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Fiber-Enriched Enteral Formulae: Advantageous or Adding Fuel to the Fire?

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Individuals receiving enteral nutrition may experience a variety of gastrointestinal symptoms and multiple factors have been implicated in their development. The addition of fiber to the enteral formula has been proposed to normalize bowel function and improve feeding tolerance; however, in the setting of certain comorbidities or severe stress due to critical illness, fiber may not be tolerated, and may even be contraindicated. At present, the amount and type of fiber and the clinical utility of adding fiber to enteral formulae remains controversial due to generally weak and conflicting data in the published literature.

The Origins of Fiber-Containing Enteral Nutrition: Phoenix Rising

Knowledge of the physiology of nutrient digestion and absorption was used in the formulation of early enteral diets. The earliest enteral diets contained little fiber as they were designed for space travel to provide beneficial stool characteristics (e.g., low stool weight and frequency) in addition to balanced nutrition.[1] It soon became apparent that another advantage of the low fiber formula was low viscosity that allowed easier administration via nasoenteral feeding tubes in hospitalized patients. Advances in fiber research in the 1970s and 1980s led to the view by many that supplementing fiber in the diet might prevent many conditions associated with Western societies. This idea that dietary fiber was beneficial to general health together with early research demonstrating a bowel regulating effect of fiber led to the suggestion that enteral diets should be supplemented with fiber. Technical impediments to fiber administration via a nasoenteral tube, namely the increased viscosity and sedimentation, have subsequently been mostly overcome and several fiber-enriched enteral formulae are now commercially available. Nevertheless, controversy remains about their efficacy, tolerability and, ultimately, their role in clinical practice.

Enteral nutrition (EN) is the preferred method of nutritional support for patients who cannot achieve sufficient oral intake and who have at least a partially functioning gut. A variety of gastrointestinal (GI) symptoms may occur in patients receiving EN including

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diarrhea, constipation, nausea, vomiting and bloating. Multiple factors may contribute to the development of these symptoms including concomitant medications, bowel anatomy, underlying comorbidities, changes in gut microbiota, hydration status, administration method and formula contamination. The influence of the type of formula in contributing to the development of GI symptoms in the enterally fed patient remains controversial. It has been suggested that the addition of fiber to enteral formulas may help to alleviate alterations in bowel function; however, fiber has well described effects on the gut and may cause multiple unwanted GI symptoms potentially leading to intolerance of EN. This review will evaluate the evidence for and against the clinical use of fiber-containing enteral formulae.

Definition, Types and Effects of Fiber on the Gut: Friendly Fire

It is generally accepted that dietary fiber refers to indigestible carbohydrates that when consumed may provide beneficial health effects. Fiber can be classified by chemical structure, solubility, viscosity, and fermentability, but is most commonly classified into soluble or insoluble forms.[2] EN formulae may be supplemented with fibers of different types and may contain a single source or a blend of fiber types (Table 1).[3] Early fiber-containing formulae contained poorly fermentable soy polysaccharides increasing the viscosity and leading to sedimentation and an increased risk of feeding tube occlusion, especially in tubes with a diameter < 10 French.[4] The composition of the fiber ingredients has evolved toward the use of blends of both soluble and insoluble fiber resulting in less tube clogging.[5]

Depending on the type of fiber used, different physiological effects on the gut may occur.[6] Fermentation of fiber by colonic bacteria produces short-chain fatty acids (SCFAs) that act as an energy source for colonocytes, affect the absorption of water and electrolytes in the colon, and may make a significant contribution to daily energy balance.[7] For every 10 g of carbohydrate that reaches the colon, 1 L of gas from fermentation may be produced.[8] Stool weight is increased due to the amount of water held by the fiber and from fermentation of the fiber which increases bacterial mass,[9] all of which promotes bowel regularity, aiding in formation of soft-formed stools and facilitating stool emptying.[3,10,11]

