

EXECUTIVE SUMMARY

Title: Fostering the Optimal Contribution of Nurses to Parental Engagement in Neonatal Intensive Care

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Investigator and Mentor: Eileen T. Lake, PhD, RN

Funding: 2014 Sigma Theta Tau International Small Grants Award (\$5000)

Summary of project aims:

Parental presence in the neonatal intensive care unit (NICU) is a building block of family-centered care (FCC), a concept that has been associated with improved patient outcomes^{1,2}. Ensuring that families are partners in the health care of their family member is a priority of the National Quality Strategy led by Agency for Healthcare Research and Quality on behalf of the U.S. Department of Health and Human Services (HHS) and mandated by the Affordable Care Act³. Families, especially mothers may participate in crucial activities such as skin-to-skin care (SSC) which may be used to achieve thermoregulation in preterm infants, and is particularly important for mothers who choose to breastfeed since SSC stimulates a cascade of chemical events that initiates the production of human milk⁴⁻⁶. We need to understand the bases for parental presence in order to have successful FCC in the NICU.

Nurses have been described as the gatekeepers of infant care in the NICU and FCC is largely dependent on the ability of the nurse to have the time, training and expertise to support families when they are present in the unit¹. The relationship between NICU nursing characteristics and parental presence has not been explored.

The organizational context within the NICU specifically the work environment may be a contributing factor to the establishment of the nurse-family relationship and whether parents spend time with their hospitalized infants. Evidence has linked the work environment to patient outcomes in infant populations⁷⁻⁹. However, less is known about how NICU work environments may be linked to outcomes related to family/parent presence. The nurse-patient relationship is unique in the NICU because nursing care is shared between the maternal and infant dyad.

We hypothesized that hospitals foster the optimal contribution of NICU nurses' work by having better work environments, higher acuity-adjusted nurse staffing ratios and more nurses educated at a baccalaureate level or higher. The optimal nurse contribution was conceptualized as achieving a higher fraction of parents present in the NICU to create opportunities for nurses to prepare to parents and families for infant care and ultimately, for hospital discharge.

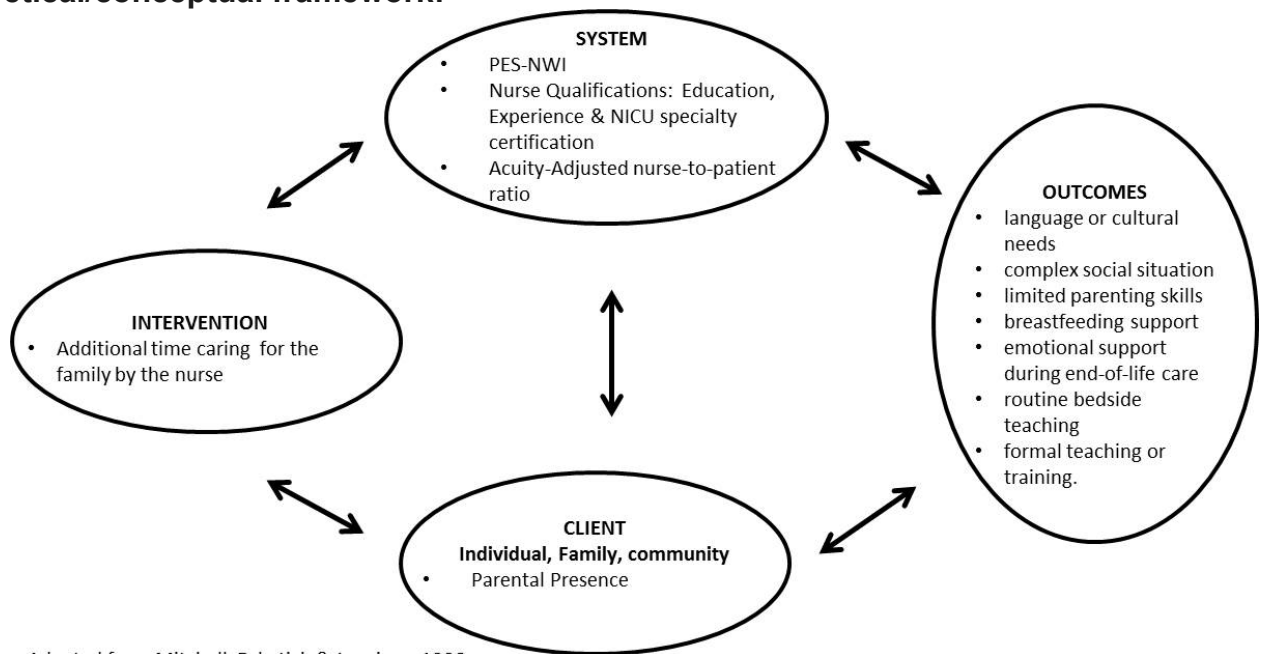
The objective of this study was to examine the associations between the NICU nurse work environment and nurse reports of parental presence utilizing novel data from a large national sample of U.S. NICUs. This study utilizes data on nurses' actual activities with parents to determine whether certain NICU nursing characteristics foster parental presence and provides a first glimpse of the associations between nursing unit level elements: the NICU work environment, the acuity-adjusted nurse ratio, and

