

Harborview Medical Center ENTERAL FEEDING GUIDELINES

**Katie Farver RD, CD
Director, Hospitalty/Nutrition
Harborview Medical Center
Box 359690
325 Ninth Ave
Seattle, Washington 98104
206-731-2980
kef@u.washington.edu**

TABLE OF CONTENTS

- PATIENT SELECTION
- FORMULA SELECTION
- FEEDING TUBE SELECTION & MANAGEMENT
- FEEDING PROTOCOL
- MONITORING TOLERANCE & COMPLICATIONS OF ENTERAL FEEDING

I. PATIENT SELECTION

Early Enteral Nutrition is encouraged for the following patient populations:

1. Multisystem Trauma

- a. Patients anticipated to require > 48 hrs of mechanical ventilation.
- b. Non-intubated patients with altered mental status or closed head injury that precludes oral intake.
- c. Patient's with an open abdomen should not receive enteral feeds until confirmation otherwise from primary surgical team

2. Burn Patients

- a. Adults (15-59 years of age) with > 19% TBSA burns. Adults >59years of age with >14% TBSA
- b. Pediatric (under 15 years of age) with >14% TBSA
- b. Intubated patients anticipated to require > 48 hrs of mechanical ventilation.

3. Surgical/Neurology/NeuroSurgery Patients

- a. All necrotizing fasciitis patients admitted to the ICU.
- b. Patients anticipated to be NPO more than 5 days or with severe malnutrition on admission.
- c. Pre-operative patients with malnutrition and altered mental status.
- d. All patients less than 15 years of age should be carefully evaluated for the need for early nutrition support

4. MICU Patients

All patients receive enteral feeds <48 hours after admission with exception of the following:

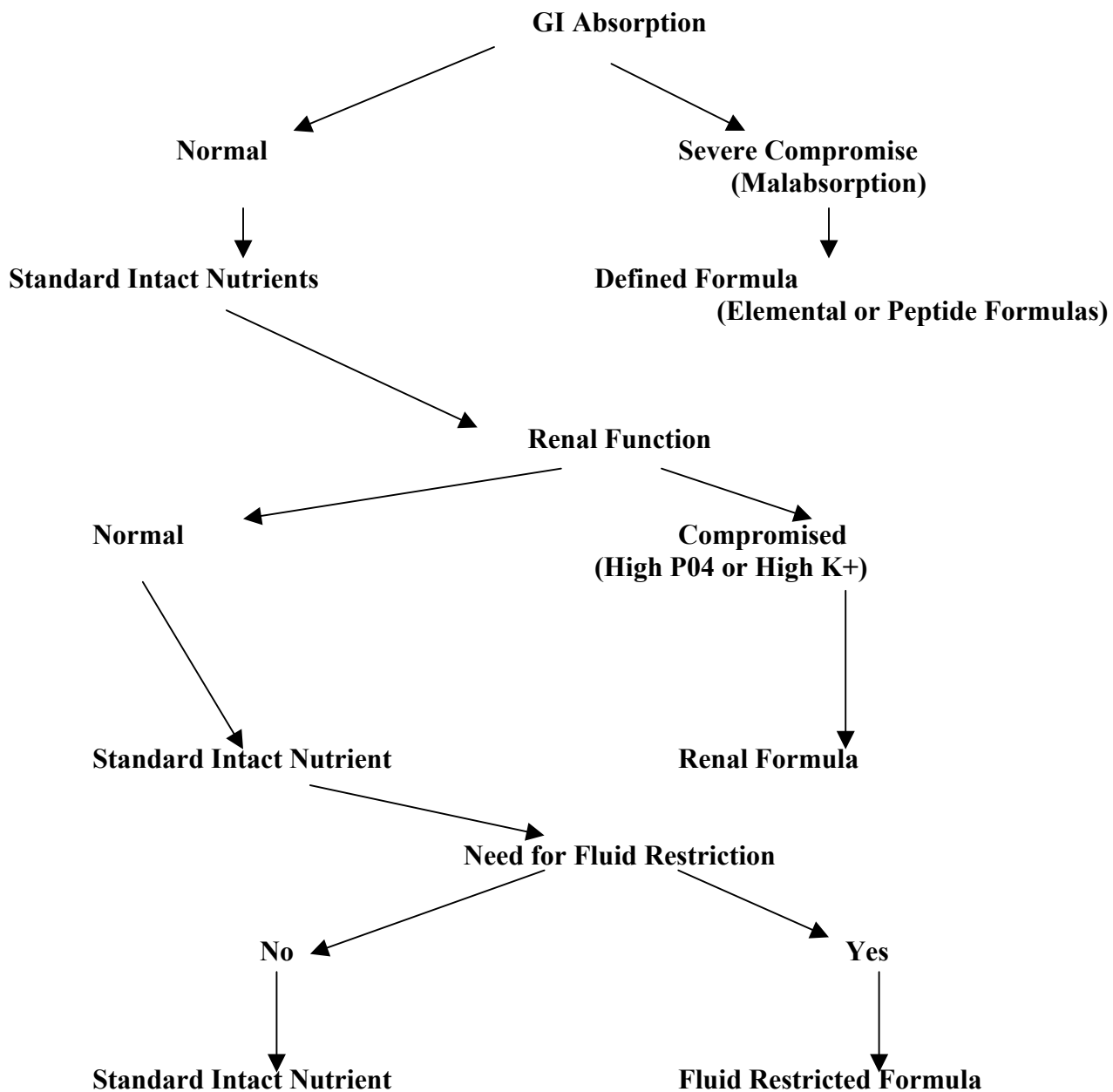
- a. Expected to be NPO less than 3 days.
- b. Acute pancreatitis unless decision is made for post-ligament of Treitz feeding tube placement.
- c. Ongoing GI bleeding.
- d. Bowel obstruction or ileus.
- e. Need for continued NPO status due to procedures.

