Neonatal Nutrition Survival Guide for Residents: Enteral Nutrition

NICU Dietitians

Rebecca Vander Veer (Orange Team) – Cisco 7989, Ext. 4513, Pager 0644
Sasha Nunes (Yellow Team) – Cisco 7988, Ext. 7812, Pager 0310
Victoria Catalano (Green Team) – Cisco 4911, Ext. 4911, Pager 3225
On-call Dietitian (after hours and weekends) – Pager 58688

Growth Assessment

- Birth weight is the med calc weight for the first 7-14 days or until fluid status stabilizes
    - Med calc weights usually reevaluated on Mondays
    - If patient is edematous, consider estimating a weight (ask dietitian for help)
- Weight is measured Sunday, Tuesday, and Friday nights in the NICU
    - Expect to weight adjust feeds Mondays and Wednesdays on rounds
    - Average growth velocity is more important than weight gain in past 2-3 days!
    - **Weight gain goals:**
        - **<2 kg**: 15-20 g/**kg**/day
        - **>2 kg**: 20-35 g/day
- Length and head circumference are measured weekly on Sunday nights
- To order daily weights, order "Measure weight" with daily frequency, not "NICU weight"

Recommended Enteral Nutrient Intakes

	Preterm	**Term**
Fluid	140-160 ml/kg	150-160 ml/kg
Kcal	110-130 kcal/kg	100-120 kcal/kg
Protein	3.5-4.5 g/kg	1.5-2.5 g/kg

NICU Feeding Guidelines

- For preterm and/or IUGR infants:
    - Fortify with Human Milk Fortifier (HMF) to 22 kcal/oz once feeds reach **80 ml/kg/day**
    - Fortify with HMF to 24 kcal/oz once feeds reach **100 ml/kg/day**
- Infants made NPO for ≤48 hours may resume feeds at the volume/strength last tolerated
- In general, 150-160 ml/kg/day of the appropriate formula or fortified human milk will provide adequate kcal
    - Infants with BPD/cardiac problems may need a fluid restriction and calorically dense formula
    - 135 ml/kg/day of 27 kcal/oz formula or 120 ml/kg/day of 30 kcal/oz formula both provide 120 kcal/kg/day

Current Weight	***Trophic feeding***	***Daily advancement***
≤750 grams	10-20 ml/kg/day x 5 days	20 ml/kg/day
751-1000 grams	20 ml/kg/day x 4 days	20 ml/kg/day
1001-1250 grams	20 ml/kg/day x 3 days	20-30 ml/kg/day
1251-1500 grams	20 ml/kg/day x 2 days	20-30 ml/kg/day
1501-2000 grams	20 ml/kg/day x 1 day	20-30 ml/kg/day

Feeding Initiation

- **Goal is to initiate feeds within 24 hours of admission**, preferably no later than 24-48 hours of life to prevent gut atrophy, facilitate GI maturation, and shorten time to full feeds
- Special consideration may be given to infants with the conditions/procedures listed below:
  - Known structural GI abnormality, signs of obstruction, or NEC
  - High dose pressors/shock
  - Symptomatic PDA
  - ECMO
  - Sepsis
  - Therapeutic hypothermia (feeding may be initiated 2 hours after rewarming if stable)
- Can delay starting feeds up to 48 hours if Mom is actively pumping, or if baby qualifies for donor milk and no consent has been obtained yet

Feeding choice

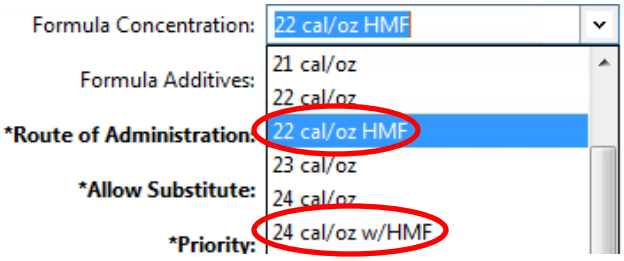
- Mother's breast milk (MBM) is the feeding of choice for all infants
- Pasteurized donor human milk (DBM) can be provided to infants who meet criteria and have insufficient MBM available once **maternal consent** is obtained. Eligible patients include:
  - Infants ≤ 1500 grams at birth and/or ≤ 30 weeks gestation
  - Infants > 1500 grams with a history of NEC, abdominal wall defects, bowel resection/short bowel syndrome, or infants with significant feeding intolerance with formula
  - DBM can be continued until 34 weeks CGA or until full feeds are established x 1 week
- Use appropriate formula for babies who do not meet DBM criteria and do not have MBM available

