A.S.P.E.N. Enteral Nutrition Practice Recommendations: Applying Them to Your Practice

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FOCUS 2013

Objectives

- Describe several serious adverse events associated with enteral feedings
- Review specific practice recommendations for
  - Enteral nutrition delivery
  - Enteral access
  - Enteral nutrition monitoring

A Bit Of History

- Rectal feeding – 1500 BC to 1950 AD
- Upper GI tract feeding used in the 16th C
- Oroduodenal and orojejunal feeding – 1910
- Enteral tube feeding techniques – 1939
- Chemically defined nutrient formulation - 1949
- Disease/disorder specific formulations - 1970

A.S.P.E.N. Enteral Nutrition Practice Recommendations - 2009

- Multidisciplinary task force established
- Charged by A.S.P.E.N. leadership to examine the literature related to:
  - Ordering enteral nutrition
  - Preparation of enteral nutrition
  - Delivery of enteral nutrition
  - Monitoring of the provision of enteral nutrition
- Establish evidence-based practice guidelines

A.S.P.E.N. Enteral Nutrition Practice Recommendations

- Limited research to support practice of many aspects of enteral nutrition support
- Consensus of expert opinion based on current knowledge and best practice
- Strength of each practice recommendation systematically graded
- Grading system based on the Agency for Healthcare Research and Quality (AHRQ), US Department of Health & Human Services criteria

A.S.P.E.N. Enteral Nutrition Practice Recommendations

- Evidence supporting each statement classified as:
  - A : There is good research-based evidence to support the guideline (Prospective, randomized trials)
  - B : There is fair research-based evidence to support the guideline (Well-designed studies without randomization)
  - C : The guideline is based on expert opinion and editorial consensus

Introduction

- Enteral nutrition (EN) is the delivery of enteral products through an enteral access device into a functioning gastrointestinal tract
  - Includes all practice settings
- Recognition by the health care practitioner is essential
  - areas for potential human error
  - administrative and organizational conditions that are conducive to error
  - the patient's own tolerance to EN

Adverse Events Related To Enteral Nutrition

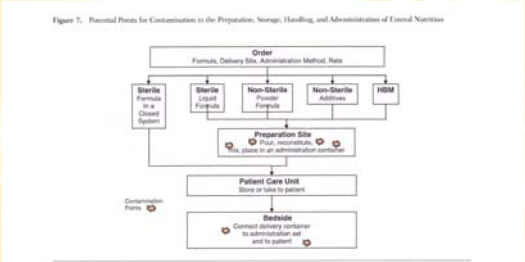
- Enteral misconnections
- Enteral access device misplacements/ displacements
- Metabolic abnormalities
- Mechanical tube complications
- Bronchopulmonary aspiration
- GI intolerance related to formula contamination
- Drug-nutrient interactions.

Question:

What safety issues are important to consider when administering enteral nutrition?

- Formula contamination
- Handling of formula during administration
- Hang times for various enteral formulas
- Formula stability

Contamination Points in Enteral Nutrition



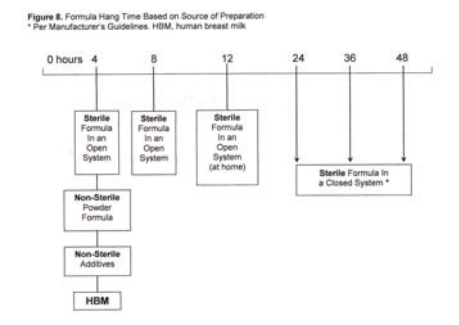
Formula Contamination/Handling

- Sterile, liquid EN formulas should be used in preference to powdered, reconstituted formulas (A)
  - Powdered formulas are not sterile
- Use of disposable gloves recommended when administering EN (A)
  - Setting up and manipulating EN feedings primary source of contamination
- Use a purified water or sterile water for irrigation supply for formula reconstitution and medication dilution (B)
  - Consider purified water for enteral access device flushes in at-risk patients