5. Medicine Wards

- a. Patients expected to be NPO for any reason for more than 5 days unless they have a contraindication to enteral feedings such as those above, provided they give consent.
- b. Special attention paid to patients who are nutritionally compromised at admission (cachexia, albumin<2.5, ESLD, ESRD, HIV, chronic infection, etc.).

II. FORMULA SELECTION

Selection Of Enteral Formula In Patient With Functional GI Tract



Categories of Enteral Formulas

TYPE	COMMENTS
Standard Intact Nutrients	Whole protein nitrogen source, for use in patients with normal or near normal GI function; Most products contain ~ 1.0 kcal/mL; Protein content varies; Most are lactose-free; Products are fiber containing or fiber-free
Elemental	Predigested nutrients; most have a low fat content or a high percentage of medium chain triglycerides; for use in patients with severely impaired GI absorption
Fluid Restricted	Intact nutrients, calorically dense (2.0 kcal/mL)
Renal	Intact nutrients, calorically dense (2.0 kcal/mL), low phosphorus and low potassium
Other disease specific	Intact nutrients designed for feeding patients with respiratory disease, diabetes, hepatic failure and immune compromise. Well-designed clinical trials may or may not be available to support use.

III. FEEDING TUBE SELECTION & MANAGEMENT

Types of feeding tubes

- Nasogastric
- Nasoduodenal
- Percutaneous Endoscopic Gastrostomy (PEG)
- Open gastrostomy
- Transgastric jejunostomy
- Surgical jejunostomy

Short Term Access: Anticipated need for enteral feeding < 6-8 weeks

Nasogastric

- Most common first line route.
- Easy to place at bedside by nursing staff.
- Use small flexible tubes to avoid nasal skin erosion.
- Check position via auscultation/aspiration of gastric contents and gastric PH, as per nursing protocol. If in doubt regarding position by auscultation and aspiration then confirm with abdominal X-ray.
- Literature review suggests no significant difference in pulmonary aspiration between gastric and post-pyloric feeding for patients with normal gastric motility.
- Check residuals to evaluate tolerance.
- **Keep HOB elevated with standard aspiration precautions**

Nasojejunal

- Used for patients who do not tolerate gastric feeds or patients with known abnormality of gastric emptying.
- Can attempt to place at bedside and check X-ray for migration past the pylorus.
- If unsuccessful then position tube under fluoroscopic or endoscopic guidance.

- Residuals not helpful if tube remains post-pyloric, watch for signs of abdominal pain or distension to determine tolerance. Avoid starting feeds until patient is hemodynamically stable and initial volume resuscitation is complete.