Donor Milk (The Silver Standard)

- NICU only
- Written consent <u>from Mom only</u> obtained by LIP
  - Phone consent is acceptable if Mom is not present
  - Provide information sheet
- Once consent is obtained, a donor milk diet order can be entered into Cerner

Human Milk Fortifier (HMF)

- Fortify breast milk for preterm infants born <2 kg and/or GA <34 weeks, and infants with IUGR
- HMF provides additional calories, protein, MCT oil, Ca, Phos, Vitamin D, Iron, Zinc, etc.



Oral Immune Therapy

- Human milk used as mouth care
  - Nurse swabs 0.2 mL of breast milk in baby's mouth
  - Cytokines & immune factors absorbed through oral mucosa, stimulate immune system
  - Must use <u>fresh</u> breast milk/colostrum (no donor milk)
- Please order for all infants who are NPO and use of maternal breast milk is NOT contraindicated

Infant Formulas

- CNMC NICU preferentially uses Enfamil products over Similac products
- Specialty formulas are designed for term infants. Please use with caution in premature infants
- Formulas can be concentrated to higher calorie levels (e.g., 22 kcal/oz, 27 kcal/oz)

Preterm Formulas (Inpatient)

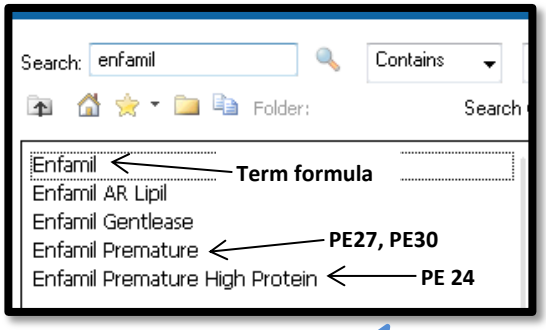
Enfamil Premature High Protein 24 kcal/oz (PE24)

- Default preterm formula for all infants with birth weight of <2 kg when breast milk is not available
- Higher in calories, protein, Ca, Phos, and other vitamins and minerals to meet the needs of preterm infants

PE formulas: No vitamin necessary

Enfamil Premature 30 kcal/oz (PE30)

- For use when a fluid restriction is necessary
- Usually mixed 1:1 with PE24 to make 27 kcal/oz



Preterm Discharge/Outpatient Formulas

Enfamil Enfacare / Similac Neosure 22 kcal/oz

- May be started for late preterm infants with birth weight >2 kg
- Transition to discharge formula once the infant weighs ~2.5-3 kg, or prior to discharge
- Nutrient levels between those of preterm and term formula
- AAP recommends continuing preterm discharge formula up until 9 months CGA

Enfacare/Neosure: 1 ml/day Poly-vi-Sol

Standard Term Formulas

Enfamil 20 kcal/oz (E20)

- Default formula for infants >37 weeks gestation

Similac 19 kcal/oz

- Use only with parent's request

Term: 400 IU vitamin D
Preterm: 1 ml/day Poly-vi-Sol

Extensively-Hydrolyzed Protein (Semi-Elemental) Formulas

Pregestimil 20 kcal/oz

- Indicated for protein allergies and fat malabsorption
- Contains 55% of fat as MCT
- Galactose-free

Alimentum 20 kcal/oz

- Indicated for protein allergies and fat malabsorption
- Contains 33% of fat as MCT
- Lactose-free

Nutramigen 20 kcal/oz

- Indicated for protein allergies, especially cow's milk protein allergy
- No MCT content
- Galactose-free
- Powder form contains *L. rhamnosus GG*, which helps regain cow's milk protein tolerance

Amino Acid–Based (Elemental) Formulas

Elecare / Neocate / PurAmino (20 kcal/oz)

