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ABM Clinical Protocol #3: Hospital Guidelines for the Use of Supplementary Feedings in the Healthy Term Breastfed Neonate, Revised 2009

The Academy of Breastfeeding Medicine Protocol Committee

A central goal of The Academy of Breastfeeding Medicine is the development of clinical protocols for managing common medical problems that may impact breastfeeding success. These protocols serve only as guidelines for the care of breastfeeding mothers and infants and do not delineate an exclusive course of treatment or serve as standards of medical care. Variations in treatment may be appropriate according to the needs of an individual patient.

Definitions

- *Supplementary feedings:* Feedings provided in place of breastfeeding. This may include expressed or banked breastmilk and/or breastmilk substitutes/formula. Any foods given prior to 6 months, the recommended duration of exclusive breastfeeding, are thus defined as supplementary.
- *Complementary feedings:* Feedings provided in addition to breastfeeding when breastmilk alone is no longer sufficient. This term is used to describe foods or liquids given in addition to breastfeeding after 6 months, a "complement" to breastfeeding needed for adequate nutrition.

Background

Given early opportunities to breastfeed, breastfeeding assistance, and instruction, the vast majority of mothers and babies will successfully establish breastfeeding. Although some infants may not successfully latch and feed during the first day (24 hours) of life, they will successfully establish breastfeeding with time, appropriate evaluation, and minimal intervention. Unfortunately, formula supplementation of healthy newborn infants in hospital is commonplace, despite widespread recommendations to the contrary.[1,2] The most recent scientific evidence indicates that *exclusive breastfeeding* (only breastmilk, no food or water except vitamins and medications) for the first 6 months is associated with the greatest protection against major health problems for both mothers and infants.[3–5]

Newborn physiology

Small colostrum feedings are appropriate for the size of the newborn's stomach,[6–8] are sufficient to prevent hypoglycemia in the healthy, term, appropriate for gestational age infant,[9–11] and easy to manage as the infant learns to coordinate sucking, swallowing, and breathing. Healthy term infants also have sufficient body water to meet their metabolic needs, even in hot climates.[12–18] Fluid necessary to replace insensible fluid loss is adequately provided by breastmilk alone.[18–20] Newborns lose weight because of a physiologic diuresis of extracellular fluid following transition to extrauterine life.[8] The normal maximal weight loss is 5.5–6.6% of birth weight in optimally exclusively breastfed infants[14,15,21,22] and occurs between days 2 and 3 of life (4872 hours after birth).[14,15,21] Optimally breastfed infants regain birth weight at an average (95% confidence interval) of 8.3 days (7.7–8.9) with 97.5% having regained their birth weight by 21 days.[21] Percentage weight loss should be followed closely for outliers in this regard, but the majority of breastfed infants will not require supplementation.

Early management of the new breastfeeding mother

Because some breastfeeding mothers question the adequacy of colostrum feedings and may receive conflicting advice, they may benefit from reassurance, assistance with breastfeeding technique, and education about the normal physiology of breastfeeding. Inappropriate supplementation may undermine a mother's confidence about her ability to meet her infant's nutritional needs[23] and give inappropriate messages that may result in continued supplementation of the breastfed infant at home.[24]

Postpartum mothers with low confidence levels are very vulnerable to external influences, such as advice to offer breastfeeding infants supplemention such as glucose water or artificial baby milk.[23] Well-meaning healthcare professionals often offer supplementation as a means of protecting mothers from tiredness or distress, although this at times conflicts with their role in promoting breastfeeding.[25,26]

Inappropriate reasons for supplementation and associated risks are multiple (see Appendix for quick reference).

There are common clinical situations where evaluation

and breastfeeding management may be necessary, but supplementation is NOT INDICATED, including:

1. The sleepy infant with fewer than eight to 12 feedings in the first 24–48 hours with less than 7% weight loss and no signs of illness
   - Newborns are normally sleepy after an initial approximately 2-hour alert period after birth.[27,28] They then have variable sleep–wake cycles, with an additional one or two wakeful periods in the next 10 hours whether fed or not.[27]
   - Careful attention to an infant's early feeding cues, and gently rousing the infant to attempt breastfeeding every 2–3 hours is more appropriate than automatic supplement after 6, 8, 12, or even 24 hours.
   - The general rule in the first week is: "an awake baby is a hungry baby!"
   - Increased skin-on-skin time can encourage more frequent feeding.
2. The healthy, term, appropriate for gestational age infant with bilirubin levels less than 18 mg/dL (mol/L) after 72 hours of age when the baby is feeding well and stooling adequately and weight loss is less than 7%[29]
3. The infant who is fussy at night or constantly feeding for several hours
4. The tired or sleeping mother

For both points 3 and 4 above, breastfeeding management that optimizes infant feeding at the breast may make for a more satisfied infant AND allow the mother to get more rest.

