ABSTRACT

IDENTIFYING BARRIERS TO MATERNAL BREAST MILK PROVISION IN THE NICU FOR PRETERM INFANTS: A NURSE'S PERSPECTIVE

Objective and Background: Nurses play a vital role in assisting in the achievement of maternal breast milk provision in the neonatal intensive care unit (NICU) and barriers in relation to this have been observed in many studies.

Methodology: A 30-question survey with the inclusion of a four to five item Likert-scale, was created after analyzing data regarding relationships between maternal risk factors, efforts towards breast milk provision, and potential barriers that could be perceived by nurses.

Results: Participants from all age groups and approximately 70% of nurses with greater than 5 years of nursing experience, received breastfeeding education greater than one year ago. Younger participants were unfamiliar with risk factors for an inadequate maternal milk supply. Nurses with greater than 10 years of experience, were not able to recall the amount of maternal breast milk needed to maintain a breast milk diet at discharge. Neutrality was expressed within questions that pertain to breastfeeding assistance and maternal breastfeeding education.

Discussion: The responses from the survey highlight many barriers that may be considered for initiating changes in practice. Some of which include increasing formal breastfeeding education for the preterm infant, facilitating collaboration with lactation specialists, and modifying feeding protocols in order to become breastfeeding friendly. Neutrality presents the possibility of interpreting barriers. Further studies can be done in order to strengthen the database and validate the survey as a tool.

Victoria Mattox
May 2021

IDENTIFYING BARRIERS TO MATERNAL BREAST MILK PROVISION IN THE NICU FOR PRETERM INFANTS: A NURSE'S PERSPECTIVE

by

Victoria Mattox, DNPc, NNP-BC

A project

submitted in partial

fulfillment of the requirements for the degree of

Doctor of Nursing Practice

California State University, Fresno

Doctor of Nursing Practice

May 2021

APPROVED

For the California State University, Fresno
Doctor of Nursing Practice:

We, the undersigned, certify that the project of the following student meets the required standards of scholarship, format, and style of the university and the student's graduate degree program for the awarding of the master's degree.

Victoria Mattox, DNPc, NNP-BC
Project Author

DocuSigned by:
Carrie Holschuh
32AB1A1BF94B49A...

Carrie Holschuh (Chair) Nursing

DocuSigned by:
Christian Bassi, DNP
1A8E83331D1E456...

Christian Bassi Valley Children's Hospital

DocuSigned by:
Katherine Chamberlain
F46D5A1E0AB347A...

Katherine Chamberlain UCSF Benioff Children's Hospital

AUTHORIZATION FOR REPRODUCTION OF DOCTORAL PROJECT

_____ I grant permission for the reproduction of this project in part or in its entirety without further authorization from me, on the condition that the person or agency requesting reproduction absorbs the cost and provides proper acknowledgment of authorship.

__X__ Permission to reproduce this project in part or in its entirety must be obtained from me.

Signature of project author: DocuSigned by: Victoria Mattox DA31AD3317C74D2...

ACKNOWLEDGMENTS

Dr. Carrie Holschuh

Dr. Kathy Rindahl

Dr. Sylvia Miller

Dr. Nisha Nair

Dr. Katherine Chamberlain

Dr. Christian Bassi

TABLE OF CONTENTS

Page

Page

CHAPTER 1: INTRODUCTION

The specific area of interest for this project is nutritional support for the preterm infant in the neonatal intensive care unit (NICU). According to Underwood (2014) “approximately 12% of infants are born preterm (prior to 37 weeks’ gestation). This is a very heterogeneous population with widely diverse nutritional requirements and highly different stages of immunocompetence” (para. 3). The overall goal when designing strategies to provide adequate nutrition for this population is to give important nutrients to meet the metabolic demands and body composition of the comparable normal healthy fetus of similar gestational age pertaining to weight, length, head circumference, organ size, tissue components, concentrations of blood and tissue nutrients, and developmental considerations. When there is a failure to provide these essential nutrients to preterm infants, they become at risk for growth failure, increases in morbidities, and suboptimal brain growth that impedes neurological development (Hay, 2018). The nutritional demands of preterm infants can be seen as rather complex and multifactorial. Nutrition for the preterm infant is often comprised of a combination of parenteral and enteral nutrition. For very preterm infants especially, adequate nutrition consists of intravenous (IV) fluids and enteral feedings, and either one or both often begin shortly after birth. The purpose of the facilitation of this early nutrition is to generate “positive” energy and a balance of protein which is directly correlated with good neurodevelopmental outcomes.

Although a generous number of preterm infants will require IV nutrition for at least the first week or two of life, they will often require this in conjunction with enteral feeds with the goal of decreasing IV fluids as enteral feeds increase. This is where the importance of breast milk provision for preterm infants becomes more

apparent. According to Eidelman and Schanler (2012) “the potent benefits of human milk are such that all preterm infants should receive human milk” (p. 831). The provision of breast milk for preterm infants helps to promote gastrointestinal (GI) development, including the initial small amounts of colostrum administered shortly after birth. The mucosal growth of the GI system depends on this as well. In particular, maternal milk decreases the occurrence of late onset sepsis and necrotizing enterocolitis (NEC) (Hay, 2018). NEC is known to affect 5-10% of all infants with a birth weight of <1500 grams and has a high case fatality. It increases long-term morbidity that includes GI strictures, cholestasis, and short bowel syndrome (Underwood, 2014). This is one of the most significant reasons why an exclusive maternal breast milk diet is valuable. Some other notable benefits of human milk include reduction in retinopathy of prematurity, fewer hospitalizations during the first year of life, and improved neurodevelopmental outcomes. The benefits that are seen later in life as they approach adolescence include lower incidence of metabolic syndrome, lower blood pressure, lower low-density lipoprotein levels, and less insulin and leptin resistance (Underwood, 2014).

Despite what is known about the benefits of maternal milk, the numbers reflect a decrease in the number of preterm infants that receive breast milk by breast or bottle. Many credible organizations such as the World Health organization (WHO), the American Academy of Pediatrics (AAP), the American College of Obstetricians and Gynecologists (ACOG), and the United States Preventive Services Task Force, all recommend breastfeeding for at least the first six months of life (Abrams & Hurst, 2019). Mothers of preterm infants seem to experience a set of unique barriers to breastfeeding and challenges that precede the decreased rate of breastfeeding occurrences when compared to term infants. In Massachusetts, for instance, the initiation to breastfeed was 77%, 70% and 63% in

term infants, infants born between 32 weeks' and 36 weeks' gestation and those born between 24-31 weeks, respectively. The numbers in this state are an example of the relationship between a younger gestational age and the decrease in the initiation to breastfeed. In addition, other factors such as increased maternal-infant separation, decreased skin-to-skin contact, irregular breast milk pumping sessions, young maternal age, and maternal stress and fatigue also contribute to the lack of breast milk provision (Abrams & Hurst, 2019).

When infants are admitted to the NICU, the mother is expected to begin the process of pumping the breast milk for use and storage. An important factor as it pertains to breastfeeding attainment, is the potentiality of a mother to produce the amount of milk that will meet the metabolic demands for the infant in the NICU, at discharge, and beyond. Many mothers who deliver a preterm infant have the capacity to generate amounts of breast milk to meet the infant's requirements as long as they are dedicated and consistent in expression. The expectation is that a mother is able to supply 350 mL-500 mL of milk per day by the 10^{th} to 14^{th} day post-delivery (Abrams & Hurst, 2019). The achievement of an adequate milk volume at discharge is linked to the fulfilment of goal milk volume by the 14^{th} day of the postpartum period. During the first two weeks, the mammary epithelial cells undertake a process of being programmed to synchronize long-term milk synthesis (Hoban et al., 2018). A rather practical approach in helping to accentuate milk production efforts and guide mothers towards the commitment to providing breast milk for their infant is giving them a way to document their pumping occurrences. Mothers are then able to have a record of their progress and remain accountable.

Once an infant is receiving full enteral feedings, mothers should have enough milk to provide their infant with at least 150 to 170 mL/kg per day. Nurses who receive specialized training and certification in the topic of breastfeeding and

lactation, are known as lactation specialists. They are valuable to have as resources in the NICU setting. The ongoing presence of these lactation specialists should be considered as this is crucial in terms of being able to assess each mother and provide them with feedback and a plan for success. The lactation specialist can provide counseling that may help the mother to enhance the results of breast milk expression and, consequentially, the percentage of breastfeeding preterm infants. Some of the other goals that lactation specialists try to achieve while working with mothers include the initiation of breast milk expression during the first six hours of the postpartum period, especially since many preterm infants will not feed at the breast for quite some time after delivery and encouraging interval expression of breast milk every 2 to 3 hours, particularly during the first two weeks post-delivery. The lactation specialist also plays an integral role in the success of initiating and maintaining proper oral and breastfeeding tactics for the mother-infant dyad to prepare them for the long-term investment. Both nurses and lactation specialists have the ability to assist the mother and infant with an early introduction to breastfeeding, which involves the incorporation of nonnutritive sucking, a skill that helps to prepare the infant for proper coordination and stamina while at the breast (Abrams & Hurst, 2019).

Mothers of newborns in the NICU are at risk for becoming discouraged when it comes to pumping breast milk. They may experience anxiety or other feelings related to having an infant in an ICU setting. The presence of stress along with the inability for the preterm infant to latch to the mother’s breast after birth is a combination of risk factors that may lead to a decrease in breast milk production. The workflow of the nurse should allow for teaching for the mother on how to use a breast pump, basic breast milk pumping techniques, and the provision of an atmosphere or private room in which the mother may use to pump milk (Hunter &

Gottheil, 2015). This is essential in the instance that a lactation specialist is not available to help at any particular time.

The implicit challenges in the NICU continue to be disseminated in nature, the approach to handling them should be congruent, and include all contributing members of the healthcare team. According to Wigert et al. (2013) "parent–provider communication in the NICU presents special challenges due to parental stress and the complexity of the highly technologized environment." Healthcare professionals such as nurses must be aware of this in order to create an atmosphere of comfortability for the mother. Nurses can play an important role in initiating and promoting discussion with mothers about the benefits of breast milk and breastfeeding. One of the most important things to consider and evaluate is the presence of adequate knowledge for the neonatal nurse, to be able to effectively support and promote lactation. In one study conducted in a NICU setting, following an eight-hour teaching session for nurses with the inclusion of breastfeeding theory and strategies, the analysis of the pre- and post-intervention surveys displayed a notable increase in the knowledge of breastfeeding in comparison of the nurses who did not attend the session. These results translated to an increase in mothers who provided breast milk for their infants at discharge observed during the year after the intervention. The increase may be due to the surge in knowledge acquired by the nurses, along with the confidence to properly encourage the increase in the prevalence of breastfeeding amongst mothers and their infants (Hunter & Gottheil, 2015).

It is helpful to evaluate the general attitudes, beliefs and opinions that nurses have about if and when it is appropriate to promote breastfeeding in the preterm infant. It is essential to look at supporting resources in the NICU such as lactation specialists and examine the role they play in promoting breastfeeding.

