

RESEARCH ARTICLE

Early Milk Expression in Mothers of Neonates in the Neonatal ICU: A Quality Improvement Project

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Citation: Miraa Qutab MBBS, Zainab Bhuriwala MD, Madrina McMahan RN, CLC, Sanam Bhawan MBBS et al. (2025) Early Milk Expression in Mothers of Neonates in the Neonatal ICU: A Quality Improvement Project, J Neonatal Stud 3: 102

Abstract

In premature infants, the importance of early breastfeeding has been emphasized throughout the literature. However, an efficient policy that targets early breast milk expression has not been nationally recognized. The aim of this quality improvement project (QIP) is to determine the result of novel standard practices on the rate of early hand milk expression in mothers of neonates in the NICU at our center. This project, designed as a quasi-experimental study, focuses on the compliance of mothers of neonates admitted to the NICU at Hunt Regional Hospital. The intervention placed by this study included the development and dissemination of colostrum collection kits, staff and patient education on its use, and frequent town hall/QIP meetings to determine efficiency. The results of this project showed a statistically significant increase ($p < 0.001$) in compliance with this new policy when compared to the pre-intervention group. In conclusion, this preliminary study shows that especially in the NICU setting, an increase in compliance can be implemented through effective hospital policy.

Keywords: Early breast milk expression, Neonates, NICU, Quality improvement

Background

Breastfeeding provides a variety of short- and long-term health benefits for full-term and premature (Gestational Age <37 weeks) or Very Low Birth Weight (VLBW) newborns [4]. Additionally, breastfeeding within the first hour of life provides the infant with colostrum, a nutrient-rich fluid that precedes breast milk release. The beneficial effects of colostrum include protection from necrotizing enterocolitis/sepsis, better immune regulation, improved feeding tolerance, decreased hospital stay, and improved Neonatal Intensive Care Unit (NICU) outcomes [10].

The WHO recommends introducing colostrum to a term newborn within the first 24 hours of life. Despite these recommendations and the known positive outcomes from early breastfeeding, global rates indicate that 60% of neonates are not breastfed within the first hour of life [14]. In developing nations, this absence or delay in breastfeeding contributes significantly to neonatal mortality at 33% [14]. In the U.S, there is no specific data available for the rate of early breastfeeding in neonates born in the US. Center-based data has shown inadequate and inconsistent initiation efforts for early breastfeeding. The national percentage of newborns ever receiving breastmilk is 84%, however, only 58.3% of these infants were continually breastfed up until 6 months [12]. The lack of data regarding the early introduction of breast milk emphasizes the need for further research in this field.

The availability and procurement of early breast milk for neonates have been complicated by several factors. These include lack of proper education and instruction, lactation difficulties, as well as logistic and social constraints [10]. Physiological factors also play a role in mothers of preterm infants due to the delay in achieving adequate lactation. Normal lactogenesis can be divided into 2 phases: Stage 1 and Stage 2. Stage 1 is achieved during mid-pregnancy and is defined by the maturation of mammary glands and ducts, with trace production of milk [9]. Stage 2 follows parturition and is marked by an abundance of milk production that is then let down when the infant suckles [9]. Achievement of this stage is determined clinically by maternal breast volume and composition of breast milk [9]. However, mothers of premature infants often experience delays in achieving stage 2 due to hormonal dysregulation in these mothers [1, 6].

A proposed solution to this dilemma is the early expression of breast milk by mothers, especially in those with neonates in the ICU. This may not only increase the production of breast milk but can lead to mothers reaching lactogenesis stage II earlier. As a result, more breast milk becomes available to neonates requiring these immunologic and nutritional benefits. Both in term and preterm infants, literature has shown that earlier initiation of milk expression is related to earlier onset of lactogenesis stage II and increased milk volume, even in the following days and weeks. [3, 5, 11].

Previous studies have shown that early milk expression of VLBW infants is related to an increased milk volume and early lactogenesis stage II. [7, 8, 10] showed an increased volume of milk production and earlier onset of lactogenesis II if the expression is commenced in the first 1 hour after delivery. However, it did not notice a statistically significant increase if initiated within the 2-6 hour period in a follow-up study conducted later [10]. Similarly, [3] found a positive correlation when breast milk expression was initiated within 6 hours following delivery and prolonged lactation over 40 weeks' postmenstrual age. [7] Have also reported a positive association between the day of milk expression initiation and milk volume after 2 weeks of expression.

