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The Institutional Cost of Acquiring 100 mL of Human Milk for Very Low Birth Weight Infants in the Neonatal Intensive Care Unit

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Abstract

Background—Human milk from the biologic mother (HM) reduces disease burden and associated costs of care during and after neonatal intensive care unit (NICU) hospitalization for very low birth weight (VLBW; birth weight < 1500 g) infants, when compared to feedings of donor human milk (DHM) or commercial formula (CF). However, compared to DHM and CF, little is known about the institutional cost to acquire HM from the biologic mother.

Objective—This study aimed to determine the institutional cost of acquiring HM for VLBW infant feedings during the NICU hospitalization.

Methods—This analysis examined 157 maternal pumping records from a prospective cohort study evaluating health outcomes and cost of HM feedings for VLBW infants. The costs for the breast pump rental fee, 1-time pump kit purchase, and disposable food-grade containers for storing expressed HM were evaluated using standard cost analysis techniques.

Results—The median cost of acquiring 100 mL of HM varied from \$0.51 when mothers pumped 700 mL daily to \$7.93 for those who pumped < 100 mL daily. Mothers who pumped 100 mL daily had lower acquisition cost compared to both DHM (\$14.84/100 mL) and CF (\$3.18/100 mL). For mothers who pumped > 100 mL daily, the exact day of pumping where the cost of HM was less expensive than DHM or CF was 4 to 7 days and 6 to 19 days, respectively.

Conclusion—Human milk from the biologic mother has lower acquisition cost than DHM and CF when mothers provided 100 mL daily and pumped for a sufficient number of days (range,

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4-19). Neonatal intensive care units should prioritize resources to ensure that mothers achieve this daily milk volume.

Keywords

breastfeeding; cost analysis; human milk; neonatal intensive care unit

Background

Human milk (HM; milk from the biologic mother) feedings received during the neonatal intensive care unit (NICU) hospitalization are associated with lower disease burden (eg, lower risk for late onset sepsis) and the associated costs of care during and after the NICU hospitalization for very low birth weight (VLBW; birth weight < 1500 g) infants.¹⁻⁶ However, when HM is unavailable, NICUs must feed either donor human milk (DHM) or commercial formula (CF; liquid ready to feed preterm formula). Although there is evidence that DHM and CF are inferior to HM feedings¹⁻⁸ for VLBW infants, little is known about the comparable acquisition cost, for example, the amount of money the institution pays to acquire HM, DHM, and CF. Although the acquisition costs for DHM and CF refer to the costs of procuring these products from an actual vendor, the acquisition cost for HM has not been conceptualized from this same perspective. The institutional cost to acquire HM includes 3 essential items: the hospital-grade breast pump rental, the breast pump collection kit, and the disposable food-grade storage containers. Historically, the costs of the breast pump rental and the breast pump collection kit were borne by the mother, and the NICU has used only the amount provided by the mother.

Only 1 previously published study addressed the maternal cost of providing HM for a VLBW infant.⁹ This study, which was limited in scope to the cost to the mother for basic lactation equipment, found that the mean maternal cost to provide 100 mL of HM varied from \$2.60 to \$6.18 (2008 US dollars) when maternal time costs were included in the figures, and from \$0.95 to \$1.55 (2008 US dollars) when maternal time costs were excluded. Furthermore, the mean cost of providing 100 mL of HM decreased for each additional day the mother provided milk, with the highest costs coinciding with the early days postbirth when maternal milk volume is limited.

Related studies have examined institutional costs of using CF for all term and premature infants in an institution¹⁰ and of using exclusively HM-based products (including donor HM fortifier) for extremely premature VLBW infants.¹¹ No previously published research could be located in which the acquisition costs of HM feedings in the NICU were calculated. Thus, the purpose of this study was to compare the institutional acquisition costs for HM, DHM, and CF for VLBW infant feedings during the entire NICU hospitalization.