The nurse often spends a considerable amount of time with the mother and can directly affect the mother-infant dyad. Considerations of nursing workflow, the environment, resources, personal beliefs and education should all be considered when evaluating potential areas that need intervention and barriers to promoting the provision of breast milk for preterm infants.

Conclusion

There is a need to embrace a supportive culture of breastfeeding in the NICU. NICU nurses can either positively or negatively influence breastfeeding outcomes and mothers have reported experiencing a lack of support from NICU physicians and nurses. The ability to support mothers through the breastfeeding and/or breast milk pumping process is directly related to providing a supportive environment, whether that includes allowing the mother to feel comfortable enough to pump in her infant's room, providing her with supplies and/or educating her on how to breastfeed a preterm infant. The Baby-Friendly Hospital Initiative (BFHI) has provided insightful and discrete guidelines designed to promote breastfeeding for routine births in hospitals and birthing centers. This initiative was created to address the needs of the term infant population but does not include instruction on how to implement measures for high-risk preterm infants who may face additional barriers because of diagnoses and being separated from their mothers. This area needs further study and development dedicated to establishing NICU specific guidelines for the preterm infant that may direct the NICU staff in a systematic nature to help increase breastfeeding rates (Cricco-Lizza, 2011).

CHAPTER 2: LITERATURE REVIEW

The literature review comprised of a search which focused in identifying data and relationships that are prevalent, pertaining to breastfeeding and maternal milk availability in the NICU. The perceptions of nurses and providers in terms of their views on the maternal milk diet and potential barriers as recognized by these populations, was an important consideration and is the primary theme within this literature review. The search for articles was conducted using the Fresno State Henry Madden library nursing database and Google Scholar. The articles below were selected based on their relevance to the topic and provided a basis for the development of this study, especially the survey tool that was created and used.

This initial study included a study design that involved the research team distributing a survey. Three obstetrical (OB) units associated with level III-IV NICUs served as recruitment sites for participants. There were 83 obstetrical/postpartum nurses invited to take the survey via email using Qualtrics. Approximately half had at least 10 years of experience (52%). Ninety-six percent of respondents supported the importance of early initiation of milk expression and 18% of nurses felt that initiation should occur within 12 hours and 4% stated within 24 hours. The strength of this study was that the majority of nurses that completed the survey were experienced nurses. The perceived barriers with the greatest influence in early initiation was the acuity level of the mother (44%) and lack of time to help with lactation support during the early postpartum period (43%) (Parker et al., 2018). One strength appreciated in this study was the ability to observe that the lack of nursing time and nursing personnel were perceived barriers that keep the nurses from assisting the mother with milk expression.

Limitations include the lack of using a piloted survey and the lack of using a Likert-scale, which may have given more insightful information in relation to

barriers. This study outlines the importance of ensuring that there is a collaborative effort between NICU staff and OB/postpartum staff, as they are able to promote breast milk provision in the early postpartum period, so that mothers may be prepped with the supplies and mindset pertaining to an active initiation and maintenance of milk supply.

The purpose of this second study was to evaluate the effect of breastfeeding education on the breastfeeding knowledge and attitudes of nurses in a NICU setting. The intervention group consisted of the NICU nurses while the untreated control group comprised of pediatric nurses who occasionally float to the NICU. A total of 51 pre-and-post surveys were captured. The educational intervention consisted of an eight-hour class that was designed to provide breastfeeding theory and techniques to increase the knowledge and hopefully positively influence the perspectives of the nurses. Both groups received the survey on separate occasions, with one being weeks after the education session. The outcome measures that were evaluated included: breastfeeding knowledge, pro-breastfeeding attitudes, baby-focused attitudes, and nurse-focused care attitudes. There was a significant increase in the amount of breastfeeding knowledge after the education session for the NICU nurses, suggesting that educational interventions may be of beneficial. A strength in this study was the ability to identify that nurses with higher education appear to be more versed about breastfeeding. This may suggest the need to obtain a baseline assessment for nurses who are joining the NICU, in order to identify strengths and gap areas. A limitation in this study was the lack of homogeneity of both control groups (NICU nurses compared to pediatric nurses). The explanation for this was that both groups at least work in the same hospital (access to similar resources) and have some level of similar experiences (Siddell et al., 2003).

Given that there are racial disparities in the provision of maternal milk at discharge for black infants, the interest of the following study was to explore social factors that may correlate with maternal milk volume at NICU discharge for VLBW infants, based on ethnicity. A prospective study was conducted that included diverse mothers of VLBW infants in a level III NICU. Maternal variables included education, lactation support, returning to school and/or work, maternal milk feeding goal, former experience with breastfeeding, and/or formula feeding. The statistical test used to analyze the data was multivariate logistic regression modeling. Other regression models were exploited to look at specific ethnic subgroups and key differences. The cohort included 362 mothers and the notable findings were that WIC (Nutrition for Women, Infants, and Children) negatively influenced the incidence of maternal milk at discharge while the maternal goal of providing any amount of maternal milk during admission, positively influenced the prevalence of a maternal milk diet at discharge. A strength of this study was the discovery of the fact that maternal goal setting for provision of milk is not fixed and may change along the course of the NICU admission. This point is essential to consider as many infants spend weeks to months in the NICU. The mothers may not only benefit from an initial evaluation to address learning and resource needs; they also deserve to have periodic assessments to determine if there are any changes and to allow them to voice any concerns or obstacles pertaining to milk production or breastfeeding. A limitation of this study involves the accidental finding of the mothers of the subjects having a negative impact on maternal milk feeding at discharge for the entire cohort. Not enough information was gathered surrounding this finding and it warrants further investigation (Fleurant et al., 2017).

Another study primarily established the goal of testing the effect of a breastfeeding educational program for improving the breastfeeding knowledge, attitudes and beliefs of maternal and newborn nurses and to improve their intentions to initiate and continue to promote breastfeeding support for new mothers. There were 240 registered nurses: 206 in the experimental group and 34 in the units at the control site. The educational intervention consisted of a self-study, peer-prepared 10 module-course. There were no differences between the pretests of the experimental and control groups. Pre-tests revealed that 65% of the groups had limited breastfeeding knowledge. The post tests were notably different and were significant for dissimilarities in breastfeeding knowledge, attitudes, beliefs and intentions. The knowledge mean score increased by 14% for the experimental group while the control group had a 1% difference. This differentiation suggests that the intervention had a desirable influence on the accumulation of knowledge about breastfeeding and may encourage nurses to have positive intentions when helping new mothers navigate breastfeeding. A strength of this study is seen in the way the educational material was offered. It is self-paced and provides the nurse with a way to learn that is minimally intimidating. This may increase information retention. A limitation of this study is the lack of assessment pertaining to nurses' knowledge about institutional policies regarding the use of alternative feeding methods, such as bottle feeding with formula or syringe feedings. It is important to have this background so that one may challenge outdated practice and promote changes that reflect evidence-based practice (Bernaix et al., 2010).

As part of a quality improvement project, the perspectives of providers on promoting breast milk feedings in preterm infants were analyzed. Clinicians engaged with the California Perinatal Quality Care Collaborative (CPQCC) were

involved. There were a series of audio recordings done monthly to discuss efforts and challenges within each unit. Two categories were established and focused on: communication and team composition. “Communication subthemes included (1) communication among hospital staff, including consistent documentation, (2) communication with family, and (3) communication between transfer hospitals. Team composition subthemes included (4) importance of physician buy-in and (5) integrated teams designed to empower leaders” (Lee et al., 2013). It was noted that the most essential component in terms of facilitating the provision of breast milk feedings in preterm infants was the incremental communication among providers and parents and optimizing team dynamics. This highlights the importance of establishing a rapport with mothers which involves ongoing dialogue that focuses on breast milk provision and feedback amongst colleagues that serves to facilitate the acceptance of a breast milk diet in the NICU. A major strength in this study was the ability to look at the provider perspective as it pertains to preterm infants, as similar studies have focused on term infants. A potential limitation was the lack of perspective for barriers that present from organizational structures such as lack of support for changes that improve and provide more time for communication (Lee et al., 2013).

The perspective given in terms of lactation support for preterm infants and the utilization of the nurse as a resource for this support in the NICU, is important to examine. The Breastfeeding Report Card that is updated by the Centers for Disease Control and Prevention recognizes that there are only 3.48 International Board-Certified Lactation Consultants (IBCLCs) per 1,000 live births in the United States and for this reason, nurses are an important asset in terms of their ability to assist mothers and infants. For the purpose of this study, lactation-based support from the nurses included education related to breast pumping, infant oral

care with maternal milk, the nonnutritive sucking approach, direct feeding at the breast, gathering of supplies for the breast pumping sessions, management of a pumping log, and referral to a lactation specialist. While the study's main purpose was to highlight the nurse's role in assisting with lactation, the second objective was to obtain a level of comprehension of nurses' attitudes regarding the concept of the maternal milk diet and breastfeeding.

A prospective study with a descriptive cohort design, included a web-based survey that was introduced with a total of 21 questions, to a group of nurses in a NICU. A total of 140 nurses responded and between 50.7% and 72.9% of the nurses stated that they have given lactation-based support during their last shift worked and during the former work week, respectively. The Iowa Infant Feeding Attitude Scale was incorporated within the survey and a score of 69.1 was reported, which translates to a "positive attitude" towards breastfeeding. This study is promising in that it reports that nurses have provided some amount of lactation support and had a positive attitude score. The study lacks specificity regarding the quality of the support given but support efforts seem significant. It would also be interesting to know more about the workflow of the nurses and whether their lack of assistance with breastfeeding may have been due to a perceived or actual lack of time within their shifts (Froh et al., 2017).

Early breast milk expression is one of the most important tasks to initiate after delivery and it is associated with effective and longer lactation in mothers with preterm infants. If early expression within six hours of delivery is achieved, lactation past 40 weeks' gestational age is likely to be attained. A quality improvement project focused on increasing the rate of early breast milk expression in mothers of preterm infants, as well as increasing the percentage of infants that receive maternal milk at 28 days of life and at discharge. Infants who weighed less

than 1500 grams were eligible to enroll with their respective mothers. The project consisted of phase I and phase II, with phase I consisting of prenatal or imminent postdelivery counseling from a neonatologist, focused on a plan for breast milk production and the amount of time after delivery to the first pumping session was recorded. The end of phase I included an educational session for lactation specialists to cover the importance of early milk expression. Educational sessions for physicians included the same content with the addition of the execution of interval discussions pertaining to maternal milk supply during daily physician-staff rounds.

Phase II was an extension of phase I with inclusion of early lactation consultation, keeping track of maternal milk supply, and an increased lactation consultant workforce. The median time of first maternal milk expression decreased from 9 hours to 6 hours in phase I to II, respectively. The percentage of infants receiving maternal breast milk at 28 days for phase I and II was 64% and 74% with no significant difference, respectively. In terms of the percentage of infants that received an exclusive breast milk diet at discharge, there was an increase from 37% after phase I to 59% after phase II, P= .046 (Murphy, Warner, Parks, Whitt, & Peter-Wohl, 2014). There is strength in the multidisciplinary approach in terms of achieving breast milk provision in the NICU. Including early lactation and members of the NICU team such as physicians and nurses may have helped to sustain the joint efforts related to the preparation, initiation, and ongoing efforts to supply maternal milk. The key here is to prepare for early expression, preferably within 6 hours of delivery, with the availability of lactation consultants that are well trained. Maternal milk supply should be pursued as this could be an indicator for the likelihood of maternal milk availability at discharge.

