Establishing Enteral Nutrition

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Introduction

NICUs should standardize feeding management based on best available evidence. The introduction of enteral feeding for the VLBW infant has changed dramatically over the past few decades. The greatest trends have been driving the earliest start of feeding with oral colostrum care (OCC), standardizing feeding advancement and maximizing use of human milk. These feeding process changes have promoted trophic changes in the intestine along with immunologic protection of the host. We are only beginning to understand that such early priming may favorably alter the gut microbiome to confer positive benefits to the infant.

POTENTIALLY BETTER PRACTICE #10

Enteral feeding begins with oral colostrum care (OCC) started shortly after birth.

Background, Rationale, and Goals

- Studies have shown that OCC can reduce sepsis, improve weight gain, and reduced length of stay[1-9]
- The benefit of oral colostrum care is mostly immunologic in nature with the introduction of immune cells, immunoglobulins, other immunoprotective agents in milk, natural probiotics and prebiotics.[10]

Recommendations, Guidelines and Algorithms

- Develop a protocol for delivery of oral colostrum care including volume, timing, duration and method of collection and delivery.
- Encourage mothers to express colostrum within 1 hr after delivery in the delivery room or recovery room after cesarean section.

Quality Improvement: Outcome/ Process Measures

- OCC guidelines/protocol available?
- % of target population (e.g. VLBW infants) receiving OCC
- Age (in hours) of 1st OCC

POTENTIALLY BETTER PRACTICE #11

Enteral feeding begins with the introduction of trophic enteral feeds initiated on day of life 1 or 2, unless there are clear contraindications such as current or recent exposure of the bowel to hypoxia, severe anemia, hypotension, or congenital anomalies precluding immediate feeding (e.g. omphalocele or gastroschisis).

Background, Rationale, and Goals

- The fetal gastrointestinal tract is continually exposed to large volumes of swallowed amniotic fluid, absorbing fluid and some nutrition, performing rudimentary peristalsis, and forming meconium.
- Trophic feeding can stimulate gut maturation, hormone release, and motility. Early introduction of feeds shortens the time to full feeds and to discharge without an increase in NEC whereas withholding of feeds puts the gut at risk for infection and delayed maturation including immune protection.[11]
- Early feeding accelerates mature intestinal motility patterns.[12]
- Early introduction of feeding results in less serious infections in low birth weight infants.[13]
- There are no contraindications to initiating or feeding with an umbilical artery catheter (UAC).[14]
- The impact of feeding in the presence of a PDA or during the treatment for a PDA closure (indomethacin, ibuprofen, acetaminophen) has not been shown to add further risk for bowel complications such as NEC or spontaneous intestinal perforation (SIP). [15-17]
- The risk of SIP associated with the concomitant use of indomethacin and steroids needs to be recognized and feeding held as a precaution in this scenario. Meta-analyses of trials of non-steroidal anti-inflammatory agents alone for PDA closure have not affected NEC rates. [18,19]

Recommendations, Guidelines and Algorithms

Enteral feeding practices should be listed as policy or guideline and available in each NICU specifying the following aspects:

- Delivery of oral colostrum care including volume, timing, duration and method of collection and delivery
- Early initiation of feedings for eligible infants with type of feeding (full strength mother's milk, heat-treated donor human milk, formula only under rare conditions for VLBW infants)
- Stopping or holding rules for cardiorespiratory instability
- Details of feeding volume advancement
- Definition of feeding intolerance
- Timing of fortification steps
- Timing of introduction of vitamins and iron
- Rules for volume and concentration of feeds for infants who are not growing optimally

Quality and Process Improvement

- Creation and implementation of OCC guidelines
- Development of feeding guidelines with timing of nutritional interventions. (see example: https://health.ucsd.edu/specialties/obgyn/maternity/newborn/nicu/spin/staff/Pages/tables.aspx
- Integration of feeding guidelines into EMR

Outcome/Process Measures

- Initial feeding type (Mother's own milk, donor human milk, formula)
- Feeding protocol completed (with/without breaks) (Y/N)
- DOL full enteral feeds achieved (140 mL/kg/day or more)
- DOL when birthweight regained
- Days on parenteral nutrition
- Percentage of infants on any enteral nutrition by 24, 48, 72 hours of life (Refer to Tool #5)

POTENTIALLY BETTER PRACTICE #12

NICUs should develop standard definitions of feeding intolerance, with specific reference to actions/inactions based on gastric residual volumes, changes in abdominal signs and the presence of bloody stools.

