Enteral Nutrition

Site Applicability

All RHS delivery areas caring for individuals with Enteral Nutrition.

Practice Level

Basic skill level within the scope of practice of all registered nurses and licensed practical nurses. Basic skill level within the scope of practice of all dietitians working in enteral nutrition, who have Reserved Acts A and B from the College of Dietitians of B.C.

Need to Know

Enteral nutrition is indicated in patients with a functional gastrointestinal (GI) tract, but who are unable to take nutrients through the oral route. Enteral nutrition is administered through the following routes: nasogastric, nasoduodenal, nasojejunal, gastrostomy, jejunostomy or gastrojejunostomy feeding tubes. Enteral nutrition is contraindicated in patients with a malfunctioning GI tract or in conditions requiring extensive bowel rest (i.e. insufficient absorptive capacity, mechanical obstruction of the GI tract, prolonged ileus, severe GI hemorrhage or severe diarrhea (i.e. > 3 loose bowel movements daily), >500 ml/day output from GI fistula, severe enterocolitis and intractable vomiting).

The administration of enteral nutrition is an interdisciplinary process. While the decision to tube feed ultimately rests with the patient/family/physician, the input and support of other members of the interdisciplinary team is essential. Tube feeding may or may not prolong life, depending on the patient's condition, and, for unconscious/unaware patients, will inevitably impact on quality of life. The physician orders the formula and rate, the dietitian makes recommendations and the nurse administers the enteral feeding. The feeding plan includes type of formula, rate, administration, residuals, monitoring, placement confirmation, and patient positioning.

There is good evidence suggesting that bowel sounds are not correlated with peristalsis, and that active bowel sounds are not required to start enteral feeding. Expert opinion recommends that enteral nutrition can be safely initiated in the absence of bowel sounds, and may enhance bowel motility. There is also good evidence supporting that osmolality of the enteral formula will not impact GI tolerance. Frequently used medications (like acetaminophen elixir, multivitamin liquid or metoclopramide) have more than 5-10 times the osmolality of enteral formulae.

The practice of initiating and advancing enteral formulae are not generally based on clinical studies but rather on common practice and textbook recommendations, which commonly include initiating feeds at 20-50 mL/hour and advancing 10-25 mL every 4-12 hours (3). For intermittent feeds, there is fair evidence to suggest that rates of advancement and goal rate should be based on individual tolerance.
Gastric residual volumes have also been studied in the literature. Residual volumes are only measured in nasogastric or gastrostomy feeding tubes (and not for nasoduodenal, nasojejunal or jejunostomy tubes). Recommendations on gastric residuals by a panel of experts (6) are to: (a) use clinical assessment in combination with gastric residuals, (b) hold enteral nutrition for a residual volume > 500 mL or overt regurgitation/aspiration of gastric contents, (c) evaluate and treat residual volumes of 200-500 mL, and (4) refeed residual volumes of < 500 mL.

Composition of specialized formulae for specific diseases has been studied in the literature. Specialized

diabetes formulae showed significant improvement in hyperglycemia management over the usual polymeric formula (2, 5). Clinical benefit of using hepatic enteral formula with branched chain amino acids has been controversial with some studies showing a reduced frequency in complications and others showing no benefit (1). Use of elemental and semi-elemental formula has been supported in the literature in patients with severe crohn's disease, severe acute pancreatitis (not requiring parenteral nutrition), and in short bowel syndrome.

Refeeding Syndrome is a set of metabolic abnormalities that can occur when a severely malnourished patient begins feeding. In a starved state, fat and muscle catabolism leads to loss of phosphate, magnesium and potassium. These depletions are not reflected in serum levels because of adjustments in renal excretion rates i.e. when blood levels get low, the kidney excretes less. With refeeding, these serum levels shift from the blood into the cells, causing decreases in potassium, phosphate, magnesium and blood glucose. There is controversy over how to treat refeeding syndrome, with the majority recommending slow gradual feeding over 4-7 days to reach goal rate. One study demonstrated that early enteral feeding using a standardized enteral feeding protocol, including electrolyte replacement protocols, showed no observed negative clinical consequences (4). This study also identified that a significant number of unrecognized risks of refeeding syndrome (depletions in electrolytes after enteral feeding was initiated) make it necessary to treat most patients as at risk of developing refeeding syndrome when starting enteral feeding. In the absence of replacement protocols for magnesium and phosphate, and in careful monitoring of electrolytes, the slow progression of enteral feeding rate is recommended in patients known to be at risk of refeeding syndrome. There is good evidence suggesting that protocols are beneficial to all patients requiring enteral support.