The accumulation of breastfeeding knowledge and developed attitudes for nurses surrounding the topic is often influenced by many factors such as education received as a nursing student, previous personal breastfeeding experience, gender, ethnicity, and culture. A cumulative review of studies consisted of a literature search from six different databases to look for studies that examined nursing students' and other health care professional students' knowledge, attitudes, and encounters pertaining to breastfeeding. Peer reviewed literature was analyzed and in particular settings, it was revealed that breastfeeding knowledge pertaining to evaluation and guidance was limited and scores pertaining to a positive attitude towards breastfeeding landed in the middle range. All of the studies that incorporated a breastfeeding education program reaped positive results in terms of increasing breastfeeding knowledge. Overall, the results from this review point to the stance that nursing and health students benefit from programs that have a special emphasis on the breastfeeding dynamic. This may help the nursing students develop a positive view of breastfeeding due to the credence that is developed from embracing the curriculum. This is also an important perspective as students transition to the new graduate nurse role and may be challenged in encouraging breast milk provision. The chance for each nurse to identify their own biases, educational gaps, and areas that lack exposure, presents opportunity for mediation (Yang et al., 2018).

Apart from some of the potential barriers to maternal milk provision that were already mentioned, another global barrier to achieving this is insufficient milk volume, particularly by 14 days postpartum. A study looked into risk factors in maternal populations by analyzing health and demographic data which may inhibit the ability for mothers to be successful at obtaining a goal volume of at least 500 mL/day, by the 14th day during the postpartum period. There was a

prospective cohort study design and data was collected from 402 mothers of preterm infants in the NICU who weighed <1500 grams at birth in a NICU. Data was compared between the 205 women who reported pumping data and the 197 women who did not provide pumping data. The pumping records of the mothers were analyzed using inverse probability weighing, regression testing, and a chi-square analysis. A total of 39.5% of mothers were able to reach goal milk volume by 14 days postpartum based on recorded pumping data. With the consideration of risk factors such as ethnicity, socioeconomic status, cesarean delivery, and gestational age, obtaining at least this goal volume is a solid indicator of being able to maintain an exclusive maternal milk diet while in the NICU and at discharge ($p<0.01$) (Hoban et al., 2018). This study presented a diverse sample which is a strength in relation to having the chance to look at many factors that could be contributory in terms of looking at reasons for decreased milk volume. NICU staff should be aware of these elements in order to make sure that adequate assistance is given to each mother based on their needs and any predisposing risk factors. Allowing the mother to work towards a goal of achieving full milk volume by 14 days can be a motivator but one must also use this important time to help her overcome barriers with close monitoring so that she is successful.

Gaps in Literature

The reasoning why mothers may not initiate and sustain breast milk production is multifactorial. Although most hospitals have resources such as lactation services and educational videos, it is known that nurses play an integral and active role in promoting breast milk provision for preterm infants. One of the ways in which neonatal providers try to encourage adequate nutrition for infants that can begin enteral feeds, especially in the first few days of life, is by providing

human milk, preferably from the mother of the infant. This requires the mother to provide colostrum as early as a few hours after delivery, have the desire to continue to pump her breast milk and provide it for the infant in the NICU. Beyond the challenges of providing adequate nutrition via mother's milk for preterm infants, lies the challenge of helping the mother to sustain her breast milk production so that it can be the diet of choice at discharge. If the focus is on the nursing perspective and the influence of this role, it should be appreciated that current BFHI only addresses the needs of mother and term infant. Nurses that work in the NICU need modified instruction on how to address the needs of the preterm infant and the mother. This begins with an identification of barriers that may vary from unit to unit.

Current studies seem to focus on obstetrical and maternal nurses and there is limited data that covers the NICU nurse population. There is a need to assess the knowledge of these nurses, acknowledging that mothers are often under the influence of having a fragile infant in the NICU and nurses have to be knowledgeable in how to deal with them collectively. There should also be some consideration for environmental factors and working conditions that may influence the perception of the NICU nurse's ability to dedicate time to support the breastfeeding, preterm infant. Another difference between the nurses that take care of the term and preterm infant population is the context in which they provide care. Maternal and newborn nurses often support the mothers for a few days while they are in the hospital, usually breastfeeding fair or well. The nurses in the NICU need specialized training on how to deal with the stressed mother, how to commit to the longevity that comes with breast milk production and initiation of breastfeeding at the appropriate time when a preterm infant is in the NICU for an

extended amount of time. These concepts deserve further assessment and exploration.

Theoretical Framework

The Theory of Planned Behavior (TPB) as compared to other theories is a sufficient way to look at potential barriers to providing breast milk for infants due to its ability to provide a way to look at the subjective reasons through many lenses. There are four components of the TPB which include: intent, attitude, behavioral control/will power, and subjective norms (Martin, 2007). When considering intention, one must look at the foundation that is set for each mother. It is important to understand if the mother intends to breastfeed and provide milk for her child. The nurse should also become aware of beliefs and limitations in terms of her experience and education. If the nurse has a positive view towards the breast milk diet and is equipped to help, she can assess the mother and continue intervention from there. It is essential to assess if there is no intent as one must provide education that not only speaks about the importance of providing a maternal milk diet, the components of what it means to provide milk for a preterm infant when they're not able to breastfeed right away, and work on eliminating views that serve as hinderances. There must be planned behaviors from the nurse and the mother of the infant. A study whose purpose was to look at barriers to providing human milk at discharge suggests that the strongest predictor of human milk provision for mothers of preterm and term infants, is pre-determined goals and intent (Fleurant et al., 2017). The next component is attitude and is significant in terms of being able to assess how one feels about a breast milk diet. This is where internal and external factors be taken into consideration. Attitudes towards a certain topic are usually established by what we perceive to be personal

preferences, conveniences, beliefs, previous experiences and motivations. External influences may include what has been shared about the topic from family, friends, social norms, religion and healthcare professionals. All of these have the ability to shape attitudes and views.

Another component of the TPB is the amount of behavioral control and will power the nurse perceives that she has when it comes to being able to encourage the mother to pump her milk and to provide breastfeeding support to the mother and infant. During the first few hours of life, it is key to develop a relationship in which the parents feel like they have options in regards to providing breast milk for their infant. Empowering the mother to continue to pump despite low milk volumes presents an additional challenge. Nurses can lean on lactation consultants to reinforce education and efforts.

The final component of the TPB to be expanded upon as it relates to this population is, subjective norms. This concept, in part, relates to the external influences that surround the nurse. These subjective norms can come from other nurses, physicians, and unit practices. Other influences may include social media and social groups. These people and the atmosphere of certain places can shape whether or not a mother has the chance to provide breast milk and/or initiates breastfeeding when the infant is ready. Many times, these influences have more of an impact on how long a mother provides an exclusive breast milk diet and how convenient it is for her to do so, especially while on the unit. For example, many NICUs have private pumping rooms and pumps available for use at any time but nurses and providers must encourage their use and may even make it a routine practice as mothers visit their infants in the NICU.

CHAPTER 3: METHODOLOGY

This DNP project seeks to answer the question: What are the perceived barriers to providing breast milk provision and breastfeeding for preterm infants (<34 weeks' gestation) in the NICU from a nurse's perspective? The study was approved by the institutional review board (IRB) at California State University at Fresno and Valley Children's Hospital. The study population is a group of NICU nurses that work at the bedside with mothers and infants for at least 50% of their work time. The nurses are employed by the prominent children's hospital in the metropolitan Fresno-Madera county. The nurses work between two hospital locations which both house NICUs. One of the hospitals has a delivery service and 14 bed level II and III NICU while the other location is a level IV regional NICU providing care for infants transported in from hospitals within the central valley and surrounding areas, and has the capacity to host 88 infants, with 21 private and semi-private rooms. The nurses have a variety of accomplishments in terms of their educational backgrounds and certifications. Both hospitals have lactation services that are offered during the day for limited hours. Currently, there are no formal interval training programs pertaining to breastfeeding or breast milk use in the NICU. The method of analysis was of a quantitative approach and involved the administration of a survey. The full survey may be seen in Appendix A. The survey was created with an originality approach. The literature review that was conducted in relation to this topic assisted in generating the concepts for questions eight through thirty. The survey questions were reviewed by members of the IRB at Valley Children's Hospital. The questions were asked in a factual manner with the incorporation of some Likert scale-based questions using the ranges, 1 = strongly agree to 5 = strongly disagree or 1 = Always to 5 = Never. The electronic

survey instrument is comprised of four categories: demographic characteristics, knowledge about breastfeeding a preterm infant, attitudes about providing breast milk and breastfeeding a preterm infant and current practice surrounding promotion of the mother to provide breast milk and breastfeeding a preterm infant. There are 30 questions which took roughly 10-15 minutes to complete. The participants received an invitation to participate with an information sheet to explain the purpose of the study and formally state a promise to maintain confidentiality. No identifying information was obtained from the participants and there were no connections to IP addresses. After 2 weeks from the release of the survey for completion, a 30-day email reminder was given to promote participation.

The demographic questions seek to gather information pertaining to age, gender, ethnicities, educational background, NICU experience, and personal experience with breastfeeding. The knowledge questions were designed in a way to get an impression concerning how well the nurses are prepared to help the mother and preterm infant breastfeed. It also assesses the baseline knowledge that the nurse needs to know in order to identify mothers who need further interventions and referrals to lactation specialists to increase the chances of achieving breast milk provision. The questions on current experiences seek to identify what the nurse feels she most likely encounters or does on a regular basis that either facilitates or hinders breast milk provision. Some important questions pertaining to nursing workflow, lactation involvement, initiation of maternal education and encouragement, and unit feeding protocols help examine potential areas for improvement. Lastly, there was inquiry about attitudes and beliefs about maternal milk use in the NICU, aspiring to look for misconceptions and negative views.

CHAPTER 4: RESULTS

A total of 102 nurses responded to the survey within the given time frame and a total of 93 nurses met the criteria in order to be included in the results of this study. One nurse did not have their gender identified. The remaining eight nurses were ineligible due to being charge nurses with <50% of their working time as a staff RN. The sample size with recorded data is 93. Female respondents were of prevalence, making up 96.7% of the gender variable. More than half of the nurses were aged 20-40 (child-bearing age) and the majority of nurses represented the White: 46.2%, Hispanic: 22.6%, and Asian: 28% ethnicities. More than half of the nurse respondents had greater than 10 years of nursing experience. The majority of nurses (68.8%) had a bachelor's degree in nursing, and more than half (58.1%) had personal experience with breastfeeding (see Appendix B).

The data retrieved from this study was analyzed in a few different ways. Demographic analysis was done while looking at the categorical data for comparison. The statistical tests used for this was Chi-square or Fisher-Freeman-Halton Exact Test (an extension of the Fisher's exact test for 2 by 2 and 3 by 2 tables), as appropriate. The continuous data comparisons were done using Kruskal-Wallis Test, a non-parametric version of the one-way ANOVA. All tests were performed using SPSS version 26. The data within Appendix C display demographics of the subjects by age group with a significance seen in the number of years as a nurse in the NICU setting, p=<0.001. More than 50% of respondents had greater than 10 year of experience as a NICU nurse.