Background, Rationale, and Goals

- Enteral feedings of VLBW infants are frequently stopped, or feeding advances held, based on concerns for feeding intolerance.
- The definition of feeding intolerance is highly variable but may include the presence and quality (normal, yellow, green, blood-tinged) of gastric residuals, emesis, abdominal distension or tenderness, the presence of heme-positive or abnormal-appearing stools, the presence, absence or quality of bowel sounds, or any combination thereof. [20,21]
- As all of these clinical phenomena may occur in a healthy premature infant tolerating feedings, it is important to put these findings into a clinical context that is understood by nursing and physician staff.[22]
- Measurement of abdominal girth may be disruptive or stressful to the infant and may not add significantly to the clinical assessment of abdominal distension or tenderness.
- In one study, when feeding intolerance was more clearly defined, nutritional outcomes were dramatically improved.[23]
- Gastric residuals reflect the immature dysmotility of the premature gut and are very common in the first few weeks of life.
- The gastric residual alone is neither a sensitive nor specific indicator of bowel injury and should not solely dictate stopping or advancing enteral feeds.[24]
- Gastric residuals may be present prior to NEC but may be more helpful in combination with other signs of early NEC (abdominal distension or tenderness, bloody stools, apnea, temperature instability) in making the diagnosis of NEC.[25]
- Not checking gastric residual volumes before each feed was associated with faster attainment of full feeding without increasing risk of NEC.[26]
- Many NICUs have now moved away from checking gastric residuals based on the lack of specificity of checking gastric residuals.
- If gastric residuals are checked, one should be cautious about using residuals as the sole reason to completely stop enteral feedings.
- There are few justifications for discarding gastric residuals as fluids, electrolytes and nutrition may be lost.

Recommendations, Guidelines and Algorithms

- Team based definition of feeding intolerance integrated into feeding algorithm

Refer to **TOOL #8** on page 42 and **TOOL #9** on page 46 for examples of feeding protocols with instructions for feeding intolerance/residuals.

- Education for staff regarding the new definition, clinical context and potential practice changes

Quality and Process Improvement

- Reasons for withholding feedings should be documented in the progress notes and discussed on rounds.

Outcome/Process Measures

- Number of feeding interruptions

POTENTIALLY BETTER PRACTICE #13

Enteral feeds can be given by bolus or continuously by gastric route and less commonly by transpyloric route.

Background, Rationale, and Goals

- VLBW infants require tube feedings before they are mature enough to safely suck and swallow.
- The two primary methods of tube feeding are bolus or continuous.
- Delivery route options are orogastric, nasogastric, or through a gastrostomy tube, and gastric versus transpyloric.
- Milk feedings given by intermittent bolus gavage method may be more physiologic because they promote the cyclical surges of gut hormones seen in normal term infants and adults.[27]
- A Cochrane analysis concluded that infants fed by the continuous tube method took longer to reach full feeds, but there was no significant difference in somatic growth, days to discharge, or the incidence of NEC.[28]
- A "slow" bolus feeding given over a longer time interval, such as 30-120 minutes, results in a return of motility and improved tolerance.[29]
- Delivery of tube feedings into the stomach elicits the associated physiologic stimulation and digestive processes.
- It is undetermined if bolus vs continuous feeding is better for GERD.[30]
- Transpyloric (e.g. nasojejunal or NJ) feeds must be continuous and are not recommended for routine use in preterm infants, as no benefit was found and are associated with a greater incidence of gastrointestinal disturbance and death.[31]
- Transpyloric feeding has the potential benefit of delivering feeds past the pylorus when concerns arise for significant GERD and/or aspiration risk and/or moderate to severe CLD.
- Fats in human milk are of lower density than other aqueous components and will therefore rise and separate.
- If a syringe is horizontal, fat may float to the top and therefore will be the last fluid emptied into the tubing, resulting in variable fat administration rates and causing some of the highest caloric feed to never reach the baby.[32-34]

Recommendations, Guidelines and Algorithms

- NICU feeding guideline should specify bolus vs continuous and if continuous is chosen greater attention to the following is required to minimize nutrient loss.
  - Orienting feeding syringes vertical and directed up using the thinnest tubing and the shortest travel distance from pump to infant will decrease fat loss.
  - Ensuring that any residual milk is purged with air or small amount of water.

