



A Quality Improvement Project to Increase Breast Milk Expression

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Abstract: Breast milk is recognized as the ideal nutrition for all infants especially for infants in the neonatal intensive care unit (NICU). Breast milk diet for critically ill infants is associated with decreased septic events and length of stay and reduced risk of surgical necrotizing enterocolitis.

Purpose: This quality improvement project focused on the development of a breast pumping program for mothers with infants in the NICU.

Methods: NICU nurse breast milk champions received education on benefits of breast milk and key factors in maintaining adequate milk supply. Champions engaged mothers in conversations to provide support and used a “Coming to Volume Assessment” tool as a guide to assess pumping effectiveness. Champions were interviewed about the benefits, ease of use of assessment tool, and future directions for the pumping program.

Results: Daily contact with the bedside nurse had a positive effect on breast milk expression rates. Six of 14 mothers, who met with a champion greater than three times in a 2-week period, reached goal volumes. Average maximum milk produced was 836.6 ml ($SD = 228.5$ ml, 95% confidence interval [596, 1076]) on infants’ eighth day of life. Champions described the program as a positive experience for the mothers and themselves and the tool as easy to use. They also endorsed continued implementation of the pumping program.

Conclusions: A pumping program in the NICU that incorporates staff education and use of the “Coming to Volume Assessment” tool with frequent dialogue with mothers to evaluate effectiveness of breast milk expression can aid in the promotion of breast milk expression.

KEY WORDS: breast milk, breast pumps, neonatal intensive care unit

INTRODUCTION

Breast milk is recognized as the ideal nutrition for infants from birth to 1 year old (Section on Breastfeeding, 2012). The Section on Breastfeeding (2012) has made this recommendation based on findings of numerous studies showing breast milk’s protective properties against

infections, diarrheal illnesses, asthma, childhood obesity, and several other disorders of childhood. The surgical neonate hospitalized in the neonatal intensive care unit (NICU) especially benefits from breast milk’s protective properties. Infants fed a breast milk diet in the postoperative period show less septic events (Manzoni et al., 2011), a decreased length of stay (Kohler, Perkins, & Bass, 2013), and a reduced risk of developing necrotizing enterocolitis (Gephart, McGrath, Effken, & Halpern, 2012). Surgical teams are increasingly reliant on breast milk for the prevention of postoperative complications as well as the nutritional management of the surgical neonate. Unfortunately, infants with a history of surgery are more likely to be discharged on formula than breast milk (Purdy et al., 2012). This finding may be related to the surgical infant’s inability to feed at the breast because of concerns for airway management and/or feeding intolerance (Edwards & Spatz, 2010). Nurses and providers may not view breastfeeding as a priority when caring for such critically ill infants. It is estimated that only one third of NICUs in the United States routinely use breast milk for most infant feedings (Perrine & Scanlon, 2013).

The critically ill infant hospitalized in the NICU may be unable to feed at the breast for weeks to months after birth because of a variety of reasons such as prematurity and respiratory or cardiovascular instability. During the interim, mothers of ill infants are encouraged to pump milk to ensure an adequate milk supply (Philipp & Academy of Breastfeeding Medicine Protocol Committee, 2010). Stimulation to express breast milk shortly after birth is associated with an increased likelihood of reaching goal milk volumes (Hill, Aldag, & Chatterton, 2001). A breast pumping program described by Spatz (2005) at the Children’s Hospital of Philadelphia incorporates staff and parent education and an emphasis on early and frequent milk expression. Mothers were instructed to begin milk expression within 2–4 hours after delivery with a hospital-grade simultaneous pump. The NICU nursing staff received training in lactation support and educated mothers on proper handling, storage, and labeling of breast milk. The NICU nurse

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was responsible for reviewing the pumping record with the mother to evaluate milk supply and difficulties with pumping. The program was associated with a total breast milk feeding or expression rate of approximately 75% in the NICU. Spatz (2005, 2012) emphasized the key role the bedside staff nurse plays in education and support of the breastfeeding mother in the NICU.

