



Preterm Nutrition Consensus

Discharge Recommendations



**Children's Hospital
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Division of Neonatology

Title Preterm Nutrition Consensus Discharge Recommendations

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Abstract

Discharge recommendations for preterm neonates with regard to their nutritional intake has very little consistent research evidence, with few studies and little neurodevelopmental outcomes to support guidelines. Inside the CHOP Division of Neonatology there are no consistent practices. There are limited “gold standard” studies and diverging goals of catch up growth vs. slow and steady growth. Using current practices guidelines and calculated caloric needs of the growing preterm neonate, a guideline is presented to provide appropriate caloric as well as mineral requirements for discharge home based on choice of discharge formula, breastmilk or a combination of both. The finalized discharge algorithm considers current breastmilk supply and caloric requirements for the neonate following discharge. If possible, it is recommended that these high-risk neonates born at less than 32 weeks gestational age and/or less than 1500 grams birth weight be maintained on these regimens until 52 weeks corrected gestational age or up to 1 year.

Consensus Goals

Develop a standardized approach for discharge nutrition for a preterm neonate.

Meet appropriate caloric and mineral needs for a discharged preterm neonate.

Background

Literature search and background studies show that there is no consensus on what diet preterm neonates should be discharged home. There very few RCTs and mostly expert opinions with inconsistency of interventions especially how to mix and what to mix formulas and breastmilk and what comparisons or baseline groups should be used. The two philosophies that exist are allowing premature neonates to have catch up growth versus slow and steady growth without intervention, neither of which touches on neurodevelopmental outcomes. Overall, with all the studies reviewed the conclusion suggests a tailored approach is best.

Previous Consensus Statement or Data from Division of Neonatology (if applicable)

None

Literature Search

	Study Type Inclusion	Intervention	Results
Amissah (2020) LOE I	Cochrane Review Preterm infants RCT (6 studies) fed HM 204 babies	Adding extra protein to human milk	Adding extra protein may increase short-term growth. Uncertain effects of LOS, intolerance, NEC. No data about later health or development.
Nzegwu (2014) LOEV	Review <1500g	Discusses several (BM, fortified BM, Formula only)	Discharge feeds should be started days to weeks before discharge. Paucity of info on long term growth and developmental outcomes at 12-18 months Individualize approach is necessary. Close monitoring and follow-up required
Teller (2016) LOEV	Review (31 studies) Post discharge feeding in preterm infants	Nutrient fortification of BM after discharge	Marked heterogeneity, nutrient enriched diets after discharge show no negative effects but frequently improve growth parameters particularly in boys, neurodevelopmental improvements rarely seen
Sundseth Ross (2013) LOEV	Review (55 studies) Preterm, Feeding	Feeding and growth outcomes post-discharge from the NICU	Established optimal feeding prior to discharge by caregivers- should not just look at what feeding but how feeding and by whom. This impacts growth and neurodevelopmental outcomes.
Young (2013) LOE II	Cochrane Review 2 small trials 246 infants	Multinutrient fortified breastmilk v unfortified breastmilk after discharge of preterm infants	No evidence at 3-4 months after discharge affected rates of growth during infancy. One trial at 18 months did not find effects on neurodevelopmental outcomes.

	Study Type Inclusion	Intervention	Outcomes	Results
O'Connor et al. (2008) LOE III	Pilot, randomized cohort <33 weeks 750-1800g 39 babies	Control (unfortified milk) v fortified (half volume feeds with Similac HMF powder to 22 calorie) in predominantly BM fed babies	Weight, length and Head Circumference at discharge, 4, 8 and 12 weeks	Study group was heavier, longer and had larger heads (especially in infants <1250g)
Parat et al. (2020) LOE IV	Prospective intervention study, <1500g and fed BM 36 babies	Target protein fortified human milk v standard fortified human milk while in-patient (Similac liquid HMF + analysis and liquid protein added in intervention group)	Body composition, growth outcomes starting at initiation of feeds to 37 week or discharge (skin fold, HC, weight, length, air placement plethysmography)	Targeted protein intake resulted in higher protein intake and fat free mass
Arslanoglu (2019) LOE IV	Retrospective Discussed individualized fortification (adjustable v targeted) v standard fortification	Standard (preset mix) Adjustable (change based on BUN) Targeted (based on milk analysis)		Suggest babies adjust volumes based on caloric intake and macronutrients SF- does not reach desired growth AF- improves somatic and head growths TF- needs improvement No consensus on DC requirements

