
The Academy Of Breastfeeding Medicine

ABM Protocols

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.

Clinical Protocol Number #12

Transitioning the Breastfeeding/Breastmilk-fed Premature Infant from the Neonatal Intensive Care Unit to Home

I. Introduction and Background

The practice of breastfeeding or providing expressed mother's milk to premature infants is promoted because of the considerable benefits to their health and well-being.^{1,2} Exclusive breastfeeding has been shown to result in adequate post-discharge weight gain even in very low birth weight infants.³ The following guidelines include recommendations for monitoring and optimizing nutritional support of premature infants after they are discharged from the hospital. These guidelines represent expert opinions and have not been validated experimentally.

This protocol addresses the care of premature infants less than 37 weeks gestation and less than 2500 grams at birth, who are being transitioned from the hospital to home. Depending on the unit, these infants often weigh 1750 to 2000 grams at discharge, or less if a kangaroo mother care (also known as skin-to-skin) program is practiced which may allow for more rapid development of feeding skills. Many of the infants weighing 2000 to 2500 grams are not admitted to NICU; they may either be in a transitional nursery or in the postnatal ward with their mothers. (Please also refer to ABM Protocol Breastfeeding the Near-Term Infant.) The plan does not distinguish in-utero appropriately grown (AGA) from growth restricted (SGA) infants, but bases decisions on current nutritional status and body weight.

For infants less than 1500 grams at birth, it is recommended that they be fed their mothers' milk fortified with nutrients and calories. Infants 1500 grams or more may breastfeed ad libitum as they are able, provided they are supplemented with multivitamins and iron. Near the time of discharge, a decision must be made as to the feeding in the post-discharge period (to 1 year corrected age). Many of these infants will

do well after discharge with full or partial breastfeeding, or receiving mother's milk by bottle, cup,^{4,5} syringe, nasogastric tube, or supplemental nursing (feeding tube) device. Growth faltering, however, has been observed in some premature infants in the post-discharge period if they receive exclusive human milk feedings without nutrient and caloric fortification.⁶⁻¹¹

Most slow growth in these babies, with the exception of the extremely low birth weight infant (ELBW is defined as less than 1000 grams at birth), is a function of absolute intake rather than milk composition such that every effort to ensure optimal milk volume should be exhausted prior to switching feedings to formula.

II. Pre-discharge: Discharge Planning

- A. The clinician should work with the mother to devise a feeding plan well before the actual date of discharge. Rooming-in by the mother for a few days prior to discharge during this transition period is strongly recommended. The baby will preferably be on exclusive breastmilk; either suckling straight from the breast and/or by use of expressed breastmilk. Less often, the plan may include a combination of breastmilk (directly from the breast and/or expressed) and formula.
- B. The following aspects of the current feeding plan should be assessed when making post-discharge plans.
 - 1) “Type” of feeding: unfortified human milk, fortified human milk, formula, or a combination.
 - 2) “Amount of feeding”: milk intake (cc/kg/day): – this includes either measuring the mothers’ pumped milk volume or performing 24 hour test weights¹³ for infants who feed at the breast. If the baby is already growing adequately, it is not typically necessary to perform test weights.
 - 3) “Method” of feeding: oral (breast, bottle, cup, supplemental nursing device, other, or a combination of methods) versus, or in combination with, tube-feeding (nasal or orogastric), or use of a feeding device (e.g. gastrostomy tube).
 - 4) “Adequacy of growth”: In-hospital growth noted as daily rate of weight gain and weekly rate of length gain calculated and/or plotted on appropriate growth charts (Table 1).
 - 5) “Adequacy of nutrition”: In-hospital biochemical nutritional status, when feasible (Table 1).

(Note: It is recognized that biochemical monitoring is not feasible in all settings. In such situations, dietary adequacy is based on optimal growth and absence of clinical rickets)
 - 6) Summary of current nutritional assessment: optimal vs. sub-optimal
 - a. Optimal Status (includes ALL of the following)
 - i. Infant can achieve entire intake orally, by breastfeeding and/or alternate methods.