- Indicated for severe, life-threatening milk protein allergy, or malabsorption
- Available in powder only, **not sterile**
- Contains 33% of fat as MCT
- *Caution in preterm infants at risk for NEC! Has higher osmolality of 350 mOsm/kg H_2O*

Disease-Specific Formulas

Similac PM 60/40

- Indicated for impaired renal function if breast milk is not available
    - Human milk is preferred for poor renal function
- Low mineral content – does not meet iron needs

Enfaport

- Indicated for Chylothorax or LCHAD deficiency
- Contains 84% of fat as MCT

Soy-Based Formulas

Prosobee / Isomil

- Indicated for galactosemia or hereditary lactase deficiency (soy is lactose-free)
- Do not provide soy formulas to preterm infants due to phytic acid and aluminum content, which decreases the bioavailability of calcium and other minerals and increases risk of bone disease

Formulas for Reflux/Fussiness

Similac Sensitive

- Indicated for NAS with severe diarrhea (when brush border enzymes are depleted)
    - Low lactose content
- Marketed for fussiness and gas due to lactose intolerance
    - Lactose intolerance is extremely rare in infants

Enfamil A.R.

- Added rice starch thickens when it hits the acidic environment of the stomach to help reduce reflux symptoms. Cannot be used with Zantac. May increase residuals.
- Questionable effectiveness; treats symptoms rather than cause – **do not recommend!**

Human Milk Powder Formula Fortification Recipes

- Please write recipe in comments of diet order and include name of formula to be used
- 22 kcal/oz: Add 0.8 g powder to every 60 ml breast milk
- 24 kcal/oz: Add 1.6 g powder to every 60 ml breast milk
- 26 kcal/oz: Add 2.4 g powder to every 60 ml breast milk

Assessing Vitamin D Status

- On TPN in the past month? Order a Miscellaneous Test and enter “25HDN, 25-Hydroxyvitamin D2 and D3, Serum”. This requires 0.5 ml of blood and is collected in a red-top tube
- No TPN x 4 weeks? Order “Vitamin D3 25 Hydroxy Level”

Assessing Feeding Tolerance

- Requires evaluation of the overall clinical status of the patient
- Signs of feeding intolerance include significant increase in abdominal circumference, bloody stools, acidosis, bloody or bilious residuals, vomiting, and diarrhea
- The presence of residuals alone is NOT an indication to hold feeds. If RN is concerned with residuals, please hold feeds *only* if the exam is concerning.
    - Refeed residuals if not bilious or bloody

Indications to hold feeds:

- Clinical NEC picture
- GI bleed, heme-positive stools
- Pneumatosis or free air on x-ray
- Aspiration event
- Frequent, severe emesis
- Bilious residuals or emesis
- Severe apnea, bradycardia
- Severe acidosis, thrombocytopenia

Gastroesophageal Reflux

- Common in preemies due to poor gastric motility, poor tone in the lower esophageal sphincter
- Physiologic GER (spit up) has no associated complications, resolves spontaneously
- Pathologic GER is associated with inadequate weight gain and respiratory problems such as aspiration and pneumonia

Management of GER

- Smaller, more frequent or continuous feedings
- Positioning techniques during and after feeds while in the NICU (prone, left-lateral, etc.)
- Do not thicken feeds with rice or oat cereal, as this dilutes out important vitamins and minerals and provides excessive carbohydrate calories
- Acid-suppressing medications may increase risk of infection and NEC and do not necessarily reduce number of events

Recommended Vitamin and Iron Supplementation for Infants

	Premature Infants	**Term Infants**
Breast Milk	**<2kg:** 200 IU/day cholecalciferol while on HMF **>2kg:** Minimum vitamin D needs met (200-400 IU/day) if fortified to 24 kcal/oz with HMF **Mostly unfortified breastmilk or breast milk enriched with powder:** 1 ml Poly-vi-sol w/iron	400 IU cholecalciferol
PE 24, 27, 30	Minimum vitamin D needs met (200-400 IU/day)	n/a
Enfacare/Neosure	1 ml Poly-vi-sol (may include iron if needed)	n/a
Term formula	1 ml Poly-vi-sol (may include iron if needed)	400 IU cholecalciferol until intake >1L/day
Infants with cholestasis	1 ml AquADEK (may divide BID if <2 kg)	1 ml AquADEK