Methods

Design and Sample

This study was a cost analysis that examined HM acquisition data using institutional budget reports, infant medical records, and maternal pumping records that were collected from mothers and their VLBW infants who were enrolled in an ongoing prospective cohort study

that examined the health outcomes and cost of HM feeding for VLBW infants (NIH 1 R01 NR010009, PI: Meier). The inclusion criteria for the larger cohort study were birth weight < 1500 grams, gestational age < 35 weeks, infant in care of the biologic mother, negative maternal drug screen other than marijuana, negative maternal screen for human immunodeficiency virus, infant admitted to the study institution within 24 hours of life, initiation of enteral feeds before day of life (DOL) 14, and absence of any major congenital anomalies or chromosomal disorders. Neither the initiation of lactation nor the provision of pumping records was an inclusion criterion for the larger cohort study, but most mothers who provided milk for their infants also provided pumping records.

For this cost analysis, the sample consisted of usable maternal pumping records from the larger cohort study where the infant survived to discharge. Pumping records were considered usable if they contained a minimum of 7 recorded pumping days, entries prior to DOL 14, decipherable handwriting and units of measure, and 50% of potential data points across all of the recorded days. Figure 1 details the exclusion of mothers with ineligible pumping records. Of the mothers enrolled in the larger cohort study (n = 390), 157 mothers met the inclusion criteria for this cost analysis. This study was approved by the Institutional Review Board at Rush University Medical Center.

Measures

Daily pumped HM volume—All mothers at the study institution who initiated lactation received standardized lactation teaching from the NICU staff, which included the recording of pumped milk volume (nearest 15 mL) for each breast separately, using a standardized pumping record (My Mom Pumps for Me!TM; Rush Mothers' Milk Club, Chicago, IL).¹² These standardized teaching instructions and instrument were described in a previous publication.¹²

Daily pumped HM volume was calculated for each day for each mother using the following algorithm. Total HM volume for each pumping session was calculated by adding the pumped HM volume for the right and left breasts. Then, the milk volumes from the daily individual pumping sessions were summed, and the average daily volume for the entire number of pumping days was calculated. Using these results, each mother was then grouped into 1 of 8 mutually exclusive “Average Daily HM Volume Pumped” categories, ranging from < 100 to 700 mL per day in 100 mL increments.

Proportion of infant enteral feedings consisting of HM—This measure was calculated using data from the larger study database, which included the volumes (mL) of HM and non-HM (DHM or CF) for each feeding during the entire NICU hospitalization for each infant. The proportion of infant enteral feedings consisting of HM was calculated by dividing the sum of HM feeding volumes during the NICU hospitalization by the sum of total enteral feeding (HM + non-HM) volumes during the NICU hospitalization. For example, an infant who received only HM feedings throughout the entire NICU hospitalization would have a proportion of HM feedings = 100%, whereas an infant who received only CF would have a value = 0% for this measure.

Number of disposable milk storage containers used by mothers—Mothers were provided with a sufficient number of food-grade milk storage containers (120 mL each) during routine visits to the NICU. For this analysis, the number of containers used by each mother was estimated using the following procedures. Based upon the mother's pumped HM volume for a specific day, the number of containers used was the greater of twice the number of pumping sessions per day, given 1 container per breast; or the value obtained by dividing the mother's pumped milk volume by 120. Next, the number of daily containers was multiplied by 1.2 to account for the possibility that the pumped volume at individual sessions occasionally exceeded 120 mL, thereby necessitating the use of more than 2. The 1.2 multiplier was selected because that represented a 20% overage allowance for containers. The total number of daily containers was rounded up to the nearest multiple of 3 because containers were dispensed 3 to a package. Finally, the total number of containers per mother was calculated as the sum of the daily number of containers over the entire pumping period.

Institutional HM acquisition costs—The institutional cost of acquiring HM was calculated using the costs for 3 essential items that are universal to all NICUs: the hospital-grade breast pump rental, the breast pump collection kit, and the disposable food-grade storage containers. Other institutional costs such as HM fortifier, freezer space, and lactation staff were not included in this analysis because they are not mutually exclusive with respect to HM, DHM, and CF and/or represent more than the minimum requirement for acquiring HM. All costs were measured in 2012 US dollars and were obtained from the institutional budget report for the NICU, which contained detailed measures of the cost of each universally required item.