- ii. Volume of intake is approximately 180 cc/kg/day or more. (Rarely, lower volumes will be adequate - if both of the following criteria are met, iii and iv).
 - iii. Growth (weight and length) is within normal limits or improving.
 - iv. Biochemical indices (phosphorus, alkaline phosphatase, blood urea nitrogen) are within normal limits (see Table 1) or improving.
- b. Sub-Optimal (includes ANY one or more of the following)
- i. Infant's intake is < 160 cc/kg/day (with rare exceptions). Infant cannot consume all feedings orally.
 - ii. Growth is less than adequate (weight gain < 20 grams/day and/or length gain < 0.5 cm/week).
 - iii. Biochemical indices are abnormal and are not improving.
- C. Transition to Post-Discharge Nutrition for infants with "Optimal Assessment":
1. If the infant has been receiving fortified human milk with/without preterm formula, the diet may be changed to unfortified human milk ad libitum, by breastfeeding and/or alternative feeding methods, at least one week before anticipated discharge.
 - a. Prior to this transition it is necessary to assure that mother's milk supply is appropriate for a trial of breastmilk without fortification. This can be done by reviewing the mother's pumping record. Ideally, the mother has been pumping/expressing breastmilk regularly. It is recommended that the mother continue pumping or expressing milk at least three times/day in order to have an "oversupply" to facilitate adequate volume consumption by the premature infant at the breast. For some mothers, pumping after each feeding ensures optimal drainage of the breast, optimal milk production and expression of the highest fat content (hindmilk) for supplemental feedings. This technique of breastfeeding, then feeding previously pumped breastmilk, and then pumping any residual volume from the breast is termed 'triple feeding'.
(Note: In many areas manual expression is the norm and/or only available method for milk expression. Preliminary evidence suggests that greater volumes may be obtained with electric, hospital-grade pumps.¹² Therefore, whenever possible, use of the latter is recommended.)
 - b. For infants receiving formula supplements, a trial without formula is appropriate while increasing human milk intake to approximately 180

cc/kg/day, if possible. Use of hindmilk to increase caloric intake for some feedings may be appropriate.

c. Add iron, 2 mg/kg/day

If enriched post-discharge formula is used, a decrease in the quantity of iron and multivitamin supplementation is indicated. Generally, if formula constitutes about 50% of the diet, the dose for iron is 1 mg/kg/day and multivitamin preparation is ½ the doses listed below.

- d. Add a complete multivitamin preparation. [Dosed to receive at least the following amounts of vitamin A (1500 IU/day), C (20-70 mg/day) and D (400 IU/day); vitamin C requirements of preterm infants are poorly studied. B Vitamins are also necessary for the former premie receiving unfortified human milk. Typically, appropriate amounts of all vitamins will be provided by infant MVI preparations at 1 cc/day] See note above under iron above C1(c) if providing enriched post-discharge formula supplements.
- e. Monitor milk intake and growth (weight and length) during this week – Volumes of pumped/expressed milk and 24 hour test weights (for infants fed at the breast) should be recorded during this period.¹³
- f. If intake and growth are adequate, continue this diet after discharge
- g. If intake and growth are sub-optimal,

Follow D (d) below

2. If the infant has been receiving unfortified human milk

- a. Continue iron (2 mg/kg/day)
- b. Continue multivitamin preparation (See dosing above, C.1(c))
- c. Continue this diet after discharge

D. Transition to Post-Discharge Nutrition for infants with “Sub-Optimal Assessment”:

1. If the infant has been receiving fortified human milk,
- a. Change the diet to unfortified human milk, with/without preterm formula, ad libitum (by breastfeeding and/or alternative feeding methods) plus a minimum of 2 to 3 feedings of enriched post-discharge formula prepared per manufacturer instructions (~22 kcal/oz) at least one week before anticipated discharge.

(Note: Many neonatologists and institutions add powdered discharge premature formula to expressed breastmilk to provide enriched feeds while still providing the advantages of breastmilk. There is no evidence to recommend for or against this practice.

This use of powdered premature formula is off-label and the potential for error is great, so be advised to be extremely cautious if using this approach.)