Pumping milk may be difficult for mothers experiencing anxiety related to their child's health compounded with the stress associated with the NICU environment (Gonzalez et al., 2003). Mothers of critically ill infants may feel unwell themselves and have difficulty initiating lactation (Callen & Pinelli, 2005). Meier, Engstrom, Patel, Jegier, and Bruns (2010) found that often mothers do not receive adequate information on the benefits of human milk and how to maintain milk supply. Several experts call for clear and direct communication with mothers about the benefits of breast milk through the use of consistent educational "talking points" (Meier et al., 2010; Rodriguez, Miracle, & Meier, 2005). The "talking points" should focus on the need for early and frequent milk expression with the use of an appropriate pump, even with mothers who do not wish to later breastfeed their infants. Mothers usually do not feel coerced when information regarding the benefits of human milk and expression is explained (Rodriguez et al., 2005).

An example of a lactation support program in the NICU setting that incorporates staff and parent education is the "Rush Mothers' Milk Club" at Rush University in Chicago. Meier, Patel, Bigger, Rossman, and Engstrom (2013) reported that 98% of infants in the Rush NICU received some human milk with an average of 60 ml/kg/day of breast milk during the NICU hospitalization. The Rush model relies heavily on NICU and maternity nurses and breastfeeding peer counselors (BPCs). The program supports mothers in the early initiation of milk expression and frequent pumping with documentation in a breastfeeding milk diary. In this program, the diary is reviewed daily with the mother by the registered nurse or the BPC, which serves as an opportunity for emotional and informational support. The daily contact may occur face-to-face or via telephone. In addition, the staff nurse or BPC completes the "Coming to Volume Assessment" tool, which helps evaluate breast milk expression and guide conversations with the mothers. Frequency of pumping sessions, volume of milk expressed, maternal medications, and nipple condition are recorded on the tool daily. The Rush program is similar to the program at the Children's Hospital of Philadelphia, where the emphasis is also on early and frequent milk expression and education of families on the benefits of breast milk

(Spatz, 2005). In both programs, there is a daily review of a pumping diary with the mothers. The interventions described by Spatz (2005) and Meier, Patel, et al. (2013) rely heavily on the nurse for education, assessment, and documentation of the pumping program.

The purpose of this quality improvement project was to implement and evaluate the utilization of a breast pumping program for mothers of infants hospitalized in a NICU. It was anticipated that a pumping program and daily contact with the mothers to review the pumping log would result in increased breast milk available for infants in the NICU.

METHODS

Design, Setting, and Sample

The setting for the project was a Level 4 NICU in a large mid-Atlantic medical center. The average census in this medical center NICU was approximately 40 infants per day. Infants usually ranged in age from 1 day of life through 10 months old. Most patients tended to be African American and from lower income families relying on medical assistance for payment.

Procedures

The proposal was submitted to the institutional review board and deemed nonhuman subjects research. After nursing administration approval, an informal survey was conducted by the project leader, a pediatric surgery advanced practice nurse (APN), of the NICU nurses during the daily pediatric surgery rounds. The purpose of the survey was to obtain baseline information before implementation of the project on nurses' awareness of the mothers' breast pumping practices and milk available for infants in their care. No identifying information was collected. The nurses were asked (a) if the infant assigned to their care had breast milk available, (b) if the mother was pumping, (c) how often the mother was pumping, and (d) how much milk was expressed daily. Nursing staff were also asked to identify any tools used to document volumes of milk mothers being expressed and the frequency of pumping. An informal assessment was also conducted to gather preliminary data on the number of infants in the NICU who were being fed breast milk.