Although the data from Appendices D, E, and F look at relationships between age and knowledge about breastfeeding and breast milk, experiences involving breast milk provision, and attitudes and beliefs about maternal milk in

the NICU, there was no statistical significance appreciated. It is important to note some of the key observations from this data as well. Greater than 50% of all age groups received formal instruction on breastfeeding, greater than 1 year ago. The age group from 20-40, which makes up more than half of the participants, had a 64% incorrect response rate to the "risk for inadequate milk supply" question. When considering the availability of donor breast milk and its hinderance on the mother's motivation to produce her own milk supply, greater than 50% of each age group of respondents disagreed that this was a factor. Some nurses felt neutral about feeling comfortable with assisting with nonnutritive breastfeeding, the allowance to provide breastfeeding education and support with latching for the mother, and the inclusion of breastfeeding support within the feeding protocol.

Data within Appendix G display demographics of the subjects by years in the NICU setting, with a significance seen within the age groups and personal experience with breastfeeding, and $p=<0.001$ and $p=0.002$, respectively. All of the nurses who had less than 5 years of experience were between 20-40 years of age and greater than 50% of nurses with more than 10 years of experience, were between 41-50 years of age. Appendices H, I, and J reveal data pertaining to knowledge about breastfeeding and breast milk, experiences involving breast milk provision, and attitudes and beliefs about breast milk, in relation to years of experience in the NICU setting. Approximately 70% of nurses with greater than 5 years of experience had formal instruction about breastfeeding a preterm infant more than a year ago and this was statistically significant with $p=0.045$. More than half of the participants had greater than 10 years of NICU nursing experience and of this group, half of them did not know the day by which a mother should achieve the minimum amount of maternal breast milk to meet nutritional needs of the preterm infant by discharge. Nurse participants with varying ranges of experience

generally felt neutral or agreed that they felt familiar with supporting an infant with nonnutritive breastfeeding, with significance represented by p=0.03 (see Appendix H for means and standard deviations with p=0.045). Some nurses also felt neutral about the workflow allowance to provide breastfeeding education and support for the mother, and the inclusion of breastfeeding support within the feeding protocol.

More than 70% of them disclosed that they always encourage the mother to begin pumping breast milk for her preterm infant, with significance represented by p=0.04. Although the responses varied mostly between always, often, and sometimes for all respondents, it was notable to mention that there is discussion on unit rounds concerning the availability of and usage of maternal breast milk, p=0.01 (see Appendix I for means and standard deviations with p=0.006). Of the group of nurses with 10 years or less of nursing experience, approximately half of this group expressed that they rarely or never participate in a collaboration with a lactation consultant in relation to creating a plan to facilitate breastfeeding for the preterm infant. Most of the nurses engage in conversation with the mother about how her breast milk will be utilized for feedings, as the preterm infant experiences feeding transitions in the NICU, p=0.007 (see Appendix I for means and standard deviations with p=0.01). Nurse respondents with diverse years of experience mostly agreed (60%-80%) that the availability and administration of donor breast milk does not hinder the mother in providing her own supply.

CHAPTER 5: DISCUSSION

The purpose of this study was to identify barriers to breast milk provision for the preterm infants in the NICU, whether it be by breast or maternal milk supply. A few of the findings were impressive in terms of appreciating barriers in the form of seeing statistical significances but many were noted observational barriers without significance. The demographics in this study revealed that a significant number of participants had more than 10 years of experience which one could be interpreted as a sign of having many seasoned nurses, with lots of experience with assisting mothers with breastfeeding their preterm infants. Although this experience was appreciated, it was observed that many of these nurses did not know the answer to the knowledge questions.

At the same time, one may also consider that many of the nurses with greater than 5 years of experience haven't had formal in services about how to support the mother of a breastfeeding infant, at least within the last year and this could signify a few or many years. Both of these observations suggest that formal education for NICU nurses should be strongly considered. Having the basic knowledge about breastfeeding the preterm infant, adequate milk volume, and the physiological processes that occur for the mother surrounding milk production, is an important aspect in terms of being able to guide the maternal milk provision process. The acquirement and retainment of knowledge also helps to build confidence in practice. The nurses should also have the chance to participate in a particular means of demonstration in order to demonstrate competence. Providing formal education is an important consideration as an essential part of maintaining skills and recalling information. The opportunity to participate in educational programs that are provided on an interval basis, especially with topics such as

breastfeeding and the breast milk diet, should be included in the experience within any NICU. Lactation professionals may help to coordinate inservices with the nurses on a periodic basis, to maintain competency. Many nurses from all age groups are not aware of the risk factors for mothers of preterm infants, in terms of having an inadequate milk supply. It is vital for them to especially target the young mothers and those who deliver an infant at less than 28 weeks' gestation. These groups of women make up a notable amount of the patients served in the NICU setting and breast milk provision for their infants is what may keep them from acquiring infections, such as necrotizing enterocolitis and from nutritional and growth deficits. A collaboration with the OB and postpartum units within the hospital, in order to create a system to identify moms who are "at risk" so that they may intervene as soon as possible, is worth pursuing as well.

A robust milk supply is preferable in order to meet the needs of a preterm infant. The availability of maternal breast milk is one of the more substantial topics pertaining to the nutrition and growth of the preterm infant, as it has the ability to have a major impact on infant growth and developmental trajectories. The results of this study showed that a pronounced number of nurses in each age group and years of experience group, incorrectly answered the question pertaining to the amount of milk needed to predict the likelihood of maintaining the breast milk diet at discharge. This could be seen as a hinderance as the nurse needs be aware of how well milk production is progressing, especially within the postpartum period, and when to intervene with other resources when the supply is low. Mothers will also appreciate when their nurse is knowledgeable about breast milk and is willing to support them. The concepts surrounding breast milk, breastfeeding, and preterm development are important topics for consideration within an educational program for the nurses and is also important in terms of

educating the mother during the early postpartum period. Once the mother is aware of the goal amount for milk supply and how to support the preterm infant while learning to breastfeed, she is able to work towards these goals and is aware of when to seek assistance.

From a global view, all groups represented by age and years of experience could not solidly recall engaging in collaboration with a lactation specialist for a plan for breastfeeding. This information was collected from question 18 and it does not include specification about the mother being at the bedside during this collaboration. One may consider that responses may have differed but having lactation connect with nursing at the bedside allows for the nurse to serve as a mediator, obtain background information about the mother's plan to breastfeed, coordinate a time to meet with lactation, and eliminate the possible barrier of the mother not feeling supported by the lactation professionals.

A sizable number of participants displayed that they agree with being able to support infants with nonnutritive breastfeeding but there were also many participants that expressed neutrality. There may have been a stronger impression towards agreeance or disagreement if this neutrality was eliminated. Other survey questions that had a particular amount of neutrality indicated were pertaining to, everyday workflow, time for nurses to educate mothers on the importance of supplying breast milk, and the notion that the unit feeding protocol supports breastfeeding. Future studies may consider removing "neutral" as an option in order to appreciate statistical significance. If neutrality is assumed to be a barrier, there should be consideration as to further investigate why nurses may not feel confident with their ability to support infants with breastfeeding, view their workflow as welcoming to the allowance of them being able to educate mothers,

and how the feeding protocol may be updated to better meet the needs of the breastfeeding infant.

Future Implications

Overall, the survey revealed some potential barriers to consider for practice changes. The need for more education that presents essential concepts relevant to the breast milk diet should be incorporated into the experience and interim educational plan for NICU nurses. NICUs should consider increasing the number of lactation specialists on staff to ensure there is the presence of a team that is dedicated to help mothers of preterm infants as they prepare to support the infant with breast milk. Hospitals should review the workflow of the OB, postpartum, and NICU departments to identify further barriers that exist such as lack of time and lack of communication, principally to assist with coming up with a formal system to identify “at risk” mothers, and to promote a culture of having a breast milk friendly atmosphere. The questions in the survey that performed well in terms of disclosing moderate to high levels of disagreement and statistical significance in consideration of the small sample size, may serve to assist in the validation of the survey. Since this is the initial study that has utilized this survey, statistical testing of the survey should precede future studies. Further research involving the survey will assist with the trajectory towards achieving reliability and validity.

REFERENCES

REFERENCES

Abrams, A. S., Hurst, M. N. (2019). Breastfeeding the preterm infant. *Advances in Neonatal Care.* Retrieved from https://www.uptodate.com/contents/breastfeeding-the-preterm-infant

Bernaix, L., Beaman, M., Schmidt, C., Harris, J., & Miller, L. (2010). Success of an educational intervention on maternal/newborn nurses' breastfeeding knowledge and attitudes. *Journal of Obstetric, Gynecologic & Neonatal Nursing, 39*(6), 658-666.

Cricco-Lizza, R. (2011). Everyday Nursing Practice Values in the NICU and Their Reflection on Breastfeeding Promotion. *Qualitative Health Research, 21*(3), 399-409.

Eidelman, I. E., Schanler, J. R. (2012). Breastfeeding and the use of human milk. *American Academy of Pediatrics, 129*(3), 827-841. doi:10.1542/peds.2011-3552

Fleurant, E., Schoeny, M., Hoban, R., Asiodu, I., Riley, B., Meier, P., Patel, A. (2017). Barriers to Human Milk Feeding at Discharge of Very-Low-Birth-Weight Infants: Maternal Goal Setting as a Key Social Factor. *Breastfeeding Medicine, 12*(1), 2-27.

Froh, E., Dahlmeier, K., & Spatz, D. L. (2017). NICU Nurses and Lactation-Based Support and Care. Advances in neonatal care: official journal of the National Association of Neonatal Nurses, 17(3), 203–208. https://doi.org/10.1097/ANC.0000000000000370

Hay, W. (2018). Nutritional support strategies for the preterm infant in the neonatal intensive care unit. *Pediatric Gastroenterology, Hepatology & Nutrition, 21*(4), 234-247.

Hoban, R., Bigger, H., Schoeny, M., Engstrom, J., Meier, P., & Patel, A. L. (2018). Milk Volume at 2 Weeks Predicts Mother's Own Milk Feeding at Neonatal Intensive Care Unit Discharge for Very Low Birthweight Infants. *Breastfeeding medicine: the official journal of the Academy of Breastfeeding Medicine*, *13*(2), 135–141. https://doi.org/10.1089/bfm.2017.0159

Hunter, C., Gottheil, S. (2015). Breastfeeding promotion: the NICU perspective. Retrieved by http://www.uwomj.com/wp-content/uploads/2012/06/2012_ER_Hunter_Gottheil.pdf

Lee, H., Martin-Anderson, S., Lyndon, A., & Dudley, R. (2013). Perspectives on promoting breastmilk feedings for premature infants during a quality improvement project. *Breastfeeding Medicine, 8*(2), 176-180.