Before any supplementary feedings are begun, it is important that a formal evaluation of each mother–baby dyad, including a direct observation of breastfeeding, is completed. The following guidelines address indications for and methods of supplementation for the healthy, term (37–42-week), breastfed infant. Indications for supplementation in term, healthy infants are few[30,31] (Table 1).

Table 2 lists possible indications for the administration of such feedings. The physician must decide if the clinical benefits outweigh the potential negative consequences of such feedings.

Recommendations

1. Healthy infants should be put skin-to-skin with the mother immediately after birth to facilitate breastfeeding,[19,31,37] because the delay in time between birth and initiation of the first breastfeed is a strong predictor of formula use.[26,38]
2. Antenatal education and in-hospital support can significantly improve rates of exclusive breastfeeding.[39] Both mothers and healthcare providers should be aware of the risks of unnecessary supplementation.
3. Healthy newborns do not need supplemental feedings for poor feeding for the first 24–48 hours, but babies who are too sick to breastfeed or whose mothers are too sick to allow breastfeeding are likely to require supplemental feedings.[30]
4. Hospitals should strongly consider instituting policy regarding supplemental feedings to require a physician's order when supplements are medically indicated and informed consent of the mother when supplements are not medically indicated. It is the responsibility of the health professional to provide information, document parental decisions, and support the mother after she has made the decision.[40] When the decision is not medically indicated, efforts to educate the mother ought to be documented by the nursing and/or medical staff.
5. All supplemental feedings should be documented, including the content, volume, method, and medical indication or reason.
6. If mother–baby separation is unavoidable, established milk supply is poor or questionable, or milk transfer is inadequate, the mother needs instruction and encouragement to pump or manually express her milk to stimulate production and provide expressed breastmilk as necessary for the infant.[19,30,31,35]
7. When supplementary feeding is necessary, the primary goals are to feed the baby and also to optimize the maternal milk supply while determining the cause of poor feeding or inadequate milk transfer.
8. Whenever possible, it is ideal to have the mother and infant room-in 24 hours per day to enhance opportunities for breastfeeding and hence lactogenesis.[19,30,31,35]
9. Optimally, mothers need to express milk each time the baby receives a supplemental feeding, or about every 2–3 hours. Mothers should be encouraged to start expressing on the first day (within the first 24 hours) or as soon as possible. Maternal breast engorgement should be avoided as it will further compromise the milk supply and may lead to other complications.[30,31]
10. All infants must be formally evaluated for position, latch, and milk transfer prior to the provision of supplemental feedings.[19,35] Most babies who remain with their mothers and breastfeed adequately lose less than 7% of their birth weight. Weight loss in excess of 7% may be an indication of inadequate milk transfer or low milk production.[34] Although weight loss in the range of 8–10% may be within normal limits, if all else is going well and the physical exam is normal, it is an indication for careful assessment and possible breastfeeding assistance.
11. The infant's physician should be notified if:
    a. The infant exhibits other signs of illness in addition to poor feeding.
    b. The mother–infant dyad meets the clinical criteria in Table 1.
    c. The infant's weight loss is greater than 7%.

Table 1. Indications for Supplemental Feeding in Term, Healthy Infants (Situations Where Breastfeeding Is Not Possible)

1. Separation
• Maternal illness resulting in separation of infant and mother (e.g., shock or psychosis)
• Mother not at the same hospital
2. Infant with inborn error of metabolism (e.g., galactosemia)
3. Infant who is unable to feed at the breast (e.g., congenital malformation, illness)
4. Maternal medications (those contraindicated in breastfeeding)[32]

