**Supplementary Material**

1. Family Driven Feeding Guidelines
2. Family Driven Feeding Poster for NICU Room
3. Supplementary Table 1: Baseline Characteristics FDF vs. Full Unmatched Control Cohort
4. Supplementary Table 2: Outcomes for FDF vs. Full Unmatched Control Cohort
5. Supplementary Figure: Flow Diagram of Control Group

# NICU CLINICAL GUIDELINE

☐ Medication included ☒ No medication included

| | |
|---|---|
| **Title:** | Family Driven Feeding |
| **This document is attached to:** | Family Driven Feeding Form |

## 1. PURPOSE

This document is a guideline for breast and bottle feeding practices, collectively referred to as nipple feeding, in the Neonatal Intensive Care Unit (NICU). The initiation and advancement of nipple feeds is based on infant behavioral cues. Cue-based infant feeding scales have been shown to result in earlier attainment of full nipple feeds compared to feeding directed by a clinician's orders (1-4). Given the importance of family engagement, parents will be taught and encouraged to participate in the scoring of their infant's readiness for feeding and quality of feeding. For the purpose of this guideline, cue-based infant feeding with family engagement will hereby be known as "Family-Driven Feeding

## 2. GUIDELINE APPICABLE IN THE FOLLOWING SETTING:

Infants must be medically stable for readiness scoring to be initiated. The following infants are eligible for inclusion in Family-Driven Feeding:

- ≥ 32 weeks post-menstrual age
- Room air or low flow oxygen (< 1 liter/min)
- Demonstrates physiological stability (i.e. no significant apnea/bradycardia/desaturation episode with handling and no moderate or severe work-of-breathing with handling)
- Tolerates enteral feeds (note: does not need to be a full enteral feeds)
- No other contraindication identified by the medical team

## 3. ELEMENTS OF CLINICAL ACTIVITY

**Readiness for feeding**

Readiness is defined as a numeric value ranging from 1-4 (Table 1: Readiness for Feeding Scale). It determines whether the infant will be offered a breast or bottle feeding. At each care time, prior to feeding, assign a readiness score and then proceed as directed.

- Scores of 1 or 2 indicate that the infant is offered nipple feed based on the parent's informed feeding decision.
- Score 3 indicates that the infant may be placed at the breast but should not be offered a bottle feed. Encourage breastfeeding mothers to allow their infant to explore the breast when cueing.
- Score 4 indicates that the infant is fed only via a nasogastric (NG) tube. Infants may be placed in skin-to-skin care while being fed via an NG tube.

**Table 1: Readiness to Feed Scale**

<table>
<tr><th colspan="4">READINESS TO FEED SCALE</th></tr>
<tr><th>Score</th><th>Baby BEFORE the feed</th><th colspan="2">Action</th></tr>
<tr><td>1</td><td>Alert or fussy prior to care, or once handled, and sustained feeding cues:<ul><li>Turns head and opens mouth (roots), and/or</li><li>Hands to mouth, and/or</li><li>Takes pacifier</li></ul></td><td rowspan="3">Put to breast</td><td rowspan="2">Offer bottle</td></tr>
<tr><td>2</td><td>Sleepy but responds to stimulation. Shows some feeding cues.</td></tr>
<tr><td>3</td><td>Briefly alert during care or sleeps throughout care. Limited or no feeding cues.</td><td>No bottle</td></tr>
<tr><td>4</td><td>Drops in heart rate or oxygen level (apnea/bradycardia/desaturation). Fast breathing (tachypnea) or difficulty breathing with care.</td><td colspan="2">Gavage only</td></tr>
</table>

**Quality of Feeding**

Quality of feeding is defined as a numeric value ranging from 1-3 (Table 2: Quality of Feeding Scale). Each feeding is rated according to the infant's cues to guide the duration of feeding. Progression to full oral feeding is individualized and supported with appropriate gavage supplementation.

