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Original Article

Direct-breastfeeding in the neonatal intensive care unit and breastfeeding duration for premature infants



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ABSTRACT

Aim: To explore the relationship between direct-breastfeeding in the neonatal intensive care unit (NICU) and breastfeeding duration after discharge.

Background: Initiating and maintaining breastmilk feeding is an important goal that begins in the NICU. Little is known about direct-breastfeeding in the NICU and its relation to breastfeeding duration.

Methods: Chart review of 46 infants (<32 weeks gestational age or <1500 grams) whose mothers provided breastmilk.

Results: One month after discharge, mothers still providing breastmilk were more likely to have provided ≥ 1 direct-breastfeed per day in the NICU (OR: 21.16, CI: 3.13–143.25, $p < 0.01$) and had prior breastfeeding experience (OR: 9.16, CI: 1.02–82.34, $p < 0.05$). At 4 months, mothers still providing breastmilk were more likely to have provided ≥ 1 direct-breastfeed per day in the NICU (OR: 12.80, CI: 1.39–118.32, $p < 0.05$).

Conclusions: Direct-breastfeeding in the NICU may play an essential role in preparing mothers for breastfeeding after discharge, thus potentially impacting breastfeeding duration.

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1. Introduction

Breastmilk is the gold standard for nutrition in infants. Premature infants benefit from a human milk diet with decreased morbidity and better long term neurodevelopmental outcomes when compared to those fed with formula (Academy of Breastfeeding Medicine Board of Directors, 2008; American Academy of Pediatrics, 2012; Okamoto et al., 2007; Sisk, Lovelady, Dillard, Gruber, & O'shea, 2007; Vohr et al., 2006, 2007). Maintaining breastfeeding to meet recommended health standards is an important public health issue for both full-term and premature infants (United States Department of Health & Human Services, 2014). Premature birth and subsequent NICU admission often are unexpected and may occur prior to families determining their infant feeding choice. The medical risks associated with premature birth increases the necessity for a human milk diet and information on the importance of breastmilk for the premature infant should be given to families with anticipated premature delivery and those with an infant in the NICU (Okamoto et al., 2007; Sisk et al., 2007; Vohr et al., 2006; Vohr et al., 2007).

In premature infants, breastmilk feedings are often initiated by tube delivery (naso- or orogastric) and then progress to oral feeding once the infants are developmentally able to coordinate sucking, swallowing and breathing (Briere, McGrath, Cong, & Cusson, 2014; Jones, 2012; National Association of Neonatal Nurses, 2013). Once oral feedings are initiated, infants may receive oral feedings through a variety of methods (two common methods are by bottle-feeding and breastfeeding), and exclusive breastmilk feeding is recommended for the first six months of life (Academy of Breastfeeding Medicine Board of Directors, 2008; American Academy of Pediatrics, 2012). Direct-breastfeeding is when an infant suckles at the mother's breast with either a nutritive or non-nutritive outcome. The transition to oral direct-breastfeeding will vary for every infant and mothers with premature infants are at an increased risk of experiencing breastfeeding difficulties; in particular, they have a greater risk of not meeting breastfeeding goals decided upon before delivery (Cahill & Wagner, 2002; Callen & Pinelli, 2005; Dougherty & Luther, 2008).

Direct-breastfeeding in the neonatal intensive care unit (NICU) may play an important role in preparing the mother and infant for direct-breastfeeding after discharge. Successful direct-breastfeeding after NICU discharge can be defined as the successful transition from a combination of direct-breastfeeding and feeding expressed breastmilk by bottle to full direct-breastfeeding (or transition to the mother's goal

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ratio of direct-breast and bottle). Since researchers have found that mothers who provide more direct-breastfeeding have an increased likelihood of maintaining longer durations of breastmilk feeding during NICU hospitalization (Pineda, 2011; Smith, Durkin, Hinton, Bellinger, & Kuhn, 2003), the act of direct-breastfeeding must be considered important in maintenance of long term breastfeeding duration.

The association of direct-breastfeeding in the NICU with breastfeeding outcomes is essential to explore so that NICU providers can understand the importance of supporting direct-breastfeeding. Encouraging mothers to increase direct-breastfeeding opportunities while hospitalized is potentially a low cost, targeted intervention to increase breastfeeding success after discharge with the goal of reaching optimal recommendations for duration. Therefore, the purpose of this study was to explore the relationship between the frequency of direct-breastfeeding in the NICU and breastfeeding duration after discharge.

2. Methods

2.1. Study Design and Setting

This study was conducted by retrospective chart review after approval from the Institutional Review Boards at the study hospital and university. The study location was a level IV urban NICU in New England with 32 patient beds. This study was the next phase in a sequence of studies that examined the characteristics and incidence of direct-breastfeeding in this NICU (Briere, McGrath, Cong, Brownell, & Cusson, 2015). Breastfeeding and other relevant data were routinely documented during NICU hospitalization, and follow-up data were obtained from follow-up lactation phone calls and neurodevelopmental follow-up appointments at four and eight months corrected gestational age (CGA). The study site provides routine follow-up lactation phone support once per week until one month post-discharge home for every infant receiving any breastmilk.