Quality and Process Improvement

- Record route of feeding
- Ensure that transpyloric feeding have defined indications and guidelines to offset risk
- Define rules and timeline for need for gastrostomy tube

Outcome/Process Measures

- Route of feeding

POTENTIALLY BETTER PRACTICE #14

Enteral feeding advancement rates should be linear and specified in the feeding guidelines.

Background, Rationale, and Goals

- The lack of a feeding guideline introduces more variability in feeding rate and may increase risk of gut morbidities.
- The feeding rate of advancement has been shown to have a wide range of tolerance (20-35 mL/kg/day) and is not a major determining factor for intestinal complications such as NEC. [35]
- There is a wide range of feeding rates that are used by NICUs around the world.
- Slower feeding protocols (8-10 mL/kg/day) in ELBW have been associated with negligible NEC rates. [36,37]
- Faster rates of feeding are associated with improved weight gain, reduced PN days and line related complications.

Quality and Process Improvement

- Define rates of feeding advancement in feeding guidelines specified by birthweight

Refer to **TOOL # 10** on page 47, **TOOL #11** on page 49 and https://health.ucsd.edu/specialties/obgyn/maternity/NEWBORN/NICU/SPIN/Pages/default.aspx.

- Automate process of calculations and/or embed advancement algorithm in EMR.

Outcome/Process Measures

- Day of life started the feeding guidelines
- Day of life completion of the feeding guidelines with/without breaks

POTENTIALLY BETTER PRACTICE #15

Fortification should be established before full feeds are reached.

Background, Rationale, and Goals

- Early fortification of human milk minimizes the nutritional gap that occurs in the transition from parenteral to enteral nutrition. Fortification of breastmilk should be initiated well before a full feeding volume is reached.[38]
- There is no clear evidence when it is safe to introduce fortification of human milk during feeding advancement. However, protocols have increasingly used earlier fortification steps before full feeding volume has been reached, including some starting as early as 40 mL/kg/day without evidence of intestinal complications.[22,39-41]
- Ascertain the increase in osmolality with the addition of fortifiers does not exceed significant levels of risk that were associated with NEC.[40,42]
- There are now decided advantages to using liquid human milk fortifiers due to ease of use and better mixing. The available liquid bovine-based fortifiers contain higher protein content that is beneficial for the ELBW infant and are void of intact bovine protein.[43,44]
- National standards have long recommended that powdered infant formulas no longer be used in the NICU (CDC, FDA, ADA).
- Liquid human milk fortifiers are preferred over powder to prevent incomplete mixing difficulties, separation of milk components, while minimizing contamination risk.
- The use of donor human milk based HMF has been shown to further reduce infant morbidities such as NEC and reduce days on parenteral nutrition.[45-47] There are retrospective data suggestive of other morbidity reductions including sepsis, ROP, CLD.[48]
- Modern NICU milk preparation has advanced to the point that quality control processes are required to provide the best quality human milk derivatives.[49-52] The collection, storage and handling of human milk with fortification preparation has become more complex. The most efficient and safe way to manage all the milk preparations each day is to streamline these processes and in particular reduce the number of handlers or preparers so that quality control can occur. The other important control element is to have a clean area that can be a consistent workspace for the preparation area.

Quality and Process Improvement

- Advocate for a dedicated milk preparation room and technician to standardize mixing and optimize the quality of milk handling. This requires both a commitment for appropriate clean space and dedicated personnel for milk preparation.
- Define a standard time for starting fortifiers in the feeding advancement
- Choose a fortifier that provides the best growth outcomes with the lowest morbidities for your infants
- Identify balancing measures such as intestinal complications

Outcome/Process Measures

- Age or volume of feeds when fortifier started
- Days on PN
- DOL Full Feeds (140 mL/kg/day based on BW)
- Number of feeding intolerance events
- NEC
- SIP

POTENTIALLY BETTER PRACTICE #16

Enteral feeds should be advanced and concentrated until they are providing adequate nutrition to sustain optimal growth along an infant's growth curves