Cost of the hospital-grade breast pump rental (pump) was measured as the institutional cost for rental of the pump from the breast pump company. This fee was paid monthly (\$29 per month) by the institution to the breast pump company on the first day of each month, and no partial-month payments were possible. The total institutional rental cost per mother over the course of pumping was considered a fixed cost equal to \$29 times the number of months pumped, regardless of whether the mother pumped the entire month.

Cost of the breast pump collection kit (kit) was measured as the institutional cost of the kit (\$31.88), which represents a 1-time fixed cost. Kits have a minimum life span of at least 180 days before they might become obsolete, ineffectual, or damaged,¹³ which exceeded the average length of NICU hospitalization (72 days) for a VLBW infant in this study sample.

Cost of the disposable milk storage containers (containers) was measured as the institutional cost for the containers to store pumped HM. The total container cost for each mother was calculated by multiplying the total number of containers used times the cost per container (\$0.20). For purposes of analysis, the container cost was a variable cost because the number of containers used per mother varied as a function of pumped HM volume.

Procedures

The data collection procedures for the larger prospective cohort study were detailed in a previous publication.⁶ Only the mothers' pumping records were used for this study.

Complete HM volume data were available for 94.5% of the 34 505 pumping sessions. At the maternal level, complete HM volume data were available for 59 (38%) mothers, and 80% of mothers had 10% data that were incomplete or missing. Three types of missing data were encountered, and the procedures for imputing these data were as follows.

Single missing session of pumping during the day—If a single HM volume entry was missing during a day of recorded pumping, the missing HM volume was imputed using the average of the following 3 values: the HM volume during the comparable pumping session on the closest pumping days before and after the missing pumping session, and the average HM volume for each recorded pumping session during the day of the missed recording.

Missing pumping day—If an entire day of pumping was not recorded, the HM volume for each pumping session on the missing day was imputed using the average HM volume during the comparable pumping session on the closest pumping days before and after the missing pumping day. The number of sessions for the missing pumping day was made equal to the number of pumping sessions on the closest day before the missing day.

Pumping records not provided prior to infant DOL 7, but separate data revealed that the infant had received HM prior to the start of maternal pumping records—The assumption was made that if HM feedings were received by the infant, the mother had begun pumping even if her pumping records did not have entries to this effect. Thus, the days between the first day the infant received HM and the day that the pumping records began were considered missing pumping days. These missing days were imputed using the following procedures. First, the pumping records containing missing days were matched to similar pumping records for other mothers without missing HM volume data prior to DOL 7. Pumping records were considered a suitable match if the average milk removal rates over the entire period of pumping documented in the pumping records were similar (± 2 mL/min). Average milk removal rates were calculated by dividing the total pumped volume by the total minutes pumped. The number of matches for mothers with missing data to mothers with complete data ranged from a minimum of 3 mothers to a maximum of 12 mothers. Once mothers were matched, the HM volume for the missing pumping record days prior to DOL 7 was calculated as the average HM volume pumped on the equivalent infant DOL for the matched records.

Analysis

Statistical analysis—Data were managed and analyzed using IBM SPSS Statistics for Windows Version 19 (Chicago, Illinois, USA) and Microsoft Excel 2007 (Redmond, Washington, USA). Frequencies and descriptive statistics, including mean, median, standard deviation, and interquartile range, were calculated for each individual day and for the number of days that the mother pumped, and for each of the categories of average daily HM volume pumped. Kruskal-Wallis statistical tests were used to test for differences by infant birth weight and gestational age across the Average Daily HM Volume Pumped category variable. Kruskal-Wallis was used because the 600–699 category had a small *n*. A Type I error rate of 0.05 was used for all statistical testing.

Cost analysis—The cost of acquiring 100 mL of HM was calculated using the costing techniques originally outlined by Drummond et al¹⁴ that were described in a previous publication on the cost of HM in the NICU.⁹ Briefly, these include defining assumptions, measuring factors that impact cost, and evaluating the magnitude of impact of each of the factors that impact cost. All costs were measured in 2012 US dollars.