In our study population, the average early hand expression rate in mothers of NICU babies within the first hour after delivery was 42% from June to November 2019. This low average indicated the potential for a new quality improvement project (QIP) to benefit the health of neonates in the NICU. The aim of this study is to determine the effect of novel standard practices on the rate of early hand milk expression in mothers of neonates in the NICU.

By increasing mothers of NICU Babies' ability to make more milk, Hunt Regional NICU babies will benefit with reduced risk

for NEC and other major complications of prematurity. Hunt Regional is currently designated by the Texas Ten Step. Our culture at Hunt Women Center promotes the use of mother's own milk in the newborn population in particular, babies admitted to the NICU.

Methods

Design: This Quality Improvement project has been organized as a prospective quasi-experimental study design. The goal of the study is to ascertain the compliance to early breast milk expression before and after intervention in mothers of infants admitted to NICU at Hunt Regional Hospital Level 3 NICU in Greenville, Texas.

Setting and Relevant Context

In Texas, several governmental health initiatives have been implemented to target an increase in breastfeeding. Data from 2020 reflects a percentage of infants ever breastfeeding reaching 85.9%, which is higher than the national average (84%) (Texas Department of State Health Services, n.d.). However, this data fails to distinguish the early lactation period that is considered much more beneficial, especially in vulnerable children [13].

In our study, early breast milk expression was defined at our center as 1 hour following birth, as supported by the literature [2]. Current interventions for mothers of breastfeeding children are state health service department programs, Texas 10 Steps Programs, community outreach tool kits and lactation counseling services. [13]. We are a Texas 10 Steps Program designated center at Hunt Regional

Sample

The following criteria were applied when recruiting mothers into the study.

Inclusion Criteria: All mothers delivering at Hunt Regional Hospital in Greenville, Texas between Nov 2019 to June 2021 whose babies met admission criteria for the NICU were included.

Exclusion Criteria: Any mothers who:

1. Were diagnosed with one or more medical comorbidities/were ill and required hospitalization/received general anesthesia
2. Only gave donor milk or formula to their neonates
3. Provided explicit refusal
4. Delivered outside of the hospital (at home or in an ambulance)

The sample size of mothers included in this study was 390. This size was adequate for this single-center study that focused on patient compliance after the intervention.

The study was conducted between Nov 2019 to June 2021. The main intervention in this study was to implement an effective hospital policy that would allow for the increase of early expression of breast milk and breastfeeding. Introductory town hall meetings with the Labor and Department (L&D) Staff were conducted to explain its significance. Additionally, one-on-one teaching sessions were arranged for all L&D and stork staff for instruction on hand expression and the importance of doing this in the first hour after delivery. They were also provided with training on how to educate and guide mothers on hand expression via a colostrum collection kit. These sessions were coupled with regular reminders via email to ensure adherence amongst

the trained staff.

Colostrum collection kits were assembled and made easily accessible for all mothers of infants admitted to the NICU. The kit contained a soft cloth for collecting colostrum and the mother's scent, an oral syringe to collect larger amounts of colostrum, an identification label for the neonate, and a detailed direction sheet on how to hand express. The guideline being followed as per protocol is as follows:

- i. Have mothers hand express or pump within one hour after birth and continue every 2-3 hours thereafter
- ii. In a syringe, draw 0.1 ml for neonates < 1 Kg or 0.2 ml, for neonates weighing >1kg
- iii. Using a swab, spread the colostrum equally on the neonate's buccal mucosa on both right and left sides
- iv. Continue every 4-6 hours for 72 hours
- v. Gavage feed colostrum only if ordered by the Neonatologist or Nurse Practitioner [8]

Data Analysis

The primary outcome of this study is the percent of compliance to maternal expression of breastmilk within 1 hour of delivery. The 2 comparison groups that were analyzed were the pre- intervention group and the post-intervention group. Data was recorded and collected monthly by the MM and lactation counselors, and compiled into a table for comparison by ZB, FS, and AF (Table A and B). Utilizing IBM® Statistical Package for the Social Sciences (SPSS®) software, the data was compiled and analyzed utilizing an independent samples t-test.

Results

A total of 390 mothers of neonates admitted to the NICU were included in this study. Pre and post intervention data are presented in Table A and B respectively. The results of this intervention revealed that the rate of early expression of breast milk did significantly increase in mothers of neonates admitted to the NICU at our hospital. Further, the percentage of mothers counseled postnatally on early expression of breast milk improved overtime and was sustained (Table 1 and 2).

