

A quality improvement project to improve human milk feeding rate in hospitalized neonates

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Abstract

Background: Human milk feeding is a well-established key of success to improve both short- and long-term outcomes in neonates. However, human milk feeding in hospitalized neonates faces many challenges, including limited availability of lactation specialists and bedside nurses, separation issue, mothers' and infants' illness. Our hospital has set up this quality improvement (QI) project based on Spatz's ten steps of breastfeeding in vulnerable infants since 2014. This is a report of our QI project outcome on breast milk feeding.

Materials and methods: This program was launched in August 2014. The QI measures to evaluate the process were the percentage of mothers starting milk expression within 4 hours and the percentage of mothers expressing milk more than 8 times/day. The outcome measure was the proportion of neonates receiving more than 50% of mother's milk feeding during hospital stay. This project was divided into 3 phases: baseline phase, early introduction phase and sustained phase.

Results: There were 563, 643 and 614 neonates admitted during baseline phase, early phase and sustained phase, respectively. Percentage of infants which received mainly mother's own milk gradually improved significantly from 49.8% \pm 11.5% at baseline, to 63.1% \pm 6.6% in the early phase, and up to 68.8% \pm 9% in the sustained phase. The percentage of mothers starting to express milk within 4 hours was 60% \pm 18.7% in the early phase and 51.9% \pm 14.3% in the sustained phase ($p = 0.242$). The percentage of mothers expressing milk at least 8 times/day slightly increased from 52.5% \pm 15.4% in the early phase to 61.9% \pm 12.2% in the sustained phase ($p = 0.146$).

Conclusions: Implementation of QI project based on Spatz's ten steps of breastfeeding in vulnerable infants has significantly improved the rate of breast milk feeding in hospitalized neonates even in a low resource setting.

Keywords

Human milk, vulnerable infants, NICU, quality improvement project, Spatz's ten steps, sick neonates.

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Introduction

Breastfeeding, or human milk feeding, is a well-established practice for improving both short- and long-term outcomes in neonates. The American Academy of Pediatrics' position statement recommends exclusive breastfeeding for 6 months, followed by continued breastfeeding with complementary foods for 1 year or longer [1]. Breastfeeding can decrease rates of otitis media [2], diarrhea [3], asthma in children [4] and reduce infant mortality rates. Human milk, whether mother's or donor's milk, has a greater importance for preterm infants because it decreases the risk of major complications such as late-onset sepsis [5] and necrotizing enterocolitis (NEC) [6, 7]. Long-term follow-up of ex-preterm infants shows intelligence test results and brain volumes are correlated to the amount of human milk received during hospital stay [8, 9]. However, human milk feeding in hospitalized babies has some complexities, including immature lactogenesis, separation issues, maternal and infant illness.

In 1991, the WHO/UNICEF launched the campaign "*Ten steps to successful breastfeeding*". It is used as a template for hospital policies to support breastfeeding in healthy term infants. For various reasons, though, it is not suitable for sick babies. Therefore, in 2004, Spatz proposed "*Ten steps for promoting and protecting breastfeeding for vulnerable infants*" [10].

In Thailand, human milk feeding in hospitalized neonates is relatively problematic for several reasons, including the lack of lactation specialists in the maternity and neonatal unit, the heavy workload of Neonatal Intensive Care Unit (NICU) staff, and the scarcity of hospital grade breast pumps. In addition, Thailand has only one

donor milk bank; thus, donor milk is not widely available.

Previously, mother's milk feeding in sick babies was promoted in our hospital non-systematically. Our rate of breast milk feeding was less than half (44.6%), as per our internal reports. In 2014, we joined the Thai Breastfeeding Organization as a leading team to support breastfeeding in sick babies. This quality improvement (QI) project was set up to improve rates of breast milk feeding in our neonatal care units based on Spatz's ten steps method.

Materials and methods

The project took place in Thammasat University Hospital, a tertiary care center with 10 beds of NICU and 16 beds of Sick Neonatal Care Unit (SNCU). The hospital has more than 4,000 deliveries per year. Nurse/patient ratios were 1:2-3 patients in NICU and 1:5 patients in SNCU. We address a wide range of neonatal problems, such as prematurity, term infants with medical/surgical problems including cardiac surgery, and more. Mothers are not allowed to stay overnight in both units. There is only one lactation nurse who typically works in the lactation clinic; no lactation specialist was available in NICU nor SNCU. Data were gathered from routine nurse's record. Therefore, we did not have much information about mother-infant dyads.

As this project was based on widely accepted evidence-based practice, data collection came from anonymous QI data. Therefore, it did not require institutional board review.

There were 3 phases.