- b. Recommend the mother continue pumping or expressing milk at least three times/day (See C.1 (a) above.)
- c. Monitor milk intake and growth during this week
- d. Assess adequacy of breastfeeding and address problems or potential problems

- i. Latch

- ii. Milk transfer/milk volume. If lactation has been suppressed and/or baby is not adequately draining the breast it may be necessary to intervene to increase volume (i.e. increased pumping after feeds and/or pumping at some feeds and feeding the expressed milk in lieu or in addition to feeding at the breast.) (Please also see ABM Galactagogue protocol)
 - iii. Maternal milk content – Consider the use of hindmilk for some feedings to increase caloric content. This must be considered in conjunction with milk transfer and volume as it may be particularly important if the baby is getting only foremilk and leaving hindmilk.
 - iv. Frequency of feeds at breast (please note that with “sleepy preemies” subtle feeding cues may be missed)
 - v. Optimize milk transfer Suggested techniques may include pumping or expressing to let down before putting baby to breast and/or using breast compression during feedings.
 - vi. Maternal satisfaction. Mothers may have preferences regarding timing of feeds, feeding devices, etc. that fit best with the family’s needs and can be accommodated without compromising the infant’s nutrition.
 - vii. Consider use of a feeding device

- 1. Nipple shield to improve milk transfer¹⁵

(Note: any mother who is discharged using a nipple shield must have close monitoring by a competent lactation professional in place to monitor for potential associated complications)

- 2. Supplemental nursing (feeding tube) device while at breast
 - 3. May be able to use nipple shield and supplemental nursing device together effectively (e.g. by placing tube inside nipple shield so when baby suckles, the volume of milk available for transfer is increased.

4. Test weighing¹³

- e. Monitor milk intake and growth (weight and length) during this week. Record volumes of pumped/expressed milk and 24-hour test weights (for infants fed at the breast) during this period¹³
 - f. If intake and growth are adequate during this week after switching:
 - i. Add iron (1-2 mg/kg/day), depending on how much formula is fed
 - ii. Add multivitamin preparation (1/2 to full dose described above C.1 (c)), depending upon how much formula is fed
 - g. Continue this diet after discharge
2. If the infant has been receiving unfortified human milk, assess the adequacy of breastfeeding and address problems or potential problems as above, D.1(d).
- a. If addressing any existing breastfeeding problems does not result in “optimal assessment”, add 2-3 feedings of enriched post-discharge formula prepared per manufacturer instructions (~22 kcal/oz) (*See note under D. 1(a) above*). Ensure that the mother is expressing milk to maintain and optimize her milk production. Anticipate at least one more week of continued hospitalization before discharge.
 - i. Monitor milk intake and growth during this week
 - ii. Continue iron and multivitamin supplement
 - iii. If the feeding assessment continues to be sub-optimal after one week, increase the number of feedings of enriched post-discharge formula *or* increase the concentration of enriched formula to 24 to 30 kcal/oz.

III. Post-Discharge Assessment

- A. Nutrition monitoring one week after discharge
 - 1. Assess intake
 - a. History
 - b. Observation of feeding
 - c. Consider test weighing if concerns persist¹³
 - 2. Growth – weight and length (Table 1)
 - 3. Biochemical indices of nutritional status (Table 1)
 - 4. Reassess nutritional status as “Optimal” vs. “Sub-optimal”.

- a. Infants with an “Optimal” assessment may be re-evaluated at one month after discharge (See III.B, below)
- b. For infants with a “Sub-optimal assessment”:
 - i. Assess adequacy of breastfeeding
 1. Latch
 2. Milk transfer/volume
 3. Maternal satisfaction
 4. Milk content – consider hindmilk
 5. Consider use of feeding devices
 - a. Nipple shield to improve milk transfer¹⁴
 - b. Test weighing¹³ to evaluate milk volume
 - ii. If addressing any existing breastfeeding problems does not result in an “optimal assessment”, add additional feedings of enriched post-discharge formula, prepared as below, per clinical judgment according to the individual infant’s assessment:
 1. Prepared per manufacturer instructions (~22 kcal/oz)
 2. Concentrated to 24-30 kcal/oz
 3. Ensure mother is expressing milk to maintain and optimize her milk production.
 - iii. Frequent follow-up visits for on-going nutritional monitoring

B. Nutrition monitoring one month after discharge

1. Assess intake
 - a. History
 - b. Observation of feeding
 - c. Consider test weighing if concerns persist¹³
2. Growth - weight and length (Table 1)
3. Biochemical indices of nutritional status (Table 1)
4. Reassess nutritional status as “Optimal” vs. “Sub-optimal”.
 - a. Infants with an “Optimal” assessment may be re-evaluated at every two months to one year corrected age.

