁰ One study found that admissions of pregnant women who reported prescription opioid use to substance abuse

treatment centers increased from 2% in 1992 to 28% in 2012 in the U.S.³¹ Therefore, it is likely that the issues our study reveals would have become more pronounced.

Conclusion

Nurse workload is higher, infant acuity is higher, and complexity of parent needs are greater for infants in drug withdrawal. Infants in drug withdrawal require more hospital resources, such as more staff nurse time, due to higher acuity and complexity of parent needs. The ethical²⁴ and legal¹³ complexities of caring for infants in drug withdrawal require hospitals to allow for sufficient nurse staffing to care for this vulnerable population. Policies legislating patient-to-nurse ratios should permit professional discretion to account for patient acuity in order to ensure that infants in drug withdrawal have adequate resources to achieve better health outcomes.

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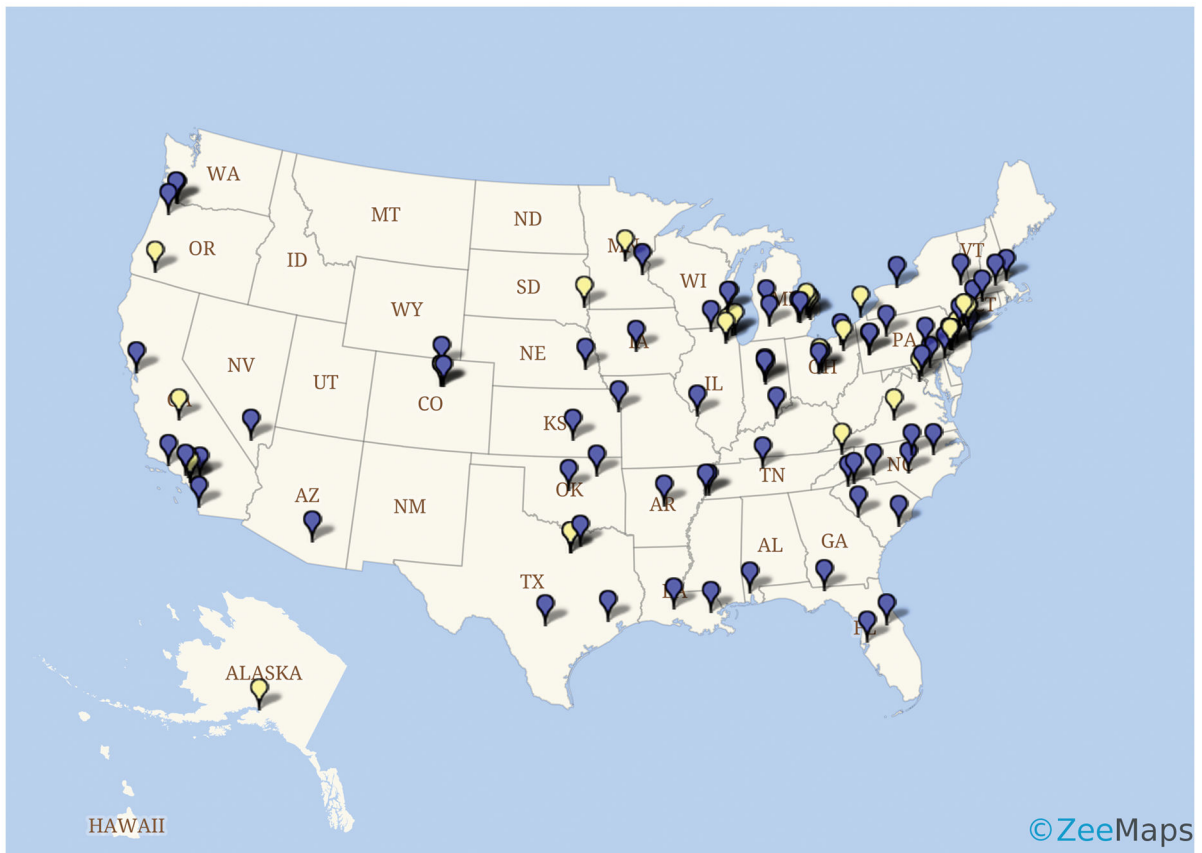


Figure 1. Blue markers indicate hospitals that had at least one infant in drug withdrawal. Yellow markers indicate hospitals with no infants in drug withdrawal.