- Score 1 indicates that the infant should be breastfed or bottle fed typically about 20 minutes.
- Score 2 indicates that the infant should be breastfed or bottle fed typically about 10 minutes
- Any nipple feed should be discontinued if the infant is showing signs of disengagement (Appendix A)
- Score 3 indicates that the nipple feeding should be discontinued, and the feed should be provided by gavage.
- For breastfeeding, full supplementation with gavage should be given until milk transfer is observed. Once baby starts having a Quality Score of 1, consider pre-post weights to guide initial supplementation (Appendix B).
- For initiation of bottle feeding, it is recommended to use a side-lying position with the slowest flow nipple available. For bottle feeding, supplementation with gavage will be determined based on the quantity not nippled by the infant.
- Gavage supplementation should be given over a maximum of 30 minutes unless indicated otherwise by the medical team
- Growth should be monitored during Family Driven Feeding, and the medical team may reassess the baby's readiness for cue based feeding if growth is inadequate.

<table>
<tr><th colspan="4">QUALITY OF FEEDING SCALE</th></tr>
<tr><th>Score</th><th colspan="2">Baby DURING the feed</th><th>Action</th></tr>
<tr><td>1</td><td><u>Breast</u>: Latch is deep and strong. Sucks, swallows, and breathes in a coordinated pattern. Drops chin to indicate swallowing.</td><td><u>Bottle</u>: Bottles with a strong suck. Sucks, swallows, and breathes in a coordinated pattern.</td><td>Stop at signs of disengagement. Typically about 20 minutes.</td></tr>
<tr><td>2</td><td><u>Breast</u>: Latch is shallow or weak, or frequent need to re-latch. Sucks on and off, may fall asleep.</td><td><u>Bottle</u>: Bottles with a weak / inconsistent suck. Coordinated but tires. Takes breaks spontaneously or needs external pacing. May have some milk loss.</td><td>Stop at signs of disengagement. Typically about 10 minutes.</td></tr>
<tr><td>3</td><td colspan="2"><u>Either breast or bottle</u>: Unable to latch or poor suck at the bottle. Unable to coordinate suck, swallow, breathe pattern (coughs, chokes). Drops in heart rate or oxygen level. Fast / difficulty breathing during feed. Large amount of milk lost.</td><td>Stop immediately, complete by gavage.</td></tr>
</table>

**Supporting Breastfeeding**

Offer mothers a period of time when all oral feeding occurs at the breast to support their breastfeeding goals if they are able to be present. This can be considered a period of protected breastfeeding time during which all oral feeding occurs at the breast, supplementation occurs via NG tube and bottles are not offered.

- Infants should be offered 3-5 days of exclusive breastfeeding once scores for readiness begin. The mother needs to commit to being present for an average of at least 2 breastfeeds per day if protected breastfeeding time is offered. The remainder of the feeds when the breastfeeding parent is not present would be given by gavage.
- If the parent intends to breastfeed but cannot be present, a discussion with the medical team regarding barriers to presence and the possibility of earlier introduction of bottles should occur.
- At the end of the designated protected breastfeeding time, the parents and interdisciplinary team will discuss whether to continue exclusive breastfeeding or to include bottle feeding.

**Occupational Therapy**

Evaluation by an occupational therapist (OT) is not necessary prior to starting Family Driven Feeding. Specific to Family Driven Feeding, OT should be consulted for the following scenarios:

For 2 consecutive days, if

Readiness

- Score 3 or 4 for > 50% of feeds at ≥36 weeks corrected gestational age OR
- Score 2, 3 or 4 for ≥ 50% of feeds at ≥38 weeks corrected gestational age OR

Quality

- Score 3 on ≥1 feed at ≥36 weeks corrected gestational age despite use of slowest flow nipple and feeding strategies OR
- Score 2 or 3 on ≥1 feed at ≥38 weeks corrected gestational age despite use of slowest flow nipple and feeding strategies

**Documentation**

Each feeding assessment needs to be documented on the Family Driven Feeding documentation form (Table 3: Documentation). Assessments should occur at care times but may become more frequent if the baby is waking to breastfeed more often.

- The parent should complete the documentation form if they perform the assessment. The nurse should complete the documentation form if they perform the assessment. The nurse and parent should sign and initial at the bottom of the form.
- The following items are to be documented: date, time, whether the parent or nurse completes the assessment, the Readiness score, the Quality of Feeding score, strategies implemented (i.e. side-lying, pacing and/or breastfeeding repositioning), duration of feed, quantity of feed, and the nipple used (breastfeeding or specific type of bottle nipple).
- Even if the baby is not offered a nipple feed, the Readiness score should still be documented for every feed.