Practice Guideline

Enteral Nutrition Ordering

1. Ensure enteral nutrition orders are completed by the physician using the Clinical Practice Guideline: Initiation of Enteral Feeding (N drive under Pathways and Order Forms) form. Dietitians and nurses may accept verbal or telephone orders from the physician to initiate feed and complete the form, and the physician will later co-sign the form. Dietitians may complete the goal rate for enteral nutrition if the physician orders "Dietitian to see regarding enteral feeding", and the physician will later co-sign the form.
2. Dietitians calculate caloric, protein, fat, carbohydrate, and fluid requirements according to individual, considering any specific dietary modifications if needed i.e. chronic kidney disease, etc. Check food allergies. Most products are kosher, lactose-free and gluten-free. Calculate rate required to meet caloric, macronutrient and micronutrient requirements within 24 hours or according to orders. Choose an enteral product to meet the patient's needs, condition, hydration, and biochemical condition.
3. Dietitians calculate fluid requirements and recommend standard flush of 50 cc q4h water. Recommend adjusting water flush amount if not meeting needs from IV, flushes and enteral nutrition (see Table 1).

Table 1: Estimating fluid requirements

Based upon:	*Method of Fluid Estimation*
Age	16-20 yr: 40 mL/kg; 20-55 yr: 35 mL/kg; 55-75 yr: 30 mL/kg; >75 yr: 25 mL/kg
Energy	1 mL/kg
Fluid Balance	Urine output + 500 mL/day

Enteral Nutrition Administration

1. If using standard formulae, initiate full-strength feeds according to the Clinical Practice Guideline: Initiation of Enteral Feeding (N drive under Pathways and Order Forms). The standard polymeric formulae are initiated at 20 mL/hr and increased by 10 mL/hr to goal rate. The concentrated formulae are initiated at 10 mL/hr and increased by 5 mL/hr to goal rate.
2. While nursing staff are responsible for administering enteral feedings, the interdisciplinary team involved in enteral care shall consider the differences in each of the below feeding methods:
    a. *Continuous enteral feeds, open system:*
        1. Raise the head of the bed to 30°-45 during feed administration.
        2. Hang a maximum of 4 hours of feed at one time. Refrigerate open tins of feed up to 24 hrs.
        3. Provide tap water flushes to patient every 4 hours according to Enteral Feeding orders. Check residuals according to the Enteral Feeding Protocol.
        4. Rinse feeding bag with tap water every four hours. Use a new feeding bag every 24 hrs.
    b. *Continuous enteral feeds, closed system:*
        1. Raise the head of the bed to 30°-45 during feed administration.
        2. Hang container for up to 48 hours maximum.
        3. Provide tap water flushes to patient every 4 hours according to Enteral Feeding orders. Check residuals according to the Enteral Feeding Protocol if into the stomach.
        4. Change container and spike set after container is emptied or if longer than 48 hour hang time.
    c. *Intermittent enteral feeds, open system:*
        1. Raise the head of the bed to 30°-45 during feed administration, and leave up for 30 minutes.
        2. Hang formula amount ordered for each intermittent feed. Flush with tap water before and after each feed according to orders.
        3. Rinse feeding bag with water after every feed. Use a new feeding bag every 24 hours.
    d. *Intermittent enteral feeds, closed system:*
        1. Raise the head of the bed to 30°-45° during feed administration, and leave up for 30 minutes.
        2. Hang container for up to 48 hours maximum.
        3. Hang formula amount ordered for each intermittent feed. Flush before and after each feed according to orders.
        4. Once intermittent feed is completed, disconnect the feeding set from the patient's nasogastric, nasointestinal, gastric tube or jejunal tube. Reapply cap to end of feeding tube and leave formula with attached spike set at patient's bedside until next scheduled intermittent feed; this does not need to be refrigerated.
        5. Change container and spike set after container is emptied or if longer than 48 hour hang time. Discard spike set with used feeding container, using a new spike set with each new container of formula. Containers of formula do not require refrigeration.