Table A: Pre-Intervention Data

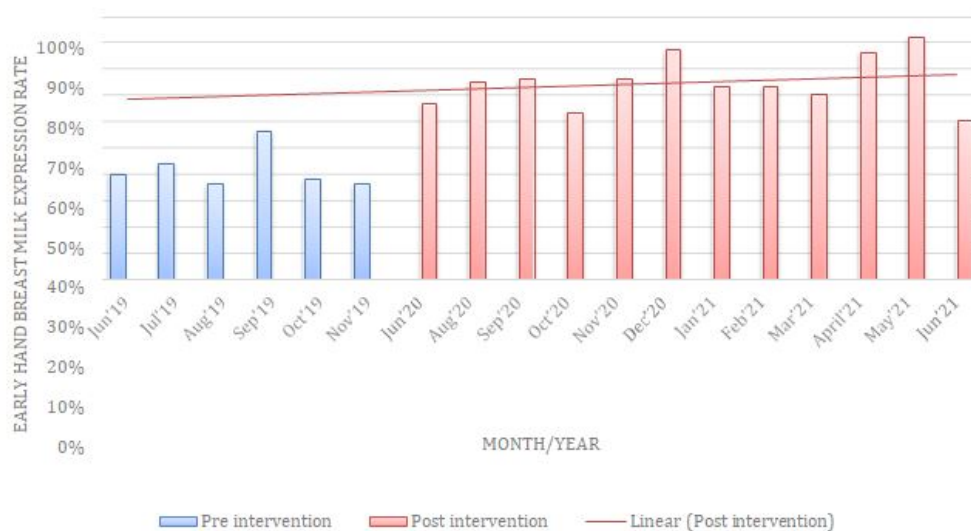
| Month | Percentage of Early Milk Expression |
|----------|-------------------------------------|
| Jun'19 | 0.4 |
| Jul'19 | 0.44 |
| Aug'19 | 0.36 |
| Sep'19 | 0.56 |
| Oct'19 | 0.38 |
| Nov'19 | 0.36 |
| Average: | 0.416 |

Table B: Post-Intervention data

| Month | Percentage of Early Milk Expression |
|----------|-------------------------------------|
| Jun'20 | 0.67 |
| Aug'20 | 0.75 |
| Sep'20 | 0.76 |
| Oct'20 | 0.63 |
| Nov'20 | 0.76 |
| Dec'20 | 0.87 |
| Jan'21 | 0.73 |
| Feb'21 | 0.73 |
| Mar'21 | 0.7 |
| April'21 | 0.86 |
| May'21 | 0.92 |
| Jun'21 | 0.6 |
| Average: | 0.748 |

Table 1: Group Statistics

| Group Statistics | | | | | | |
|------------------|-------------------|-----|---------|----------------|-----------------|---------|
| | groups | N | Mean | Std. Deviation | Std. Error Mean | |
| Percentage (%) | Pre-intervention | 132 | 41.6667 | 7.63326 | 3.11627 | 3.11627 |
| | Post-intervention | 264 | 74.8333 | 9.63736 | 2.78207 | 2.78207 |



Graph 1: Early Hand Breast Milk Expression Rates in Mothers of NICU patients

Discussion

This study demonstrates the importance of quality intervention in promoting the use of breast milk in the NICU. We were able to significantly increase our use of breast milk in the NICU, by early intervention and by involving the team taking care of the mothers and babies. In my experience, it resulted in a complete change in culture. We have a zero NEC center and we feel that higher breast milk use has had a major impact.

Limitations

This quality improvement project was carried out as a single-center regional hospital study, therefore the primary outcome of this study may not produce as pronounced results in other settings. Additionally, the study focused on a subset of mothers that did not meet the exclusion criteria. These criteria were selected to reduce the potential factors that would confound the compliance rate.

Conclusion

This QI project improved early milk expression in mothers of neonates admitted to this level 3 NICU. We achieved these sustained results through collecting progress updates from staff interviews, monthly QI meetings, and chart reviews. These meetings helped any clarify gaps in work flow processes and staff knowledge if present. These practices developed by this study have since been implemented into the NICU policy as standard practice.

Author's Contribution

MQ: Manuscript writing, Coordination of tasks and analysis

ZB: Manuscript writing, Coordination of Tasks, Graph creation

MM: Protocol implementation

SB: Manuscript writing and analysis

DW: Protocol administration

LK: Manuscript writing and protocol administration

AK: Protocol writing, administration, manuscript review

The author(s) certify that based on information obtained from the participating investigators and the institution where the study was performed (Hunt Regional Hospital Greenville, Texas), neither the listed investigators nor the institution participated in any financial arrangement or proprietary interest in any product, and they were not the recipients of significant payments of other sorts or of the donation of any equipment.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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