**Table 3: Documentation**

| **Date** (dd/mm/yy) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time (00:00) | | | | | | | | | | |
| Assessment by:<br>Parent (P) / Nurse (N) | | | | | | | | | | |
| Readiness score | | | | | | | | | | |
| Quality score | | | | | | | | | | |
| Strategies (refer to legend) | | | | | | | | | | |
| Breast / Nipple type | | | | | | | | | | |
| Duration (minutes) | | | | | | | | | | |
| Quantity (mL) | | | | | | | | | | |
| Top off by gavage (mL) | | | | | | | | | | |
| Parent initials | | | | | | | | | | |
| Nurse initials | | | | | | | | | | |

**Feeding Progression**

- Infants showing breastfeeding or bottling 75% of expected feeds for 48 hours should be considered for a trial of ad lib demand feeding. The NG tube should be discontinued at this time.
- Family Driven Feeding scoring and documentation should continue for the first 24 hours of ad lib demand feeding and can then be discontinued if the feeding quality is maintained.
- Prior to discharge, the infant must show adequate growth, maintain feeding quality, and feed at least 6-8 times in 24 hours.

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**6. SPECIAL CONSIDERATIONS**

None

**7. APPROVAL PROCESS**

***Institutional and professional approval***

| Committees | Date [yyyy-mm-dd] |
|---|---|
| ☒ NICU Multidisciplinary FDF Committee | 2024-03-28 |
| ☒ Pediatric Clinical Practice Review Committee (CPRC) (if applicable) | |
| ☐ Pediatric Pharmacy and Therapeutics (Peds P&T) (if applicable) | |

## 8. REVIEW DATE

To be updated in maximum of 4 years or sooner if presence of new evidence or need for practice change.

## 9. REFERENCES


1. McCain GC, Gartside PS, Greenberg JM, Lott JW. A feeding protocol for healthy preterm infants that shortens time to oral feeding. J Pediatr. 2001;139(3):374-9.
2. Kirk AT, Alder SC, King JD. Cue-based oral feeding clinical pathway results in earlier attainment of full oral feeding in premature infants. J Perinatol. 2007;27(9):572-8.
3. Puckett B, Grover VK, Holt T, Sankaran K. Cue-based feeding for preterm infants: a prospective trial. Am J Perinatol. 2008;25(10):623-8.
4. Wellington A, Perlman JM. Infant-driven feeding in premature infants: a quality improvement project. Arch Dis Child Fetal Neonatal Ed. 2015;100(6):F495-500.


| Version History (for Administrative use only) | | | |
|---|---|---|---|
| **Version** | **Description** | **Author/responsable** | **Date** |
| 1 | FDF Guildeline | Jessica Duby | 2024-03-28 |

## Appendix B: Breastfeeding Pre-Post Test Weights

**Purpose:** Calculate milk transfer from the breast to adjust NG supplementation
Note: Evidence remains mixed about the accuracy of milk transfer, largely due to differences and consistency in technique (1-5).

**Timing**: Consider using test weights to guide initial NG supplementation when infant starts scoring a Quality Score of 1

**Procedure:**

- Have stand-alone scale ready in patient's room.
- Unplug monitor leads.
- Keep baby's diaper on.
- Weight baby with monitor leads placed inside the scale with diapered baby.
- Give baby to parent to breastfeed.
- Weigh the baby the same way after feeding (i.e. with same diaper on and leads unplugged and put inside the scale with the baby.)
- Calculate feed volume: (post fed weight – pre feed weight = breast milk volume transferred) 1g = 1ml
- Supplement remaining feed volume via gavage.

**Additional practice points:**

- Initially, test weight may be needed for each breastfeed while feed volumes are fixed.
- As baby becomes more consistent in his/her breastfeeding abilities and feed volumes become less strict, test weight can be reduced to once every few days as a spot check, and NG supplementation can be estimated.
- Once NG has been removed stop test weights and feed ad lib.

**Note**: It is advised to take parental preference into consideration when deciding when and if to use test weights. Some parents may need a longer period to transition off of use test weights while others will not want them at all. Options can always be discussed with the medical, nursing, nutrition, and lactation teams.