	Study Type Inclusion	Intervention	Outcomes	Results
ESPGHAN (2006) LOE I vV	Consensus/Expert Opinion, some review (7 RCT 650 babies) Preterm Infants (<37 weeks or <1850g)	Diets	Growth and Development as far out as 12 months	Monitor weight, length, HC regularly. Adapt nutritional supplementation to achieve appropriate growth. #1 BM. #2 Formula-preterm If require catch-up growth- HM with fortification or special post-discharge formula until 52 weeks.
Cooke (2011) LOE VII	Expert Opinion	Feeds to achieve "catch-up" growth.		Monitor growth until 1-2 months corrected age to make sure "recover" growth occurs with supplementation to achieve this
Marino (2019) LOE VI	Quality Improvement BF Less than or equal to 1800g 39 babies	BMF "shots" (sachet of BMF mixed with small volume of BM at regular intervals, 4-6x day) from discharge until 48 weeks	Questionnaires to assess feasibility, safety and attitudes Growth at 1 year Change in SD of weight, length and HC at "various time points"	Compared to baseline, improved growth of weight, HC and length at discharge and at 1 year for head and length. Showed feasible and safe.
Groh-Wargo (2014) LOE V	Expert Opinion, Review	Discusses various articles with addition of fortification		HM does not meet needs of VLBW at discharge Enriched HM (PTDF powder to 24 cal) adds little nutrition. HM alternated with PTDF or FHM gets closer to recommendations FHM is BEST option.

	Study Type Inclusion	Intervention	Outcomes	Results
Kleinman (2019) LOE VII	Text			-Paucity of information on what to feed. -Unsure about how fast to grow a preterm infant -Preferred feeding is HM -Variability in HM puts preterm infants at risk for nutritional deficits -Reports mixed outcomes on review of fortification of BM on long term outcomes of growth and neurodevelopment -Recommends fortification of HM or formula if born <1000g and discharged <2000g for at least 12 weeks
Heird (2008) LOE VII	Text			-No universally accepted approach -AAP endorsed post-discharge formula but provides no recommendations -"most authors recommend that the post-discharge formulas be used routine or that breast-fed infants receive a nutrient supplement, which of course is problematical and may interfere with normal lactation and breastfeeding"
Taylor (2022) LOE VII	NeoReviews			-Some evidence- length gain proportional to weight gain relate to higher neurodevelopmental scores. -Strong evidence from full term population- maternal milk should be prioritized at discharge -Some evidence- specific formula or maternal milk supplementation has not been identified as superior -Some evidence plus consensus- many require nutrient supplementation to sustain acceptable growth for at least a few weeks to months. Some recommend 12-16 weeks corrected age -Consensus-likely requires personalized approach that considers deficits, history, milk supply and lactation goals

Literature Summary

The literature varies in recommendations for discharge nutritional needs of the preterm neonate. There are no standardization of goals and assumptions are made for the final recommendations, which remain vague. There are limited “gold standard” studies and consistency and perseverance is lacking.

Using recommendations discussed in the Groh-Wargo article as well as recommendations from the Best Practices Recommendations of the CPQCC 2018, a joint algorithm was developed to help guide the discharge <32 weeks and/or <1500 grams neonates.

Delphi Survey Round Results (if applicable)

Practice survey conducted throughout the Network. Overview of the results below:

What criteria do you use to switch to a home feeding regimen?

- **42% - 100% PO and no other criteria**
- 7% - 60% PO and no other criteria
- 7% 80% PO, ~35 weeks, and 1800-2000g
- 14% 3500-4000g or prior to discharge
- 7% 34wks CGA
- 14% no response

For infants <32 wks at birth, now CGA of \leq 40 weeks and meets the standard criteria for switching to a home feeding regimen, what home feeding regimen(s) would you utilize for moms that are producing breast milk and desire breast feeding?

- **36% will occasionally send home on direct BF or 100% EBM (unfortified)**
- **36% will send home on some combination of BF and fortified BM with discharge formula or formula feeds**
- **29% will send home on BF and discharge or preterm formula (do not use powder in BM)**
- 14% occasionally send home with BF and fortified BM w/ HMF
- 14% no response

At what CGA do you send babies home without fortification or formula supplementation?

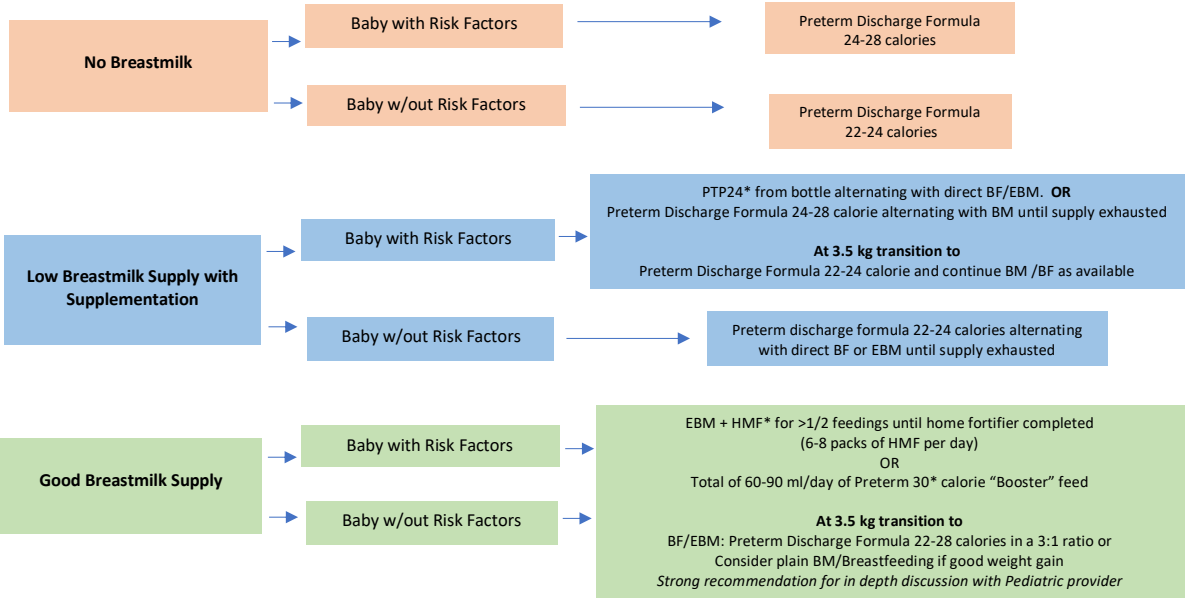
- **43% - not typical for <32wks at birth**
- 29% - no standard
- 21% - no response
- 7% - based on growth, not CGA