qualifications of nurses, parental presence in the NICU. This body of work fits into the larger body of evidence linking organizational nursing factors to health care quality in the United States.

Aim 1. To describe the presence of parents in the NICU and nursing care activities (addressing language or cultural needs, complex social situation, limited parenting skills, providing emotional support during end-of-life care, routine bedside teaching or formal teaching or training) that required additional time beyond what would have been required had the family not been present.

Aim 2. To examine the relationship between three organizational nursing factors (hospital work environment, acuity-adjusted nurse staffing ratio and nurse education), the rate of parental presence, and nursing care activities involving NICU parents.

Theoretical/conceptual framework:



Adapted from Mitchell, Feketich & Jennings, 1998

Figure 1. Quality Health Outcomes Model

The relationship between NICU nursing organizational factors and nurse-reported outcomes related to parental presence will be explored using the Quality Health Outcomes Model (QHOM)¹⁰ developed by the Expert Panel on Quality Health Care by the American Academy of Nursing. The QHOM model identified the bi-directional nature of the intervention, system, outcomes and client domains. The effect of NICU nurse interventions (additional time caring for the family by the nurse) will be mediated by both system and client domains, rather than having an independent effect on the outcomes related to parental presence, as illustrated in Figure 1. The study will examine several outcomes related to nurses’ work with parents when present in the

NICU: language or cultural needs, complex social situation, limited parenting skills, breastfeeding support, emotional support during end-of-life care, routine bedside teaching and formal teaching or training.

Methods, procedures and sampling: The survey data originated from the parent study, “Acuity- adjusted staffing, nurse practice environments and NICU outcomes” (Dr. Lake, principal investigator), funded by the Robert Wood Johnson Foundation Interdisciplinary Nursing Quality Research Initiative program. Nurse survey data were collected in March 2008 from 104 NICUs nationally. All NICUs were members of the Vermont Oxford Network (VON www.vtoxford.org), a voluntary collaborative dedicated to the quality and safety of care for newborns and their families. NICUs were recruited from all US VON NICUs. In 2008, the US VON contained 578 hospitals representing approximately 65% of NICUs and 80% of all VLBW infants born in the United States⁸. Sigma Theta Tau International funded the current study. Institutional review board approval was obtained for this project from the University of Pennsylvania. The parent study received IRB approval both from the University of Pennsylvania and Rutgers University.

Design: A retrospective, cross-sectional study to examine the outcome of interest; the presence of parents in the NICU and the nurses’ work with parents.

Subjects and Setting: A sample of 104 NICUs nationally participated in the parent study data¹¹. These NICUs were broadly representative of all US VON NICUs and represented 18% of the VON members in 2008. The sample had disproportionately more not-for-profit teaching, and children’s hospitals compared with total VON members. Hospitals with Magnet designation comprised one-third of the study sample, compared with about a quarter of the VON. NICUs were classified into the following 3 VON levels: level A (restriction to minor ventilation, no surgery), B (major surgery), and C (cardiac surgery and extracorporeal membrane oxygenation)¹². These correspond to high level II and level III units in the American Academy of Pediatrics classification¹³.