**References:**


1. Ericson J, Flacking R. Estimated breastfeeding to support breastfeeding in the neonatal intensive care unit. J Obstet Gynecol Neonatal Nurs. 2013; 42(1):29-37.
2. Funkquist EL, Tuvemo T, Jonsson B, Serenius F, Nyqvist KH. Influence of test weighing before/after nursing on breastfeeding in preterm infants. Adv Neonatal Care. 2010;10(1):33-9.
3. Haase B, Barreira J, Murphy PK, Mueller M, Rhodes J. The development of an accurate test weighing technique for preterm and high-risk hospitalized infants. Breastfeed Med. 2009;4(3):151-6.
4. Rankin MW, Jimenez EY, Caraco M, Collinson M, Lostetter L, DuPont TL. Validation of Test Weighing Protocol to Estimate Enteral Feeding Volumes in Preterm Infants. J Pediatr. 2016;178:108-112.
5. Savenije OE, Brand PL. Accuracy and precision of test weighing to assess milk intake in newborn infants. Arch Dis Child Fetal Neonatal Ed. 2006;91(5):F330-2.

# Family-Driven Feeding

Learn how to read your baby's feeding cues and signs of disengagement

## Feeding cues



Wakes up spontaneously/ stretches / moves



Actively sucks on pacifier



Brings hands to mouth



Turns head and opens mouth



Is alert / fussy

## Signs of disengagement



Pushes away / arches back



Closes eyes / falls asleep



Gags / vomits



Closes mouth / slows down or stops sucking



Body becomes floppy

Hôpital de Montréal pour enfants
Centre universitaire de santé McGill

Montreal Children's Hospital
McGill University Health Centre

NICU
Montreal Children's Hospital
Hôpital de Montréal pour enfants

Supplementary Table 1: Baseline Characteristics FDF vs. Full Unmatched Control Cohort

| | **FDF** (n=72) | **Unmatched Controls** (n=143) | **Absolute standardized difference** |
|---|---|---|---|
| Gestational age groups, n (%) | | | |
| <26 | 7 (9.8) | 14 (9.8) | -0.02 |
| 26-28 | 22 (30.6) | 43 (30.1) | 0.01 |
| 29-31 | 43 (59.7) | 86 (60.1) | -0.01 |
| Birthweight (grams) (mean, SD) | 1312 (353) | 1287 (375) | 0.07 |
| Male sex, n (%) | 37 (51.4) | 71 (49.6) | 0.03 |
| Multiple births, n (%) | 21 (29.2) | 48 (33.6) | 0.09 |
| Inborn, n (%) | 64 (88.9) | 123 (86.0) | 0.09 |
| Caesarean section, n (%) | 45 (62.5) | 86 (60.1) | 0.05 |
| 5-Minute Apgar (median, IQR)[¥] | 7 (6, 8) | 7 (6, 8) | |
| Necrotizing enterocolitis[‡] n (%) | 2 (2.8) | 8 (5.6) | 0.14* |
| Never intubated n (%) | 46 (63.9) | 89 (62.2) | 0.03 |
| Post-menstrual age at discontinuation of respiratory support (weeks_days) (median, IQR)[¥] | 33+4 (32+2, 35+0) | 33+2 (32+0, 34+6) | |

*Absolute standardized difference > 0.1 indicating imbalance

[¥] Standardized difference was not calculated for variables summarized as median (IQR)