Previous concern regarding fiber impairing mineral and micronutrient absorption may have been overstated.[12] However, intake of dietary fiber can decrease the effectiveness of some medications. Guar gum has been shown to reduce absorption of acetaminophen, bumetanide and digoxin and lessen the absorption of metformin, penicillin and some formulations of glyburide when taken together.[13] Lovastatin absorption declines with concomitant use of pectin.[13] Finally, oat bran may interfere with the absorption of lipid-lowering agents while wheat bran can interfere with levothyroxine.[4]

Utility of Adding Fiber to Enteral Formulae: Conflagration of Data

A number of clinical studies have examined the effects of fiber-enriched enteral formulae on gut function and have shown conflicting findings.[14] These inconsistent results reflect a number of methodological differences including patients studied, confounding factors such as medications, comorbidities, immobility, types of interventions and endpoints.

There have been 3 systematic reviews published that focus on the clinical role of fiber-enriched enteral formulae. The first study identified 25 studies published prior to 2002 that compared fiber-free formulae with isocaloric, isonitrogenous fiber-containing formulae.[15] No decrease in diarrhea in the critically ill and post-surgical populations was found when fermentable fiber was added to enteral formulae. Although insoluble fiber seemed to show an increased frequency in bowel movements and a decreased need for laxatives, these findings were also not significant. Finally, there was no difference in bowel movement frequency in healthy individuals with normal bowel function when administered formula with or without fiber. Yang et al. included 7 randomized, controlled studies published prior to 2003 examining the occurrence of diarrhea in hospitalized patients and did not show a significant reduction in the occurrence of diarrhea in those receiving fiber-enriched enteral formulae.[16] Both studies concluded that there was insufficient evidence to recommend the routine use of fiber-containing formulae.

Most recently, Elia and colleagues conducted the most comprehensive and statistically rigorous systematic review and meta-analysis of fiber-containing enteral formulae; however, numerous limitations of the studies examined exist that constrain the conclusions that can

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Table 1. Commercially Available Adult Fiber-Containing Enteral Formulae

Fiber Containing Adult Formulas	Fiber Source(s)	Grams of Fiber per Liter	Soluble Fiber	Insoluble Fiber
Nestle				
Compleat®	PHGG, vegetables	6	✓	✓
Diabetisource® AC	FOS, PHGG, soy fiber, fruits, vegetables	15.2	✓	✓
Fibersource® HN	Soy fiber, PHGG	10	✓	✓
Glytrol®	Pea fiber, gum acacia, FOS, inulin	15.2	✓	✓
Impact Advanced Recovery®	PHGG	15	✓	
Isosource® 1.5 Cal	Soy fiber, PHGG	8	✓	✓
Nutren 1.0® Fiber	Pea fiber, FOS,inulin	14	✓	✓
Peptamen AF®	FOS, Inulin	5.2	✓	
Peptamen® 1.5 with Prebio1™	Inulin, FOS, guar gum	6.5	✓	
Peptamen® Bariatric	FOS, inulin, guar gum	4.4	✓	
Peptamen® with Prebio1™	Inulin, FOS, guar gum	4	✓	
Replete® Fiber	Soy fiber	14		✓
Abbott				
Glucerna® 1.0 Cal	Soy fiber	14.4		✓
Glucerna® 1.2 Cal	FOS, oat and soy fiber	16.1	✓	✓
Glucerna® 1.5 Cal	FOS, oat and soy Fiber	16.1	✓	✓
Jevity® 1 Cal	Soy fiber	14.4		✓
Jevity® 1.2 Cal	FOS, oat and soy fiber, gum arabic	18	✓	✓
Jevity ® 1.5 Cal	FOS, oat and soy fiber, gum arabic	22	✓	✓
Nepro® with Carb Steady®	FOS	12.6	✓	
Perative®	FOS	6.5	✓	
Pivot® 1.5 Cal	FOS	7.5	✓	
Promote® with Fiber	Oat and soy fiber	14.4	✓	✓
Suplena® with Carb Steady®	FOS	12.7	✓	
TwoCal® HN	FOS	5	✓	
Vital AF 1.2 Cal™	FOS	5.1	✓	
Vital® 1.0 Cal	FOS	4.2	✓	
Vital® 1.5 Cal	FOS	6	✓	