The cost components measured were the pump, the kit, and the containers. The median total cost of acquiring 100 mL of HM was calculated using the following equation: cost per 100 mL = [(pump + kit + containers) ÷ (total HM volume pumped)] × 100. The cost of acquiring 100 mL of HM was examined over the entire period the mother pumped, and by the category of the Average Daily HM Volume Pumped category variable.

After calculating the cost of acquiring 100 mL using the above equation, a 1-way sensitivity analysis was conducted to determine which cost component contributed most to the total cost of acquiring HM. The sensitivity analysis examined changes in the cost of acquiring 100 mL of HM when each individual cost component was doubled and tripled while holding the other cost components constant.

The final step in the cost analysis was to compare the cost of acquiring 100 mL of HM to the cost of acquiring 100 mL of DHM and CF. The median cost of DHM and the cost of CF used in this analysis were obtained from the data from our previously published work.⁹ These cost values were inflated from 2008 to 2012 US dollars using the inflation index of the Consumer Price Index for all goods.¹⁵ The costs per 100 mL of DHM and CF were \$14.84 (interquartile range, \$14.17-\$14.98) and \$3.18, respectively.

Results

The demographic characteristics of the mothers and their infants and overall milk volume pumped are displayed in Table 1. The median number of pumping days and daily HM volume pumped were 44 days (range, 7-177) and 330.0 mL (range, 0-2330), respectively. Of the 157 mothers who provided HM for their infants, 30% pumped until the infant was discharged from the NICU. Of those who did not pump for the entire NICU hospitalization, 50% pumped for at least the first 36 days of the infant's hospitalization.

Table 2 depicts the maternal, infant, pumping, and cost data for the 8 categories of average daily HM volume pumped. There were no statistical differences in birth weight or gestational age for the infants of mothers across the 8 categories. A total of 29 (19%) mothers pumped an average daily HM volume < 100 mL whereas 15 (10%) mothers pumped an average daily milk volume 700 mL. Infants of mothers whose pumped HM volume was 300 mL per day received HM for 85% of their NICU feedings. Furthermore, infants of mothers whose pumped HM volume was < 100 mL per day still received significant amounts of HM, as evidenced by the fact that the median latest day of exclusive and partial HM feedings for this group was DOL 26 and DOL 47, respectively.

The median cost of acquiring 100 mL of HM per pumping day over the first 31 days of pumping declined with every additional day of pumping for all volume categories (Figure 2). The cost of acquiring 100 mL of HM declined with each pumping day relatively equally

for the 8 categories. Further, each subsequent volume category was less expensive than the previous 1 for every day of pumping except on days 3 and 4. On those days, pumping for the 600-699 category was less than the 700 category. However, only 7 mothers were included in the 600-699 category, so these results may not be generalizable.

After 31 days, the daily cost of acquiring 100 mL increased by an average of 9% above the cost at day 31 for the first 7 days of the new pumping month (pumping days 32-38) due to the additional institutional cost of providing the pump for the subsequent pumping month. This cost pattern was repeated at each start of a new month of pumping when the cost of an additional monthly pump rental was added. However, after this 7-day period (days 39-61), the cost per 100 mL was less than or equal to the cost on day of pumping 31. In fact, for those in the 700 mL category, the cost per 100 mL declined to as low as \$0.46 per 100 mL between day 58 and day 61.

The sensitivity analysis demonstrated that the cost of acquiring 100 mL of HM was sensitive to all 3 of the cost components (Figure 3). The largest variation in cost occurred when the container cost was varied, with the cost of acquiring 100 mL of HM increasing by 55% and 109%, respectively, when container cost was doubled and tripled (analysis not shown). The second largest variation in cost occurred when the pump rental cost was varied, with the cost of acquiring 100 mL of HM increasing by 28% and 57%, respectively, when the pump cost was doubled and tripled. Variations in the kit cost had the least impact with the cost of acquiring 100 mL of HM increasing 17% and 36%, respectively, when the costs were doubled and tripled.

