Structural Support for the Use of Human Milk in Preterm Infants

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Disclosures

- I have no conflicts of interest.

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Review of New AAP Clinical Report

- Brief epidemiology
- Review key recommendations in the report
- Review key evidence that supports recommendations

About the Report

- Promoting Human Milk and Breastfeeding for the Very Low Birth Weight Infant
- Released online Oct 11, 2021
- Authors:
  - Section on Breastfeeding- Meg Parker, Lisa Stellwagen, Larry Noble
  - Committee on Nutrition- Jae Kim
  - Committee on Fetus and Newborn- Karen Puopolo, Brenda Poindexter
- Drafts started in summer 2018!
Human milk is the optimal nutrition for VLBW infants and decreases the risk of significant complications of prematurity, most notably NEC.

Pasteurized donor milk feeding is recommended when mother’s own milk is not available, is insufficient, or is contraindicated.

Overview of Data

- Report provides summary of existing dose-response epidemiologic studies and RCTs (Tables 2 and 3)
- Large body of work demonstrates an array of health benefits of mother’s own milk
- Generally, higher doses of mother’s milk are associated with increased health benefits; however, exposures of human milk are highly variable between studies
- Pasteurized donor milk protective against NEC

Human Human Milk Fortifier

- RCTs vary in exposure and treatment groups when studying the “exclusive human milk diet” (Table 3)
- RCTs of exclusive human milk diet:
  - MOM + DM + human HMF vs. MM + PF + bovine HMF
  - Show benefit of exclusive human milk diet for NEC
- O’Conner et al, 2018, Am J Clin Nutrition
  - MM + DM + human HMF vs. MM + DM + bovine HMF
  - No benefit of exclusive human milk diet
- We opted NOT to make any recommendation at this time supporting human HMF
- More studies to come: intact vs. hydrolyzed fortifiers
**Recommendation #2:**

Culturally appropriate lactation education should be provided to families of VLBW infants

- Education on lactation associated with decreased maternal anxiety (Sisk et al. 2006)
- Start lactation education prenatally
- Focus on health benefits: Mom and baby
- Focus on practical issues:
  - Early milk expression
  - Frequency of milk expression
  - Use of a pump or hand expression
  - Milk storage

**Lactation Education Continued**

- It’s a team sport!
- It is not ONLY the lactation consultants that are involved in lactation and encouragement
- NICU team-based approaches are highly successful.

**Recommendation #3:**

NICU care for VLBW infants should include determination and support of maternal lactation goals.

Lactation consultation with expertise in the needs of preterm infants is an integral part of VLBW NICU care.
Lactation Goals

- Mothers of VLBW infants initiate breastfeeding at higher rates than the general population
- Many mothers of VLBW infants do not meet their intended goals

- When was the last time you asked a mother what her lactation goal was? Especially post-discharge?
- Frame your breastfeeding support around achieving these goals!!

What we didn’t include

- Recommendations for FTEs of IBCLCs per # of NICU beds
- Recommendations for other kinds of lactation support personnel such as CLCs or peer-counselors

Research Gap:

“Race/ethnicity” is not very specific

Recommendation #4:

Racial and ethnic disparities in the provision of mother’s own milk and donor milk for VLBW infants exist and may be best addressed with center-specific efforts to identify and mitigate local disparities
Solutions to Address Inequities in Breastfeeding for VLBW Infants

- Peer-counselor programs: peers shared lived experience
- Few IBCLCs are racial/ethnic minorities
  - Need to be an RN, costs

Thomas et al. J of Human Lactation, 2018

Unmet Basic Needs: Transportation, Food, Child Care

- Qualitative Study: "I Felt Like I Was a Part of Trying to Keep My Baby Alive": Perspectives of Hispanic and Non-Hispanic Black Mothers in Providing Milk for Their Very Preterm Infants

- Unmet basic needs particularly impact the barrier of mother-infant separation during the NICU hospitalization
  - Transportation, parking, housing, food, child care
  - Financial burdens are enormous
  - Return to work

  "I spent so much of my money on cabs, coming back and forth to the hospital, and I had to space out times. I didn’t have the money to go back and forth. I think that’s the worst part of them being in the hospital, its transportation."