PHGG, partially hydrolyzed guar gum; FOS, fructo-oligosaccharides

http://www.nestlehealthscience.us/products http://abbottnutrition.com/product/product-handbook-landing

Fermentable Fiber	Non-Fermentable Fiber	Viscous Fiber	Non-Viscous Fiber	Potential FODMAPs (Fiber or Carbohydrate Source)
✓	✓		✓	✓
✓	✓		✓	✓
✓			✓	✓
✓	✓		✓	✓
✓			✓	✓
✓			✓	
✓	✓		✓	✓
✓			✓	✓
✓		✓	✓	✓
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be made.[17] Fifty-one studies including 43 randomized, controlled trials in adults and children receiving EN as their sole source of nutrition for at least 3 days were included in the analysis. They found significant benefits from fiber-supplemented enteral formula for patients with diarrhea, particularly in those with a high baseline incidence of diarrhea. Nevertheless, significant heterogeneity among the studies was identified resulting mainly from studies conducted in intensive care unit patients in whom the clinical effects of fiber are far more variable. Fiber significantly reduced stool frequency in those with diarrhea and increased stool frequency in those with constipation, demonstrating a regulating effect of fiber on bowel function. These effects were, however, most noticeable when the baseline frequency of bowel movements was high or low, respectively, suggesting the possibility of bias associated with regression to the mean. Fiber mixtures were found to be better tolerated than single fiber-containing formulae. The authors' concluded that fiber-containing enteral formulae exhibit clinically relevant physiologic effects and clinical benefits and should be considered as first-line treatment in enterally fed patients.

As alluded to previously, it is important to note the many limitations of the clinical data available for use in this systematic review. First, information on the fiber sources used was rarely described in the papers. Fifteen different types of fibers were utilized in the individual studies including both single and mixed blends and a large range in the amount of fiber used was noted – some studies did not even quantify the amount of fiber used. Second, minimal data were obtained from long-term care facilities where insight on fiber-containing formulae is particularly important given the high prevalence of altered bowel habits in this setting. Third, there were a variety of definitions of constipation and diarrhea used in the individual studies. Fourth, many studies did not specify a clear primary endpoint and lacked justification of the sample size studied. Finally, only 15 of the 51 studies reported antibiotic use and its route of administration and other potentially confounding problematic medications and infections were also missing from this review.

A variety of fiber types are used in commercially available enteral formulae (Table 1). Although the clinical benefits of specific types of fiber remain unclear, partially hydrogenated guar gum (PHGG) added to enteral formulae has generated supportive evidence in preventing diarrhea.[18, 19] Theoretically, combining different fibers in lower doses may result in better tolerance. Mixed fibers or fiber blends may also have more beneficial physiological effects on the body as they will more closely resemble a normal mixed diet. There are a number of commercially available fiber blends; however, further studies comparing mixed fiber blends are needed to determine the most appropriate combinations and dosing.[3]

Enteral Nutrition, Fiber and the Critically Ill: Firestorm of Controversy

Although there may be some benefit from the addition of fiber to enteral formulae, at least in certain patient populations, a fiber-supplemented formula should be used judiciously. In particular, concern exists regarding the use of fiber-containing enteral formulae in the critically ill due to the potential for alterations in splanchnic perfusion possibly placing the patient at risk of mesenteric ischemia.[20] The redistribution of blood flow also increases stress demands on enterocytes, which may lead to mucosal injury and interfere with nutrient absorption.[21] Use of a fiber-free, polymeric formula has been recommended in this population to minimize this risk.[20, 21] Irrespective of the formula chosen, close and careful monitoring is recommended upon initiation of EN in this population.[20, 21]