A web survey of all registered nurses who worked at least 16 hours per week and had been employed at least 3 months was used to collect the parent data. The response rate was 77% (n = 6060 nurses reported about the care of 15 233 infants). In addition, nurse managers provided data about the size of each NICU (total nursing staff and number of beds).

The sample will be derived from a single data source:

104 NICUs, where 6060 nurse survey respondents reported on the characteristics of their unit and on 15,233 infants they cared for on the last shift they worked. Eligible respondents were full or part-time staff registered nurses (RN).

Organizational Nursing Factors

Practice Environment.

The Practice Environment Score of the Nurse Work Index (PES-NWI) will be used to measure the degree to which certain aspects of a professional practice environment, including staffing, were present in the nurse's current job^{14,15}. Multiple studies have demonstrated the predictive and discriminant validity of this 31-item, 4-point Likert-type instrument^{14,16-18}. The survey responses were strongly disagree, disagree, agree, and strongly agree. The PES-NWI items are categorized into five subscales that measure the following practice environment domains: nurse participation in hospital affairs, nursing foundations for quality of care, nurse manager ability, leadership and support of nurses, staffing and resource adequacy, and collegial nurse-physician relations. A score of 2.5 is the midpoint between agree and disagree, a score of 3 or greater indicates agreement that the element is present in the job¹⁵. The average of the subscale items will be computed.

Staffing

The acuity-adjusted nurse staffing ratio will be measured as the observed-to-expected ratio based on the acuity mix of the infants. This ratio was determined by the parent study where researchers in collaboration with the National Association of Neonatal Nurses (NANN) developed acuity definitions to classify infants into five categories from lowest to highest acuity¹¹. The observed nurse-to-patient ratio for the unit was computed as the mean nurse-to-patient ratio for nurses in the unit. The expected ratio for the unit was computed based on the number of infants in each acuity level. The observed-to-expected staffing ratio for each NICU was computed as the observed ratio divided by the expected ratio for the unit.

Nurse Education

NICU nurse qualifications comprised the percentages of nurses with a BSN or higher degree. NICU-level measures were constructed for all variables. Missing data from nurses' responses to PES-NWI items was less than 1%. Missing data on activities with parents were minimal because the survey included a verification series in which respondents verified the data they had entered about their infant assignment and activities with parents.

Family Centered Care Measures

Parental Presence.

Parental presence will be measured by the response "Yes" to the question "Were parents of this infant(s) present on your last shift?. Responses indicating yes" less than half the shift" and "more than half the shift" will be coded yes in response to the survey question.

Nursing Care Activities Involving Parents.

Nurses' work with parents is comprised of seven categories: language or cultural needs, a complex social situation, limited parenting skills, emotional support during end-

of-life care, routine bedside teaching and formal teaching or training. Extra time with the nurse will be measured by the response “Yes” to the question “Did the presence of this infant(s) family require additional time beyond what would have been required had the family not been present on your last shift?”

Data Analysis:

Aim 1: Descriptive statistics were used to describe the hospital sample and NICU nursing characteristics, parental presence, and care activities with parents. Bivariate relationships were assessed between the independent variables—nurse practice environment subscales and composite, and the dependent variable—parental presence.

Aim 2: Independent variables with correlation with the dependent variable at $p < 0.05$ were analyzed in a bivariate linear regression model. The dependent variable was the percent of infants that whose parents were present in each NICU. Continuous practice environment variables were standardized for ease of interpretation. The statistical significance level was $p < 0.05$ for a 2-tailed test. Analyses was conducted using Version 14.0.¹⁹

Summary of findings: The majority of NICUs (57%) in the sample provided mid-level care (level B) (Table 1). The sample had a larger proportion of higher level (C) NICUs and fewer low-level (A) NICUs as compared with all US VON NICUs. The sample units were larger than average US NICUs (mean = 41 vs. 22 beds); comparisons with U.S. distribution not shown in tabular form. The average staff size was 75 full-time registered nurses. In terms of staffing, each nurse cared for an average of 2 infants per shift. Most infants were lower acuity: 62% were Levels 1 or 2. The hospital characteristics of the sample have been published previously (Hallowell et al., 2014). The majority of nurse survey respondents (69%) worked their last shift on a weekday.

