Feeding at Breast: NICU to Home Best Practices

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How Many of Your Human Milk Fed Infants are Discharged Exclusively Breastfeeding?

- Few VLBW infants can feed exclusively from the breast at the time of NICU discharge, whereas they can consume adequate volumes of expressed milk by bottle feeding.
- Consuming adequate volumes of milk from the breast routinely coincides with expected birth date.

Meier et al., 2010; Meier et al., in press; Davanzo et al., 2009, 2012

Why is this the case?

- Infants “just get used to the bottle” in the NICU
- It is “nipple confusion”
- It is easier to bottle feed than to breastfeed
- Staff do not support breastfeeding in the NICU, and encourage mothers to bottle feed to “get their babies home sooner”
But Data Reveal that Supplementation of At-Breast Feedings is Common Throughout the World in Premature Infants

Historically, Premature Infants Needed Some “Help” to Consume Enough Milk at Breast, Too

Premature Infants Fall Asleep Quickly at the Breast, Sleep Long Stretches without Waking Up to Feed, and Appear Satiated After Minimal Intake

What are the major similarities and differences between bottle and breast feeding for the premature infant?

Similarities between bottle and breast feeding

- Coordination of suck, swallow and breathe is necessary for safe and effective feeding
- The availability of milk determines the sucking rate, rhythm and pressures (NNS is not a model for NS)
- The rate of milk flow impacts sucking rate, rhythm, pressures and the frequency of swallowing during nutritive feeding
- Swallowing interrupts respiration
- The physical act of feeding overrides normal chemical control of breathing, with large inter-infant variability
- The healthy infant will modify feeding behaviors in order to protect respiration
- "Suck-training" and "learning" to feed are not based in scientific studies


Differences between bottle and breast feeding

The breast is not as predictable as the bottle with respect to milk flow
Suck, Swallow, Breathe (SSB) coordination during breastfeeding occurs prior to SSB coordination during bottle feeding in infants who serve as their own controls for the two feeding methods.

Meier, 1997; 1988; 1996; 2010; 2013

Infants remain more physiologically stable during breastfeeding than bottle feeding because they can control the rate of milk flow when breastfeeding, but only respond to it with bottle feeding.

Meier, 1988; 1997; Mathew & Bhatia, 1989; Geddes et al., 2008, 2009

Premature Infants Slip Off of the Nipple Easily and Require Frequent Repositioning.
Milk is transferred to the infant during suction when breastfeeding, and (likely) during expression when bottle feeding. Geddes et al, 2008; Jacinto-Goncalves et al, 2004; Inoue et al., 1995.

The infant creates vacuum during breastfeeding by using greater mandibular excursion than during bottle feeding.
Suction pressures are maturationally-dependent, reaching values that are critical to effective and efficient milk removal from the breast (but not from the bottle) at approximately term, corrected age (Lau et al., 2000).

Mothers assigned randomly to in-home measurement of milk intake or "clinical cues"

All mothers had adequate milk volume for infant needs

All “extra” milk was expressed mothers’ milk (Hurst NM, Meier PP, Engstrom JL. J Human Lactation 2004; 20: 178-187).

**Being Able to Pump Enough Milk Doesn’t Mean that the PT Infant Consumes Enough Milk at Breast**

![Image of a mother expressing milk]

24-Hour Milk Intake Patterns PDC

![Graph showing milk intake over weeks]

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Most premature infants discharged from the NICU will make the final transition to exclusive breastfeeding at home

- Infants are vulnerable to consuming an adequate volume of milk until term, corrected age (or beyond)
- Breastfeeding effectiveness tools (e.g., LATCH and others) that do not measure actual milk transfer must be used with caution
- Mothers need to anticipate several weeks of breast pump use and other lactation aids

These Findings Underscore the Interplay between Maternal Milk Volume and Infant Sucking

- PT infants who feed at breast are getting as much milk as they do because the breast pump is doing the work of creating and maintaining the milk supply
- This means that infants can still suckle immaturity and consume some (or even enough) milk because the pump has created the volume they consume
- Implication: Most mothers of PT infants will need to use a breast pump until the infant can assume the “work” of maintaining the milk supply, usually about term, corrected age.

Lactation technologies can assist with the transition from partial to exclusive breastfeeding

- Meier et al., 2014
Nipple Shield

An ultrathin nipple shield can help compensate for weak suction pressures in the LPT infant.
The shield allows the baby to consume more milk at breast and less away from the breast.
Most mothers use the shield until about the expected birth date, but some infants need them much longer than others.

A Nipple Shield Can Serve as a Temporary Aid for Increasing Milk Intake in Premature Infants

It looks like a bottle and "sends" the wrong message to the mother.
It means the baby is "lazy" or doesn't want to "work" for the feeding.
It will decrease milk transfer to the baby.
It should be discontinued as soon as possible so that the infant doesn't become "addicted".
Mothers must use the breast pump after they feed with the shield.
It violates "the Code".

Ideology About the Nipple Shield

• When properly placed at breast with the nipple shield, the LPT infant should look as if he or she were feeding and the shield weren’t there.

• The shield should not move in and out of the infant’s mouth with sucking.