What other criteria do they need to meet to go home without fortification?

- **36% - appropriate growth**
- **36% - no standard practice**
- 7% - 33-34wks at birth
- 21% no response

Consensus Statement and Clinical Recommendations

Discharge Feeding Algorithm Babies <32 wk or <1500 gm
 For Infants approaching DC, CGA >34 wk and >1800 gram and ~80% PO
 Anticipate ~3 days on this regimen with good weight gain prior to DC



Risk Factors Include

Anthropometric: ≤1500 g BW GA and/or ≤32 weeks at birth; history of suboptimal weight gain with declining weight percentile or Z-score 1-2 weeks prior to discharge. At ≤37 weeks and/or ≤2 kg at dc

Biochemical: alkaline phosphatase ≥600 U/L, serum phosphorus ≤5.5 mg/dL

Nutritional: Total parenteral nutrition ≥4 weeks; total volume intake <130 mL/kg per day; history of intolerance or use of low nutrient density nutrition (e.g., soy, protein hydrolysate, amino acid-based formulas, or unfortified human milk).

Miscellaneous: Osteopenia of prematurity, radiological evidence of bone demineralization and/or fracture(s); chronic use of mineral-wasting medications (e.g. furosemide)

Tips for After Discharge

Consider continuing until at least ~52 wk corrected GA and up to 1 year for neonates born <32 wk GA, or at the discretion of your pediatrician

Always use CORRECTED GESTATIONAL AGE for growth charts until at least 2 years of age (even for late preterm neonates)

If weight gain is suboptimal (declining weight percentile or Z score), increase caloric concentration

Lactation support as available

May need a letter of medical necessity for WIC

Abbreviations

PTP24	Preterm 24 calorie formula * (Enfamil Premature)
PTDF	Preterm Discharge Formula (Neosure or Enfacare)
PT30	Preterm 30 Calorie Formula*
EBM	Expressed Breast Milk
BF	Breastfeeding

*Formula representative will need to be contacted to obtain products for post discharge by hospital representative

Further Goals

Education and dissemination of recommendations to local pediatricians.

Monitoring and comparison of growth following discharge, especially growth failures

QI Metrics

Implementation survey of neonatology and pediatric partners following dissemination

Post discharge/Follow Up clinic analysis of growth parameters

WIC Supplemental Letter Template

To Whom It May Concern,

My patient, @NAME@, DOB @DOB@, was seen in the Neonatal Neurodevelopmental Follow-up program today. As you know, * was born at the premature age of *** weeks. It is vital to *** as @HE@ grows that @HE@ receives optimal nutrition. To this end, @HE@ should not be switched to whole milk when @HE@ reaches @HIS@ first birthday. *** should remain on infant formula until at least @HIS@ due date of *****

Thank you for your understanding in this matter. If you require any further information on this matter, please call the neonatology office at *.**

Sincerely,

Nutrition Discharge Planning Instructions

Patient Name:		DOB:	Discharge Date:
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This patient requires a specialized nutritional plan due to (select all that apply):

<input type="checkbox"/>	Prematurity (_____ weeks)
<input type="checkbox"/>	IUGR / SGA (_____ grams)
<input type="checkbox"/>	Suboptimal weight trajectory
<input type="checkbox"/>	Osteopenia of prematurity
<input type="checkbox"/>	Prolonged parenteral nutrition
<input type="checkbox"/>	Volume restriction
<input type="checkbox"/>	Daily use of mineral wasting medications
<input type="checkbox"/>	Other: _____

This infant's discharge feeding plan is as follows:

This infant should continue this feeding recommendation until

- 52 weeks CGA, which will be around the following date: _____
- AND / OR
- _____ kg / _____ percentile

He/she should then transition to: _____

Name of NICU Healthcare Provider: _____

Date: _____

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