Parker et al., Breastfeeding Medicine, 2018
Lewis et al. BMC Pregnancy and Childbirth, 2019

Cash Transfer RCT of Medicaid-Eligible Mothers with Hospitalized Preterm Infants (n= 46)

- 2017-2018; Tufts Medical Center
- Mothers randomized to receive $200 a week x 3 weeks maximum vs. control (usual care)
- Intervention group received a one time “label” stating that cash was intended to help mothers visit the NICU

Andrews KG et al. Maternal Child Health J, 2020
Cash Transfer RCT continued

- What did mothers use the money for?
  - Food 45%
  - Transportation 35%
  - Infant related expenses (e.g. car seats, formula) 30%
  - Other (e.g. rent) 20%

- In summary, provision of $200 a week for a maximum of 3 weeks led to significant differences in breastfeeding, skin-to-skin, and NICU visitation

  - This is dramatically less than the cost of a typical NICU hospitalization (~$2,000 a day for a <32 weeker)

- New Study: R01 HD109293-01 Effect of Support for Low-Income Mothers of Preterm Infants on Parental Caregiving in the Neonatal Intensive Care Unit (NICU)
  - PI: Parker/McConnell

Recommendation #5:

Effective and efficient double electric breast pumps for mothers of VLBW infants will maximally support mothers in milk expression at the hospital and at home

The Pump Type Matters!

- We did not use the term “hospital-grade” because that definition technically just means that there is more than one user
- Example: Medela symphony
- Ideal for hospital AND home
- Need for advocacy efforts to provide these pumps for home
  - NICU loaner pump programs
  - Reduce rental costs by insurers

The Pump Type Matters!

- Even if the mother has a pump, she won’t succeed unless she knows what to do with it
- Mothers should be trained in use of her home pump prior to discharge if all possible
- Mothers should have all the equipment they need
  - Flanges (correct size), tubing, etc
  - Storage containers with labels
- NICU staff should be trained in navigating the basics:
  - Use of the pump
  - Suction strength
  - Pain with pumping
  - Proper flange fit
Express Yourself

- Multi-site NICU QI Collaborative focused on increasing mother’s milk and reducing racial disparities in Mississippi and New Orleans area
  - ~15 NICUs in MS and 8 in NOLA
  - 2019-2023
  - First time for multi-site QI data collection
- Dr. Bolaji Famuyide MS
- Dr. Stacy Drury NOLA

### Rates of Mother’s Milk among 114 VLBW Infants cared for at NOLA Level 3 NICUs 2019-20

<table>
<thead>
<tr>
<th>Any initiation</th>
<th>Any MM day 7</th>
<th>Exclusive MM day 7</th>
<th>Any MM day 28</th>
<th>Exclusive MM day 28</th>
<th>Any MM discharge</th>
<th>Exclusive MM discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>40%</td>
<td>20%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
<td>5%</td>
</tr>
</tbody>
</table>

>10% drop in first week of life

### Family Reported Measures

Mother’s approached by phone > 2 weeks post-discharge (mean 23 days); n = 47

<table>
<thead>
<tr>
<th>Measure</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast pump type</td>
<td></td>
</tr>
<tr>
<td>&quot;Hospital grade&quot; (e.g. Medela Symphony)</td>
<td>50%</td>
</tr>
<tr>
<td>Medela pump and style</td>
<td>25%</td>
</tr>
<tr>
<td>Received a breast pump &gt; maternal discharge</td>
<td>50%</td>
</tr>
<tr>
<td>Already returned to work or plan to return while baby admitted</td>
<td>25%</td>
</tr>
<tr>
<td>Not able to visit baby in hospital as often as desired</td>
<td>25%</td>
</tr>
</tbody>
</table>

Express Yourself, preliminary data

Study on-going to ascertain national prevalence of hospital grade breast pump access and understand process led by Michelle Peña, Emory
Recommendation #6:

Because of the need for early and frequent milk expression, technical assistance in early milk expression should be available to mothers within 6 to 8 hours of birth of any VLBW infant.