Table 2. Possible Indications for Supplementation in Term, Healthy Infants

1. Infant indications
   a. Asymptomatic hypoglycemia documented by laboratory blood glucose measurement (not bedside screening methods) that is unresponsive to appropriate frequent breastfeeding. Symptomatic infants should be treated with intravenous glucose. (Please see ABM Hypoglycemia Protocol for more details.[9,10])
   b. Clinical and laboratory evidence of significant dehydration (e.g., >10% weight loss, high sodium, poor feeding, lethargy, etc.) that is not improved after skilled assessment and proper management of breastfeeding[33,34]
   c. Weight loss of 8–10% accompanied by delayed lactogenesis II (day 5 [120 hours] or later)
   d. Delayed bowel movements or continued meconium stools on day 5 (120 hours)[34,35]
   e. Insufficient intake despite an adequate milk supply (poor milk transfer)[34]
   f. Hyperbilirubinemia
      i. "Neonatal" jaundice associated with starvation where breastmilk intake is poor despite appropriate intervention (please see ABM Jaundice in the Breastfed Infant Protocol)
      ii. Breastmilk jaundice when levels reach >20–25 mg/dL (μmol/L) in an otherwise thriving infant and where a diagnostic and/or therapeutic interruption of breastfeeding may be helpful
   g. When macronutrient supplementation is indicated
2. Maternal indications
   a. Delayed lactogenesis II (day 3–5 or later [72–120 hours] and inadequate intake by the infant[34]
      i. Retained placenta (lactogenesis probably will occur after placental fragments are removed)
      ii. Sheehan's syndrome (postpartum hemorrhage followed by absence of lactogenesis)
      iii. Primary glandular insufficiency, occurs in less than 5% of women (primary lactation failure), as evidenced by poor breast growth during pregnancy and minimal indications of lactogenesis
   b. Breast pathology or prior breast surgery resulting in poor milk production[36]
   c. Intolerable pain during feedings unrelieved by interventions

Adapted with permission from Powers and Slusser.[30]

Choice of Supplemental Feeding

1. Expressed human milk is the first choice for supplemental feeding,[19,41] but sufficient colostrum in the first few days (0–72 hours) may not be available. The mother may need reassurance and education if such difficulties occur. Hand expression may elicit larger volumes than a pump in the first few days and may increase overall milk supply.[42] Breast massage along with expressing with a mechanical pump may also increase available milk.[43]
2. If the volume of the mother's own colostrum does not meet her infant's feeding requirements, pasteurized donor human milk is preferable to other supplements.[41]
3. Protein hydrolysate formulas are preferable to standard artificial milks as they avoid exposure to cow's milk proteins, reduce bilirubin levels more rapidly,[44] and may convey the psychological message that the supplement is a temporary therapy, not a permanent inclusion of artificial feedings. Supplementation with glucose water is not appropriate.
4. The physician must weigh the potential risks and benefits of other supplemental fluids, such as standard formulas, soy formulas, or protein hydrolysate formula, with consideration given to available resources, the family's history for risk factors such as atopy, the infant's age, the amounts needed, and the potential impact on the establishment of breastfeeding.

Volume of Supplemental Feeding

Several studies give us an idea of intakes at the breast over time. In one study the mean yield of colostrum (using infant test-weighing) for over the first 24 hours after birth was 37.1 g (range, 7–122.5 g) with an average intake of 6 g per feed and six feedings in the first 24 hours.[45] A similar study also using test-weighing revealed a mean intake of 13 g/kg/24 hours (range, 3–32 g/kg/24 hours) for the first 24 hours, increasing to a mean of 98 g/kg/24 hours (range, 50–163 g/kg/24 hours) on day 3 (by 72 hours).[46] Yet another study[47] noted breastmilk transfer of 6 mL/kg/24 hours for day 1 (24 hours), 25 mL/kg/24 hours for day 2 (48 hours), 66 mL/kg/24 hours for day 3 (72 hours), and 106 mL/kg/24 hours for day 4 (96 hours) in healthy, vaginally delivered infants allowed on-demand breastfeeding. Interestingly, the intake of infants delivered by cesarean section was significantly less during days 2–4 (within 48–96 hours).[47] In a study where there was no rooming in and infants were fed every 4 hours, the average intake was 9.6 mL/kg/24 hours on day 1 and 13 mL/kg/24 hours on day 2 (48 hours).[48] In most studies, the range of intake is wide, with formula-fed infants usually taking in larger volumes than breastfed infants.

1. Infants fed artificial milks ad libitum commonly have higher intakes than breastfed infants.[48] Acknowledging that ad libitum breastfeeding recapitulates evolutionary feeding and considering recent data on obesity in artificially fed infants, it can be concluded that such artificially fed infants may well be overfed.
2. As there is no definitive research available, the amount of supplement given should reflect the normal amounts of colostrum available, the size of the infant's stomach (which changes over time), and the age and size of the infant.
3. Based on the limited research available, suggested intakes for term healthy infants are given in Table 3, although feeding should be by infant cue to satiation.