The median institutional cost of acquiring 100 mL of HM was less expensive than comparable costs for DHM or CF for all of the average daily HM volume pumped categories except the < 100 mL category (Table 2). The median cost over the entire pumping period was less expensive than DHM for all average daily HM volume pumped categories (Table 2). The median cost over the entire pumping period was less expensive than CF for all average daily HM volume pumped categories except the < 100 mL category.

Figure 2 reveals that the day of pumping when the median cost of acquiring 100 mL of HM was lower than for either DHM (\$14.84/100 mL) or CF (\$3.18/100 mL) was a function of the average daily HM pumped volume. For mothers who pumped > 700 mL, the cost of acquiring 100 mL of HM was less than that of DHM and CF, respectively, after only 4 and 6 days of pumping. For mothers who pumped 100 to 199 mL, the cost of acquiring 100 mL of HM was less expensive than DHM or CF after 7 and 19 days of pumping, respectively. For mothers in the lowest volume category (< 100 mL), the cost of acquiring 100 mL of HM was less expensive than DHM after 16 days of pumping but was not less than CF during the first month of pumping.

Discussion

This is the first study to evaluate the institutional cost of acquiring 100 mL of HM from the biologic mothers of VLBW infants, based on the costs of the breast pump rental, the collection kit, and the disposable HM storage containers. These findings demonstrate that

the median cost of acquiring 100 mL of HM is less (\$0.51-\$2.57) than acquiring either DHM (\$14.84/100 mL) or CF (\$3.18/100 mL), provided that mothers pump a minimum average daily volume 100 mL and that they pump for a sufficient period of time (range, 4-19 days). Specifically, compared to DHM, HM is less expensive after 4 to 7 days of pumping and less expensive than CF after 6 to 19 days of pumping for mothers whose average daily milk volume is 100 mL. Thus, from an economic perspective, institutional efforts should be directed toward early identification and intervention for mothers who produce < 100 mL for their VLBW infants. Efforts that prioritize lactation care for these mothers not only provide recipient infants with higher doses of HM but clearly translate into cost savings for institutions.

Although the median cost of acquiring 100 mL of HM from mothers in the lowest volume category (\$7.93) was not lower than CF, it was lower than DHM. Further, the infants of these mothers still received significant amounts of HM during the early postbirth period, a finding that may impact NICU costs in a more subtle manner. For example, the infants in this study received relatively high doses of HM throughout the first 26 to 47 DOLs (Table 2) because small amounts of pumped HM were sufficient for exclusive or near-exclusive HM feedings when infant intake was limited. A recent article from this research team revealed that high doses of HM during the first 28 DOL reduced the risk of late onset sepsis and its associated NICU costs for VLBW infants in a dose-response manner.⁶ Thus, from a broader cost-effectiveness perspective, this limited pumped volume category may be economically advantageous for overall NICU costs. However, this overall cost-effectiveness analysis was not the focus of this study and is currently under investigation by this research team.

The findings from this study are consistent with those from our previous research and reveal that the cost of acquiring or providing HM is directly related to the HM volume pumped for the infant by the mother. Additionally, the findings from both studies reveal that the daily acquisition or provision cost of 100 mL of HM declines with each additional day of pumping (Figure 2). This finding is most likely related to the fact that the breast pump rental is a fixed monthly fee, and its cost impact per 100 mL of HM is a function of pumped milk volume. In this study, we examined the cost impact of different pumped milk volumes using the 8 mutually exclusive average daily HM volume pumped categories. These findings reveal that the costs of acquiring HM declined in a similar manner across all average daily HM volume pumped categories with each additional day of pumping. However, the primary mechanism for a reduction in the absolute acquisition costs of HM is to increase the mother's average daily HM volume pumped, thus moving into a higher volume category. This finding has specific implications for the economics of HM acquisition in the NICU.

Several studies have demonstrated that most mothers of VLBW infants are able to establish an abundant milk volume when they are provided with evidence-based lactation care and products such as effective breast pumps and correctly fitted breast shields.^{2,12,16-18} The findings from this study provide additional economic support for these strategies in that the HM volume pumped by the mother is the key driver of the institutional acquisition cost of HM.

