



# NEWBORN CRITICAL CARE CENTER (NCCC) FEEDING GUIDELINES

## PURPOSE

The purpose of this guideline is to improve feeding tolerance in low birth weight infants and to reduce parenteral nutrition days by providing a consistent approach to feeding the ELBW and VLBW infant. This guideline does not replace clinical judgment. Also, reduced variability in practice will facilitate evaluating clinical outcomes.

## BACKGROUND

- Prolonged fasting causes atrophy of the intestinal mucosa
- Human milk is well tolerated
- TPN increases an infant's risk for infection and TPN associated cholestasis

## INITIATION OF FEEDINGS

1. Begin feedings with the specified NCCC feeding guideline per physician order (based on weight and/or gestational age).
2. Infants may feed with umbilical lines in place.
3. Human milk, especially mother's own milk, is preferred (colostrum for OIT and early feedings).
4. Gavage feedings are given by infusion pump over 60-120 minutes unless otherwise ordered.
5. Oral feedings are initiated based on infant cues.

## PROGRESSION OF FEEDINGS

1. The bedside nurse will calculate the daily feeding volume and calories according to the appropriate feeding pathway.
2. **Daily total fluids per physician order should include all IV fluids and enteral feedings (including trophic feedings.)**
3. Avoid oral medications until full volume enteral feeds are tolerated.
4. Check OG/NG tube placement per nursing protocol. Check residuals when feeding volume is  $\geq 30$  mL/kg/day.
5. "Clear, light yellow/green or partially digested residuals" with a normal exam, are not an indication to hold feedings.
6. **Re-feed residuals** (per nursing protocol) **unless otherwise ordered**. Give current feeding volume in addition to re-fed residual volume.
7. Do not routinely check residuals for babies on continuous feedings.

## WHEN TO NOTIFY MD/NP

1. An abnormal exam: Unstable vital signs, abdominal distention ( $\uparrow$  in abdominal circumference greater than 2 cm), visible bowel loops, large or bilious emesis, or visible blood in stool.
2. Significant residuals:
  - Dark green residuals
  - "Undigested" residuals if greater than 50% of total feeding

## DISCONTINUATION OF FEEDINGS

1. A maximum of two consecutive feedings may be held by the intern or resident.
2. Discontinue feedings only after evaluation by Attending MD, Neonatal Fellow, or Nurse Practitioner.

## FEEDING INTERVAL EXCEPTIONS

Consider continuous feedings (based on MD/NNP order) if infant exhibits pathologic reflux, has GI motility/absorption issues (short gut, liver disease etc.) or doesn't appear to tolerate bolus feedings.

## LABORATORY MONITORING

Obtain Chem 10 and alkaline phosphatase on day 28 of the protocol. If alkaline phosphatase  $> 600$  U/L or phosphorous  $> 7$  mg/dL, consult dietitian and consider increasing vitamin D supplement to 800 IU/d. Follow until resolved.

## TRANSITION OFF EXCLUSIVE HUMAN MILK DIET

1. Begin transition at 32 weeks corrected gestational age
2. If available at the time of transition, use MBM fortified with LHMf to 24 Kcal/oz. If no MBM is available, use Similac Special Care 24 Kcal/oz.
3. After transition off Prolacta<sup>®</sup> **DECREASE** MVI supplement to 0.5 mL once daily and continue iron supplement at 3 mg/kg/day.

# NCCC Feeding Pathway (NON-Prolacta®) for Infants < 1000g Birth Weight OR < 29 Weeks GA

Patient Name

Birth Weight (grams)