Table 3. Average Reported Intakes of Colostrum by Healthy Breastfed Infants[45–48]

Time	*Intake (mL/feed)*
1st 24 hours	2–10
24–48 hours	5–15
48–72 hours	15–30
72–96 hours	30–60

Methods of Providing Supplementary Feedings

1. When supplementary feedings are needed there are many methods from which to choose: a supplemental nursing device at the breast, cup feeding, spoon or dropper feeding, finger-feeding, syringe feeding, or bottle feeding.[49]
2. There is little evidence about the safety or efficacy of most alternative feeding methods and their effect on breastfeeding; however, when cleanliness is suboptimal, cup feeding is the recommended choice.[41] Cup feeding has been shown safe for both term and preterm infants and may help preserve breastfeeding duration among those who require multiple supplemental feedings.[50–55]
3. Supplemental nursing systems have the advantage of supplying appropriate supplement while simultaneously stimulating the breast to produce more milk and reinforcing the infant's feeding at the breast. Unfortunately, most systems are awkward to use, difficult to clean, and expensive and require moderately complex learning.[49] A simpler version, supplementing with a dropper or syringe while the infant is at breast, may be effective.
4. Bottle feeding is the most commonly used method of supplementation in more affluent regions of the world, but is of concern because of distinct differences in tongue and jaw movements, differences in flow, and long-term developmental concerns.[49] Some experts have recommended a nipple with a wide base and slow flow to try to mimic breastfeeding, but no research has been done evaluating outcomes with different nipples.
5. An optimal supplemental feeding device has not yet been identified, and may vary from one infant to another. No method is without potential risk or benefit.[49,56]
6. When selecting an alternative feeding method, clinicians should consider several criteria:
   a. cost and availability
   b. ease of use and cleaning
   c. stress to the infant
   d. whether adequate milk volume can be fed in 20–30 minutes
   e. whether anticipated use is short- or long-term
   f. maternal preference, and
   g. whether the method enhances development of breastfeeding skills.

Research Needs

1. Research is necessary to establish evidence-based guidelines on appropriate supplementation volumes for specific conditions and whether this varies for colostrum versus artificial milk. Other specific questions include: Should the volume be independent of infant weight or a per kg volume? Should supplementation make up for cumulative losses? Should feeding intervals be different for different supplements?
2. Research is also lacking on what is the optimal method of supplementation. Are some methods best for infants with certain conditions, ages, and available resources? Which methods interfere least with establishing direct breastfeeding?

Notes

This protocol addresses the term healthy newborn. For information regarding appropriate feeding and supplementation for the late preterm infant (35–37 weeks), see "ABM Protocol #10: Breastfeeding the Near-Term Infant"[57] and "Care and Management of the Late Preterm Infant Toolkit."[58]

The World Health Organization is currently updating its annex to the Global Criteria for the Baby Friendly Hospital Initiative: "Acceptable Medical Reasons for Supplementation."[59] The annex has been broadened to acceptable reasons for use of breastmilk substitutes in all infants. The handout (#4.5) is available at: http://www.who.int/nutrition/publications/infantfeeding/WHO_NMH_NHD_09.01/en/.

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ABM protocols expire 5 years from the date of publication. Evidence-based revisions are made within 5 years or sooner if there are significant changes in the evidence.