Martin, L. (2007). *Theory of planned behavior: definition, explained, examples.* Retrieved from https://www.cleverism.com/theory-of-planned-behavior/

Murphy, L., Warner, D. D., Parks, J., Whitt, J., & Peter-Wohl, S. (2014). A quality improvement project to improve the rate of early breast milk expression in mothers of preterm infants. *Journal of Human Lactation: Official Journal of International Lactation Consultant Association*, *30*(4), 398–401.

Parker, L., Hoffman, J., & Darcy-Mahoney, A. (2018). Facilitating Early Breast Milk Expression in Mothers of Very Low Birth Weight Infants. *MCN: The American Journal of Maternal/Child Nursing, 43*(2), 105-110.

Siddell, E., Marinelli, K., Froman, R., & Burke, G. (2003). Evaluation of an Educational Intervention on Breastfeeding for NICU Nurses. *Journal of Human Lactation, 19*(3), 293-302.

Underwood, A. M. (2014). Human milk for the preterm infant. *Pediatric Clinical North America*, *60*(1), 189-207. Doi: 10.1016/j.pcl.2012.09.008

Wigert, H., Dellenmark-Blom, M., & Bry, K. (2013). Strengths and weaknesses of parent – staff communication in the NICU: A survey assessment. *BMC Pediatrics, 13*(1), 71.

Yang, S. F., Salamonson, Y., Burns, E., & Schmied, V. (2018). Breastfeeding knowledge and attitudes of health professional students: a systematic review. *International Breastfeeding Journal*, *13*, 8. https://doi.org/10.1186/s13006-018-0153-1.

APPENDICES

APPENDIX A: SURVEY

Identifying Barriers and Facilitators to Maternal Breast Milk Provision in the NICU for Preterm Infants: A Nurse's Perspective

Screening Question:
Identify the role in which you spend at least 50% of your work time (Staff RN or Charge RN)

1) Staff RN 2) Charge RN

Demographics

1. What is your age range?

1) 20-40 2) 41 -50 3) Over 50 years

2. What is your gender identification?

1) Female 2) Male 3) Other_____

3. Please identify your ethnicity or ethnicities.

1) White 2) African-American 3) Hispanic 4) Asian/Pacific Islander 5) Other_____

4. How long have you been a nurse in a NICU setting caring for infants <34 weeks gestational age?

1) Less than 5 years 2) 5-10 years 3) Over 10 years

5. What is your highest degree obtained to date?

1) Associate's Degree 2) Bachelor's Degree 3) Master's Degree 4) Doctoral Degree

6. Do you have personal experience with breastfeeding an infant of your own?

1) Yes 2) No

7. If so, was this experience with a full term infant, preterm infant, or both?

1) Full Term Infant 2) Preterm Infant 3) Both

Knowledge about Breastfeeding and Breastmilk for a Preterm Infant

8. When is the last time you received formal instruction (hospital or unit in service) about how to support the breastfeeding preterm infant and mother?

1) Less than 6 months ago 2) Between 6 months and one year 3) Greater than one year ago

9. The mothers of preterm infants born at <34 weeks' gestation are at risk for an inadequate milk supply due to the following:

1) The delivery of an infant at <28 weeks' gestation and young maternal age
2) Maternal fatigue and advanced maternal age
3) The delivery of an infant at <28 weeks' gestation and advanced maternal age

(Answer is #1)

10. What is the minimum amount of breast milk a healthy mother should be producing in order to meet the nutritional requirements for the preterm infant at discharge (based on a weight of 3 kg)?

1) 200ml to 300ml 2) 300ml-500ml 3) 500ml to 700ml (Answer is #2)

11. A healthy mother should be able to produce a minimum amount of breast milk per day in order have the best chance at meeting the nutritional needs for the preterm infant at discharge, by what day during the postpartum period should she achieve this?

1) 6-9 days 2) 10-14 days 3) 15-21 days (Answer is #2)

12. I am familiar with how to accurately support the infant with nonnutritive breastfeeding.

1) Strongly Agree 2) Agree 3) Neutral 4) Disagree 5) Strongly Disagree

Experiences Involving Maternal Breast Milk Provision in the NICU/ Current practice surrounding promotion of the mother to provide Breastmilk and Breastfeed a Preterm Infant

13. When a preterm infant born <34 weeks' gestation is newly admitted to the NICU, I encourage the mother to begin pumping breast milk as long as it is not medically contraindicated.

1) Always 2) Often 3) Sometimes 4) Rarely 5) Never

14. I believe that the everyday practices (workflow) in the NICU allow me to have enough time to educate the mother on the importance of providing breastmilk for her preterm infant.

1) Strongly Agree 2) Agree 3) Neutral 4) Disagree 5) Strongly Disagree

15. Upon visitation, I ask the mother of a preterm infant about how much milk she is pumping (actual volume).

1) Always 2) Often 3) Sometimes 4) Rarely 5) Never

16. I encourage the mother who is pumping breastmilk to keep track of her efforts via a paper log or breastmilk pumping mobile application.

1) Always 2) Often 3) Sometimes 4) Rarely 5) Never

17. During unit rounds for the preterm infant born <34 weeks' gestation, I discuss the availability and current usage of maternal breast milk.

1) Always 2) Often 3) Sometimes 4) Rarely 5) Never

18. I have experienced the practice of a lactation consultant collaborating with me at the bedside to come up with a plan to facilitate breastfeeding for the preterm infant.

1) Always 2) Often 3) Sometimes 4) Rarely 5) Never

19. I advocate for a referral to a certified lactation consultant for a mother who needs additional help with breastfeeding her preterm infant.

1) Always 2) Often 3) Sometimes 4) Rarely 5) Never

20. I educate the mother of a preterm infant about the process of how her breastmilk will be utilized for feedings (gavage and transition to oral feeds/breastfeeding) during their NICU stay.

1) Always 2) Often 3) Sometimes 4) Rarely 5) Never

21. I include the lactation consultant in the plan of care to help the preterm infant learn how to breastfeed successfully.

1) Always 2) Often 3) Sometimes 4) Rarely 5) Never

22. Considering my everyday workflow, I feel that I have enough time to support a breastfeeding mother (helping her to latch, observing quality of feeds).

1) Strongly Agree 2) Agree 3) Neutral 4) Disagree 5) Strongly Disagree

23. I feel that my unit feeding protocol supports the initiation and maintenance of breastfeeding (ex. Breastfeeding Sliding Scale) for the preterm infant.

1) Strongly Agree 2) Agree 3) Neutral 4) Disagree 5) Strongly Disagree

Attitudes and Beliefs about Maternal Breast Milk Use in the NICU

24. Preterm infants born <34 weeks' gestation should receive an exclusive maternal breast milk diet.

1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

25. Preterm infants that are exposed to an exclusive maternal breast milk diet are at a decreased risk for morbidities such as infections and necrotizing enterocolitis.

1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

26. The availability and administration of donor breast milk hinders a mother's motivation to provide her own breast milk for her preterm infant.

1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

27. Preparing the mother before delivery surrounding the provision of breast milk increases her desire to provide milk for her preterm infant.

1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

28. My efforts to support breastfeeding preterm infants are reinforced by lactation consultants on the unit.

1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

29. I feel supported in my efforts to support breastfeeding preterm infants by the providers (NPs and MDs) on the unit.

1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

30. Fellow nurses on my unit support my efforts to promote breastfeeding preterm infants.

1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

APPENDIX B: DEMOGRAPHICS OF SUBJECTS

Demographics of subjects, N = 93

Variable	n	(%)
Gender		
Female	89	(95.6)
Male	3	(3.2)
Unidentified Gender	1	(1)
Age		
20-40 years	49	(52.7)
41-50 years	27	(29.0)
Over 50 years	17	(18.3)
Race/ethnicity		
White	43	(46.2)
African-American	2	(2.2)
Hispanic	21	(22.6)
Asian/Pacific Islander	26	(28.0)
Other	1	(1.1)
Nurse in NICU setting		

Less than 5 years	27	(29.0)
5-10 years	17	(18.3)
Over 10 years	49	(52.7)
Highest degree		
Associate's degree	22	(23.7)
Bachelor's degree	64	(68.8)
Master's degree	6	(6.5)
Doctoral degree	1	(1.1)
Personal experience with breastfeeding		
Yes	54	(58.1)
No	39	(41.9)

*No data or responses for Charge RN in dataset, Gender not identified for one respondent; if Charge RN excluded, then sample size = 93

APPENDIX C: DEMOGRAPHICS OF SUBJECT BY AGE GROUP

Demographics of subjects by age group, N = 93

Variable	**Age**						**p-value**
	20-40 Years (N=49)		**41-50 Years (N=27)**		**50 + Years (N=17)**		
	n	(%)	n	(%)	n	%	
Gender							
Female	48	(98.0)	25	(96.2)	16	(94.1)	0.76
Male	1	(2.0)	1	(3.8)	1	(5.9)	
Race/ethnicity							
White	24	(49.0)	10	(37.0)	9	(52.9)	0.17
African-American	1	(2.0)	1	(3.7)	0	(0.0)	
Hispanic	14	(28.6)	3	(11.1)	4	(23.5)	
Asian/Pacific Islander	9	(18.4)	13	(48.1)	4	(23.5)	
Other	1	(2.0)	0	(0.0)	0	(0.0)	
Nurse in NICU setting							
Less than 5 years	27	(55.1)	0	(0.0)	0	(0.0)	**<0.001**
5-10 years	14	(28.6)	2	(7.4)	1	(5.9)	
Over 10 years	8	(16.3)	25	(92.6)	16	(94.1)	
Highest degree							
Associate's degree	9	(18.4)	5	(18.5)	8	(47.1)	0.20

Bachelor's degree	36	(73.5)	19	(70.4)	9	(52.9)	
Master's degree	3	(6.1)	3	(11.1)	0	(0.0)	
Doctoral degree	1	(2.0)	0	(0.0)	0	(0.0)	
Personal experience with breastfeeding							
Yes	25	(51.0)	18	(66.7)	11	(64.7)	0.35
No	24	(49.0)	9	(33.3)	6	(35.3)	

APPENDIX D: KNOWLEDGE ABOUT BREASTFEEDING AND BREAST MILK FOR A PRETERM INFANT BY AGE GROUP

Knowledge about breastfeeding and breast milk for a preterm infant by age group, N =93

Variable	Age						p-value
	20-40 Years (N=49)		41-50 Years (N=27)		50 + Years (N=17)		
	n	(%)	n	(%)	n	%	
8. When is the last time you received formal instruction (hospital or unit in service) about how to support the breastfeeding preterm infant and mother?							
Less than 6 months ago	10	(21.7)	7	(28.0)	5	(29.4)	0.17
Between 6 months and one year	8	(17.4)	0	(0.0)	3	(17.6)	
Greater than one year	28	(60.9)	18	(72.0)	9	(52.9)	
9. The mothers of preterm infants born at <34 weeks' gestation are at risk for an inadequate milk supply due to the following:							
Wrong answer	29	(64.4)	15	(62.5)	7	(46.7)	0.46
Correct answer	16	(17.7)	9	(37.5)	8	(53.3)	
10. What is the minimum amount of breast milk a healthy mother should be producing in order to meet the nutritional requirements for the preterm infant at discharge (based on a weight of 3 kg)?							
Wrong answer	12	(26.7)	7	(30.4)	7	(41.2)	0.54
Correct answer	33	(73.3)	16	(69.6)	10	(58.8)	