3. Administering medications via the enteral tubing:

Recommend adequate crushing of medications and encourage use of liquid medications to prevent clogging of the feeding tube related to medications. Recommend flushing with water before and after any medication (30 mL tap water). Recommend protocol for Clearing Obstructed Feeding Tube (pre-checked box on the Enteral Feeding order sheet). Discourage use of Coke® or other acidic product not recommended for clearing feeding tubes because they can cause curdling of the enteral formulae and further obstruction.

Monitoring of Enteral Nutrition

1. *Biochemical Data and Refeeding Syndrome*
   Laboratory data that is monitored for enteral nutrition include: sodium, potassium urea, creatinine, phosphate, magnesium, blood glucose, calcium, and albumin.

Table 2: Interpretation of Laboratory Values in Enteral Nutrition

Laboratory test	*Potential reason for abnormality*	*Potential treatment of abnormality*
Sodium (Na)	Elevated Na indicates dehydration whereas below normal Na can indicate edema.	Monitor hydration status; recommend changes in water flushes amounts if needed; consider IV i.e. suggest changing IV to D5W if appropriate for high Na or to NS if low sodium Recommend concentrated formulae for overhydrated patient; recommend standard formulae and additional fluids for underhydrated patient if disease state allows.
Potassium (K)	Only about 2% is present in fluids outside the cells (serum or plasma). Because the blood concentration of K is so small, minor changes can have significant consequences. Low K can reduce Mg levels. Refeeding syndrome, dehydration, and some medications can cause high K. Low K can be caused by medications, diarrhea, and vomiting.	Recommend K replacement (by protocol if available) Recommend renal-specific formulae for high K if needed. Monitor hydration status
Urea (BUN)	Increased BUN levels suggest impaired kidney function. It may also be due to a condition that results in decreased blood flow to the kidneys, such as congestive heart failure, shock, stress, recent heart attack, or severe burns, to conditions that cause obstruction of urine flow, or to dehydration. BUN concentrations may be elevated when there is gastrointestinal (GI) bleed, because of the proteins present in the blood. Low BUN levels may be seen in severe liver disease (because of reduced production of urea), malnutrition, and sometimes when a patient is overhydrated.	If related to kidney disease, consider changing to renal-specific enteral formulae, especially if eGFR < 60. If GI bleed present, continue feeding current formulae unless otherwise ordered to hold by physician. Monitor hydration status; if overhydrated and not receiving excessive IV, consider concentrated enteral formulae.

Creatinine	Almost all creatinine is excreted by the kidneys, so it is a good measure of kidney function. The quantity produced depends on a person's size and muscle mass i.e. creatinine is lower with amputations or paralysis; use in conjunction with the eGFR.	Recommend renal-specific enteral formulae if high creatinine associated with kidney disease. Monitor hydration status
Laboratory test	*Potential reason for abnormality*	*Potential treatment of abnormality*
Phosphate (PO4)	About 1% of total body PO4 is found within plasma. Ca and PO4 are related so that when one increases the other usually decreases. High PO4 may be caused by kidney damage.	Recommend PO4 replacement protocol Recommend correction of Ca if needed Recommend renal-specific formulae if needed for high PO4
Magnesium (Mg)	About half of the body's Mg is combined with Ca and PO4 to form bone. Need to replace K and Ca to improve and maintain Mg levels. Levels decreased in refeeding syndrome, diarrhea, vomiting, hypokalemia, hypocalcemia, and some medications (i.e. cisplatin)	Recommend Mg replacement protocol Recommend correction of K and Ca
Blood Glucose (BG)	Increased in diabetes, acute stress, steroid use, and refeeding syndrome. Decreased in liver disease, starvation, and alcohol use	Continue to monitor BG levels and normally treated with insulin if needed. Recommend diabetes-specific enteral formulae if needed.
Calcium (Ca)	PTH and vitamin D are responsible for maintaining calcium concentrations in the blood within a narrow range of values. Albumin is measured to calculate unbound calcium when ionized calcium unavailable. Low calcium can be seen with low Alb, low Mg, and high PO4. Calcium may increase with dehydration, high intake of vitamin D, hyponatremia, and low PO4.	Low calcium treated normally with IV calcium High calcium is normally treated by discontinuing vitamin D supplements, and if needed by Bisphosphonates. Recommend increased hydration if dehydrated and correction of related electrolyes i.e Na, PO4, Alb, Mg
Albumin (Alb)	Alb increases when a person is dehydrated or on insulin. Low Alb is seen in kidney disease (nephrotic syndrome), malnourishment, poor protein absorption (Crohn's or celiac) or liver damage. Alb has a half-life of about 20 days making it a less useful indicator of nutritional status. However, it is an effective indicator of morbidity and mortality.	Recommend adequate protein and/or calories Monitor fluid status Recommend elemental formulae if poor absorption of nutrients