Day of Protocol and Date	Caloric Density of Human Milk <i>(Kcal/30 mL)</i>	Total Enteral Intake <i>(per kg/day)</i>	Volume of Feeds <i>(mL/kg/day)</i>	Weight 1. BW (kg) 2. Current weight (If > BW) 3. Dosing weight	Total Daily Feeding Volume <i>Desired volume (mL/kg/day) x weight</i>	Individual Feeding Volume <b>(Given every 3 hours)</b> <i>Total daily volume ÷ 8</i>	TPN Changes <i>(for MD/NP TPN order)</i>	Comments <i>Colostrum should be used for Oral Immune Therapy (OIT) for the first week.</i>
Day 1 / /201_	20		10				<b>TPN GOALS:</b> <i>(for optimal nutrition)</i> GIR 12mg/Kg/min Protein 4g/Kg/d Lipids 3g/Kg/d	
Day 2 / /201_	20		10					
Day 3 / /201_	20		10					
Day 4 / /201_	20		↑20					
Day 5 / /201_	20	Kcal = 23 Protein = 0.3	↑30 ↑40 @ 2300				GIR 10-12	
Day 6 / /201_	20	Kcal = 37 Protein = 0.5	↑50 ↑60 @ 2300				GIR 8-10 Pro 3.5 g/Kg/d	
Day 7 / /201_	↑22	Kcal = 55 Protein = 1.3	↑70 ↑80 @ 2300				GIR 7-9 Pro 3 g/Kg/d	Increase HM to 22 Kcal/oz using LHMF
Day 8 / /201_	22	Kcal = 79 Protein = 1.7	↑90 ↑100 @ 2300				GIR 6-8 Pro 2.5g/Kg/d Lipid 1.5 g/Kg/d	Increase infusion time of feeds to 60-120 minutes
Day 9 / /201_	↑24	Kcal = 92 Protein = 2.9	↑110 ↑120 @ 2300				GIR 4-5 Pro 2 g/Kg/d D/C lipid	Increase HM to 24 Kcal/oz using LHMF
Day 10 / /201_	24	Kcal = 108 Protein = 3.4	↑130 ↑140 @ 2300				Discontinue TPN/IVF	MD/NP discontinues central line, if appropriate
Day 11 / /201_	24	Kcal = 124 Protein = 3.9	↑150 ↑160 @ 2300					Add Iron 3 mg/kg/day divided twice daily
Day 12 / /201_	24	Kcal = 128 Protein = 4.0	160					Add Poly-Vi-Sol 0.25 mL twice daily
Day 28 / /201_								Order chem 10 and alkaline phosphatase in AM

1. **DAY OF PROTOCOL:** Day 1 is considered the day feedings were started. Specify the date in the box provided.
2. **CALORIC DENSITY OF HUMAN MILK:** Caloric density to be prepared for that day. If human milk is unavailable, use a premature 24 Kcal/oz formula (Similac Special Care 24) from Day 1. Feeding advances are at 1100 and 2300 unless otherwise specified.
3. **INDIVIDUAL FEEDING VOLUME:** This is calculated by dividing the daily volume by 8. Round this volume to the nearest 0.5 mL.
4. **GROWTH GOALS:** Weight 15-20 g/Kg/d. If growth < 15 g/Kg/d for 3-5 days, increase volume to 170 mL/Kg/d.
5. **CONSULT DIETITIAN:** If growth is not optimized on 170 mL/Kg/d, consider adding 0.5 - 1 g/Kg/day liquid protein fortifier or/and fortifying human milk to 26 or 28 Kcal/oz.
6. **CONSULT DIETITIAN:** If on day 28 alkaline phosphatase is > 600 U/L or phosphorous > 7mg/dL, consider giving vitamin D 400 IU/d. Follow until resolved.

# NCCC Feeding Pathway for Infants 1000-1250g Birth Weight AND ≥ 29 Weeks GA

Patient Name

Birth Weight (grams)

Day of Protocol and Date	Caloric Density of Human Milk <small>(Kcal/30 mL)</small>	Total Enteral Intake <small>(per kg/day)</small>	Volume of Feeds <small>(mL/kg/day)</small>	Weight 1. BW (kg) 2. Current weight (If > BW) 3. Dosing weight	Total Daily Feeding Volume <small>Desired volume (mL/kg/day) x weight</small>	Individual Feeding Volume <small>(Given every 3 hours) Total daily volume ÷ 8</small>	TPN Changes <small>(for MD/NP TPN order)</small>	Comments <small>Colostrum should be used for Oral Immune Therapy (OIT) for the first week.</small>
Day 1 / /201_	20		10					
Day 2 / /201_	20		10					
Day 3 / /201_	20		↑20					
Day 4 / /201_	20	Kcal = 23 Protein = 0.3	↑30 ↑40 @ 2300					
Day 5 / /201_	20	Kcal = 36 Protein = 0.5	↑50 ↑60 @ 2300				Pro 3.5 g/kg/d GIR 8-10	
Day 6 / /201_	↑22	Kcal = 55 Protein = 1.3	↑70 ↑80 @ 2300				Pro 3 g/kg/d GIR 7-9	Increase HM to 22 Kcal/oz using LHMF
Day 7 / /201_	22	Kcal = 70 Protein = 1.7	↑90 ↑100 @ 2300				Pro 2.5 g/kg/d GIR 6-7 ↓ Lipids 1.5	
Day 8 / /201_	↑24	Kcal = 92 Protein = 2.9	↑110 ↑120 @ 2300				Pro 2 g/kg/d GIR 4-6 DC lipids	Increase HM to 24 Kcal/oz using LHMF
Day 9 / /201_	24	Kcal = 108 Protein = 3.4	↑130 ↑140 @ 2300				Discontinue TPN/IVF in PM	MD/NP discontinues central line, if appropriate
Day 10 / /201_	24	Kcal = 124 Protein = 3.9	↑150 ↑160 @ 2300					Add Iron 3 mg/kg/day divided twice daily
Day 11 / /201_	24	Kcal = 128 Protein = 4.0	160					Add Poly-Vi-Sol 0.25 mL twice daily
Day 28 / /201_								Order chem 10 and alkaline phosphatase in AM