1. Baseline phase (Oct 2013-Jul 2014): this period occurred before our program was officially launched. During this period, breast milk feeding was promoted non-systematically. Only the percentage of infants who received > 50% of mother's milk was recorded.
2. Early introduction phase (Aug 2014-Jul 2015): this was the first year of our QI program. It included a kickoff conference, focusing on the importance of breast milk feeding in sick babies, how to establish and maintain milk supply, study procedures, outcome measures, roles and responsibilities, and criteria for success. The breastfeeding team was the project lead. Key stakeholders included obstetricians, neonatologists and nurses from the lactation clinic, labor room, maternity unit, NICU and SNCU.

3. Sustained phase (Aug 2015-Aug 2016): one year after the project had officially launched, we evaluated the outcomes using a Plan-Do-Study-Act cycle. Nurses from the maternity unit reported that causes of unsatisfactory rates of milk expression partly came from maternal pain and exhaustion. Consequently, more breast pumps were provided to the postpartum unit to help facilitate mothers to express milk. Meanwhile, the SNCU had started a parent empowerment project by giving a certificate of success to mothers whose infants received breast milk > 50% of the time whilst in hospital.

Study procedures

An informed decision, regarding the benefits of breastfeeding in vulnerable infants, was given to high-risk pregnant women, e.g. multiple pregnancy, preterm delivery, and fetus with congenital anomalies. All mothers of sick babies were encouraged to express milk within 4 hours after delivery and more than 8 times/day during their hospital stay. NICU staff developed colostrum collection kits, which consisted of baby label stickers and 1 and 3 ml syringes and caps, to facilitate colostrum collection. Colostrum was transferred to NICU and SNCU as soon as possible.

Oral care using colostrum was promoted in all admitted infants. Trophic feeding was initiated as soon as infants were clinically stable and colostrum was used sequentially during oral care and feeding initiation. Because we had no access to the donor milk bank, formula milk was used if mothers were unable to express breast milk. Each mother's milk was kept separately in our unit freezers. As freezing maternal milk has shown to reduce the immunomodulatory proteins, we tried to use the most recent milk first. Skin-to-skin contact, non-nutritive sucking, and transition to breast were encouraged as soon as possible once the infants were stable.

Before discharge, a discharge plan was discussed with the mothers, focusing on a feeding and follow-up plan. Most preterm infants were unable to breastfeed effectively at discharge, and mothers were encouraged to continue expressing milk until their child breastfed effectively. Mothers were also urged to breastfeed for at least 6 months. After discharge, infants were followed up in the outpatient clinic where feeding practice, weight gain and infant general condition were reviewed.

Data collection and analysis

This was a retrospective review of our QI outcomes. Data collection was based on our process and outcome measures. Therefore, baseline characteristics of our patients were not available. Mean and standard deviation (SD) of the proportion recorded monthly over 3 periods were described. Paired t-test compared process measurements between early and sustained phase.

Measurement

1. Process measurement: percentage of mothers who can initiate expressing milk within 4 hours after delivery and percentage of mothers who express ≥ 8 times/day during admission were selected as process measures in this QI program.
2. Outcome measurement: percentage of infants who received > 50% of maternal breast milk during hospital stay.

Results

There were 563, 643 and 614 neonates admitted to NICU and SNCU during the baseline phase, early phase and sustained phase, respectively. We had no process measures data during the baseline phase. The percentage of infants which received > 50% of maternal breast milk during hospital stay significantly improved from $49.8\% \pm 11.5\%$ at baseline, to $63.1\% \pm 6.6\%$ in the early phase, and up to $68.8\% \pm 9\%$ in the sustained phase (**Fig. 1**). The percentages of mothers who could start expressing milk within 4 hours of delivery changed from $60\% \pm 18.7\%$ in the early phase to $51.9\% \pm 14.3\%$ in the sustained phase (p -value = 0.242). However, the percentage of mothers who could express milk at least 8 times/day slightly increased from $52.5\% \pm 15.4\%$ in the early phase to $61.9\% \pm 12.2\%$ in the sustained phase ($p = 0.146$).

Discussion

We found that, after the project launch, the number of mothers who first expressed milk within 4 hours after birth improved gradually. The barriers for milk expression in the first year were maternal pain, exhaustion and limited staff to encourage bedside milk expression and stimulation. Once we provided more electrical breast pumps to maternity units to facilitate milk expression, the percentage of mothers who expressed milk ≥ 8