Background, Rationale, and Goals

- The goal of enteral feedings is to provide optimal nutrition and growth and replace the need for parenteral nutrition.
- The advancement of volume is the first approach to delivering nutrients.
- Delivery of volumes between 150 to 200 mL/kg/day can often be given without significant adverse effects.[53] Some growth restricted infants may demand even more volumes.
- Feeding volume should be increased until the infant shows signs that gut capacity has been reached, then kept at that volume through daily adjustment of the feeding volume for weight gain.[38,54]
- Increased milk intakes were associated with increased daily weight gains and a greater weight at 35 weeks, but no difference in any growth parameter at 1 year or difference in morbidity.[53]
- There are no standardized upper limits of volume however some preterm infants with significant lung disease may experience challenges and require further fortification instead.
- Since human milk nutrient content is so variable, infants that are not growing optimally with peak volume and 24 kcal/oz fortification will require further fortification. Restricting feeding volume until a weight plateau has been identified is the most common cause of growth delay.[55]
- Although fortification of human milk beyond 24 kcal/oz has not been well evaluated it is increasingly coming into practice.
- A proactive versus a reactive approach to growth with daily nutrition and growth assessments is favored to prevent repeated protracted poor growth performance.
- Feeding prescriptions should be adjusted according to daily weights and not weekly weights.
- Customized fortification may be required for some infants who are not growing as targeted. These infants may have differences in nutrient intake due to the variability of their mother's milk, with the use of donor milk or have energy expenditure higher than expected.
- Increases in volume or caloric density are possible to meet the greater needs of the infant. Some have advocated an adjustable approach to fortification based on growth and low BUN levels less than 9 mg/dL as a trigger for adding greater nutrient density with more fortification.[56]
- Additional fortification can be in the form of protein, formula or concentrate remembering that protein is the key to optimizing growth.
- There are also emerging technologies available that can measure macronutrient content in human milk samples down to a few milliliter volumes[57-60] These data may be helpful in growing infants since there is such variability in human milk samples between mothers whereby some milk may contain significantly less protein and fat that will not optimally support growth even with HMFs. However, these devices have not yet been approved by the FDA to support clinical decision making for selectively fortifying human milk in a targeted manner. More clinical data are required, along with more defined workflow and approval from FDA, before targeting fortification using human milk analyzers can be used clinically.

Quality and Process Improvement

- Provide education to all caregivers on nutritional planning and assessment including proactive strategies to prevent growth faltering
- Define volume practices and decision rules in feeding guidelines being used
- Define normal growth velocity targets based on growth charts
- Automate calculations of feeding volumes and calories

Outcome/Process Measures

- Anthropomorphic growth metrics
- Current Z relative to birth Z for growth metrics

EXAMPLE: Infant Feeding Nasogastric Tube Protocol

Title:	Feeding Nasogastric Tube: Infant [x] Policy [x] Procedure [ ] Guideline [ ] Other
Patient Population:	[ ] High Risk OB/Labor, Delivery and Recovery [ ] Post-partum [ ] Low Risk Infant [x] High Risk Infant
Unit(s) Affected:	[ ] L&D/BC/Antepartum [x] NICU [ ] Postpartum
Ancillary Services:	[ ] Pharmacy [ ] Nutrition [ ] Respiratory [ ] Social Work [ ] Lactation
Effective Date:	
Revision/Review Date(s):	

POLICY STATEMENT/SCOPE: N/A

RELATED POLICIES: N/A

DEFINITIONS: N/A

POLICY

1. Multidisciplinary collaboration will determine need for gavage feeding, and the type of nutrient, volume, frequency, plan for advancement and administration of gavage feedings.
2. Gavage feeding is indicated for infants requiring endotracheal intubation and infants with immature, weak, or absent suck, swallow, or gag reflex.
3. Only enteral products will be used to minimize risk of parenteral/enteral misadministration.
4. Prolonged oral gastric or nasogastric feedings may cause adverse oral stimulation and promote GERD and problems of oral aversion.
5. Feeding intolerance is frequently the first sign of illness.
6. Feedings will be held and the licensed medical provider be notified immediately if there are any negative abdominal findings, bilious or hemorrhagic residuals or evidence of feeding intolerance.
7. Non-bilious formula or breastmilk residuals can be re-fed after notifying the medical provider (see below).
8. Type of nutrient (e.g. breastmilk, formula, and fortifiers) will be documented at each feeding interval.
9. Feeding tube insertion is considered a stressful and moderately painful procedure (comparable to the pain of a heelstick). There is also evidence to suggest that the insertion of a feeding tube alters the cerebral blood flow in premature infants. Minimizing insertions will assist in minimizing exposure to pain and discomfort. (Wallace, 2014)
10. Bacterial contamination with pathogens is a documented problem with feeding tubes. While there is inconsistent evidence to suggest this may lead to an increased risk of feeding intolerance and NEC, it may be prudent to treat feedings, feeding tubes and all of the associated tubes in an aseptic manner in an attempt to minimize nosocomial contamination. (Wallace, 2014)

11. Venting of feeding tubes after feedings should be done after feeding has infused in order to prevent gaseous distention of abdomen.
12. For infants on nasal IMV or nasal CPAP the abdomen needs to be vented with an open 8 FR feeding tube.