- b. For infants with a “Sub-optimal assessment”:
 - i. Ensure optimal milk production, breastfeeding
 - ii. Add additional feedings of enriched post-discharge formula, individualizing preparation either:
 - Prepared per manufacturer instructions (~22 kcal/oz) *or* concentrated to 24-30 kcal/oz
 - iii. Frequent follow-up visits for on-going nutritional monitoring.
- C. Once nutrition has been optimized, nutritional monitoring can occur every two months until one year corrected age.
- D. With regard to enriched formula, a few studies have demonstrated a positive effect on growth using enriched formulas for 6 to 9 months. Until more definitive data are available for breastfed former preemies, we recommend continuing an enriched post-discharge formula for a minimum of 6 months.

IV. General Strategies

- A. Enriched post-discharge formula is used because it provides greater nutrient intake than term infant formula. Human milk fortifier usually is not recommended post-discharge because its nutrient content is too great for the infant at the time of discharge, it is expensive, and very difficult to prepare according to specifications.
- B. Hindmilk, if used, will provide extra calories (estimated at 22-24 cal/oz), but provides no increase in the intake of minerals or protein. (Hindmilk is the fat-rich milk that occurs at the end of the feeding.)
- C. It is imperative that the hospital physician communicates with the physician who will provide follow-up care to ensure that the desired plan is carried out and convey any unique concerns about growth, diet, feeding patterns and biochemical monitoring.

V. Support for Breastfeeding Mothers of Premature Infants

- A. Support mothers to initiate kangaroo (skin to skin) care as early as possible in-hospital.^{1,15}
- B. Encourage mothers to express their milk soon after delivery and approximately every 3 hours on an on-going basis. Aim for at least 8 pumping sessions in 24 hours, so that if pumping does not occur exactly every 3 hours, sessions will not be missed. Instruct mothers on the use of effective breast pumping methods, either electric rental-grade or effective manual pumps, or manual expression. Whenever possible, electric rental-grade pumps should be used for maximal stimulation, particularly for the establishment

of milk supply. Skin-to-skin contact, simultaneous milk expression, and non-nutritive suckling at the breast may facilitate the establishment of the milk supply.

- C. Educate mothers that early feeding behaviors will emerge during skin-to-skin holding, and that mothers can follow the infant's cues for early feeding attempts. Mothers should understand that early feeding attempts are gradual, and not expected to result in a full feeding for the infant.
- D. Sustained suckling with swallowing for five minutes is one indicator that the infant may be ready to transition from nasogastric tube to breastfeeding.^{16,17} Other studies suggest that early introduction of oral feeding hastens the development of oral motor skills.¹⁸ Nursing supplementers may provide additional volume.¹⁹
- E. Have trained personnel evaluate breastfeeding (position and latch) on a regular basis. A correct latch is critical for efficient milk removal.
- F. Monitor mothers for nipple soreness. If present, this may be an indication of shallow latch. Temporary use of silicone nipple shields is a helpful adjunct for milk transfer and more efficient latch-on for premature infants with shallow latch.¹⁵
- G. If the infant is achieving partial intake directly at the breast, consider "triple feeding" – put the baby to breast, supplement with expressed breastmilk or formula (at breast with the supplemental nursing [tube feeding] device or after the breastfeeding), and then pump or express milk afterward to maintain the milk supply.
- H. If the baby is discharged home with partial feedings at the breast, consider a scale sensitive enough to distinguish milk intake for home use to help with the transition to total feedings at the breast.
- I. Refer and coordinate supportive care services such as, community support, visiting nurse, lactation consultant visits, social services, and WIC.

Table 1. Biochemical* and Growth Monitoring for Premature Infants in the Post-Discharge Period Modified from Hall²⁰ and Schanler²¹

Parameter	Action Values
Growth	
Weight gain	<20 g/day
Length increase	<0.5 cm/wk
Head circumference increase	<0.5 cm/wk
Biochemical Markers	
Phosphorus	<4.5 mg/dL
Alkaline phosphatase	>450 IU/L
Blood Urea Nitrogen	<5 mg/dL

* It is recognized that biochemical monitoring is not feasible in all settings; presence or absence of clinical rickets then becomes a substitute parameter.