On average, 60% of infants’ parents were present during the shift (SD = 9.7%). This ranged from 33% to 79% across units (Figure 1). The percent of parents present was similar across days, nights and weekends shifts. Parents of 46% of infants required extra care from the nurse (Table 2). At least one activity requiring extra nursing care was provided to parents of 40% of the infant sample, 35% of parents present required two activities, 26% of required three or more activities.

One third (36%) of the parents present required extra care from the nurse to provide routine bedside teaching and communication. Non-routine teaching (11%) and special training sessions (2%) (e.g. apnea monitor training, however, examples were not provided in the survey) were activities that also required extra nursing care. As reported in prior studies breastfeeding support was provided to 13% of parents present (Hallowell et al., 2014). Nine percent of parents required extra time with nurses due to limited parenting skills. Language, cultural needs and complex social situations each required extra nursing care for 5% of the infants.

The practice environment was highly rated in the NICU sample where the average PES-NWI composite score was more than 3.0 (mean = 3.06) with a range of 2.42 to 3.97.

Modest correlations were observed between parental presence and the PES-NWI subscales, “nurse participation in hospital affairs” ($r = 0.24$; $p < 0.02$), and “nurse

manager ability, leadership and support” ($r=0.23$; $p < 0.02$) as well as the composite PES-NWI ($r = 0.25$; $p < 0.01$). The latter relationship is depicted in the scatterplot, in which the correlation between the composite PES-NWI and parental presence is shown by the upward sloping line in the scatterplot (Figure 2).

In bivariate regression models, a 1 SD higher PES-NWI “nurse participation in hospital affairs” subscale score was associated with 2.3% higher percentage of parents present ($p < 0.02$). A 1 SD higher PES-NWI “nurse manager ability, leadership and support” subscale score was associated with a 2.2% higher percentage of parents present ($p < 0.02$) and the PES-NWI composite score was associated with 2.5% higher percentage of parents present ($p < 0.01$). A 1 SD higher PES-NWI “staffing and resource adequacy” subscale score was associated with a 1.8% increase in parental presence however, this was marginally significant ($p < 0.06$).

Recommendations: Nursing can play an important role in fostering the presence of parents in NICUs, which is important for FCC. Positive nurse work environments are an essential foundation for a welcoming milieu in the NICU. The prominent elements of these environments are effective nurse leaders and sufficient staffing. Nurses are perfectly positioned to foster the bond between parents and infants.

Financial Summary: Funds from STTI in the amount of \$5,000 went to support Tim Cheney, senior data analyst, for the project. Mr. Cheney assisted me with problem solving, data cleaning, data documentation and codebook creation, and running statistical models. Mr. Cheney’s hourly rate is \$46.50 (exclusive of benefits) and worked on the project for 80 hours. He is a full time employee with employee benefits rate of 34.5%.

Testimonial: Receipt of the 2014 Sigma Theta Tau International Small Grant Award was instrumental in providing the resources necessary to complete this project. Access to a senior data analyst was necessary to provide correct interpretation of findings for dissemination as well as with cleaning data, creating data documentation and codebook creation and running statistical models. I am incredibly grateful to Sigma Theta Tau International for the opportunity to explore this topic and am honored to have been accepted to present the findings at the Sigma Theta Tau Creating Health Work Environments Conference Event March 17-19, 2017 in Indianapolis, Indiana.

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Table 1

NICU and Infant Sample Characteristics

NICUs (N = 104) ^a	%
NICU level of care ^b	
A	14
B	57
C	29
Number of beds, mean (SD)	41(20)
Registered Nurses, mean (SD)	75(42)
Infant Acuity Distribution (n = 15,191) ^c	
Level 1 continuing care	33
Level 2 requiring intermediate care	29
Level 3 requiring intensive care	26
Level 4 requiring multi-system support	8
Level 5 requiring complex critical care	4

^a Results have been reported in Hallowell, S.G., Spatz, D.L., Hanlon, A.L., Rogowski, J.A., Lake, E.T. (2014). Characteristics of the NICU Work Environment Associated with Breastfeeding Support. *Advances in Neonatal Care*. 14(4): 290-300. doi: 10.1097-ANC.000000000000102. Published online July 31, 2014.