When is the Optimal to Time to First Milk Expression?

• Existing expert opinion is to initiate first milk expression within 6 hours of birth
  • WHO 10 Steps
  • Expansion of Baby-Friendly Initiative to NICU (JHL 2013)

• Data supporting this were based on reports from single centers and pilot RCTs with small numbers

Data Driven Approach to Determine Optimal Timing to First Milk Expression among 1,157 mother-VLBW dyads

RCT of Timing of Milk Expression (n = 180)

• Parker LA; Journal of Perinatology 2020
• 3 groups of first milk expression:
  • Within 60 minutes
  • 61-180 minutes (1-3 hours)
  • 181-360 minutes (4-6 hours)

• Findings: 4-6 hour group produced more milk over first 6 weeks

• Our committee felt that existing literature therefore supported a recommendation for first milk expression within 6 to 8 hours

Parker MG et al, Obstetrics and Gynecology, 2019
What we didn’t include

• Direct recommendation about *mode* of milk expression (hand or by pump)
• Direct recommendation about “hands on pumping”

**Recommendation #7:**

Mothers should be encouraged to express their milk as often as needed to maintain a milk supply for their infant(s), ideally every 3 to 4 hours

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**Milk Expression Frequency**

- Existing expert opinion is to pump 8 times in 24 hours, or every 2-3 hours
- WHO 10 Steps
- Expansion of Baby-Friendly Initiative to NICU (JHL 2013)

- Existing data suggest that many mothers do not comply with this recommendation
- Published cut-points for pumping frequency ≥4 to 7 times a day
- More frequent pumping is associated with greater milk production

Furman *et al.* Pediatrics 2002
Morton *et al.* J Perinatology 2009
Hoban *et al.* Breastfeeding Medicine 2018

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**Milk Expression Frequency**

- In reality, different mothers make different amounts of milk when they pump
- Ideally the recommendation would be to pump as frequently as needed to attain a certain milk volume.
  . This is impractical because many mothers don’t keep track of their milk volumes
- Our committee decided on the recommendation of every 3-4 hours
- We also refer to the study by the Rush University Medical College Team: production of milk ≥500 ml by day 14 is associated by increased duration of lactation

Hoban *et al.* Breastfeeding Medicine, 2018
**Recommendation #8:**

Written protocols and maternal education addressing milk collection, storage, and transport will optimize infant feeding safety.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Temperature</th>
<th>Freshly Expressed Mother's Milk</th>
<th>Frozen Mother's Milk</th>
<th>Frozen Pasteurized Donor Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room temperature</td>
<td>60-85°F/16-29°C</td>
<td>4 hours</td>
<td>4 hours²</td>
<td>4 hours¹</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>39°F/4°C</td>
<td>96 hours</td>
<td>48 hours²</td>
<td>48 hours¹</td>
</tr>
<tr>
<td>Freezer (2 door fridge/freezer)</td>
<td>0°F/-18°C</td>
<td>9 months</td>
<td>9 months</td>
<td>6-8 months²</td>
</tr>
<tr>
<td>Deep Freezer</td>
<td>0°F/-18°C</td>
<td>12 months</td>
<td>12 months</td>
<td>6-12 months²</td>
</tr>
<tr>
<td>Laboratory Freezer</td>
<td>-94°F/-70°C</td>
<td>12 months</td>
<td>12 months</td>
<td>6-12 months²</td>
</tr>
</tbody>
</table>

**Recommndation #9:**

Centers may encourage and support families in skin-to-skin care, nonnutritive suckling and direct breastfeeding when appropriate to the infant’s medical condition.