This study is limited in that it examined the acquisition costs of only the pump, the kit, and the containers. Additional analyses that examine the impact of other institutional costs that are incurred for HM, DHM, and CF feeding are under investigation by this research team. These additional costs include HM fortifier, lactation care specialists, freezer storage, staff time to prepare specialty CF, storage space for CF, and the volume of waste materials generated by each feeding option. These items were not examined in this study because the purpose of this analysis was to solely look at the items that were universal to all NICUs. A second limitation of this analysis was that one-fifth of mothers had > 10% missing data. However, sensitivity analysis (not shown) comparing mothers with no missing data to those where the missing data were imputed revealed that there were no statistical differences in cost. A third limitation was that this analysis used conservative approaches to costing that could result in overestimating the true cost of 100 mL of HM. This was particularly important for the estimation of the number of containers where a 20% overage allowance was used. Because the containers were the largest driver of cost in the sensitivity analysis, future analyses should examine the exact container usage per mother to determine if this overage allowance does indeed overestimate the cost of HM.

Conclusion

In conclusion, the findings from this study demonstrate that the acquisition costs for HM are less than those for comparable volumes of either DHM or CF, provided the mother pumps a minimum average daily volume of 100 mL and pumps for a sufficient number of days (range, 4-19 days). These data add economic evidence to the existing clinical evidence for the use of HM feedings for VLBW infants hospitalized in the NICU. Because the cost of acquiring HM is a function of the mother's pumped volume, the NICU should prioritize prevention, diagnosis, and management of HM volume problems, especially for those mothers who pump < 100 mL daily.

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Well Established

Human milk from the biologic mother is superior to either donor human milk or commercial formula for very low birth weight infant feedings, but little is known about the costs incurred by the institution to acquire human milk.

Newly Expressed

The institutional cost to acquire human milk from the biologic mother is lower than the cost to acquire either donor human milk or commercial formula if the mother's milk volume is 100 mL per day and she pumps for a sufficient number of days (range, 4-19).

Figure 1. Maternal and Infant Disposition of Subjects
Abbreviation: DOL, day of life.

Figure 2. Institutional Cost to Acquire 100 mL of Human Milk from the Biologic Mother (HM) per Day of Pumping over the First 31 Days of Pumping by Average Daily HM Volume Pumped Category

Abbreviation: HM, human milk from biologic mother.

Figure 3. Sensitivity Analysis for the 3 Components of Cost by Average Daily HM Volume Pumped Category

Abbreviation: HM, human milk from biologic mother.

Costs represent the median cost to acquire 100 mL of HM for that category. The lowest average daily volume pumped category is not shown.

Table 1
Maternal and Infant Demographic Characteristics for the Study Sample (n = 157)

	No. (%), Median (25th, 75th percentile), or Mean (SD)
Maternal characteristics	
Age, mean (SD), y	29 (6)
Race, No. (%)	
Non-Hispanic black/African American	57 (36)
Non-Hispanic Caucasian/white	40 (26)
Hispanic	56 (36)
Other	4 (3)
Education, No. (%)	
Less than high school	17 (11)
High school graduate	39 (25)
Some college/trade school	61 (39)
College graduate	26 (17)
Graduate or professional school	14 (9)
WIC eligible, No. (%)	
Yes	82 (52)
No	63 (40)
Unknown	12 (8)
Primary payer, No. (%)	
Medicaid	70 (45)
Commercial	87 (55)
Infant characteristics	
Male gender, No. (%)	86 (55)
Multiple gestation, No. (%)	27 (17)
Birth weight, mean (SD), g	1052 (250)
Gestational age, mean (SD), wk	28 (2)
Length of infant NICU hospitalization, median (25th, 75th), d	67 (48, 88)
Human milk and pumping characteristics	
Days pumped, median (25th, 75th)	44 (26, 64)
Daily sessions pumped, median (25th, 75th)	4 (3, 5)
Daily pumped volume of HM, median (25th, 75th), mL	330 (155, 507)
Daily proportion of total infant enteral feedings of HM, median (25th, 75th)	91 (54, 100)
Pumped to infant discharge from NICU, No. (%)	47 (30)
Pumping duration during the NICU hospitalization, No. (%)	
Infant DOL 1-15	157 (100)
Infant DOL 16-30	146 (94)
Infant DOL 31-45	107 (76)
Infant DOL 46-60	79 (64)
Infant DOL > 60 (range, 61-179)	47 (50)