11. A healthy mother should be able to produce a minimum amount of breast milk per day in order have the best chance at meeting the nutritional needs for the preterm infant at discharge, by what day during the postpartum period should she achieve this?							
Wrong answer	16	(34.8)	10	(43.5)	11	(64.7)	0.10
Correct answer	30	(65.2)	13	(56.5)	6	(35.3)	
12. I am familiar with how to accurately support the infant with nonnutritive breastfeeding.							
Strongly Disagree	0	(0.0)	0	(0.0)	0	(0.0)	0.38
Disagree	6	(13.0)	0	(0.0)	0	(0.0)	
Neutral	13	(28.3)	8	(32.0)	5	(29.4)	
Agree	25	(54.3)	14	(56.0)	11	(64.7)	
Strongly Agree	2	(4.3)	3	(12.0)	1	(5.9)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
12. I am familiar with how to accurately support the infant with nonnutritive breastfeeding.	3.50	(0.78)	3.80	(0.65)	3.76	(0.56)	0.30

APPENDIX E: EXPERIENCES INVOLVING MATERNAL BREAST MILK PROVISION IN THE NICU/CURRENT PRACTICE SURROUNDING PROMOTION OF THE MOTHER TO PROVIDE BREAST MILK AND BREASTFEED A PRETERM INFANT BY AGE GROUP

Experiences Involving Maternal Breast Milk Provision in the NICU/ Current practice surrounding promotion of the mother to provide Breastmilk and Breastfeed a Preterm Infant by age group, N =93

Variable	Age						p-value
	20-40 Years (N=49)		41-50 Years (N=27)		50 + Years (N=17)		
	n	(%)	n	(%)	n	%	
13. When a preterm infant born <34 weeks' gestation is newly admitted to the NICU, I encourage the mother to begin pumping breast milk as long as it is not medically contraindicated.							
Always	35	(81.4)	20	(83.3)	14	(82.4)	0.65
Often	3	(7.0)	4	(16.7)	2	(11.8)	
Sometimes	3	(7.0)	0	(0.0)	1	(5.9)	
Rarely	2	4.7)	0	(0.0)	0	(0.0)	
Never	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
13. When a preterm infant born <34 weeks' gestation is newly admitted to the NICU, I encourage the mother to begin pumping breast milk as long as it is not medically contraindicated.	4.65	(0.81)	4.83	(0.38)	4.76	(0.56)	0.92
14. I believe that the everyday practices (workflow) in the NICU allow me to have enough time to educate the mother on the importance of providing breastmilk for her preterm infant.							
Strongly Agree	5	(11.9)	4	(16.0)	0	(0.0)	0.45
Agree	13	(31.0)	10	(40.0)	5	(29.4)	

Neutral	10	(23.8)	5	(20.0)	8	(47.1)	
Disagree	11	(26.2)	6	(24.0)	4	(23.5)	
Strongly Disagree	3	(7.1)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
14. I believe that the everyday practices (workflow) in the NICU allow me to have enough time to educate the mother on the importance of providing breastmilk for her preterm infant.	3.14	(1.16)	3.48	(1.05)	3.06	(0.75)	0.35
15. Upon visitation, I ask the mother of a preterm infant about how much milk she is pumping (actual volume).							
Always	9	(21.4)	7	(28.0)	5	(29.4)	0.75
Often	17	(40.5)	10	(40.0)	6	(35.3)	
Sometimes	13	(31.0)	5	(20.0)	3	(17.6)	
Rarely	3	(7.1)	3	(12.0)	2	(11.8)	
Never	0	(0.0)	0	(0.0)	1	(5.9)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
15. Upon visitation, I ask the mother of a preterm infant about how much milk she is pumping (actual volume).	3.76	(0.88)	3.84	(0.99)	3.71	(1.21)	0.90
16. I encourage the mother who is pumping breastmilk to keep track of her efforts via a paper log or breastmilk pumping mobile application.							
Always	9	(20.9)	3	(12.0)	3	(17.6)	0.49
Often	14	(32.6)	10	(40.0)	6	(35.3)	
Sometimes	12	(27.9)	7	(28.0)	5	(29.4)	
Rarely	8	(18.6)	5	(20.0)	1	(5.9)	
Never	0	(0.0)	0	(0.0)	2	(11.8)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	

16. I encourage the mother who is pumping breastmilk to keep track of her efforts via a paper log or breastmilk pumping mobile application.	3.56	(1.03)	3.44	(0.96)	3.41	(1.23)	0.90
17. During unit rounds for the preterm infant born <34 weeks' gestation, I discuss the availability and current usage of maternal breast milk.							
Always	8	(18.6)	8	(32.0)	5	(29.4)	0.24
Often	15	(34.9)	12	(48.0)	7	(41.2)	
Sometimes	11	(25.6)	3	(12.0)	2	(11.8)	
Rarely	9	(20.9)	1	(4.0)	2	(11.8)	
Never	0	(0.0)	1	(4.0)	1	(5.9)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
17. During unit rounds for the preterm infant born <34 weeks' gestation, I discuss the availability and current usage of maternal breast milk.	3.51	(1.03)	4.00	(1.00)	3.76	(1.20)	0.12
18. I have experienced the practice of a lactation consultant collaborating with me at the bedside to come up with a plan to facilitate breastfeeding for the preterm infant.							
Always	3	(7.0)	1	(4.0)	2	(11.8)	0.09
Often	4	(9.3)	5	(20.0)	5	(29.4)	
Sometimes	12	(27.9)	11	(44.0)	2	(11.8)	
Rarely	9	(20.9)	3	(12.0)	6	(35.3)	
Never	15	(34.9)	5	(20.0)	2	(11.8)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
18. I have experienced the practice of a lactation consultant collaborating with me at	2.33	(1.25)	2.76	(1.13)	2.94	(1.30)	0.13

the bedside to come up with a plan to facilitate breastfeeding for the preterm infant.							
19. I advocate for a referral to a certified lactation consultant for a mother who needs additional help with breastfeeding her preterm infant.							
Always	20	(46.5)	17	(68.0)	8	(47.1)	0.10
Often	17	(39.5)	8	(32.0)	4	(23.5)	
Sometimes	5	(11.6)	0	(0.0)	3	(17.6)	
Rarely	1	(2.3)	0	(0.0)	2	(11.8)	
Never	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
19. I advocate for a referral to a certified lactation consultant for a mother who needs additional help with breastfeeding her preterm infant.	4.30	(0.77)	4.68	(0.48)	4.06	(1.09)	0.08
20. I educate the mother of a preterm infant about the process of how her breastmilk will be utilized for feedings (gavage and transition to oral feeds/breastfeeding) during their NICU stay.							
Always	20	(46.5)	13	(52.0)	9	(52.9)	0.66
Often	19	(44.2)	10	(40.0)	7	(41.2)	
Sometimes	4	(9.3)	2	(8.0)	0	(0.0)	
Rarely	0	(0.0)	0	(0.0)	1	(5.9)	
Never	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
20. I educate the mother of a preterm infant about the process of how her breastmilk will be utilized for feedings (gavage and transition	4.37	(0.66)	4.44	(0.65)	4.41	(.80)	0.85

to oral feeds/breastfeeding) during their NICU stay.							
21. I include the lactation consultant in the plan of care to help the preterm infant learn how to breastfeed successfully.							
Always	12	(28.6)	4	(16.0)	6	(37.5)	0.13
Often	9	(21.4)	10	(40.0)	3	(18.8)	
Sometimes	16	(38.1)	7	(28.0)	2	(12.5)	
Rarely	5	(11.9)	3	(12.0)	5	(31.3)	
Never	0	(0.0)	1	(4.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
21. I include the lactation consultant in the plan of care to help the preterm infant learn how to breastfeed successfully.	3.67	(1.03)	3.52	(1.05)	3.63	(1.31)	0.91
22. Considering my everyday workflow, I feel that I have enough time to support a breastfeeding mother (helping her to latch, observing quality of feeds).							
Strongly Agree	3	(7.0)	2	(8.0)	0	(0.0)	0.90
Agree	7	(16.3)	4	(16.0)	4	(23.5)	
Neutral	18	(41.9)	9	(36.0)	7	(41.2)	
Disagree	12	(27.9)	7	(28.0)	3	(17.6)	
Strongly Disagree	3	(7.0)	3	(12.0)	3	(17.6)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
22. Considering my everyday workflow, I feel that I have enough time to support a breastfeeding mother (helping her to latch, observing quality of feeds).	2.88	(1.01)	2.80	(1.12)	2.71	(1.05)	0.92
23. I feel that my unit							

feeding protocol supports the initiation and maintenance of breastfeeding (ex. Breastfeeding Sliding Scale) for the preterm infant.							
Strongly Agree	3	(7.0)	4	(16.7)	3	(17.6)	0.20
Agree	12	(27.9)	5	(20.8)	7	(41.2)	
Neutral	19	(44.2)	7	(29.2)	5	(29.4)	
Disagree	9	(20.9)	5	(20.8)	2	(11.8)	
Strongly Disagree	0	(0.0)	3	(12.5)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
23. I feel that my unit feeding protocol supports the initiation and maintenance of breastfeeding (ex. Breastfeeding Sliding Scale) for the preterm infant.	3.21	(0.86)	3.08	(1.28)	3.65	(0.93)	0.20

APPENDIX F: ATTITUDES AND BELIEFS ABOUT MATERNAL BREAST MILK USE IN THE NICU BY AGE GROUP

Attitudes and Beliefs about Maternal Breast Milk Use in the NICU by age group, N =93