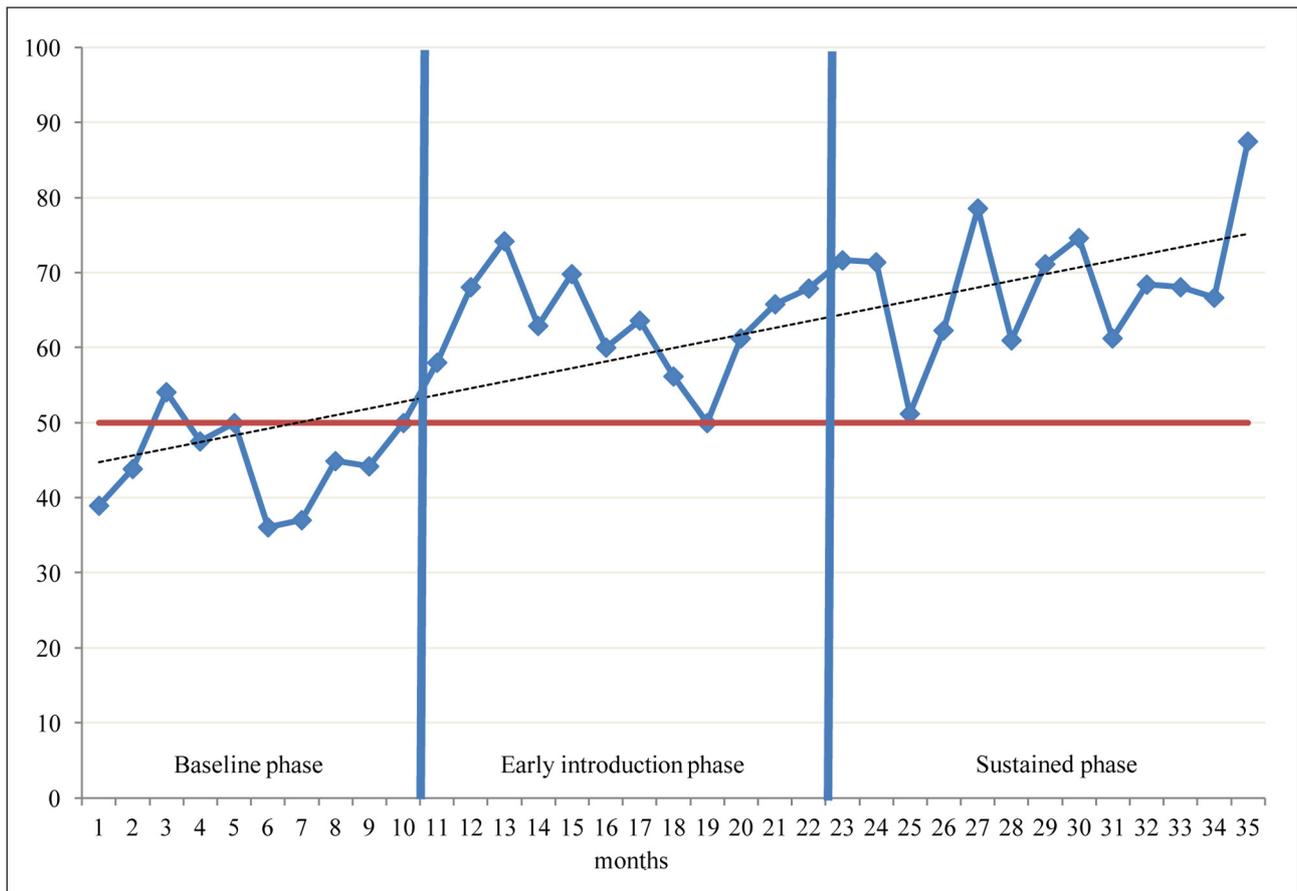


Figure 1. Percentage of infants receiving > 50% of maternal breast milk during hospital stay.

times/day increased from 52.5% to 61.9%. The proportion of mothers who expressed within 4 hours after delivery slightly decreased, but not to a statistically significant level. This may be from the limited nursing staff available during the sustained phase.

According to a study in the USA in 2014, mothers of preterm infants whose first breast milk expression occurred within 6 hours after delivery were more likely to succeed in breastfeeding at 28 days [11]. Hence, time to first milk expression should be our next focus, to further improve the rate of breastfeeding success.

We believe another element can explain the increased percentage of maternal breast milk feeding in the units: the parent empowerment program. This involved giving a certificate with the infant's photo to mothers who were able to feed their infants with their own milk for > 50% of the time. This program probably had a knock-on effect by motivating mothers to express their breast milk and create a supportive environment among mothers in the unit.

Several studies on the effect of QI projects to improve breastfeeding have shown positive effects

on human milk feeding in NICUs [12-15]. Our study also demonstrated benefits in a low-resource setting with no lactation specialist available in the units. Furthermore, empowering mothers added value as well.