1. **DAY OF PROTOCOL:** Day 1 is considered the day feedings were started. Specify the date in the box provided.
2. **CALORIC DENSITY OF HUMAN MILK:** Caloric density to be prepared for that day. If human milk is unavailable, use a premature 24 Kcal/oz formula (Similac Special Care 24) from Day 1. Feeding advances are at 1100 and 2300 unless otherwise specified.
3. **INDIVIDUAL FEEDING VOLUME:** This is calculated by dividing the daily volume by 8. Round this volume to the nearest 0.5 mL.
4. **GROWTH GOALS:** Weight 15-20 g/kg/d. If growth < 15 g/Kg/d for 3-5 days, increase volume to 170 mL/Kg/d.
5. **CONSULT DIETITIAN:** If growth is not optimized on 170 mL/Kg/d, consider adding 0.5 - 1 g/Kg/day liquid protein fortifier or/and fortifying human milk to 26 or 28 Kcal/oz.
6. **CONSULT DIETITIAN:** If on day 28 alkaline phosphatase is > 600 U/L or phosphorous > 7mg/dL, consider giving vitamin D 400 IU/d. Follow until resolved.

## NCCC Feeding Pathway for Infants 1251 - 1800g Birth Weight AND/OR < 32 Weeks Gestational Age

Patient Name

Birth Weight (grams)

Day of Protocol and Date	Caloric Density of Human Milk <i>(Kcal/30 mL)</i>	Total Enteral Intake <i>(per kg/day)</i>	Volume of Feeds <i>(mL/kg/day)</i>	Weight 1. BW (kg) 2. Current weight (If > BW) 3. Dosing weight	Total Daily Feeding Volume <i>Desired volume (mL/kg/day) x weight</i>	Individual Feeding Volume (Given every 3 hours) <i>Total daily volume ÷ 8</i>	TPN Changes <i>(for MD/NP TPN order)</i>	Comments <i>Colostrum should be used for Oral Immune Therapy (OIT) for the first week.</i>
Day 1 / /201_	20		20					
Day 2 / /201_	20		20					
Day 3 / /201_	20	Kcal = 23 Protein = 0.3	↑30 ↑40 @ 2300					
Day 4 / /201_	20	Kcal = 37 Protein = 0.5	↑50 ↑60 @ 2300					
Day 5 / /201_	↑22	Kcal = 55 Protein = 1.3	↑70 ↑80 @ 2300				↓ Lipids 1.5	Increase HM to 22 Kcal/oz using LHMF
Day 6 / /201_	22	Kcal = 79 Protein = 1.7	↑90 ↑100 @ 2300				DC lipids	
Day 7 / /201_	↑24	Kcal = 92 Protein = 2.9	↑110 ↑120 @ 2300					Increase HM to 24 Kcal/oz using LHMF
Day 8 / /201_	24	Kcal = 108 Protein = 3.4	↑130 ↑140 @ 2300				Discontinue TPN/IVF in PM	MD/NP discontinues central line, if appropriate
Day 9 / /201_	24	Kcal = 120 Protein = 3.9	↑150					Add Iron 3 mg/kg/day divided twice daily
Day 10 / /201_	24	Kcal = 124 Protein = 4.0	150 - 160					Add Poly-Vi-Sol 0.25 mL twice daily

- DAY OF PROTOCOL:** Day 1 is considered the day feedings were started. Specify the date in the box provided.
- CALORIC DENSITY OF HUMAN MILK:** Caloric density to be prepared for that day. If human milk is unavailable, use a premature 24 Kcal/oz formula (Similac Special Care 24) from Day 1. Feeding advances are at 1100 and 2300 unless otherwise specified.
- INDIVIDUAL FEEDING VOLUME:** This is calculated by dividing the daily volume by 8. Round this volume to the nearest 0.5 mL.
- GROWTH GOALS:** Weight: 15-20 g/kg/d; if growth <15 g/kg/d for 5-7 days, increase volume to 160 -170 mL/kg/d.
- CONSULT DIETITIAN:** If growth is not optimized on 170 mL/kg/d, consider adding 0.5 - 1 g/kg/day Liquid Protein Fortifier.
- CONSULT DIETITIAN:** For fortifying to 26 or 28 Kcal/oz if fluid restriction is requested.