2.2. Sample Selection

A convenience sample of eligible infants born between January 1, 2012 and December 31, 2012 was used in this retrospective review. Included infants were those eligible for neurodevelopmental follow-up (<32 weeks gestational age [GA] at birth, or <1500 grams). Infants were selected from the sample of infants that were eligible for the first phase of the study (<34 weeks GA at birth, received maternal breastmilk for ≥ 7 days, and discharged home with their mother on full oral feedings) (Briere et al., 2015). For this study, in addition to the requirement that infants meet criteria for follow-up, infants were also excluded if they had not continued to receive maternal breastmilk at the introduction of oral feeding (these infants could not receive any direct-breastfeeding). The initial sample was 88 infants from the first study (Briere et al., 2015). After applying the additional inclusion/exclusion criteria for this study, 46 infants were eligible and included in the final analysis. See Fig. 1.

2.3. Measures

2.3.1. Direct-Breastfeeding in NICU

For the purposes of this study, direct-breastfeeding was when an infant suckled directly at the mother's breast. Quantity of milk transfer was not a variable of interest within this study. Oral feeding method is routinely documented by the nurse or lactation consultant for each feeding. Each feeding was only coded once and when an infant received a direct-breastfeeding followed by a bottle supplementation, the feeding was defined as a direct-breastfeeding.

2.3.2. Frequency of Direct-Breastfeeding

All oral feedings were recorded from the first oral feeding until discharge. The number of direct-breastfeedings was divided by all oral

feeding opportunities prior to discharge. To assist in understanding the clinical implications of breastfeeding practices, in the first study we divided infants into one of two groups to describe their direct-breastfeeding while in the NICU (Briere et al., 2015). Infants were divided at the median percentage amount of direct-breastfeeding which translated to the first group receiving <1 direct-breastfeed per day in the NICU and the other group receiving ≥ 1 direct-breastfeed per day (after oral feeding initiation). The median of this smaller sample was similar to that of the larger sample and the same clinical interpretation was used.

2.3.3. Breastfeeding Duration

The first breastfeeding follow-up call occurs two days after discharge, and then continues weekly until one month after discharge. Breastfeeding is recorded as "any breastfeeding" (exclusive and non-exclusive breastmilk feeding). Breastfeeding duration was also assessed by data collected from the NICU neurodevelopmental clinic appointments at 4 and 8 months CGA. At these appointments families report feeding type and method. Breastfeeding duration was categorized as breastmilk receipt; yes or no. Breastmilk receipt was categorized as "any" due to the lack of specific amounts available retrospectively in the charts.

2.4. Data Collection Procedure

Paper and electronic data were collected retrospectively through chart review by a NICU nurse (C.E.B.). These data were entered into an electronic database by a trained research assistant and 10% of entries were double coded to determine inter-rater agreement. Inter-rater agreement was 100% for the lactation follow-up data and 98% for the follow-up clinic data.

2.5. Statistical Analysis

Statistical analyses were completed using SPSS Version 20. To eliminate redundancy of breastfeeding duration information in the first four lactation follow-up calls, the final call at one month after discharge was used, along with outcome at 4 and 8 months CGA. Bivariate analyses (χ^2) were conducted at each time point to examine the proportion of breastfeeding continuation (yes/no) with the direct-breastfeeding group (<1/day or ≥ 1 /day) in the NICU as well as other potentially related factors from the literature and from the previous study (Briere et al., 2015). See Table 1. Variables with p -values <0.05 were chosen for inclusion into the multivariate backward selection Wald logistic regression models. Ethnicity and length of stay were forced into all multivariable models, regardless of the results of bivariate analyses.

A priori power analyses were completed to determine power for the available sample size. The sample size was able to achieve power of 87% (two sided; $\alpha = 0.05$) with a difference in group proportion (of direct-breastfeeding group) of continued breastfeeding in chi-squared analyses of 40 percent.

3. Results

3.1. Sample Description

The mean GA at birth was $29\ 6/7 \pm 2.5$ weeks (range 25 3/7–33 3/7 weeks) with a mean birth weight of $1,280 \pm 358$ grams (range 706–2470 grams). The mean length of stay was 58 ± 27.5 days (range 19–131 days). The sample included primarily White, non-Hispanic, first-time mothers. Table 1 presents additional details on sample characteristics of infants and mothers.

At discharge, 48% ($n = 22$) of infants received an exclusively breastmilk diet (inclusive of infants with fortified calories), 17% ($n = 8$) received a mixed breastmilk and formula diet, and 35% ($n = 16$) were discharged solely on formula. Of the 30 infants discharged home

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