***Caution: Patients with nasal obstruction or severe facial fractures should have these tubes placed orally.**

Long Term Access (anticipated need for enteral feeding > 6-8 weeks)

Percutaneous Gastrostomy Tubes (PEG)

- Can be placed with endoscopic or radiographic guidance.
- GI consult for endoscopic placement, Interventional radiology for radiographic placement. General Surgery will place PEG in OR but only in combination with another procedure (usually tracheostomy).
- Post-placement may start enteral feeds between 6 and 24 hours. Keep tube clamped until able to start enteral feeds. Recent studies support early enteral feeding with PEG tubes (6-12 hrs), however, many providers continue to support a 24 hour period of gravity drainage prior to feeding.
- Tube is secured to skin by outer flange that is carefully positioned during the procedure to prevent tube migration and keep stomach opposed to abdominal wall. Do not manipulate this flange or place any gauze beneath it as this may loosen the approximation with the abdominal wall. Flange should be loosened after 5 days by physicians performing the procedure to prevent skin necrosis. The PEG external bolster (skin disc) should be rotated every 8 hours for the first 24 hours. Do NOT loosen the bolster to rotate it! check the measurement of PEG depth before and after rotation to ensure that it has not changed.
- The tube should also be secured to the skin with tape to avoid traction on the tube leading to dislodgment.
- Care of site: Soap and water, Gauze over tube and tape securely for 24 hours.

Open Gastrostomy

- These are usually performed either in conjunction with a laparotomy for other reasons or for patients who cannot have percutaneous placement due to intra-abdominal adhesions
- This procedure requires a general anesthetic
- The stomach is tacked to the abdominal wall with sutures and an external suture is usually placed around the tube to prevent it from being dislodged.
- The tube should be left to gravity drainage for 24 hours and then can start enteral feeds.
- Can check residuals for tolerance
- Surgical incision should remain dressed for 24 hours and then left open to air if there is no drainage.

Transgastric Jejunostomy

- These tubes can be placed surgically, or with endoscopic or radiographic guidance.
- May contain a second port for gastric aspiration.
- Can be converted to gastrostomy later.
- Cannot monitor residuals to determine tolerance.
- Post placement care is same as PEG.

Surgical Jejunostomy

- Usually placed in conjunction with a laparotomy or for patient who need long term enteral access and cannot tolerate gastric feeds.
- These can be placed either via a laparoscopic or open approach and require a general anesthetic.
- A variety of tubes are used including red rubber catheters, Jackson Pratt drain tubing, and needle catheter jejunostomies.
- The jejunum is tacked to the abdominal wall with sutures and an external suture is usually placed around the tube to prevent it from being dislodged.
- Laproscopically placed tubes will have suture bolsters around the skin exit site. These should not be manipulated by anyone other than the surgeon.
- Enteral feeds can begin 12 hours after surgery.

NOTE: Needle catheter jejunostomy tubes are much smaller diameter than standard tubes and are thus much more likely to obstruct. They must be flushed frequently and high fiber formula and medications should not be administered through these tubes.

NOTE: All tubes not being used for continuous enteral feeds should be flushed with 30cc (adults) or 5-10 cc (pediatric) tap water every 4 hrs to ensure patency.

NOTE: All tubes should be marked at the skin entrance to allow monitoring for migration of the tube. Tube position should be monitored by the nursing staff q Shift.

***Caution:** If a PEG or surgically placed tube is dislodged from the abdominal wall this should be reported to the physician immediately. Place a 4x4 secure dressing over the site. Recently placed tubes (<7 days) will not have a well formed fistula tract with the abdominal wall and so must be re-cannulated quickly to avoid closure of the tract. After replacement of all tubes, a fluoroscopic exam should be ordered to confirm placement in the GI tract and rule out any leak prior to resuming enteral feeds.

Feeding Tube Obstruction

1. Causes of Clogged Feeding Tubes

- a. Improper flushing of tubes.
- b. Caloric dense formulations.
- c. Small bore feeding tubes.
- d. Rate of flow that could allow gastric pH to clump the formula as well as cause a build up on the sides of the feeding tube.
- e. While evaluating gastric residuals the low pH can cause formula coagulation.
- f. Medications that are not properly crushed. Bulk forming medications (Psyllium).

2. Solutions

- a. **Prevention:** Frequent flushing with water is the easiest way to prevent clogging. Tubes should be flushed with 30 mls to 50 mls (adults) or 10cc (pediatrics) of water every 4-6 hours as a routine process as well as flushing pre and post medications can prevent most

clogged feeding tubes. Flushing pre and post gastric residual checks can also prevent the gastric acid accumulation and henceforth formula coagulation.