**Skin to Skin Care**

- Skin to skin care is associated with an array of health benefits, including improved milk production.
- There is already an AAP clinical report on skin to skin care.
- Skin to skin should be encouraged as much as possible and for as long as the family desires.
- There is controversy regarding which infants are “eligible” for skin to skin.
- Skin to skin can occur safely in the following clinical settings:
  - Ventilated or on CPAP
  - Securely placed lines

Baley J. Skin to skin care for term and preterm infants in the neonatal ICU; AAP COFN: Pediatrics 2015
Tremendous Variation in STS

Florida Perinatal Quality Collaborative “PAIRED” Initiative

- Statewide quality collaborative focused on NICU skin to skin
- [https://health.usf.edu/publichealth/chiles/fpqc/paired/toolbox](https://health.usf.edu/publichealth/chiles/fpqc/paired/toolbox)
- Focus on early and frequent STS
- Training materials

Direct Breastfeeding

- Longer duration of lactation associated with:
  - Initial oral feedings at the breast
  - More frequent direct breastfeeding
  - Earlier gestational age at the time of first breastfeeding attempt

- Initiate oral feedings according to feeding cues
  - 31-33 weeks in existing studies

Recommendation #10:

Human milk frequently requires fortification to meet the nutritional needs of VLBW infants. Centers may provide mothers with information on the rational for and content of HMFs

Pinchover-Kadik, et al. Nutrients 2017
Briere, et al. JHL 2015
Fortification

- VLBW infants nutritional needs exceed that of term infants and therefore fortifiers are needed
- Overview of existing HMF types
  - Bovine vs. human
  - Powder vs. liquid
  - Hydrolyzed vs. non-hydrolyzed proteins
  - Acidified vs. non-acidified
- Emphasize that donor milk is inferior in nutritional content than mother’s milk and therefore more fortification may be needed
- Timing: many studies have shown fortification before 80 cc/kg/day without adverse consequences

Sullivan et al. J Pediatrics, 2010

Human Milk Fortifiers

“This really should be its own AAP statement!”

“Dilemmas in human milk fortification”
Hair et al., J of Perinatology, 2022

Recommendation #11:

CMV infection can be acquired through mother’s own milk feeding. Current evidence is insufficient to support withholding a mother’s own milk solely based on this risk.
Postnatally Acquired CMV (pCMV) Through Mother’s Own Milk

- Meta-analysis: Among VLBW infants fed mother’s own milk
  - Risk of asymptomatic infection: 19% (11-32%)
  - Risk of sepsis-like syndrome: 4% (2-7%)
  - Apnea, pneumonitis, leukopenia, thrombocytopenia, hepatitis, cholestasis
- Providers should consider pCMV as a cause of late onset sepsis in VLBW infants
- Freezing:
  - Freezing does reduce risk of sepsis-like syndrome (5% [2% to 12%])
  - More studies on long-term effects are needed.

Lansieri et al. Pediatrics, 2013

Recommendation #12:
NICU discharge planning optimally includes defined feeding plans that consider and address the mother’s breastfeeding goals in conjunction with the infant’s need for milk fortification

Post-discharge fortification

- Many VLBW infants with extrauterine growth failure at discharge and longer term micronutrient needs

<table>
<thead>
<tr>
<th>Options</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fortify some expressed milk feeds and directly breastfeed</td>
<td>Some pumping may be preferred for mothers</td>
</tr>
<tr>
<td>Directly breastfeed most of the day and give small number of high calorie formula feeds</td>
<td>Some mothers may not want to pump</td>
</tr>
</tbody>
</table>

- Variable practice across the US and in our own committee
- Our view: “NICU teams need to balance the need for fortification based on growth status with mother’s personal breastfeeding goals.”

O’Conner et al. Pediatrics, 2008
Zachariaussen et al. Pediatrics, 2011

Thank you!
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