PROCEDURES AND RESPONSIBILITIES

Procedure for insertion of NG or OG tube:

1. Assess infant to determine need for indwelling vs. intermittent gavage tube.
   a. Polyurethane indwelling feeding tubes (long term) should be used if an infant requires gavage feedings for > 24 hours. These tubes do not harden over time and can be left in place for up to 30 days.
   b. Polyvinyl chloride (PVC) tubes (short term) harden with time when exposed to the acidic environment of the stomach and should only be used for a single feeding or left in place 1-3 days. PVC feeding tubes have been implicated with tissue perforation (Wallace 2014).
2. Determine appropriate type and size of feeding tube.
   a. 16 or 20 inch feeding tubes are preferred over 36 inch feeding tubes in order to minimize the loss nutrients in tubing.
   b. If needed for decompression or venting, an 8fr will be more effective than a 5fr.
3. If an infant without a feeding tube needs to be gavaged after nippling part of a feeding, a rest period must be given before a feeding tube is passed.
4. Position infant for assessment/placement.
5. If placing a nasal feeding tube, use measuring tape to measure from the nose to the mid- earlobe to a point halfway between the xiphoid process and the umbilicus. If placing an oral feeding tube, measure from the mouth to the mid-earlobe to a point halfway between the xiphoid process and the umbilicus.
6. Put on gloves.
7. Pass the feeding tube through the mouth or nose into the stomach. If placing the tube nasally, lubricate the tip with sterile water or saline before insertion.
8. Verify correct tube placement:
   a. Inject 0.25-0.5mL of air into tube and auscultate over stomach. **NOTE:** Auscultation of air over the stomach can be unreliable and DOES NOT assure the tip of the tube is in the stomach.
   b. Aspirate residual from tube and verify gastric contents (color, consistency, and amount).
   c. While the x-ray is not a practical tool for routine assessment in the neonatal population, it does present the most accurate picture of placement. When x-rays are obtained for other purposes the tube insertion depth should be recorded and the tip location should be noted and tracked.
   d. Carefully track and record the position of the feeding tube each time it is used. Compare cm mark to measurement described in step 5 above.
9. Secure feeding tube to infant's face. Document cm mark (at nare or lip), characteristics of aspirate, and the date and time of insertion on the EMR.

Procedure for feeding/administering medication with NG or OG tube:

1. Verify correct position of the feeding tube with methods listed in step 8 above. Also note cm mark at nare or lip. Document this in the EMR.
2. Assess abdomen for bowel sounds, softness, girth, and color.
3. In the absence of a UAC/UVC, abdominal girth is to be measured at the level of umbilicus.
4. In the presence of a UAC/UVC, abdominal girth is to be measured directly above the level of the umbilicus.
5. Hold feeding and notify licensed medical provider ASAP for positive abdominal findings (such as: emesis, diarrhea/watery stools, loops of bowel, abdominal distention, increased girth, firmness, tenderness, discoloration of abdomen, decreased or absent bowel sounds, and/or heme positive (+) stools.
6. Document the amount, color, and consistency of residual or aspirate.
7. If non-bilious/non-hemorrhagic, residuals >50% notify licensed medical provider of the amount and if there are any signs of feeding intolerance. Decision will be made whether to subtract the amount from the total feeding volume from the next feed.
8. If non-bilious/non-hemorrhagic, residuals <50% should be returned and the total feeding volume given (if there are no other signs of feeding intolerance).
9. Feeding should be held for any sign of feeding intolerance and the licensed medical provider notified.
10. Residuals should not be checked if feedings are continuous.
11. Methods of administration:
    a. **Syringe pump:** Use syringe pump for ongoing or established intermittent or continuous feedings.
    b. **Hand controlled:** Slowly administer feeding with syringe over 15-30 minutes for a full feeding volume. Observe infant for intolerance of rate of administration.
    c. **Gravity controlled:** Attach syringe barrel without plunger to the feeding tube. Fill the barrel with feeding, control rate of administration by lowering or elevating the syringe. Observe infant for intolerance of rate of administration.
    d. **Continuous feedings:** Syringe and tubing will be changed every 3 hours.
12. If using intermittent feeding tube, pinch off and remove quickly after feeding complete. Use new tube with each feeding.
13. After administration of feeding or medication, flush indwelling tubes with 0.5-1 mL of sterile water.
14. Venting of feeding tubes after feedings should be done after feeding has infused in order to prevent gaseous distention of abdomen. Venting of feeding tubes should be continuous on all infants on nasal IMV, nasal CPAP, and high flow NC>2 L.
    a. A 10mL Gavifeed venting syringe (see picture below) should be attached to feeding tube between feedings. Gravifeed syringe should have end cap open to minimize resistance. Please place the syringe on a diaper or 4x4 to avoid spills.
    b. An 8 fr feeding tube will vent more effectively than a 5 fr feeding tube.
15. To facilitate gastric emptying, consider positioning infant prone or on the right side with head of bed elevated. If infant meets criteria for black to sleep positioning, need MD order for prone or HOB elevated.