While the survey data were being collected, the NICU manager assisted in recruitment of NICU nurses to act as "breast milk champions." The champions were provided with information on "talking points" to share with the mother (see Table 1), key articles on how to present evidence-based information on the benefits of breastfeeding with the mother, and instructions on how to use the "Coming to Volume Assessment" tool

Table 1: Talking Points

• Make the analogy between breast milk as “medicine” for the baby at this time because it is the perfect food easily digested and has components that prevent infection.
• Reinforce that breast milk expression needs to begin early after birth.
• Affirm that decisions about feedings at the breast can be made later, and the nurses will help with decisions related to feeding at the breast, bottle feeding, or weaning, as needed.
• Encourage mother to contact a lactation consultant if milk volume is not increasing even when pumping eight times per day or she experiences nipple pain or breakdown.
• To establish adequate breast milk volume, encourage the mothers to:
○ Pump eight times per day or every 3 hours
○ Use a simultaneous electric pump
○ Pump until the milk stops flowing
○ Check breasts after pumping to be sure they feel empty
○ Work toward reaching 800–1000 ml by Day 14
Suggested statements to share with the mother:
• Your milk is both food and medicine for your baby.
• The early milk you produce is called colostrum and helps protect your baby from infections. This early milk is important for your baby's intestines to help them mature.
• The milk your baby ingests now can help her now and in the future. Pumping now will help you develop a good supply of milk.
• You do not need to worry about how long you will pump or whether you will put the baby at your breast. Just take this 1 day at a time and pump today. Down the road, we can help you figure it out.

(Meier, Patel, et al., 2013; Rodriguez et al., 2005). The tool was used to determine the number of pumping sessions, volume, and longest interval between pumping within the past 24 hours. The tool also included questions regarding common concerns of mothers related to pumping (e.g., nipple redness or soreness, breast emptying completely, and milk leaking). Permission to use this copyrighted tool was obtained from one of the developers before implementation. The staff nurses were instructed to review the “talking points” and items in the “Coming to Volume Assessment” tool with the mother daily via telephone or in person from the time of admission for up to 14 days or until 800–1000 ml of milk was expressed by the mother daily (Meier, Patel, et al., 2013).

Measures

The breastfeeding support program was carried out over a 6-week period. Daily review and evaluation of the completed tools for completeness and accuracy was performed by the project leader. Upon completion of the program, the breast milk champions were interviewed by the project leader to evaluate their training, ease of use of the tool, and potential barriers and facilitators. Data from the “Coming to Volume Assessment” tools were analyzed using descriptive statistics including frequencies, means, and standard deviations. The

interview data collected from the champions were analyzed for common trends and patterns.

RESULTS

Preliminary Staff and Infant Survey

The informal survey performed before the implementation of the breastfeeding support program revealed that most staff nurses lacked information on the status or frequency of pumping and the availability of breast milk from mothers of infants assigned to them. During this period, it was also noted that only 35%–45% of infants receiving enteral nutrition in the NICU were being fed breast milk.

Mothers and Infants

Twelve mothers of 16 infants participated in the program (see Table 2). Most mothers were African American (58.3%) and receiving medical assistance (50%). Infants of mothers enrolled in the study were hospitalized in the NICU with the following diagnoses: multiple births, prematurity, gastroschisis, respiratory distress, congenital cardiac defects, and small for gestational age.

Thirty-four contacts with 12 mothers took place over the 6-week implementation period (see Table 3). The goal was to meet with individual mothers by

Table 2: Type of Delivery, Ethnicity, Insurance, and Infant Diagnosis of Participants

Mother	Type of Delivery	Ethnicity	Insurance	Diagnosis
1	Singleton	African American	Medical assistance	Small for gestational age
2	Singleton	Caucasian	Commercial	Respiratory distress
3	Singleton	African American	Medical assistance	Tetralogy of Fallot
4	Singleton	African American	Medical assistance	Pulmonary hypertension
5	Triplets	Caucasian	Commercial	Multiple births/prematurity
6	Twins	African American	Medical assistance/ commercial	Multiple births/prematurity
7	Singleton	Caucasian	Medical assistance	Gastroschisis
8	Singleton	African American	Medical assistance/ commercial	Prematurity
9	Singleton	Caucasian	Commercial	Prematurity
10	Twins	Caucasian	Commercial	Multiple births/prematurity
11	Singleton	African American	Commercial	Meconium aspirate
12	Singleton	African American	Medical assistance	Prematurity

telephone or in person daily for a 14-day period. Although 12 mothers were enrolled, only six mothers achieved goal milk volumes of at least 800 ml per day. The mothers who reached goal volumes met with a breast milk champion via telephone or in person between three and seven times with an average of 4.5 ± 1.5 times during the project period (see Table 3). Of

the six mothers who were not able to reach goal volume, all had less than two contacts with the breast milk champions. All six mothers, who reached goal volumes, reported pumping a minimum from five to eight times daily in the 24 hours before reaching goal. The average maximum daily milk production was 971 ml ($SD = 233$ ml, 95% confidence interval [513, 1429]). Maximum milk