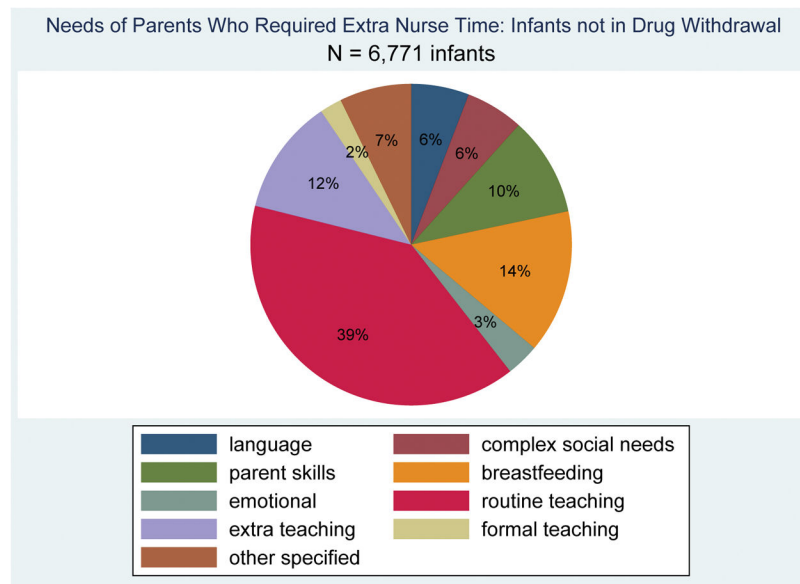
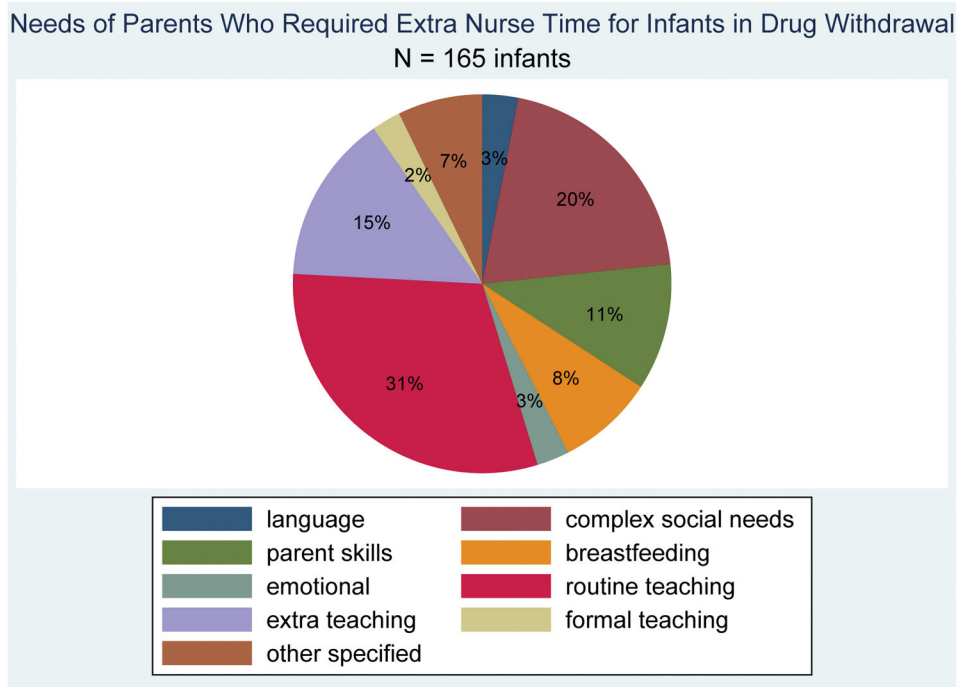


Figure 2.

Figure 2a. Needs of Parents Who Required Extra Nurse Time for Infants in Drug Withdrawal N = 165 infants

Figure 2b. Needs of Parents Who Required Extra Nurse Time: Infants not in Drug Withdrawal N = 6,771 infants

Table 1

Characteristics of Hospitals and Nurses

	<i>n</i>	%
<i>Hospital Characteristics (n = 104)</i>		
Geographic Region		
Midwest	30	28.9
Northeast	22	21.2
South	32	30.8
West	20	19.2
<i>Neonatal Intensive Care Unit Level (n = 104)</i>		
A (restriction on ventilation, no surgery)	15	14.4
B (major surgery)	59	56.7
C (open heart surgery permitted)	30	28.9
<i>Nurse Characteristics (n = 6,045)</i>		
Registered Nurses	5,969	98.8
Licensed Practical Nurses	74	1.2
<i>Years Worked as Neonatal Nurse (n = 6,028)</i>		
<1	419	7.0
1 to <2 years	475	7.9
2 to <5 years	1,009	16.7
5 to <10 years	1,236	20.5
10 to <15 years	694	11.5
15 or more years	2,195	36.4
<i>Education (n = 5,966)</i>		
Diploma	712	11.9
Associate Degree	1,763	30.0
BSN	3,353	56.2
MSN or higher	138	2.3
Neonatal Nurse Certification (n = 5,969)	1,916	32.1

Note. Nurse characteristic *n*'s vary due to missing data.

Table 2

Descriptive Statistics for Infant Acuity and Parental Needs

	Infants in Drug Withdrawal %	Infants not in Drug Withdrawal %	<i>p</i>
	(<i>n</i> = 361)	(<i>n</i> = 14,872)	
<i>Number of Infants</i>	2.4	97.6	-
<i>Acuity of Infants</i>	(<i>n</i> = 361)	(<i>n</i> = 14,869)	<0.05
Continuing care	30.2	31.0	
Requiring intermediate care	31.0	29.8	
Requiring intensive care	21.6	26.7	
Requiring multi-system support	11.6	8.4	
Unstable, requiring complex critical care	5.5	4.1	
<i>Parental Presence</i>	(<i>n</i> = 360)	(<i>n</i> = 14,851)	0.18
No	45.0	40.3	
Yes, less than half the shift	42.8	47.1	
Yes, more than half the shift	12.2	12.6	
<i>Required Extra Time for Parent Present</i>	(<i>n</i> = 198)	(<i>n</i> = 8,855)	<0.05
No	16.7	23.5	
Yes	83.3	76.5	
<i>Parents had Complex Social Needs</i>	(<i>n</i> = 165)	(<i>n</i> = 6,771)	<.001
No	49.1	88.5	
Yes	50.9	11.5	

Percentages may not add to 100 due to rounding. χ^2 tests were used to determine statistical significance of differences.

Table 3Description of Nurse Workload ($n = 6,045$)

	<i>n</i>	Mean	SD	<i>p</i>
Nurses with at least one infant in drug withdrawal	343	2.69	.93	<.001
Nurse workload for all nurses in the sample	5,702	2.51	.86	

Abbreviations: SD= standard deviation

T-test was used to test to determine statistical significance of differences.

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