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Appendix

Inappropriate Reasons for Supplementation, Responses, and Risks

Concerns	*Responses*	*Risks of supplementation*
There is no milk, or colostrum is insufficient, until the milk "comes in"	• Mother and family should be educated about the benefits of colostrum (e.g., liquid gold) including dispelling myths about the yellow substance. Small amounts of colostrum are normal, physiologic, and appropriate for the term healthy newborn (refer to Table 3).	• Can alter infant bowel flora[60,61] • Potentially sensitizes the infant to foreign proteins[62–65] • Increases the risk of diarrhea and other infections[66–69] especially where hygiene is poor[31,72] • Potentially disrupts the "supply-demand" cycle, leading to inadequate milk supply and long-term supplementation
Concern about weight loss and dehydration in the postpartum period	• A certain amount of weight loss is normal in the first week of life and is due to both a diuresis of extracellular fluid received from the placenta and passage of meconium. • There is now evidence that too *little* weight loss in the newborn period is associated with an increased risk of obesity later in life.[72]	• Supplementation in the first few days interferes with the normal frequency of breast feedings.[31,71] • If the supplement is water or glucose water, the infant is at risk for increased bilirubin,[73–77] excess weight loss,[78] longer hospital stay,[22] and potential water intoxication.[20]
Concern about infant becoming hypoglycemic	• Healthy, full-term infants do not develop symptomatic hypoglycemia simply as a result of suboptimal breastfeeding.[11]	• Risk as for weight loss/dehydration
Concern about jaundice	• The more frequent the breastfeeding, the lower the bilirubin level.[29,79,80] • Bilirubin is a potent antioxidant.[81] The appropriately breastfed infant has *normal* levels of bilirubin unless affected by another pathologic process such as hemolysis (e.g., ABO or Rh incompatability) • Colostrum acts as a natural laxative helping to eliminate the retained pool of bilirubin contained in meconium.	• Risk as for weight loss/dehydration

Not enough time to counsel mother about exclusive breastfeeding, mothers may request supplement	• Training all staff in how to assist mothers with breastfeeding is important. • Mothers may also benefit from education about artificial feeds and/or how supplements may adversely affect subsequent breastfeeding.[25,38] • Help healthcare professionals understand that time spent on passive activities interactions such as listening to and talking with mothers is of critical importance as opposed to other more active interventions (which may be viewed more as "real work" to them).[25,38]	• If the supplement is artificial milk, which is slow to empty from the stomach[82,83] and often fed in larger amounts,[48] the infant will breastfeed less frequently.[48] • Depending on the method of supplementation,[49,84] or the number of supplements,[51,85,86] an infant may have difficulty returning to the breast. • Prelacteal feeds (as opposed to supplementation) are associated with delayed initiation of breastfeeding and negatively associated with exclusivity and duration of breastfeeding.[87–90]
Medications that may be contraindicated with breastfeeding	• Accurate references are easily available to providers (e.g., Lactmed on Toxnet website,[91] AAP policy,[92] *Medications and Mothers' Milk*[93])	• Risk of decreasing breastfeeding duration or exclusivity
Mother too malnourished or sick to breastfeed	• Even malnourished mothers can breastfeed. • Reasons for supplementation with maternal illness that are listed in text	• Risk of decreasing breastfeeding duration or exclusivity
Need to quiet a fussy or unsettled baby	• Infants can be unsettled for many reasons. They may wish to "cluster feed" (several short feeds in a short period of time) or simply need additional skin-to-skin time or holding.[49] • Filling (and often *overfilling*) the stomach with artificial milk may make the infant sleep longer,[83] missing important opportunities to breastfeed, and demonstrating to the mother a short-term solution which may generate long-term health risks. • Teaching other soothing techniques to new mothers such as breastfeeding, swaddling, swaying, side lying techniques, encouraging father or other relatives to assist. Again, caution should be taken to not ignore early feeding cues.[100]	• Risk of decreasing breastfeeding duration or exclusivity[52,75,84,94–98] • Studies have noted delayed lactogenesis II (also known as "secretory activation" or "milk coming in)[38] • Maternal engorgement due to decreased frequency of breastfeeding in the immediate postpartum period.[24,99]
Accommodate growth or appetite spurts or periods of cluster feeds	• Periods when infants demand to nurse more and/or excrete less stool are sometimes interpreted by mothers as insufficient milk. This may happen in later weeks but also in the second or third night (48–72 hours) at home, in the immediate postpartum period. • Anticipatory guidance may be helpful.	• Risk of decreasing breastfeeding duration or exclusivity
Mother needs to rest or sleep	• Postpartum mother has been shown to be restless when separated from her infant and actually gets less rest.[97] • Mothers lose the opportunity to learn their infant's normal behavior and early feeding cues.[35] • The highest risk time of day for an infant to receive a supplement is between 7 p.m. and 9 a.m.[2]	• Risk of decreasing breastfeeding duration or exclusivity
Taking a break will help with sore nipples	• Sore nipples are a function of latch, positioning, and sometimes individual anatomic variation, like ankyloglossia, not length of time nursing.[101] • There is no evidence that limiting time at the breast will prevent sore nipples.	• Problem with latch not addressed • Risk of shortening breastfeeding duration or cessation of breastfeeding

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