GI Symptoms and Enteral Nutrition: Fanning the Flames of the GI Tract

Gastrointestinal symptoms are often associated with EN. Although differing definitions have made it difficult to determine its true prevalence, diarrhea is the most common "complication" of enteral feeding, at least in the hospital setting.[5, 22, 23] Diarrhea is particularly distressing for patients and their families due to the risk of fecal incontinence, infected decubitus ulcers, and fluid/electrolyte imbalance. While the enteral formula is often blamed for diarrhea, there are a number of other potential causes that are more likely to be responsible including formula administration method, medications, infection, underlying disease and/or alterations in gut anatomy and/or microbiota. In many instances, the etiology may be multifactorial.[24] Simply changing to a fiber-containing formula as the first option may delay both the diagnosis and appropriate treatment of the diarrhea.[25]

Although constipation is often seen in patients on EN and is probably more common than diarrhea, it is

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Table 2. Global Recommendations Regarding Use of Fiber Containing Enteral Formulae

Society	Geographic Origin/Year	Rationale for Using Fiber
American Society for Parenteral and Enteral Nutrition (ASPEN) Society of Critical Care Medicine (SCCM)	United States 2009	Patients with persistent diarrhea (in whom hyperosmolar agents and *C. difficile* have been excluded) may benefit from use of a soluble fiber-containing formulation or small peptide semi-elemental formulation. Three small level II studies using soluble PHGG demonstrated a significant decrease in the incidence of diarrhea in patients receiving EN.
British Association of Parenteral and Enteral Nutrition (BAPEN) British Society of Gastroenterology (BSG)	United Kingdom 2003	SCFAs promote salt and water reabsorption in the colon and also limit growth of pathogenic bacteria due to lower colonic pH. Fiber enriched feeds aim to increase the overall colonic bacterial population and hence stool mass and water absorptive capacity and seem to normalize transit times.
Canadian Critical Care Practice Guidelines Committee	Canada 2003	Not addressed in guidelines.
European Society for Clinical Nutrition and Metabolism (ESPEN)	Europe 2006	A dietary fiber intake of 15-30 g/day is recommended in patients on EN as this is what is recommended for healthy persons. The main purpose using fiber containing formulae is feeding the gut to maintain gut physiology and for glycemic and lipid control. In acute illness, fermentable fiber is effective in reducing diarrhea in patients after surgery and in critically ill patients. PHGG and pectin are superior to soy polysaccharides. In non-ICU patients or in patients requiring long-term EN the use of a mixture of bulking and fermentable fiber would appear to be the best approach.
Fiber Consensus Group	International Physicians 2004	PHGG is effective in reducing enteral nutrition associated diarrhoea in patients after surgery and in critically ill patients. Soy polysaccharides, or soy polysaccharide combined with oat fiber are effective to increase daily stool weight and frequency in individuals on enteral feedings.
Spanish Society of Intensive Care Medicine and Coronary Units (SEMICYUC) Spanish Society of Parenteral and Enteral Nutrition (SENPE)	Spain 2011	Soluble fiber may be beneficial in patients developing diarrhea while receiving EN.

PHGG, partially hydrolyzed guar gum; EN, enteral nutrition; SCFAs, short chain fatty acids; IBD, inflammatory bowel disease

Rationale for Not Using Fiber
Insoluble fiber has not been shown to decrease the incidence of diarrhea in the ICU patient. Cases of bowel obstruction in surgical and trauma patients who were provided enteral formulations containing insoluble fiber have been reported.
Both soluble and insoluble fiber should be avoided in patients at high risk for bowel ischemia or severe dysmotility.
Little evidence that fiber enriched feeds helps with EN-related diarrhea.
Lack of definite benefit may also relate to some problems when manufacturing fiber enriched feeds, which need to contain small particles of non-starch polysaccharide or other insoluble carbohydrate components in order to limit viscosity. Small particles ferment easily and hence little fiber reaches the distal colon where it can help to absorb fecal water.
There are insufficient data to support the routine use of fiber in enteral feeding formulae in critically ill patients.
Not addressed in guidelines.
Contraindications for adding fiber to enteral nutrition include intestinal or colonic strictures (e.g. IBD), fistulae (liquid fiber could be used, but there is no data on this topic) and gastroparesis (except when post pyloric access could be reached). The level of evidence for this recommendation is poor.
Both soluble and insoluble fibers must be avoided in patients at a high risk of intestinal ischemia or intestinal motility disorders. Cases of intestinal obstruction in non-surgical patients who were given an enteric formulation with insoluble fiber have been described