Formula Contamination/Handling

- Feeding pumps with drip chambers prevents retrograde contamination (A)
- A recessed spike on a closed system container is preferable (B)
- Change administration sets every 24-48 hours (A)
  - Closed system feeding sets have been demonstrated to be safe w/i this time period

Formula Hand Time



Formula Hang Time/Stability

- 8-hour hang time for decanted formula with adults (B)
- Powdered, reconstituted formulas and formulas with additives should have a 4-hour hang time (C)
- Closed system EN formulas may hang for 24-48 hours according to manufacturer recommendations (A)

Broncho-pulmonary Aspiration

- Patient positioning
  - Sustained supine position increases GE reflux and probability for aspiration
  - Pneumonia greater in those with frequent aspiration
  - Strategies for improving HOB elevation
    - Included in medical order sets
    - Staff education

Torres A. Ann Intern Med. 1992;116:540-543. Metheny N. Crit Care Med 2006;34:1-9.

Patient Positioning

- Elevate the backrest to a minimum of 30º, and preferably to 45º (A)
- Use the reverse Trendelenberg position to elevate the HOB (C)
- If necessary to lower the HOB for a procedure position as soon as feasible (C)

Aspiration Risk Factors

- Sedation
- Supine patient positioning
- Presence and size of nasogastric tube
- Malpositioned feeding tube
- Mechanical ventilation
- Vomiting
- Bolus feeding delivery
- High-risk disease or injury
- Poor oral health
- Nursing staffing level
- Advanced patient age

Metheny N. JPEN 2002;26(6 Suppl):S26-S31.

"No adequately powered studies have, to date, demonstrated a relationship between aspiration pneumonia and GRV"

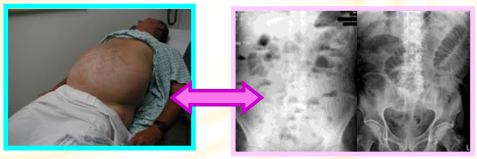
McClave S. Crit Care Med. 2005;33:324-330

Gastric Residual Volumes (GRV)

- Monitoring of gastric residual volumes
  - Practice is based on opinion and ritual
  - Frequency and method of measurement is undefined
  - Identified as the most significant contributor to underfeeding

Williams & Leslie, Int Crit Care Nurse, 2004

Physical Exam and Abdominal Film Distinguish Normal vs Abnormal Gastric Emptying (ileus) Better than GRVs



Physical Exam Abdominal Radiograph

- Physical exam findings correlate to radiographic findings (p=0.016)
- GRV failed to correlate with PE or Xray findings

McClave (JPEN 1992;16:99)

Research: Aspiration & GRVs

STUDY	OUTCOME	GRVs
Elpern, *AJCC*, 2004 Fiaccardori, *Kid Int*, 2004	Visible formula or glucose in secretions to detect aspiration	> 150 ml
McClave, *CCM*, 2005 Metheny, 2007	Laboratory methods to detect aspiration	0 to > 400 ml 0 to > 250 ml
Petrillo-Albarano, *Ped Crit Care Med*, 2006	Aspiration (not defined)	Not measured
Mentec, CCM, 2001 Kesek, *Clin Nutr*, 2002 Kompan, *Clin Nutr*, 2004	Pneumonia (variable clinical signs)	> 150-500 ml > 50-500 ml 200 ml x 2

Published in final edited form as:
Am J Crit Care. 2008 November ; 17(6): 512–520.