Table 3: Measures Affecting Breast Milk Goal Volumes

Mother	No. of Daily Contacts With Breast Milk Champion	Frequency of Pumping per Day (Mean \pm SD)	Maximum Breast Milk Volume Reached (ml/day)	Reached Goal Volume	Used Hospital-Grade Breast Pump
1	2	0 ^a	0	No	No
2	1	8 ± 0	Drops	No	No
3	1	0 ^a	0	No	No
4	1	3 ± 0	Drops	No	No
5	7	5.4 ± 2.05	1280	Yes	Yes
6	5	8.2 ± 1.36	800	Yes	Yes
7	5	8.2 ± 0.56	890	Yes	Yes
8	4	7.5 ± 4.25	800	Yes	Yes
9	3	7.6 ± 0.37	800	Yes	Yes
10	1	10 ± 0	Drops	No	Yes
11	3	8 ± 0	1260	Yes	Yes
12	1	1 ± 0	0	No	No

^aDespite the mothers beginning the program, they had stopped pumping by the first follow-up contact with the champion.

production most frequently occurred on infants' eighth day of life.

A variety of pumps were used by the mothers in this quality improvement project. Seven of the mothers reported using a hospital-grade double electric breast pump at home (see Table 3). The six mothers, who reached goal volumes, all used a hospital-grade breast pump. Type of pump and availability were based on insurance plan, Women's Infant and Children Program pump availability, and mother's preference.

Breast Milk Champions

Five NICU nurses were recruited to be breast milk champions. The champions were seasoned NICU nurses experienced in working with breastfeeding mothers. The APN project lead for this project functioned at times as a champion, when there was no NICU staff champion available to contact a mother.

Only four champions completed the interview questions upon completion of the project because one champion resigned before completion of the project. The champions reported on several barriers and facilitators to implementing the breast pumping support program. Barriers included the changes in daily assignments that at times did not include infants they initially enrolled in a program. The champions reported that it would have been easier and more efficient to contact the mothers, if they continued to follow the infant enrolled as a regular daily assignment. The acuity of individual champion's assignments also was perceived as a barrier because it limited the time they were able to spend in locating and contacting mothers enrolled in the program. One of the champions reported that some of the questions of the "Coming to Volume Assessment" tool seemed repetitive. Two of the champions voiced concern about newer NICU nurse's comfort levels with the tool, such as their ability to speak to mothers about more personal issues. Finally, the difficulty in getting a hospital-grade simultaneous breast pump for mothers to use at home was perceived as another barrier. Despite the barriers encountered, the champions stated that the program was a positive experience for them and endorsed continued implementation of the pumping program. One champion recalled a mother stating "I like when you call to check on me." Another champion reported a mother saying, "I feel like you are the only nurse I can talk to about breastfeeding." The frequent conversations related to breast milk expression allowed an opportunity for nurses to give support and encouragement to mothers to continue to provide breast milk for their infants.

Suggestions provided by the champions to increase support for mothers expressing breast milk focused on

additional education for nursing and physician staff and mothers. Two champions also discussed the need for more privacy in the NICU as a means to increase breast milk expression. One champion noted that mothers appeared to speak more openly during telephone conversations than in person about breastfeeding. She perceived this to be because of the lack of privacy in the NICU setting making personal conversations difficult. Two champions strongly endorsed the need for more lactation specialists assigned to the NICU to support mothers expressing breast milk. The champions responded positively to the query about the quality of the training for the pumping program and reported the articles as being informative. The use of "talking points" was also identified as an effective practice.