^b Level refers to level of clinical care: A, minor ventilation only; B, minor surgery; C, cardiac surgery and extracorporeal membrane oxygenation.

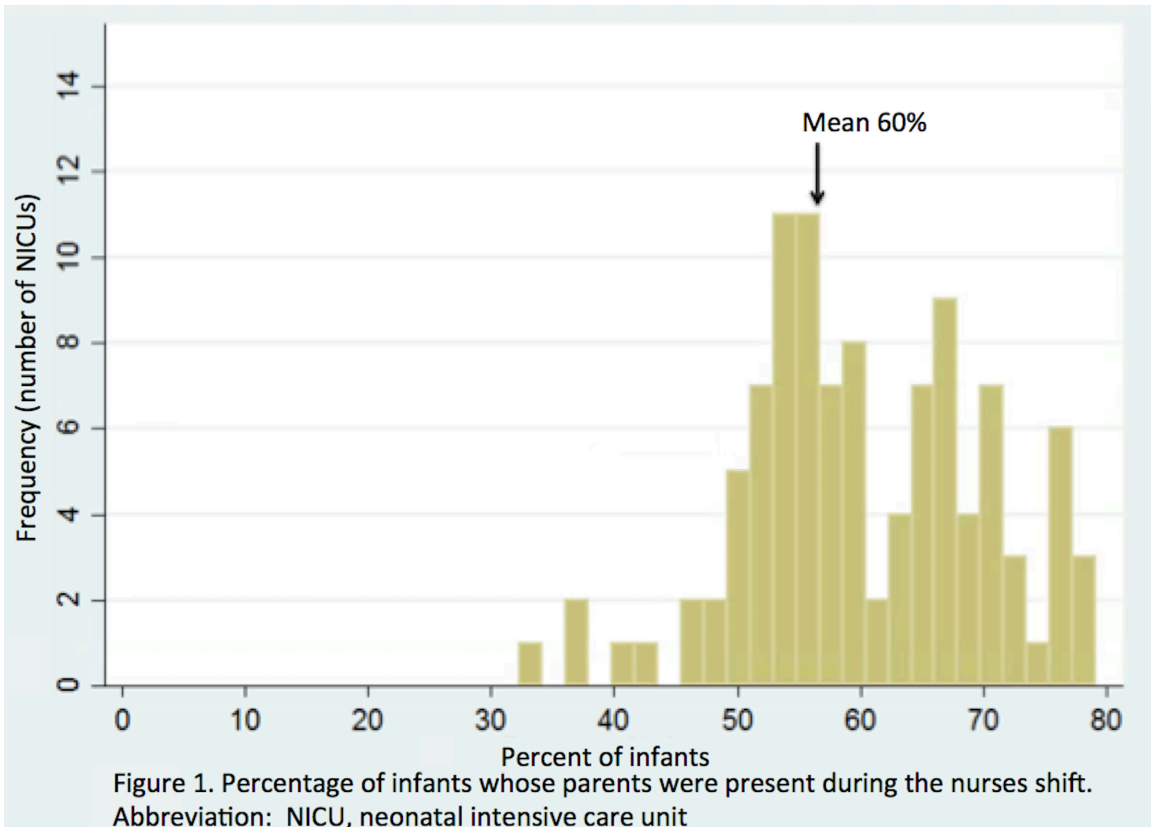
^c Results have been reported in Rogowski J, Staiger D, Patrick T, Horbar J, Kenny M, Lake E. Nurse Staffing in Neonatal Intensive Care Units in the United States. *Research in Nursing & Health*, 2015, 38: 333-341.