Variable	Age						p-value
	20-40 Years (N=49)		41-50 Years (N=27)		50 + Years (N=17)		
	n	(%)	n	(%)	n	%	
24. Preterm infants born <34 weeks' gestation should receive an exclusive maternal breast milk diet.							
Strongly Agree	20	(46.5)	13	(52.0)	9	(52.9)	0.36
Agree	22	(51.2)	12	(48.0)	6	(35.3)	
Disagree	1	(2.3)	0	(0.0)	2	(11.8)	
Strongly Disagree	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
24. Preterm infants born <34 weeks' gestation should receive an exclusive maternal breast milk diet.	3.44	(0.55)	3.52	(0.51)	3.41	(0.71)	0.88
25. Preterm infants that are exposed to an exclusive maternal breast milk diet are at a decreased risk for morbidities such as infections and necrotizing enterocolitis.							
Strongly Agree	29	(67.4)	20	(80.0)	10	(58.8)	0.42
Agree	13	(30.2)	5	(20.0)	6	(35.3)	
Disagree	1	(2.3)	0	(0.0)	0	(0.0)	
Strongly Disagree	0	(0.0)	0	(0.0)	1	(5.9)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
25. Preterm infants that are exposed to an exclusive maternal breast milk	3.65	(0.53)	3.80	(0.41)	3.47	(0.80)	0.28

diet are at a decreased risk for morbidities such as infections and necrotizing enterocolitis.							
26. The availability and administration of donor breast milk hinders a mother's motivation to provide her own breast milk for her preterm infant.							
Strongly Agree	1	(2.3)	0	(0.0)	1	(5.9)	0.53
Agree	5	(11.6)	6	(25.0)	1	(5.9)	
Disagree	31	(72.1)	14	(58.3)	13	(76.5)	
Strongly Disagree	6	(14.0)	4	(16.7)	2	(11.8)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
26. The availability and administration of donor breast milk hinders a mother's motivation to provide her own breast milk for her preterm infant.	2.02	(0.60)	2.08	(0.65)	2.06	(0.66)	0.86
27. Preparing the mother before delivery surrounding the provision of breast milk increases her desire to provide milk for her preterm infant.							
Strongly Agree	18	(41.9)	14	(58.3)	6	(35.3)	0.48
Agree	24	(55.8)	10	(41.7)	11	(64.7)	
Disagree	1	(2.3)	0	(0.0)	0	(0.0)	
Strongly Disagree	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
27. Preparing the mother before delivery surrounding the provision of breast milk increases	3.40	(0.54)	3.58	(0.50)	3.35	(0.49)	0.28

her desire to provide milk for her preterm infant.							
28. My efforts to support breastfeeding preterm infants are reinforced by lactation consultants on the unit.							
Strongly Agree	13	(30.2)	9	(37.5)	5	(29.4)	0.82
Agree	26	(60.5)	12	(50.0)	9	(52.9)	
Disagree	3	(7.0)	3	(12.5)	3	(17.6)	
Strongly Disagree	1	(2.3)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
28. My efforts to support breastfeeding preterm infants are reinforced by lactation consultants on the unit.	3.19	(0.66)	3.25	(0.68)	3.12	(0.70)	0.81
29. I feel supported in my efforts to support breastfeeding preterm infants by the providers (NPs and MDs) on the unit.							
Strongly Agree	9	(20.9)	5	(20.8)	3	(17.6)	0.60
Agree	22	(51.2)	14	(58.3)	12	(70.6)	
Disagree	12	(27.9)	4	(16.7)	2	(11.8)	
Strongly Disagree	0	(0.0)	1	(4.2)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
29. I feel supported in my efforts to support breastfeeding preterm infants by the providers (NPs and MDs) on the unit.	2.93	(0.70)	2.96	(0.75)	3.06	(0.56)	0.79
30. Fellow nurses on							

my unit support my efforts to promote breastfeeding preterm infants.							
Strongly Agree	11	(26.2)	7	(29.2)	4	(23.5)	0.87
Agree	28	(66.7)	14	(58.3)	11	(64.7)	
Disagree	3	(7.1)	2	(8.3)	2	(11.8)	
Strongly Disagree	0	(0.0)	1	(4.2)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
30. Fellow nurses on my unit support my efforts to promote breastfeeding preterm infants.	3.19	(0.55)	3.12	(0.74)	3.12	(0.60)	0.92

APPENDIX G: DEMOGRAPHICS OF SUBJECTS BY YEARS IN NICU SETTING

Demographics of subjects by years in NICU setting, N = 93

Variable	Years in NICU Setting						p-value
	< 5 years (N=27)		5-10 years (N=17)		10 + years (N=49)		
	n	(%)	n	(%)	n	(%)	
Gender							
Female	27	(100.0)	15	(88.2)	47	(97.9)	0.16
Male	0	(0.0)	2	(11.8)	1	(2.1)	
Race/ethnicity							
White	16	(59.3)	5	(29.4)	22	(44.9)	0.11
African-American	0	(0.0)	1	(5.9)	1	(2.0)	
Hispanic	7	(25.9)	5	(29.4)	9	(18.4)	
Asian/Pacific Islander	3	(11.1)	6	35.3)	17	(34.7)	
Other	1	(3.7)	0	(0.0)	0	(0.0)	
Age							
20-40 years	27	(100.0)	14	(82.4)	8	(16.3)	**<0.001**
41-50 years	0	(0.0)	2	(11.8)	25	(51.0)	
Over 50 years	0	(0.0)	1	(5.9)	16	(32.7)	
Highest degree							
Associate's degree	6	(22.2)	2	(11.8)	14	(28.6)	0.38
Bachelor's degree	20	(74.1)	12	(70.6)	32	(65.3)	
Master's degree	1	(3.7)	2	(11.8)	3	(6.1)	
Doctoral degree	0	(0.0)	1	(5.9)	0	(0.0)	
Personal experience with breastfeeding							
Yes	8	(29.6)	11	(64.7)	35	(71.4)	**0.002**
No	19	(70.4)	6	(35.3)	14	(28.6)	

APPENDIX H: KNOWLEDGE ABOUT BREASTFEEDING AND BREAST MILK FOR A PRETERM INFANT BY YEARS IN THE NICU SETTING

Knowledge about breastfeeding and breastmilk for a preterm infant by years in NICU setting, N =93

Variable	Years on NICU Setting						p-value
	< 5 years (N=27)		5-10 years (N=17)		10 + years (N=49)		
	n	(%)	n	n	(%)	n	
8. When is the last time you received formal instruction (hospital or unit in service) about how to support the breastfeeding preterm infant and mother?							
Less than 6 months ago	10	(41.7)	1	(5.9)	11	(23.4)	0.045
Between 6 months and one year	4	(16.7)	3	(17.6)	4	(8.5)	
Greater than one year	10	(41.7)	13	(76.5)	32	(68.1)	
9. The mothers of preterm infants born at <34 weeks' gestation are at risk for an inadequate milk supply due to the following:							
Wrong answer	15	(62.5)	12	(75.0)	24	(54.5)	0.35
Correct answer	9	(37.5)	4	(25.0)	20	(45.5)	
10. What is the minimum amount of breast milk a healthy mother should be producing in order to meet the nutritional requirements for the preterm infant at discharge (based on a weight of 3 kg)?							
Wrong answer	6	(25.0)	5	(31.3)	15	(33.3)	0.77
Correct answer	18	(75.0)	11	(68.8)	30	(66.7)	
11. A healthy mother should be able to produce a minimum amount of breast milk							

per day in order have the best chance at meeting the nutritional needs for the preterm infant at discharge, by what day during the postpartum period should she achieve this?							
Wrong answer	8	(33.3)	6	(35.3)	23	(51.1)	0.28
Correct answer	16	(66.7)	11	(64.7)	22	(48.9)	
12. I am familiar with how to accurately support the infant with nonnutritive breastfeeding.							
Strongly Disagree	0	(0.0)	0	(0.0)	0	(0.0)	**0.03**
Disagree	4	(16.7)	2	(11.8)	0	(0.0)	
Neutral	8	(33.3)	4	(23.5)	14	(29.8)	
Agree	12	(50.0)	11	(64.7)	27	(57.4)	
Strongly Agree	0	(0.0)	0	(0.0)	6	(12.8)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
12. I am familiar with how to accurately support the infant with nonnutritive breastfeeding.	3.33	(0.76)	3.53	(0.72)	3.83	(0.64)	**0.045**

APPENDIX I: EXPERIENCES INVOLVING MATERNAL BREAST MILK PROVISION IN THE NICU/CURRENT PRACTICE SURROUNDING PROMOTION OF THE MOTHER TO PROVIDE BREAST MILK AND BREASTFEED A PRETERM INFANT BY YEARS IN THE NICU SETTING

Experiences Involving Maternal Breast Milk Provision in the NICU/ Current practice surrounding promotion of the mother to provide Breast milk and Breastfeed a Preterm Infant by years in NICU setting, N =93

Variable	**Years in NICU Setting**						**p-value**
	< 5 years (N=27)		**5-10 years (N=17)**		**10 + years (N=49)**		
	n	**(%)**	**n**	**n**	**(%)**	**n**	
13. When a preterm infant born <34 weeks' gestation is newly admitted to the NICU, I encourage the mother to begin pumping breast milk as long as it is not medically contraindicated.							
Always	17	(77.3)	13	(76.5)	39	(86.7)	**0.04**
Often	1	(4.5)	2	(11.8)	6	(13.3)	
Sometimes	2	(9.1)	2	(11.8)	0	(0.0)	
Rarely	2	(9.1)	0	(0.0)	0	(0.0)	
Never	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
13. When a preterm infant born <34 weeks' gestation is newly admitted to the NICU, I encourage the mother to begin pumping breast milk as long as it is not medically contraindicated.	4.50	(1.01)	4.65	(0.70)	4.87	(0.34)	0.38
14. I believe that the everyday practices							

(workflow) in the NICU allow me to have enough time to educate the mother on the importance of providing breastmilk for her preterm infant.							
Strongly Agree	1	(4.8)	1	(5.9)	7	(15.2)	0.72
Agree	6	(28.6)	8	(47.1)	14	(30.4)	
Neutral	8	(38.1)	3	(17.6)	12	(26.1)	
Disagree	5	(23.8)	4	(23.5)	12	(26.1)	
Strongly Disagree	1	(4.8)	1	(5.9)	1	(2.2)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
14. I believe that the everyday practices (work flow) in the NICU allow me to have enough time to educate the mother on the importance of providing breastmilk for her preterm infant.	3.05	(0.97)	3.24	(1.09)	3.30	(1.09)	0.67
15. Upon visitation, I ask the mother of a preterm infant about how much milk she is pumping (actual volume).							
Always	4	(18.2)	2	(11.8)	15	(33.3)	0.24
Often	8	(36.4)	9	(52.9)	16	(35.6)	
Sometimes	9	(40.9)	5	(29.4)	7	(15.6)	
Rarely	1	(4.5)	1	(5.9)	6	(13.3)	
Never	0	(0.0)	0	(0.0)	1	(2.2)	

	mean	(sd)	mean	(sd)	mean	(sd)	
15. Upon visitation, I ask the mother of a preterm infant about how much milk she is pumping (actual volume).	3.68	(0.84)	3.71	(0.77)	3.84	(1.11)	0.51
16. I encourage the mother who is pumping breastmilk to keep track of her efforts via a paper log or breastmilk pumping mobile application.							
Always	3	(13.6)	2	(11.8)	10	(21.7)	0.94)
Often	7	(31.8)	7	(41.2)	16	(34.8)	
Sometimes	7	(31.8)	5	(29.4)	12	(26.1)	
Rarely	5	(22.7)	3	(17.6)	6	(13.0)	
Never	0	(0.0)	0	(0.0)	2	(4.3)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
16. I encourage the mother who is pumping breastmilk to keep track of her efforts via a paper log or breastmilk pumping mobile application.	3.36	(1.00)	3.47	(0.94)	3.57	(1.11)	0.66
17. During unit rounds for the preterm infant born <34 weeks' gestation, I discuss the availability and							