Gastric Residual Volume and Aspiration in Critically Ill Patients Receiving Gastric Feedings

Norma A. Metheny,
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Lynn Schallom,
Clinical nurse specialist at Barnes-Jewish Hospital, St Louis, Missouri
Dana A. Oliver, and
Biostatistician at the Cancer Center of Saint Louis University Medical Center, St Louis, Missouri
Ray E. Clouse
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- Prospective study of 206 critically ill patients receive gastric feeds 3 consecutive days. Residual volumes quantified as at least 150 ml, 200 ml or 250 ml.
- Frequent aspirators ≥ 40% tracheal secretions + pepsin
- Infrequent aspirators < 40% + for pepsin
- GRV compared within the 2 aspiration groups

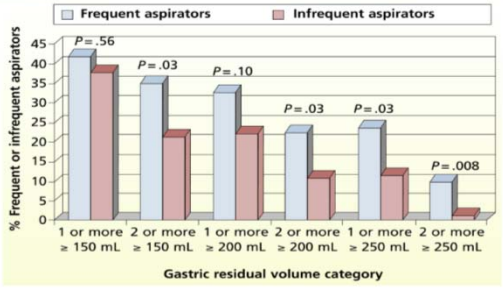


Figure 4.
Distribution of gastric residual volume categories in frequent and infrequent aspirators (univariate analysis, χ^2 analysis).

Am J Crit Care. 2008 Nov;17(6):512-9

Gastric Residual Monitoring Recommendations

- If the GRV is ≥ 250 mL after a second gastric residual check, a promotility agent should be considered in adult patients (A)
- A GRV >500 mL should result in holding EN and reassessing patient tolerance by use of an established algorithm (B)
- Consideration of a feeding tube placed below the ligament of Treitz when GRVs are consistently measured at > 500 mL (B)

Optimizing Enteral Feeding

- Aspiration Risk Reduction Protocol - ICU
  - Metheny, Nurs Research, 2010;59:18-25
- Advanced practice RN driven protocol
- Combined HOB, small bowel tube and GRV assessment
  - HOB - ≥ 30
  - GRV ≥ 200 ml X 1, prokinetic X 1
    - If GRV remains ≥ 200 ml, place small bowel tube

Optimizing Enteral Feeding

- Aspiration Risk Reduction Protocol - ICU
- Protocol initiated in 2008, compared to 2006 data
- HOB elevation increased 38 – 82% ($p<0.001$)
- SB tube placement increased 39% - 68% ($p<0.001$)
- Aspiration decreased 88% - 39% ($p<0.001$)
- Pneumonia decreased 48% - 19% ($p<0.001$)

Nurs Research, 2010;59:18-25

Are Pump Assisted Feedings Better Than Gravity Feedings?

- Base enteral delivery method and initiation and advancement of EN regimens on patient condition, age, enteral route (gastric vs small bowel), nutrition requirements, and GI status. (C)
- Shang E, et al, 2004; JPEN;28:180
- Prospective, randomized crossover trial (n=100)
- Compared pump assisted to gravity feedings
  - Pump: maximum 12 hr cycle feeding – 200-300 ml/hr
  - Gravity: 300 ml/hr over 5 hours
- Side effects measured included
  - Regurgitation, vomiting, pneumonia, diarrhea

Side Effects Between Pump and Gravity Feedings

TABLE III
Side effects in groups 1 and 2 during observation periods 1 and 2

	PA* (n = 50)	GC* (n = 50)	p**
Observation period 1			
Substrate intake (mL/h)	202 ± 11	306 ± 52	ns
Regurgitation (d/42d)	1 ± 1	12 ± 4	<.0002
Vomiting (d/42d)	0	6 ± 2	<.0009
Aspiration (d/42d)	0	5 ± 1	<.01
Pneumonia (d/42d)	0	4 ± 1	<.02
Diarrhea (d/42d)	0	10 ± 2	<.0007
Observation period 2			
Substrate intake (mL/h)	204 ± 13	315 ± 61	ns
Regurgitation (d/42d)	3 ± 1	17 ± 3	<.0002
Vomiting (d/42d)	0	5 ± 2	<.001
Aspiration (d/42d)	0	5 ± 1	<.001
Pneumonia (d/42d)	0	5 ± 1	<.001
Diarrhea (d/42d)	0	9 ± 3	<.007

*Mean ± SD, **significance level = $p < .05$; d/42d, Count of days of emergent symptoms during 42 days' observation; PA, pump-assisted nutrition; GC, gravity-controlled nutrition; ns, nonsignificant.