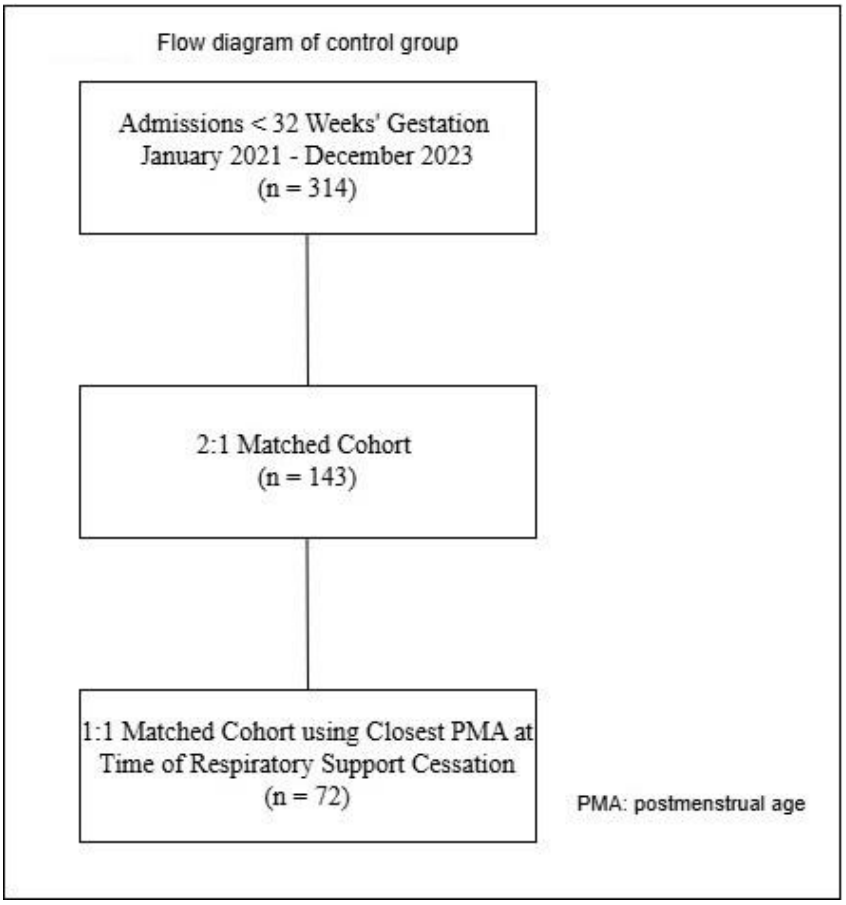
[‡]necrotising enterocolitis stage 2[16]

Supplementary Table 2: Outcomes[¥] for FDF vs. Full Unmatched Control Cohort

| | **FDF** (n=72) | **Unmatched Controls** (n=143) | **Adjusted effect estimate*** (95%CI) |
|---|---|---|---|
| Achieved ≥25% oral feeds, n (%) | 54 (75.0) | 77 (53.8) | 2.55 (1.36, 4.77) |
| Days between discontinuation of respiratory support and first oral feed, median (IQR) | 2 (1, 6) | 8 (4, 14) | 2.94 (2.16, 4.00) |
| Days between first oral feed and achievement of ≥25% oral feeds, median (IQR) | 8 (4, 16) | 7 (4, 15) | 1.10 (0.77, 1.57) |
| Days between birth and achievement of ≥25% oral feeds, median (IQR) | 43 (20, 71) | 47 (26, 78) | 1.50 (1.05, 2.14) |
| Achieved 100% oral feeds, n (%) | 22 (30.6) | 44 (30.8) | 0.98 (0.53, 1.83) |
| Length of stay, days, median (IQR) | 53 (27, 91) | 55 (28, 87) | 1.06 (0.87, 1.29) |
| Postmenstrual age at discharge or transfer, weeks, median (IQR) | 37 (34, 40) | 37 (34, 40) | 1.01 (0.97, 1.04) |
| Direct breastfeeding prior to discharge, n (%) | 45 (62.5) | 69 (48.2) | 1.78 (1.00, 3.19) |
| Any breastmilk at discharge, n (%) | 44 (61.1) | 93 (66.0) | 0.80 (0.44, 1.44) |

[¥] Outcomes were compared using multivariable logistic regression for binary outcomes and gamma regression model with a log link for continuous outcomes, adjusting for sex, multiple births, and mode of delivery.

*Adjusted effect estimates: odds ratio (OR) for binary outcomes, ratio of means (RoM) for continuous outcomes and hazard ratio (HR) for time-to-event outcomes


Flow diagram of control group
Admissions < 32 Weeks' Gestation
January 2021 - December 2023
(n = 314)
2:1 Matched Cohort
(n = 143)
1:1 Matched Cohort using Closest PMA at Time of Respiratory Support Cessation
(n = 72)
PMA: postmenstrual age