2. *Gastric Residuals*
    a. Recommend Clinical Practice Guidelines for Management of Tube Feed Residuals
    b. Encourage clinical assessment of abdominal distension, fullness, bloating and discomfort
    c. Change to concentrated enteral formulae only if unable to resolve ongoing high residual volumes.

3. *Managing Other Complications*
    a. Diarrhea is often associated with medications or infectious causes. Many liquid medications are switched to enteral route at the initiation of enteral feeding. If appropriate, recommend screening patient for *Clostridium difficile*. If stool is positive, recommend initiating *Clostridium difficile* Pre-printed Orders. If not positive for *Clostridium difficile*, consider fibre-containing enteral formulae if appropriate. Consider changing to elemental enteral formulae if malabsorption likely.
    b. Constipation is rare in patients who are enterally fed but if present, the causes may include dehydration, inadequate activity, inadequate fibre or GI obstruction.
    c. Nausea/Vomiting/Abdominal Distension is often associated with ileus, delayed gastric emptying, or intolerance. Patient may benefit from more concentrated formulae at a slower rate, prokinetic, antinausea medication, or elemental formulae (if malabsorbing nutrients).

Enteral Access and Long Term Goals

1. *Home tube feeding*
    a. Insertion of Percutaneous Endoscopic Gastrostomy (PEG) tube may be recommended for patients requiring at least 6 weeks of enteral feeding. See PEG pre-printed orders for pre and post care of the PEG insertion. Start intermittent feeds according to orders post-PEG insertion. PEG tube may be changed every 18 months or earlier if needed.
    b. Insertion of a Radiology Inserted Gastrostomy tube may be recommended for patients requiring long term enteral feeding. There are no recommended replacement times for this tubing but typically it is replaced every 6-12 months.
    c. Instruct patient for home tube feeding using the handout on Home Tube Feeding. Order supplies for patient to pick up and ensure that current feeding schedule is similar to the one for home. Provide 3-4 days worth of formulae, bags, and water flush syringes to take home until supplies are available. Instruct patient on feeding schedule, flushing of tube, administration of enteral formula, allowing the patient and family to practice prior to discharge. Use the Home Tube Feeding Checklist (Appendix) to ensure all information is provided.
2. *Long term goals*
    Enteral feeding, in most cases, may be a component of an overall plan of care. Any changes in the plans of care require a review of the feeding goals.

Patient/Client/Resident Education

D Patient education while admitted. Provide education on home tube feeding is patient to receive enteral nutrition once home.

Documentation

Documentation according to Nutrition Assessment form used for all patients or clients seen.
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Developed By

Clinical Nutrition Practice Leader, Richmond Health Services

Endorsed By

Richmond Health Services Nutrition Committee

Nursing Professional Advisory Council, Richmond Health Services

Approved by RHS Nursing Professional Advisory Committee – April 2009

Date of Creation/Review/Revision

Original publication date: February 18, 2009

Revised: April 22, 2009,
September 16, 2009

Appendices: **See next page –** do not list appendices here. Refer to any Appendix information within the document so it can be directly linked.


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