Table 2

Frequency of Parental Presence and Nursing Care Activities provided with Parents

Infants N = 15,233	n (%)
Parents were present at least half the nurses shift or more	8989 (59)
Parents who were present and required extra nursing care	6828 (45)
Nursing Care Activities provided with Parents^a	
Routine beside teaching and communicating with families	5509 (36)
Breastfeeding support	2004 (13)
Parent teaching beyond routine bedside teaching	1602 (11)
Parents have limited parenting skills	1421 (9)
A complex social situation (eg. Drug use or addiction, housing)	837 (5)
Parents have special language or cultural needs	823 (5)
Emotional support to parents due to infant's rapid deterioration or termination of life support	458 (3)
Needs formal teaching or training session	292 (2)

^a Activities performed with infants whose parents were reported to require extra nursing care



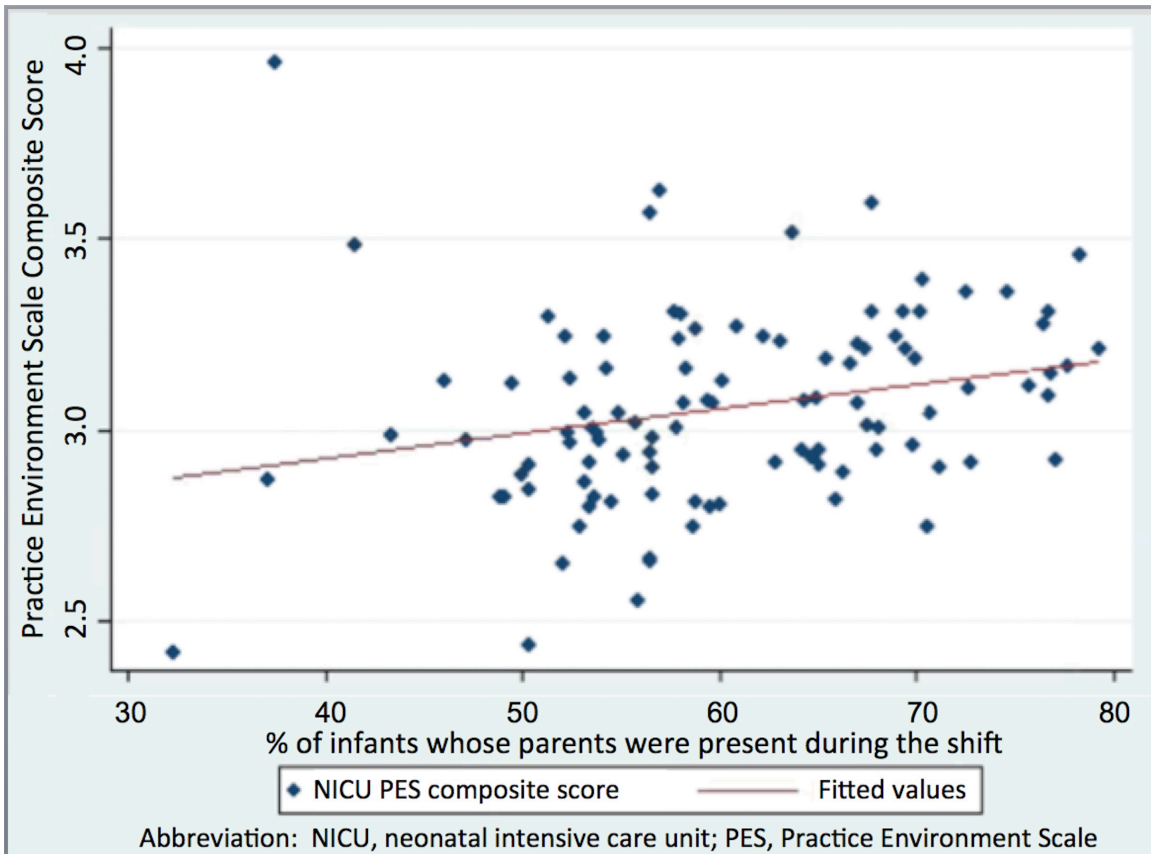


Figure 2. Scatterplot of the percent of the relationship between the percent of infants in each NICU whose parents were present during the nurse's last shift worked and the organization feature Practice Environment Scale of the Nursing Work Index