not caused by the EN itself.[26] Much like diarrhea, large interindividual variation and differences in perception of normal bowel habits makes defining a constipated state difficult. Importantly, constipation may cause abdominal distension, vomiting, bowel obstruction and bowel perforation and has been associated with difficulties in weaning from mechanical ventilation, prolonged length of ICU stay and increased ICU mortality.[27, 28] In addition to inadequate fiber intake, there are multiple other factors that increase the risk of constipation in an enterally fed patient including insufficient fluid intake, medications (especially narcotics), underlying dysmotility, inadequate calorie and/or carbohydrate intake, reduced physical activity and limited access to the toilet.[29] It should be noted that certain patient populations prone to constipation from underlying dysmotility may not tolerate fiber.[8, 30, 31]

The development of fecal impaction with overflow incontinence may be confused with diarrhea in the enterally fed patient.[32] Following disimpaction, it is important to identify and eliminate potential causes to prevent recurrence.This includes discontinuing medications that may contribute to constipation, improving the availability of toileting, and regular use of medications to treat the constipation. The benefit of altering the patients' fiber and fluid intake in this setting requires further study. There is a paucity of evidence to support the use of fiber-containing enteral formulae with respect to increasing stool frequency or stool weight in patients on long-term EN support.[1]

Nausea may occur in up to 20% of patients receiving EN with multiple causes unrelated to the formula including underlying disease process, treatment of the disease process, alterations in patient gastrointestinal motility/physiology or the rate and/or site of infusion.[32] Similar factors may also be responsible for the bloating and cramping that occasionally occurs. The role of fiber in the pathogenesis of these symptoms remains unclear. These symptoms will usually resolve in a matter of days to weeks. Management most commonly consists of use of antiemetic and/or prokinetic medications or a temporary slowing of the rate of tube feeding.

Fiber in Enteral Formula Guidelines: Conundrum Combustion

The controversy regarding fiber and its presence or absence in enteral formulae becomes evident upon review of national and international society recommendations and guidelines (Table 2). There

are conflicting views among professional societies on fiber-supplemented formulae;[25, 33-36] some, including the Academy of Nutrition and Dietetics,[37] Intensive Care Society of Ireland[38] and Australia and New Zealand Intensive Care Society,[39] do not mention fiber in their guidelines. There are multiple reasons for the differences in recommendations from these societies including the inclusion of different patient populations, lower levels of evidence required in the guideline production process, lack of clarity between the evidence and the recommendation, and a lack of a uniform reporting of levels of evidence and grade of recommendation.[40] Clearly, guideline users need to be aware of the differences in these guidelines before applying the recommendations to their daily clinical practice.

CONCLUSION

Gastrointestinal symptoms occur commonly in the enterally fed patient. The influence of the type of formula in contributing to the development of GI symptoms remains controversial. Although fiber is thought by many clinicians to be a "natural and healthy" addition to a normal diet, thus far, translating that into a clearly beneficial role in patients requiring enteral feeding either in the hospital or long-term care setting has not been convincingly demonstrated. Because there are patients in whom fiber should be avoided and others in whom fiber may exacerbate GI symptoms, until more evidence is available supporting the addition of fiber to enteral formulae, we recommend its judicious use. ■