- b. Medications: Use liquid medications whenever possible. Some medications can be crushed after consultation with pharmacy.
- c. Small bore jejunostomy feeding tube clog very easily. Clarify medication administration guidelines from physician before using these tubes for medication administration.
- c. Unclogging: Here are several options:
 - 1. Use 30 to 60 cc syringe, avoid small syringes due to high pressure.
 - 2. Flush with warm water.
 - 3. Flush with Carbonated beverage (approximately 5 ml).
 - 4. Liquid meat tenderizer (approximately 5 ml). Papain is probably beneficial. May repeat but avoid more than 2 doses. *
 - 5. 1 capsule Cotazym + 1 tab Sodium Bicarbonate with 10 mls warm water to tube, clamp x 5 minutes then flush. *
 - 6. 1-2 caps Cotazym in 6 ounces (180 mls) of warm water, draw up in catheter tip clamp x 30 minutes, then flush. *
 - * **Caution: avoid eye contact when mixing.**
 - 7. If these attempts to unclog the tube fail then the tube must be replaced

FEEDING PROTOCOL

1. Rate of Administration

Adults:

A. Gastric Feeding

- a. Standard formulas should be started at a rate of 50cc/hr unless there is significant concern regarding gastric motility
- b. If tolerated the rate of feeding can be advanced by 25cc/hr every 4-8 hours until the goal rate is met.
- c. Elemental formulas should start at full strength at 25cc/hr for the first 12 hours then advance by 25cc/hr every 6-12 hours until reaching goal rate
- d. 2 kcal/cc formulas should be started at 25cc/hr and advanced as elemental formulas even if the patient has been on a standard formula prior to this formula change.

B. Jejunal or duodenal feeding

- a. Standard or elemental feedings at full strength at 25 cc/hr for the first 12 hours then advance by 25cc/hr every 6-12 hrs until reaching goal rate.
- b. Do not use bolus feeding method

C. Blue Dye is not recommended or available to color enteral products due to safety concerns.

Pediatrics:

A. Gastric Feeds (NG, continuous) (5):

1. Initiation of feeding: 1-2 ml/kg/hr

If the patient has been NPO for several days initiate the feeding more slowly.

2. If tolerated increase q 6-8 hrs to goal rate

3. Gastric Residual evaluation:

a. If residuals are greater than the previous hour's feeding volume this is considered a significant volume. Hold tube feeds for one hour. If patient continues to have a high residual, use of a prokinetic agent should be considered. Consider post-pyloric feeding tube placement if necessary.

B. Gastric Feeds (PEG):

1. Initiation:

Infant <1: 30 ml q 3hrs x 2

Toddler 1-5 50 ml q 3hrs x 2

Child > 5 75 ml q 3hrs x 2

Adol 12-14 100 ml q 3hrs x 2

2. If bolus feeds tolerated then begin continuous feed and then advance as tolerated:

Infant <1 10 ml/hr x 24 hrs

Toddler 1-5 20ml/hr x 24 hrs

Children >5 30ml/hr x 24 hrs

3. Gastric Residual evaluation (6): Check residual q 4 hrs.

a. Bolus Feedings: If residual is > than half the volume of the last bolus, hold feeds and call MD

b. Continuous Feedings: If residual volume is > 2x the hourly rate call the MD

C. Jejunostomy feedings:

Rarely used in children. Do not use bolus feedings. Start slowly.

D. Blue dye is not recommended or available to color enteral feeding formula due to safety concerns.

2. When to Hold Enteral Feeding

- a. 1/2 hour prior to procedures requiring the Trendelenberg position
- b. 6 hours prior to general anesthesia for non-intubated patients
- c. Intubated patients having either airway surgery (includes tracheostomy) or planned reintubation (such as thoracotomy/thoracoscopy) NPO a minimum of 6 hours.
- d. Intubated patients having planned surgery on the GI tract, NPO from Midnight.
- e. All other intubated patients, enteral feeds can be continued until the time of departure to the operating room. This includes any patient who will be proned during surgery or extubated post-operatively

MONITORING TOLERANCE AND COMPLICATIONS OF ENTERAL FEEDING

1. Monitoring tolerance

- a. Gastric feeds
 - Check gastric residual volumes every 4 hours. Hold tube feedings for residuals greater than 200cc. Reinfuse the residual and recheck in 2 hours. Notify MD if residuals remain so high that the patient cannot be fed for more than 2 hours.
 - Feeds should also be held for increasing abdominal distension and/or emesis. Notify MD.
- b. Jejunal feeds
 - Residual volumes are not helpful. Monitor abdomen for distension and bowel sounds q4 hrs. Hold feeds for emesis, abdominal pain or distension.