current usage of maternal breast milk.							
Always	3	(13.6)	3	(17.6)	15	(32.6)	**0.01**
Often	5	(22.7)	7	(41.2)	22	(47.8)	
Sometimes	7	(31.8)	4	(23.5)	5	(10.9)	
Rarely	7	(31.8)	3	(17.6)	2	(4.3)	
Never	0	(0.0)	0	(0.0)	2	(4.3)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
17. During unit rounds for the preterm infant born <34 weeks' gestation, I discuss the availability and current usage of maternal breast milk.	3.18	(1.05)	3.59	(1.00)	4.00	(1.01)	**0.006**
18. I have experienced the practice of a lactation consultant collaborating with me at the bedside to come up with a plan to facilitate breastfeeding for the preterm infant.							
Always	2	(9.1)	0	(0.0)	4	(8.7)	0.39
Often	3	(13.6)	3	(17.6)	8	(17.4)	
Sometimes	4	(18.2)	5	(29.4)	16	(34.8)	
Rarely	5	(22.7)	2	(11.8)	11	(23.9)	
Never	8	(36.4)	7	(41.2)	7	(15.2)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
18. I have experienced the practice of a lactation	2.36	(1.36)	2.24	(1.20)	2.80	(1.17)	0.17

consultant collaborating with me at the bedside to come up with a plan to facilitate breastfeeding for the preterm infant.							
19. I advocate for a referral to a certified lactation consultant for a mother who needs additional help with breastfeeding her preterm infant.							
Always	11	(50.0)	5	(29.4)	29	(63.0)	0.25
Often	8	(36.4)	8	(47.1)	13	(28.3)	
Sometimes	2	(9.1)	3	(17.6)	3	(6.5)	
Rarely	1	(4.5)	1	(5.9)	1	(2.2)	
Never	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
19. I advocate for a referral to a certified lactation consultant for a mother who needs additional help with breastfeeding her preterm infant.	4.32	(0.84)	4.00	(0.87)	4.52	(0.72)	0.05
20. I educate the mother of a preterm infant about the process of how							

her breastmilk will be utilized for feedings (gavage and transition to oral feeds/breastfeeding) during their NICU stay.							
Always	5	(22.7)	9	(52.9)	28	(60.9)	**0.007**
Often	14	(63.6)	5	(29.4)	17	(37.0)	
Sometimes	3	(13.6)	2	(11.8)	1	(2.2)	
Rarely	0	(0.0)	1	(5.9)	0	(0.0)	
Never	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
20. I educate the mother of a preterm infant about the process of how her breastmilk will be utilized for feedings (gavage and transition to oral feeds/breastfeeding) during their NICU stay.	4.09	(0.61)	4.29	(0.92)	4.59	(0.54)	**0.01**
21. I include the lactation consultant in the plan of care to help the preterm infant learn how to breastfeed successfully.							
Always	6	(27.3)	3	(17.6)	13	(29.5)	0.54
Often	7	(31.8)	3	(17.6)	12	(27.3)	
Sometimes	8	(36.4)	7	(41.2)	10	(22.7)	
Rarely	1	(4.5)	4	(23.5)	8	(18.2)	
Never	0	(0.0)	0	(0.0)	1	(2.3)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
21. I include the	3.82	(0.91)	3.29	(1.05)	3.64	(1.16)	0.30

lactation consultant in the plan of care to help the preterm infant learn how to breastfeed successfully.							
22. Considering my everyday workflow, I feel that I have enough time to support a breastfeeding mother (helping her to latch, observing quality of feeds).							
Strongly Agree	1	(4.5)	0	(0.0)	4	(8.7)	0.88
Agree	4	(18.2)	4	(23.5)	7	(15.2)	
Neutral	11	(50.0)	6	(35.3)	17	(37.0)	
Disagree	4	(18.2)	6	(35.3)	12	(26.1)	
Strongly Disagree	2	(9.1)	1	(5.9)	6	(13.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
22. Considering my everyday workflow, I feel that I have enough time to support a breastfeeding mother (helping her to latch, observing quality of feeds).	2.91	(0.97)	2.76	(0.90)	2.80	(1.13)	0.85
23. I feel that my unit feeding protocol supports the initiation and maintenance of							

breastfeeding (ex. Breastfeeding Sliding Scale) for the preterm infant.							
Strongly Agree	1	(4.5)	0	(0.0)	9	(20.0)	0.14
Agree	6	(27.3)	5	(29.4)	13	(28.9)	
Neutral	8	(36.4)	10	(58.8)	13	(28.9)	
Disagree	7	(31.8)	2	(11.8)	7	(15.6)	
Strongly Disagree	0	(0.0)	0	(0.0)	3	(6.7)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
23. I feel that my unit feeding protocol supports the initiation and maintenance of breastfeeding (ex. Breastfeeding Sliding Scale) for the preterm infant.	3.05	(0.90)	3.18	(0.64)	3.40	(1.18)	0.31

APPENDIX J: ATTITUDES AND BELIEFS ABOUT MATERNAL BREAST MILK USE IN THE NICU BY YEARS IN NICU SETTING

Attitudes and Beliefs about Maternal Breast Milk Use in the NICU by Years in NICU Setting, N =93

Variable	Years in NICU Setting						p-value
	< 5 years (N=27)		5-10 years (N=17)		10 + years (N=49)		
	n	(%)	n	n	(%)	n	
24. Preterm infants born <34 weeks' gestation should receive an exclusive maternal breast milk diet.							
Strongly Agree	7	(31.8)	10	(58.8)	25	(54.3)	0.16
Agree	15	(68.2)	6	(35.3)	19	(41.3)	
Disagree	0	(0.0)	1	(5.9)	2	(4.3)	
Strongly Disagree	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
24. Preterm infants born <34 weeks' gestation should receive an exclusive maternal breast milk diet.	3.32	(0.48)	3.53	(0.62)	3.50	(0.59)	0.26
25. Preterm infants that are exposed to an exclusive maternal breast milk diet are at a decreased risk for morbidities such as infections and necrotizing enterocolitis.							
Strongly Agree	13	(59.1)	13	(76.5)	33	(71.7)	0.32
Agree	9	(40.9)	3	(17.6)	12	(26.1)	
Disagree	0	(0.0)	1	(5.9)	0	(0.0)	
Strongly Disagree	0	(0.0)	0	(0.0)	1	(2.2)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
25. Preterm infants that are exposed to an exclusive maternal breast milk diet are at a decreased risk for morbidities such as infections and necrotizing enterocolitis.	3.59	(0.50)	3.71	(0.59)	3.67	(0.60)	0.53

26. The availability and administration of donor breast milk hinders a mother's motivation to provide her own breast milk for her preterm infant.							
Strongly Agree	0	(0.0)	1	(6.3)	1	(2.2)	0.72
Agree	2	(9.1)	3	(18.8)	7	(15.2)	
Disagree	18	(81.8)	10	(62.5)	30	(65.2)	
Strongly Disagree	2	(9.1)	2	(12.5)	8	(17.4)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
26. The availability and administration of donor breast milk hinders a mother's motivation to provide her own breast milk for her preterm infant.	2.00	(0.44)	2.19	(0.75)	2.02	(0.65)	0.70
27. Preparing the mother before delivery surrounding the provision of breast milk increases her desire to provide milk for her preterm infant.							
Strongly Agree	10	(45.5)	6	(37.5)	22	(47.8)	0.49
Agree	12	(54.5)	9	(56.3)	24	(52.2)	
Disagree	0	(0.0)	1	(6.3)	0	(0.0)	
Strongly Disagree	0	(0.0)	0	(0.0)	0	(0.0)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
27. Preparing the mother before delivery surrounding the provision of breast milk increases her desire to provide milk for her preterm infant.	3.45	(0.51)	3.31	(0.60)	3.48	(0.51)	0.65
28. My efforts to support breastfeeding preterm infants are reinforced by lactation consultants on the unit.							
Strongly Agree	7	(31.8)	3	(18.8)	17	(37.0)	0.68

Agree	13	(59.1)	12	(75.0)	22	(47.8)	
Disagree	2	(9.1)	1	(6.3)	6	(13.0)	
Strongly Disagree	0	(0.0)	0	(0.0)	1	(2.2)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
28. My efforts to support breastfeeding preterm infants are reinforced by lactation consultants on the unit.	3.23	(0.61)	3.13	(0.50)	3.20	(0.75)	0.79
29. I feel supported in my efforts to support breastfeeding preterm infants by the providers (NPs and MDs) on the unit.							
Strongly Agree	3	(13.6)	3	(18.8)	11	(23.9)	0.90
Agree	13	(59.1)	9	(56.3)	26	(56.5)	
Disagree	6	(27.3)	4	(25.0)	8	17.4)	
Strongly Disagree	0	(0.0)	0	(0.0)	1	(2.2)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
29. I feel supported in my efforts to support breastfeeding preterm infants by the providers (NPs and MDs) on the unit.	2.86	(0.64)	2.94	(0.68)	3.02	(0.72)	0.59
30. Fellow nurses on my unit support my efforts to promote breastfeeding preterm infants.							
Strongly Agree	6	(27.3)	3	(20.0)	13	(28.3)	0.83
Agree	14	(63.6)	12	(80.0)	27	(58.7)	
Disagree	2	(9.1)	0	(0.0)	5	(10.9)	
Strongly Disagree	0	(0.0)	0	(0.0)	1	(2.2)	
	mean	**(sd)**	**mean**	**(sd)**	**mean**	**(sd)**	
30. Fellow nurses on my unit support my efforts to promote breastfeeding preterm infants.	3.18	(0.59)	3.20	(0.41)	3.13	(0.69)	0.98

Fresno State

Non-exclusive Distribution License (Keep for your records)

(to archive your thesis/dissertation electronically via the Fresno State Digital Repository)

By submitting this license, you (the author or copyright holder) grant to the Fresno State Digital Repository the non-exclusive right to reproduce, translate (as defined in the next paragraph), and/or distribute your submission (including the abstract) worldwide in print and electronic format and in any medium, including but not limited to audio or video.

You agree that Fresno State may, without changing the content, translate the submission to any medium or format for the purpose of preservation.

You also agree that the submission is your original work, and that you have the right to grant the rights contained in this license. You also represent that your submission does not, to the best of your knowledge, infringe upon anyone's copyright.

If the submission reproduces material for which you do not hold copyright and that would not be considered fair use outside the copyright law, you represent that you have obtained the unrestricted permission of the copyright owner to grant Fresno State the rights required by this license, and that such third-party material is clearly identified and acknowledged within the text or content of the submission.

If the submission is based upon work that has been sponsored or supported by an agency or organization other than Fresno State, you represent that you have fulfilled any right of review or other obligations required by such contract or agreement.

Fresno State will clearly identify your name as the author or owner of the submission and will not make any alteration, other than as allowed by this license, to your submission. **By typing your name and date in the fields below, you indicate your agreement to the terms of this use. Publish/embargo options (type X in one of the boxes).**

[X] **Make my thesis or dissertation available to the Fresno State Digital Repository immediately upon submission.**

[ ] Embargo my thesis or dissertation for a period of 2 years from date of graduation. After 2 years, I understand that my work will automatically become part of the university's public institutional repository unless I choose to renew this embargo here: fsdr-discuss@csufresno.edu

[ ] Embargo my thesis or dissertation for a period of 5 years from date of graduation. After 5 years, I understand that my work will automatically become part of the university's public institutional repository unless I choose to renew this embargo here: fsdr-discuss@csufresno.edu

Victoria Mattox

Type full name as it appears on submission

5/5/2021

Date