References

1. Silk DB: Fibre and enteral nutrition. Gut 1989;30(2):246-64.
2. Anderson JW, Baird P, Davis RH Jr, et al: Health benefits of dietary fiber. Nutr Rev 2009;67(4):188-205.
3. Klosterbuer A, Zamzam FR, Slavin J: Benefits of dietary fiber in clinical nutrition. Nutr Clin Pract 2011;26(5):625-635.
4. Gottschlich MM. Fiber. In: The ASPEN Nutrition Support Core Curriculum: A case-based approach – the adult patient. American Society for Parenteral and Enteral Nutrition, Silver Spring, MD, 2007;88-103.
5. Whelan K, Schneider SM: Mechanisms, prevention, and management of diarrhea in enteral nutrition. Curr Opin Gastroenterol 2011;27(2):152-159.
6. Hillemeier C: An overview of the effects of dietary fiber on gastrointestinal transit. Pediatrics 1995;96(5 Pt 2):997-9.
7. Elia M, Cummings JH: Physiological aspects of energy metabolism and gastrointestinal effects of carbohydrates. Eur J Clin Nutr 2007;61 Suppl 1:S40-74.
8. Schiller LR: Nutrients and Constipation: Cause or Cure? Pract Gastroenterol 2008;61:43-49.
9. Slavin JL: Position of the American Dietetic Association: health implications of dietary fiber. J Am Diet Assoc 2008;108:1716-1731.
10. Raninen K, Lappi J, Mykkänen H, et al: Dietary fiber type reflects physiological functionality: comparison of grain fiber, inulin, and polydextrose. Nutr Rev 2011;69:9-21.
11. Institute of Medicine, Food and Nutrition Board. Dietary Reference Intakes: Energy, Carbohydrates, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, DC: National Academies Press; 2002.
12. Bowen PE, Taper LJ, Milam R, et al: Mineral absorption using fiber-augmented liquid formula diets. JPEN J Parenter Enter Nutr 1982;6:575.
13. http:// lpi.oregonstate.edu/infocenter/phytochemicals/fiber/. Accessed August 11, 2013.
14. James SL, Muir JG, Curtis SL, et al: Dietary fibre: a roughage guide. Intern Med J 2003;33:291-296.
15. del Olmo D, Lopez del Val T, Martinez de Icaya P, et al: La fibre en nutricion enteral: revision sistematica de la literatura. Nutr Hosp 2004;19:167-174.
16. Yang G, Wu X-T, Zhou Y, et al: Application of dietary fibre in clinical enteral nutrition: a meta-analysis of randomized controlled trials. World J Gastroenterol 2005;11:3935-3938.
17. Elia M, Engfer MB, Silk DBA: Systematic review and meta-analysis: the clinical and physiological effects of fibre containing enteral formulae. Aliment Pharmacol Ther 2008;27(2):120-145.
18. Slavin JL, Greenberg NA: Partially hydrolyzed guar gum: Clinical nutrition uses. Nutrition 2003;19(6):549-552.
19. Spapen H, Van Malderen C, Opdenacker G, et al: Soluble fiber reduces the incidence of diarrhea in septic patients receiving total enteral nutrition: a prospective, double-blind, randomized, and controlled trial. Clin Nutr 2001;20(4):301-305.
20. Turza KC, Krenitsky J, Sawyer RG: Enteral feeding and vasoactive agents: suggested guidelines for clinicians. Pract Gastroenterol 2009;78:11-22.
21. Cresci G, Cúe J: The patient with circulatory shock: to feed or not to feed? Nutr Clin Pract 2008;23(5):501-9.
22. Bliss DZ, Guenter PA, Settle RG: Defining diarrhea in tube-fed patients – what a mess! Am J Clin Nutr 1992;55:753-759.
23. Montejo JC: Enteral nutrition-related gastrointestinal complications in critically ill patients: a multicenter study. The Nutritional and Metabolic Working Group of the Spanish Society of Intensive Care Medicine and Coronary Units. Crit Care Med 1999;27(8):1447-53.
24. Edes TE, Walk BE, Austin JL: Diarrhea in tube-fed patients: feeding formulas not necessarily the cause. Am J Med 1990;88:91-93.
25. McClave SA, Martindale RG, Vanek VW, et al: Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). JPEN J Parenter Enter Nutr 2009;33(3):277-316.
26. Shankardass K, Churchmach S, Chelswick K, et al: Bowel function of long-term tube-fed patients consuming formulae with and without dietary fiber. JPEN J Parenter Enter Nutr 1990;14:508-512.
27. Gacouin A, Camus C, Gros A, et al: Constipation in long-term ventilated patients: associated factors and impact on intensive care unit outcomes. Crit Care Med. 2010 Oct;38(10):1933-8.
28. Mostafa SM, Bhandari S, Ritchie G, et al: Constipation and its implications in the critically ill patient. Br J Anaesth. 2003 Dec;91(6):815-9.
29. Btaiche IF, Lingtak-Neander C, Pleva M, et al: Critical illness, gastrointestinal complications, and medication therapy during enteral feeding in critically ill adult patients. Nutr Clin Pract 2010;25(1):32-49.
30. Gabbard SL, Lacy BE: Chronic intestinal pseudo-obstruction. Nutr Clin Pract 2013 Jun;28(3):307-16.
31. Parrish CR, McCray S: Gastroparesis and nutrition: The art. Pract Gastroenterol 2011;99:26-41.
32. Boullata J, Carney LN, Guenter P. Complications of Enteral