DISCUSSION

The preliminary data from this inner-city NICU indicate a less than ideal environment to support breastfeeding. Only 35%–45% of infants in the NICU on enteral feedings were receiving human milk in the days before implementation of the quality improvement project. These rates were significantly less than the Healthy People 2020 goal of a breastfeeding initiation rate of 81.9% (Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services, 2015). This inner-city NICU also falls outside the 34.9% of NICUs who reported in a 2011 survey as routinely providing breast milk for $\geq 90\%$ of their infants (Perrine & Scanlon, 2013).

Although the sample size for this project was small, there was an indication that the number of contacts with a breast milk champion was associated with mothers achieving goal breast milk. These findings are similar to those reported by Meier, Patel, et al. (2013) in which the success of an inner-city NICU pumping program was related to frequent contact between the mothers and breastfeeding support staff. In that study, most infants in the NICU received some human milk during their hospitalization, despite maternal demographics traditionally associated with lower breastfeeding success rates. Achieving goal volume may have also been dependent on having a hospital-grade double electric breast pump, because all of the mothers with this type of pump were able to meet their goal.

The champions in this project identified several barriers and facilitators to breastfeeding in the NICU setting. The champions reported the limited privacy in the current NICU environment and the lack of breast pumps as barriers to breastfeeding success. The nurses' reports were similar to findings in the literature by

mothers of NICU babies. Alves, Rodrigues, Fraga, Barros, and Silva (2013) reported that mothers identified a lack of privacy and restricted availability of breastfeeding equipment as barriers to successful breastfeeding in the NICU. A private room for each mother to breastfeed or express milk could address these concerns. The champions also reported that increasing the number of lactation specialists employed in the NICU could increase breastfeeding rates. Gonzalez et al. (2003) reported a 16% increase in breastfeeding initiation rates in 1 year with a lactation specialist performing one educational intervention and two observations of breastfeeding for each mother–infant dyad in the NICU. The use of BPCs has also been reported to be an effective resource in finding solutions to specific lactation questions and problems and in providing quality care for infants and their families (Meier, Engstrom, & Rossman, 2013).

A major limitation of this quality improvement project was the use of a small diverse convenience sample from one NICU and the inability to generalize the findings beyond this setting. It is also important to note that the champions who volunteered to assist in the study were expressing their personal opinions and experiences, which may not be representative of the nursing management or other nurses working in the NICU. However, the findings of this project appear to be a useful first step for identifying barriers and facilitators in providing quality of care to mothers and infants in this NICU.

CONCLUSIONS AND RECOMMENDATIONS

Mothers enrolled in a NICU breast pumping program, who had frequent contacts with NICU nurses serving as breast milk champions using a “Coming to Volume Assessment” tool, were able to meet goal volumes in expressed breast milk for their critically ill infants. Nurses participating in the program also provided positive feedback related to their interactions with mothers. The bedside nurse in the NICU may play a crucial role in supporting and educating mothers to continue to express breast milk for their infants. The initial 35%–45% rate of NICU infants receiving breast milk was very low, and a breast pumping program is one initiative that could be used to improve these rates. Future initiatives of interest to the organization are the development of a breastfeeding policy, possible expansion of the breastfeeding champion role in the NICU, and a move toward becoming a baby-friendly facility (World Health Organization and the United Nations Children’s Fund, 2012).

The pediatric surgery APN is an ideal team member to advocate for similar programs that promote a breast milk diet for the surgical neonate. This advocacy best

begins when working with pregnant women who plan on delivering an infant with a known surgical diagnosis. During the prenatal period, a referral to a lactation specialist helps ensure that the mother receives information about the benefits of breastfeeding and gets off to the best start upon delivery. The pediatric surgery APN’s role should also extend to maintaining open communication with lactation specialists and the NICU staff nurses in obtaining daily updates on the progress made in establishing a breast milk supply for the surgical neonate. A coordinated effort by APNs, staff nurses, and lactation specialists in the support of the mother of a surgical neonate will provide greater chances of that infant obtaining optimal nutrition and lowering the risk of complications.

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In the article mentioned above, the author affiliations for Bruno Martinez were listed incorrectly. The correct affiliation is below:

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Reference

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