2. GI Complications Associated with Enteral Feedings (Adults:

Complication	Severity	Definition	Treatment
Vomiting	(occurrence)	1-4+ times/12 hrs	Place NG to suction, check function. Check existing NG function. ▼ TF infusion rate by 50%; Notify primary team
Abdominal Distension and/or cramping or tenderness (if detectable)	Mild	Hx and/or physical evidence	Check for constipation; Maintain TF infusion rate; Reexamine in 6 hrs if indicators remain mild, maintain TF infusion rate
	Moderate	Hx and/or physical evidence	Order abdominal series Xrays to assess for small bowel obstruction. If SB, notify primary team. Stop TF infusion. Replace existing NG Catheter
	Moderate >24 hr or Severe	Hx and/or physical evidence	Stop TF infusion. Consider TPN. Notify primary team
Diarrhea	Mild	1-2 x per shift or 100-200cc/12 hrs	Maintain TF infusion rate. Evaluate for pharmaceutical causes. Increase to goal
	Moderate	3-4 x per shift or 200-300cc/12 hrs	Maintain TF infusion rate. Re-examine in 6 hrs. if mild or moderate, continue to goal rate; Evaluate medications
	Severe	>4 x per shift or >300cc/12 hrs	▼ TF infusion rate by 50%. Order stool studies per primary team; Evaluate medications. Give antidiarrhea meds per primary team.
High NG output with post-pyloric Feeding Tube Placement	(measured)	NG output > 800cc (with post-pyloric FT placement)	Hold tube feedings and notify primary team; Check Xray to verify post-pyloric feeding tube placement
High Gastric Residuals with gastric Feeding Tube placement	(measured)	Hold tube feedings for residuals greater than 200cc	Notify primary team; Start prokinetic agent; Head of bed elevated 30 degrees when possible. Check for constipation
Constipation	(measured)	Less than 2 bowel movements per week	Stool softeners and water boluses per primary team;

3. Possible Metabolic Complications of Enteral Feedings

Possible Etiology	Possible Causes	Possible Treatment
Hyponatremia	Excessive free water, abnormal sodium loss	Change to Fluid restricted formula, discontinue water boluses/IVF, replace sodium losses
Hypernatremia	Inadequate hydration, increased fluid losses, Diabetes Insipidus	Add or increase water boluses or IVF
Hypokalemia	Anabolism/refeeding, diuretics/medications	Supplement potassium
Hyperkalemia	Renal Failure, metabolic acidosis, catabolism, GI bleed, Acute dehydration	Correct imbalance, Change to renal formula as appropriate
Hypophosphatemia	Anabolism/refeeding	Supplement phosphorus
Hyperphosphatemia	Renal failure	Change to renal formula, phosphate binders if necessary
Hypomagnesemia	Anabolism/refeeding, diuretics/medications	Supplement magnesium
Hyperglycemia	Diabetes, steroid therapy, Sepsis, Trauma, Pancreatitis	Insulin drip per protocol. Goal is to maintain blood glucose at or less than 110 mg/dL

Bibliography:

1. Adapted from ASPEN Guidelines for the Use of Parenteral and Enteral Nutrition in Adult and Pediatric Patients, JPEN, 1993; 17:1SA-52SA.
2. Adapted from The Science and Practice of Nutrition Support, A Case-Based Core Curriculum, "Enteral Nutrition: Indications, Options, and Formulations", by Pamela Charney, pg. 148, 2001, Kendall/Hunt Publishing Co.
3. Adapted from Farver, K. "Enteral Feeding Complications" Vol. 1 (4), Perspectives on Nutrition, 1993.
4. Adapted from Study Protocol "Medial Food Evaluation Clinical Confirmation of Safety and Tolerance Elemental Free Amino Acids", Nestle Corporation, 2000.
5. Olson, Diane, Cht. 27, Nutritional Considerations in the Intensive Care, pg. 315-19 ASPEN, 2002
6. Adapted from Addison-Wesley Manual of Pediatric Nursing Procedure Manual, 1993.
7. McClave S, et al. "Use of residual volume as a marker for enteral feeding intolerance: Prospective blinded comparison with physical examination and radiographic findings. JPEN 16:99-105, 1992
8. Bengmark, S et al, "Uninterrupted perioperative enteral nutrition" Clinical Nutrtrion (2001) 20(1) 11-19.