Abbreviations: DOL, day of life; HM, human milk from biologic mother; NICU, neonatal intensive care unit; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

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Table 2
Maternal, Infant, and Cost Characteristics by Average Daily HM Volume Pumped Category

	Average Daily HM Volume Pumped Category, mL							
	< 100 (n = 29)	100-199 (n = 22)	200-299 (n = 22)	300-399 (n = 24)	400-499 (n = 18)	500-599 (n = 20)	600-699 (n = 7)	> 700 (n = 15)
Maternal payer								
Medicaid (n = 70), No. (%)	12 (41)	9 (41)	10 (46)	10 (42)	11 (61)	8 (40)	2 (29)	8 (53)
Commercial (n = 87), No. (%)	17 (59)	13 (59)	12 (55)	14 (58)	7 (39)	12 (60)	5 (71)	7 (47)
Birth weight, mean (SD), g	993 (281)	1046 (267)	1037 (210)	1152 (230)	1079 (282)	1033 (224)	1144 (236)	984 (239)
Gestational age, mean (SD), wk	28 (3)	27 (2)	28 (2)	29 (2)	28 (3)	28 (2)	29 (3)	27 (2)
Length of infant NICU hospitalization, median (25th, 75th), d	83 (47, 108)	76 (49, 103)	64 (55, 85)	63 (44, 79)	68 (57, 101)	58 (45, 66)	50 (31, 71)	78 (56, 90)
Days pumped, median (25th, 75th)	30 (23, 46)	60 (30, 82)	50 (28, 59)	53 (30, 68)	53 (26, 80)	45 (34, 53)	29 (16, 54)	53 (26, 65)
Daily sessions pumped, median (25th, 75th)	4 (3, 4)	4 (3, 5)	5 (3, 5)	4 (4, 5)	5 (4, 6)	5 (4, 5)	5 (3, 5)	5 (4, 6)
Daily pumped volume of HM, median (25th, 75th), mL	50 (22, 83)	155 (147, 194)	259 (235, 277)	362 (332, 389)	444 (427, 466)	540 (517, 563)	653 (634, 679)	828 (804, 1045)
Daily proportion of total infant enteral feedings of HM, median (25th, 75th)	21 (13, 32)	70 (54, 87)	86 (72, 99)	96 (89, 100)	98 (91, 100)	100 (99, 100)	100 (97, 100)	100 (92, 100)
Latest DOL any HM, median (25th, 75th)	47 (36, 72)	61 (44, 99)	63 (51, 74)	63 (44, 79)	66 (53, 91)	54 (44, 66)	50 (31, 71)	74 (55, 85)

	Average Daily HM Volume Pumped Category, mL							
	< 100 (n = 29)	100-199 (n = 22)	200-299 (n = 22)	300-399 (n = 24)	400-499 (n = 18)	500-599 (n = 20)	600-699 (n = 7)	> 700 (n = 15)
Latest DOL exclusive HM, median (25th, 75th)	26 (13, 41)	47 (35, 72)	51 (45, 74)	62 (36, 76)	65 (39, 91)	54 (44, 66)	50 (31, 71)	73 (55, 85)
Cost of pump, kit, and containers to acquire 100 mL HM, median (25th, 75th)	\$7.93 (\$5.57, \$17.71)	\$2.57 (\$2.21, \$2.91)	\$1.65 (\$1.54, \$1.89)	\$1.26 (\$1.18, \$1.51)	\$1.01 (\$0.89, \$1.10)	\$0.82 (\$0.75, \$0.91)	\$0.72 (\$0.64, \$0.92)	\$0.51 (\$0.47, \$0.59)

Abbreviations: DOL, day of life; HM, human milk from biologic mother; NICU, neonatal intensive care unit.