16. A pacifier should be offered with gavage feedings for non-nutritive sucking if infant is awake and interested.
17. All feedings containing breast milk or any additives should have the syringe with a 90 degree angle, tip/tubing pointing up to maximize fat and nutrient delivery.
18. Document the type of nutrient and volume of feeding, residuals and emesis in the EMR record.

ATTACHMENTS

Attachment 1: Images of available catheters

FORMS/PARENT HANDOUTS

None

RESOURCES/REFERENCES

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Commission Tubing Misconnections – A persistent and potentially deadly occurrence, Sentinel Event Alert, Issue 36, Apr. 3, 2006.

EXAMPLE: Residuals & Feeding Intolerance Protocol

Use if residuals are checked routinely.

Check residuals with all NG feedings. Check residuals before restarting continuous feeds off greater than or equal to 1 hour. Residuals on continuous feeds with no break are not checked; follow P&P for continuous feeds.

Disregard:

1. Residual volume of less than 2ml regardless of infant's feeding volume.
2. Residual volume of less than 50% of feeding volumes (if there are no additional signs of feeding intolerance and the clinical evaluation is normal.)
3. Residuals less than 50% shall be refed and continue with feeding order without deducting residual from feeding volume. Do not refeed residuals that are bloody, brown and/or dark green bilious.
4. Residuals that appear light green or yellow are considered a normal gastric residual.

Physician/NNP/PA will be notified for any of the following signs/symptoms:

1. Residuals that are bloody, brown and/or dark green bilious.
2. Residuals greater than 50%.
3. Residuals continue at 30-50% x 3 consecutive feedings of the current feeding volume.
4. Abnormal abdominal exam as evidenced by but not limited to: Increased distension: greater than 2 cm increase in abdominal girth; Abdominal discoloration (ie. Red and/or grayish black/blue); New onset visible bowel loops; Tenderness;
5. Repeated emesis
6. Change in characteristic of stool
7. The nurse may notify the physician at any time there is concern of feeding intolerance.