• Milk intake with the shield can be measured with the BabyWeigh scale.
The BabyWeigh scale measures milk intake to the nearest 2 grams. It is portable, accurate, and easy-to-use. Mothers who measured milk intake in the home after discharge of the premature infants did not feel stressed. Instead, the mothers were reassured by knowing how much extra milk they needed to give each day.

Translational Studies about Test-Weighing in the NICU

- Test-Weighing is not accurate
  - Meier et al., 1990
  - Meier et al., 1994
- Clinical Indices can substitute for test-weights
  - Meier et al., 1994
  - Meier et al., 1996
- Test-Weighing is stressful to mothers and compromises lactation outcomes
  - Hurst et al., 2004

- Test Weights are accurate when performed correctly.
- The LATCH and other breastfeeding effectiveness instruments do not measure intake and do not correlate with milk intake.
- If you need to know how much milk an infant consumes at breast, test weights are indicated.
- When taught and presented correctly, mothers can perform test weights accurately and do not feel nervous

Measuring Milk Intake During Breastfeeding to Prepare for NICU Discharge

Families are taught to perform routine test-weights to measure milk intake during breastfeeding
The Rush NICU (Intermediate Care) on a weekday at 4PM

Mothers perform test-weights independently to determine supplements and complements and maintain cue-based feedings

CUE-BASED FEEDINGS IN NICU

- When infant consumes at least 50-75% of feeds orally (breast and/or bottle) and
- Awakens prior to scheduled 3-hourly feedings,
- Order “minimum” intake over 4 or 12-hour period to be given orally.
- If minimum is not consumed,
  - Remainder can be given by gavage (or if feeding at breast, remainder can be given by bottle) at the end of the “minimum” interval.
- Transitions the infant and family to cue-based feedings in the home.
Mothers need careful guidance about ensuring that milk supply does not decrease during the time that feeding at breast begins and progresses.

- Premature infants do not typically empty the breasts as feedings begin.
- Mothers are reluctant to pump as frequently as they should because they want the breasts to “have milk” when infants are awake and ready to feed.
- This period is also complicated by mothers’ returning to work, long-term pump dependency and other stressful factors that reduce the overall milk supply.

Discharge Plans

- Most premature infants will require feedings of human milk via breast AND bottle, but not necessarily at each feeding.

  - **Daytime hours:**
    - Feed on demand, but at least every 3-4 hours
    - Pump after each (or every other) feeding, depending upon volume consumed
    - Give bottle of expressed milk (unrestricted volume) after 8 hours

  - **Nighttime hours:**
    - Mother pumps both breasts every 3-4 hours
    - Father feeds bottle of expressed milk
    - Everyone goes back to sleep

- This plan protects BOTH infant intake and maternal milk volume, and allows feeding at breast to be preserved.

**Nutritive Feedings at the Breast in the NICU**
Gradual Transition from Nonnutritive to Nutritive Feedings

- Infant demonstrates more effective latch at the breast
- Awakens eagerly before feedings
- Start all feedings at breast until he or she falls asleep
- Mother gives gavage after infant feeds at breast

Gradual Transition from Nonnutritive to Nutritive Feedings

- Positioning that supports infant head and neck

- Discourage positions that do not support the infant head, neck and torso
- Teach mothers to bring the baby to them, not bend to put nipple in baby’s mouth
- Teach mothers that premature infants have heavy heads, but weak neck muscles
Teach Families to Begin the Feeding as Soon as the Infant Wakens

- Do not wait for the baby to cry
- Do not offer pacifier
- Do not change diaper first, with the idea that baby will become more awake

Maintenance of Milk Volume is Impacted When Infants Feed at the Breast in the NICU

- Mothers often assume that feeding their infants replaces the need to pump.
- Once infants are receiving cue-based feedings, mothers want to make sure they have milk in the breasts when infants awaken
- These common NICU practices impact the maintenance of milk volume

Using the Breast Pump at Home

- Most mothers with NICU infants will need the pump to help protect their milk supply until about the expected birth date
- The reason the NICU infant progressively consumes more milk at the breast is because the pump creates and maintains it.
- Discontinuing the breast pump too soon must be avoided

### Protecting Maternal Milk Volume and Infant Intake

- For the mother who wants to feed at breast as much as possible:
  - Do not routinely “triple feed”
- Establish breastfeeding times and pumping (and bottle feeding times)
  - **Daytime hours:**
    - Feed on demand, but at least every 3-4 hours
    - Pump after each (or every other) feeding, as advised to protect milk volume
    - Give bottle of expressed milk (unrestricted volume) after 6-8 hours
  - **Nighttime hours:**
    - Father pumps both breasts every 3-4 hours
    - Father feeds bottle of expressed milk
    - Everyone goes back to sleep

### Summary

- Much ideology surrounds the practice of feeding at breast in the NICU for premature infants, and mothers and their infants are disadvantaged as a result.
- Immature feeding behaviors, characterized by not waking to feed, slipping off the nipple, and falling asleep quickly, are normal in this population, and contribute to inadequate milk intake.
- These risks are not accurately measured with visually-scored instruments such as the LATCH.
- Lactation tools, including the breast pump, the BabyWeigh scale and the nipple shield, should be used as temporary aids to facilitate and monitor milk intake and protection of the milk supply.
- Targeted, proactive lactation interventions that are specific to this population of mothers and infants should be implemented to address the specific at-breast feeding problems.