## NCCC Feeding Pathway for Infants 1500 - 2000g Birth Weight AND/OR > 32 Weeks Gestational Age

Patient Name

Birth Weight (grams)

Day of Protocol and Date	Caloric Density of Human Milk <small>(Kcal/30 mL)</small>	Total Enteral Intake <small>(per kg/day)</small>	Volume of Feeds <small>(mL/kg/day)</small>	Weight 1. BW (kg) 2. Current weight (If > BW) 3. Dosing weight	Total Daily Feeding Volume <small>Desired volume (mL/kg/day) x weight</small>	Individual Feeding Volume <small>(Given every 3 hours) Total daily volume ÷ 8</small>	TPN Changes <small>(for MD/NP TPN order)</small>	Comments <small>Colostrum should be used for Oral Immune Therapy (OIT) for the first week.</small>
Day 1 / /201_	20	Kcal = 20 Protein = 0.3	30					
Day 2 / /201_	20	Kcal = 30 Protein = 0.4	↑40 ↑50 @ 2300					
Day 3 / /201_	20	Kcal = 44 Protein = 0.6	↑60 ↑70 @ 2300					
Day 4 / /201_	↑22	Kcal = 62 Protein = 1.5	↑80 ↑90 @ 2300				↓ Lipids 1.5	Increase HM to 22 kcal/oz using LHMF
Day 5 / /201_	22	Kcal = 76 Protein = 1.9	↑100 ↑110 @ 2300				DC Lipids	
Day 6 / /201_	↑24	Kcal = 100 Protein = 3.1	↑120 ↑130 @ 2300				Discontinue TPN	Increase HM to 24 Kcal/oz with LHMF MD/NP discontinues central line, if appropriate
Day 7 / /201_	24	Kcal = 116 Protein = 3.6	↑140 ↑150 @ 2300					
Day 8 / /201_	24	Kcal = 124 Protein = 3.9	150 - 160					Add Iron 3 mg/kg/day divided twice daily
Day 9 / /201_								Add Poly-Vi-Sol 0.25 mL twice daily

1. **DAY OF PROTOCOL:** Day 1 is considered the day feedings were started. Specify the date in the box provided.
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6. **CONSULT DIETITIAN:** For fortifying to 26 or 28 Kcal/oz if fluid restriction is requested.

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- Prolonged fasting causes atrophy of the intestinal mucosa
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## INITIATION OF FEEDINGS

1. Begin feedings with the specified NCCC feeding guideline per physician order (based on weight and/or gestational age).
2. Infants may feed with umbilical lines in place.
3. Human milk, especially mother's own milk, is preferred (colostrum for early feedings).
4. Gavage feedings are given by infusion pump over 30-120 minutes depend on tolerance.
5. Oral feedings are initiated based on infant cues (see below).

## PROGRESSION OF FEEDINGS

1. The bedside nurse will calculate the daily feeding volume and calories according to the appropriate feeding pathway.
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3. Avoid oral medications until full volume enteral feeds are tolerated.
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7. Do not routinely check residuals for babies on continuous feedings.

## WHEN TO NOTIFY MD/NP

1. An abnormal exam: Unstable vital signs, abdominal distention ( $\uparrow$  in abdominal circumference greater than 2 cm), visible bowel loops, large or bilious emesis, or visible blood in stool.
2. Significant residuals:
  - Dark green residuals
  - "Undigested" residuals if greater than 50% of total feeding

## DISCONTINUATION OF FEEDINGS

1. A maximum of two consecutive feedings may be held by the intern or resident.
2. Discontinue feedings only after evaluation by Attending MD, Neonatal Fellow, or Nurse Practitioner.

## FEEDING INTERVAL EXCEPTIONS

Consider continuous feedings (based on MD/NNP order) if infant exhibits pathologic reflux, has GI motility/absorption issues (short gut, liver disease etc.) or doesn't appear to tolerate bolus feedings.

## TRANSITION TO ORAL FEEDING

- Goals:**
- Transition to safe pleasurable feeding experience.
  - Transition to breast milk per the AAP guidelines, with a goal of 6 months of exclusive breast milk.
  - Establish direct breastfeeding prior to hospital discharge. (See [Breastfeeding Guidelines](#))

*For infants who are not breastfeeding*, begin cue based bottle feeding when appropriate (infant medically stable, alert periods for at least 10 minutes, respiratory support equal to or less than 2L HFNC).