Shang E, et al, 2004; JPEN;28:180

Long Term Enteral Access Devices

- Successful long term EN requires careful selection of access device and proper maintenance
  - GI anatomy and motility
  - Prior GI surgery
  - Patency of the upper GI tract
  - Intended use
  - Intended length of therapy

- Long-term feeding devices should be considered when the need for enteral feeding is at least 4 weeks in adults, children, and infants after term age (C)

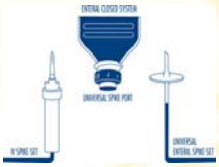
Long Term Enteral Feeding Devices

- Problem areas
  - Inappropriate use of urinary drainage catheters and other tubes not designed or intended for enteral feeding
  - Premature removal
  - Accidental catheter tip malposition
  - Excessive traction of the feeding device
- External and internal retention device ideal
  - To prevent migration
- Complications
  - Buried bumper syndrome
  - Peritonitis

Long Term Enteral Feeding Devices

- Document tube type, tip location, and external markings in the medical record and in follow-up examinations (C)
- Avoid placement of catheters or tubes not intended for use as enteral feeding devices (B)
- Evaluation by a multidisciplinary team is indicated prior to insertion of a long-term feeding device to establish whether:
  - benefit outweighs the risk of access placement
  - insertion of feeding tubes near end of life is warranted

Enteral Misconnections



An inadvertent connection between an enteral feeding system and a non-enteral system

Enteral Misconnections

- First report in 1972 with IV infusion of breast milk
- April 2006 - The Joint Commission issued a Sentinel Event Alert on tubing misconnections
- Review in 2007 reported up to 60 published reports of enteral misconnections
- Reports to the FDA cite key factors
  - confusion about a new patient's medical history
  - confusion during patient transfer to another department
  - treatment situations that require nurses to perform multiple tasks simultaneously and quickly
  - devices with different functions that appear similar

Simmons D, Graves K. Small bore medical connectors reference list. 2007; http://www.jointcommission.org/assets/1/18/SEA_36.PDF

Enteral Misconnections

Related Factors	Number of Cases	Number of Sentinel Events	Percent of Cases with Sentinel Events (Life-Threatening or Fatal)
Use of Syringe Pump and IV Tubing	1	0	0
Use of Ready-to-Hang Enteral Containers/Bags and IV Tubing	3	2	66%
Enteral Meds Administered IV (Used IV Syringe)	13	3	23%
Other Solution Intended for Enteral Route given IV	4	2	50%
Enteral Tube Not in Place, Med Given IV	3	1	33%
Total	24	8	33%

Table 1. Reported Enteral Misconnections and Related Factors (Jan. 2000–Dec. 2006). Data supplied by USP MEDMARX and USP-ISMP Medication Errors Reporting Program. Reprinted with permission from Guenter P, Hicks, RW, Simmons D, et al. Enteral feeding misconnections: A consortium position statement. The Joint Commission Journal on Quality and Patient Safety. 2008; 34(5):285-292.

Guenter P. Safe Practices in Patient Care, Vol 4 No. 2

Enteral Connections Practice Recommendations – All Grade C

- Do not modify or adapt IV or feeding devices
- Practitioners should routinely trace lines back to their origins
- When arriving at a new setting or as part of a hand-off process, staff should recheck connections and trace all tubes
- Identify and confirm the EN label, because a 3-in-1 PN admixture can appear similar to an EN formulation bag
- Purchase pre-filled enteral feeding containers with design technology labeled non-IV compatible.

To Summarize

- Enteral nutrition is not without adverse events/complications
- Recognition of ordering, administration, and monitoring steps of EN delivery which may increase risk of complications is essential
- Specific practice recommendations provided to optimally provide EN
- Further research is needed

Thank You!! – Questions??