One limitation was that it was a retrospective QI study with a very limited scope of data collection. Originally, we would have preferred to collect data in all 10 steps, but this proved overwhelming for our nursing staff. Thus, we had to choose only some of what was considered the important steps for our QI. We also had restricted access to hospital grade breast pumps, which have proven to be effective in maintaining lactation in mothers of sick babies. Moreover, we did not have a system in place for early detection of inadequate milk supply, which is a key to successful lactation throughout hospital stay [16].

Conclusion

We have shown promoting breast milk feeding for sick babies based on Spatz's 10 steps through QI methods is an effective mechanism to improve feeding rates, even within a low resource setting.

However, more work is needed to optimize these and other potential strategies to increase the percentage of mothers who breastfeed early and sustain breastfeeding in the long term.

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Declaration of interest

The Authors declare that there is no conflict of interest. There is no funding for this quality improvement project.

References

1. American Academy of Pediatrics – Section on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics*. 2012;129(3):e827-41.
2. Korvel-Hanquist A, Djurhuus BD, Homoe P. The Effect of Breastfeeding on Childhood Otitis Media. *Curr Allergy Asthma Rep*. 2017;17(7):45.
3. Ogbo FA, Agho K, Ogeleka P, Woolfenden S, Page A, Eastwood J; Global Child Health Research Interest Group. Infant feeding practices and diarrhoea in sub-Saharan African countries with high diarrhoea mortality. *PloS One*. 2017;12(2):e0171792.
4. Kemp JP, Kemp JA. Management of asthma in children. *Am Fam Physician*. 2001;63(7):1341-8, 53-4.
5. Furman L, Taylor G, Minich N, Hack M. The effect of maternal milk on neonatal morbidity of very low-birth-weight infants. *Arch Pediatr Adolesc Med*. 2003;157(1):66-71.
6. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. Breastfeeding and maternal and infant health outcomes in developed countries. *Evid Rep Technol Assess (Full Rep)*. 2007(153):1-186.
7. Sullivan S, Schanler RJ, Kim JH, Patel AL, Trawöger R, Kiechl-Kohlendorfer U, Chan GM, Blanco CL, Abrams S, Cotten CM, Laroia N, Ehrenkranz RA, Dudell G, Cristofalo EA, Meier P, Lee ML, Rechtman DJ, Lucas A. An exclusively human milk-based diet is associated with a lower rate of necrotizing enterocolitis than a diet of human milk and bovine milk-based products. *J Pediatr*. 2010;156(4):562-7.e1.
8. Vohr BR, Poindexter BB, Dusick AM, McKinley LT, Wright LL, Langer JC, Poole WK; NICHD Neonatal Research Network. Beneficial effects of breast milk in the neonatal intensive care unit on the developmental outcome of extremely low birth weight infants at 18 months of age. *Pediatrics*. 2006;118(1):e115-23.
9. Isaacs EB, Fischl BR, Quinn BT, Chong WK, Gadian DG, Lucas A. Impact of breast milk on intelligence quotient, brain size, and white matter development. *Pediatr Res*. 2010;67(4):357-62.
10. Spatz DL. Ten steps for promoting and protecting breastfeeding for vulnerable infants. *J Perinat Neonatal Nurs*. 2004;18(4):385-96.
11. Murphy L, Warner DD, Parks J, Whitt J, Peter-Wohl S. A quality improvement project to improve the rate of early breast milk expression in mothers of preterm infants. *J Hum Lact*. 2014;30(4):398-401.
12. Bixby C, Baker-Fox C, Deming C, Dhar V, Steele C. A Multidisciplinary Quality Improvement Approach Increases Breastmilk Availability at Discharge from the Neonatal Intensive Care Unit for the Very-Low-Birth-Weight Infant. *Breastfeed Med*. 2016;11(2):75-9.
13. Fugate K, Hernandez I, Ashmeade T, Miladinovic B, Spatz DL. Improving Human Milk and Breastfeeding Practices in the NICU. *J Obstet Gynecol Neonatal Nurs*. 2015;44(3):426-38; quiz E14-5.
14. Ward L, Auer C, Smith C, Schoettker PJ, Pruett R, Shah NY, Kotagal UR. The human milk project: a quality improvement initiative to increase human milk consumption in very low birth weight infants. *Breastfeed Med*. 2012;7:234-40.
15. Sethi A, Joshi M, Thukral A, Singh Dalal J, Kumar Deorari A. A Quality Improvement Initiative: Improving Exclusive Breastfeeding Rates of Preterm Neonates. *Indian J Pediatr*. 2017;84(4):322-5.
16. Wu B, Zheng J, Zhou M, Xi X, Wang Q, Hua J, Hu X, Liu JQ. Improvement of Expressed Breast Milk in Mothers of Preterm Infants by Recording Breast Milk Pumping Diaries in a Neonatal Center in China. *PLoS One*. 2015;10(12):e0144123.