TOOL #10

EXAMPLE: Neonatal Feeding Protocol

	Weight Group 1	Weight Group 2	Weight Group 3	Weight Group 4
Birth Wt	< 750 grams	751-1000 grams	1001-1500 grams	1501-2000 grams
Daily Advance Rate	**15 mL/kg/day** BID rate increase= every 12 hours	**20 mL/kg/day** BID rate increase= every 12 hours	**25 mL/kg/day** QID rate increase= every 6 hours	**35 mL/kg/day** QID rate increase= every 6 hours
Feed Day				
1 **trophic**	10 mL/kg x 24 hrs **trophic**	10 mL/kg x 24 hrs **trophic**	10 mL/kg x 24 hrs **trophic**	10 mL/kg x 6 hr 20 mL/kg x 6 hr 30 mL/kg x 6 hr 40 mL/kg x 6 hr
2 **trophic**	10 mL/kg x 24 hrs **trophic**	10 mL/kg x 24 hrs **trophic**	20 mL/kg x 6 hrs 25 mL/kg x 6 hrs 30 mL/kg x 6 hrs 35 mL/kg x 6 hrs	45 mL/kg x 6 hr 55 mL/kg x 6 hr 75 mL/kg x 6 hr
3	20 mL/kg x 12 hrs 25 mL/kg x 12 hrs	20 mL/kg x 12 hrs 30 mL/kg x 12 hrs	45 mL/kg x 6 hrs 50 mL/kg x 6 hrs 55 mL/kg x 6 hrs 60 ml/kg x 6 hrs	65 mL/kg x 6hr HMF: 1:50 **optional** 90 mL/kg x6 hr *100 mL/kg x 6 hr ***Consider PO meds** 90 mL/kg x 6hr HMF: 1:25
4	35 mL/kg x 12 hrs 40 mL/kg x 12 hrs	40 mL/kg x 12 hrs 50 mL/kg x 12 hrs	75 mL/kg x 6 hrs 70 mL/kg x 6hrs HMF: 1:50 6 hrs	115 mL/kg x 6 hr 125 mL/kg x 6 hr 135 mL/kg x 6 hr 145 mL/kg x 6 hr D/C CVL
5	50 mL/kg x 12 hrs 55 mL/kg x 12 hrs	60 mL/kg x 12 hrs 70 mL/kg x 12hr HMF: 1:50	*100 mL/kg x 6 hrs 95 mL/kg x 6hr HMF: 1:25 105 mL/kg x 6 hrs 110 mL/kg x 6 hrs	150 mL/kg x 6 hr **160 mL/kg** Completed

	Weight Group 1	Weight Group 2	Weight Group 3	Weight Group 4
6	65 ml/kg x 12 hrs 70 mL/kg x 12hr Prolacta+8 or HMF 1:50	80 mL/kg x 12 hrs 90 mL/kg x 12hr HMF: 1:25	120 mL/kg x 6 hrs D/C CVL 125 mL/kg x 6 hrs 130 mL/kg x 6 hrs 135 mL/kg x 6 hrs	
7	80 mL/kg x 12 hrs 85 mL/kg x 12 hrs	*100 mL/kg x 12 hr *Consider PO meds 110 mL/kg x 12 hrs	145 mL/kg x 6 hrs 150 mL/kg x 6 hrs	
8	95 mL/kg x 12hr Prolacta+8 or HMF 1:25 *100 mL/kg x 12 hrs *Consider PO meds	120 mL/kg x 12 hr D/C CVL 130 mL/kg x 12 hrs	160 ml/kg Completed	
9	110 mL/kg x 12 hrs 120 mL/kg x 12 hrs D/C CVL	140 mL/kg x 12 hrs 150 mL/kg x 12 hrs		
10	130 mL/kg x 12 hrs 140 mL/kg x 12 hrs	160 ml/kg Completed		
11	150 mL/kg x 12 hrs 160 mL/kg Completed			
# Days to Full Feeding	11	9-10	7-8	5

TOOL #11

EXAMPLE: Neonatal Feeding Protocol

BW < 1kg			
Feeding Day	**Total Enteral Feeds mL/kg/day**	**Frequency**	**Comments**
1	10	q6	
2	10	q6	
3	10	q6	
4	20	q3	
5	20	q3	
6	20	q3	
7	40	q3	
8	60	q3	Prolact+6
9	80	q3	
10	100	q3	
11	120	q3	d/c PN & increase fortification with Prolact+8
12	140	q3	
13	160	q3	
BW 1-1.25 kg			
Feeding Day	**Total Enteral Feeds mL/kg/day**	**Frequency**	**Comments**
1	20	q3	
2	20	q3	
3	20	q3	
4	20	q3	
5	40	q3	
6	60	q3	Prolact+6
7	80	q3	
8	100	q3	
9	120	q3	d/c PN &increase fortification with Prolact+8
10	140	q3	
11	160	q3	
BW 1.25-1.5kg			
Feeding Day	**Total Enteral Feeds mL/kg/day**	**Frequency**	**Comments**
1	20	q3	
2	20	q3	
3	40	q3	
4	40	q3	
5	60	q3	LHMF to 24 cal/oz
6	80	q3	
7	100	q3	
8	120	q3	
9	140	q3	
10	160	q3	

EXAMPLE: Feeding Flow Chart

Please reference:

Figure 1 from: Yue-Feng Li, Hung-Chih Lin, Roberto Murgas Torrazza, Leslie Parker, Elizabeth Talaga, Josef Neu. Gastric Residual Evaluation in Preterm Neonates: A Useful Monitoring Technique or a Hindrance? Pediatrics and Neonatology 2014; 55:335-340.

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