REFERENCE LIST

1. Schanler RJ. Human milk for premature infants. *Pediatr Clin North Am* 2001; 48:207-219.
2. Bier JAB, Ferguson AE, Morales Y, Leibling JA, Oh W, Vohr BR. Breastfeeding infants who were extremely low birth weight. *Pediatrics*. 1997; 100:e3.
3. Slusher T, Slusher I, Biomdo M, Bode-Thomas F, Redd B, Meier P. Electric breast pump use increases maternal milk volume and decreases time to onset of adequate maternal milk volume in African nurseries. *PediatrRes* 2004;55(4, Part 2):445A.
4. Marinelli K, Burke G, Dodd V. A comparison of the safety of cup feedings and bottle feedings in premature infants whose mothers intend to breastfeed. *J Perinatol* 2001;21:350-5.
5. Collins CT, Ryan P, Crowther CA, McPhee AJ, Paterson S, Hiller JE. Effect of bottles, cups, and dummies on breast feeding in preterm infants: a randomised controlled trial. *BMJ*. 2004; doi:10.1136/bmj.38131.675914.55.
6. Lucas A, Bishop NJ, King FJ, Cole TJ. Randomized trial of nutrition for preterm infants after discharge. *Arch Dis Child* 1992; 67:324-327.
7. Carver JD, Wu PJK, Hall RT, Zeigler EE, Sosa R, Jacobs J, Baggs G, Auestad N, Lloyd B. Growth of preterm infants fed nutrient-enriched or term formula after hospital discharge. *Pediatrics* 2001;107:683-689
8. Schanler RJ, Burns PA, Abrams SA, Garza C. Bone mineralization outcomes in human milk-fed preterm infants. *PediatrRes*1992;31:583-586.
9. GM, Growth and bone status of discharged very low birth weight infants fed different formulas or human milk. *J Pediatr* 1993;123:439-443.
10. Greer FR. Feeding the preterm infant after hospital discharge. *Pediatric Annals* 2001;30:658-665.

11. Lucas A, Fewtrell MS, Morley R, Singhal A, Abbott RA, Isaacs E, Stephenson T, MacFadyen UM, Clements H. Randomized trial of nutrient-enriched formulas versus standard formula for postdischarge preterm infants. *Pediatrics* 2001;108:703-711.
12. Ramsethu J, Jeyaseelan L, Kirubakaran C. Weight gain in exclusively breastfed preterm infants. *J Trop Peiatr* 1993; 39:152-9.
13. Meier PP, Engstrom JL, Crichton C, et al. A new scale for in-home test-weighing for mothers of preterm and high-risk infants. *J Hum Lact* 1994;10:63-68.
14. Meier PP, Brown LP, Hurst NM, et al. Nipple shields for preterm infants: Effect on milk transfer and duration of breastfeeding. *J Hum Lact* 000;16:106-113.
15. Kirsten GF, Bergman NJ, Hann FM. Kangaroo mother care in the nursery. *Pediatr Clin North Am* 2001;48:443-452
16. Kliethermes PA, Cross ML, Lanese MG, Johnson KM, Simon SD. Transitioning preterm infants with nasogastric tube supplementation: increased likelihood of breastfeeding. *J Obstet Gynecol Neonatal Nurs* 1999;28:264-273.
17. Valentine CJ, Hurst NM. A six step feeding strategy for preterm infants. *J Hum Lact* 1995;11:7-8.
18. Simpson C, Schanler R, Lau C. Early introduction of oral feeding in preterm infants. *Pediatrics* 2002; 110:517-22.
19. Meier PP. Breastfeeding in the special care nursery: Prematures and infants with medical problems. *Pediatr Clin North Am* 2001;48:425-442.
20. Hall RA. Nutritional follow-up of the breastfeeding premature infant after hospital discharge. *Pediatr Clin North Amer* 2001;48:453-460.
21. Schanler RJ. Nutrition support of the low birth weight infant. IN: Walker WA, Watkins JB, Duggan CP (eds): *Nutrition in Pediatrics*, 3rd edition, BC Decker Inc, Hamilton, ON, Canada, 2003; 392-412.

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