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Nutrition. In: ASPEN Enteral Nutrition Handbook. American Society for Parenteral and Enteral Nutrition. Silver Spring, MD, 2010;267-307.
33. Lochs H, Allison SP, Meier R, et al: Introductory to the ESPEN Guidelines on Enteral Nutrition: Terminology, definitions and general topics. Clin Nutr 2006;25(2):180-6.
34. Stroud M, Duncan H, Nightingale J: British Society of Gastroenterology. Guidelines for enteral feeding in adult hospital patients. Gut 2003;52 Suppl 7:vii1-vii12.
35. Heyland DK, Dhaliwal R, Drover JW: Canadian Critical Care Clinical Practice Guidelines Committee. Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. JPEN J Parenter Enter Nutr 2003;27(5):355-73.
36. Sánchez Álvarez C, Zabarte Martínez de Aguirre M, Bordejé Laguna L: Metabolism and Nutrition Working Group of the Spanish Society of Intensive Care Medicine and Coronary units. Guidelines for specialized nutritional and metabolic support in the critically-ill patient: update. Consensus SEMICYUC-SENPE: gastrointestinal surgery. Nutr Hosp 2011;26 Suppl 2:41-5.
37. Critical Illness Evidence Analysis Project by the American Dietetic Association, http://andevidencelibrary.com/topic.cfm?cat=3039 Accessed August 11, 2013.
38. Critical Care Programme Reference Document for Nutrition Support Guideline 2012 (Adults), http://www.irspen.ie/wp-content/uploads/2013/01/Critical-Care-Programme-Nutrition-Support-Reference-Document-2013-update.pdf Accessed August 11, 2013.
39. Doig GS, Simpson F. Evidence-based guidelines for nutritional support of the critically ill: results of a bi-national guideline development conference. EvidenceBased.net, Sydney, NSW, Australia, 2005.
40. Dhaliwal R, Madden SM, Cahill N: Guidelines, guidelines, guidelines: what are we to do with all of these North American guidelines? JPEN J Parenter Enter Nutr 2010;34(6):625-43.

AUTHOR ADDENDUM/CORRECTION

We regret the following oversights in our article, "**Chronic Constipation in Children: An Overview**" by Ritu Walia, Nicholas Mulhearn, Raheel Khan, Carmen Cuffari, which appeared in our July 2013 issue (Vol. XXXVII No. 7, pp. 19, 26). Specifically, on page 19, our author Nicholas Mulhearn's name is spelled incorrectly as Mulheran. The correct spelling of his name is Nicholas Mulhearn. On page 26, Almivopan is incorrect. The correct spelling is "Alvimopan".

The Editors

This article has been updated on our website: practicalgastro.com