

## Rapid Communication

# Nutrition in Critically Ill Patients

Omar Assasa<sup>1</sup> and Fayez Kheir<sup>2\*</sup><sup>1</sup>University of Balamand, Lebanon<sup>2</sup>Department Pulmonary Diseases, Tulane University Health Sciences Center, Louisiana

**\*Corresponding author:** Fayez Kheir, Department Pulmonary Diseases, Critical Care, & Environmental Medicine, Tulane University Health Sciences Center, 1430 Tulane Avenue, SL-9, New Orleans, LA 70112, Louisiana, Tel: 504-988-3541; Fax: 504-988-2144; Email: fkheir@tulane.edu

**Received:** July 22, 2014; **Accepted:** July 24, 2014;**Published:** July 26, 2014

## Keywords

Critical care; Enteral Nutrition; Parenteral Nutrition

## Introduction

The use of nutrition in treating diseases isn't a new born concept. Many philosophers and ancient physicians like Hippocrates and Celsius used food to treat several diseases and improve patient's health. However the term "Dietetics" wasn't introduced until the 19<sup>th</sup> century, where nutrition is now considered one of the basic fundamentals in the management of critically ill patients [1]. It is well established that early enteral feeding support during critical illness decreases length of stay in the intensive care unit (ICU), disease severity, time of mechanical ventilation, morbidity and mortality as well as maintains gut barrier [2-5]. Malnutrition is one of the most complicated challenges that critical care physicians might face in ICU. Many physiologic changes occur in response to stress leading to increase in protein catabolism, decrease in lean body mass thus leading to increase in infection rate and wound dehiscence [6]. Although current guidelines support the use of nutritional therapy in critically ill patients, many ICU patients still receive inadequate feeding [7].

## Enteral Nutrition

Gastrointestinal tract is the major organ of digestion and absorption, barrier against bacteria and toxins as well as major secretion site of immune globulins, especially IgA [8]. Maintaining that barrier through enteral feeding will stimulate intestinal growth and function, directly by supplying substrates for enterocyte oxidation and indirectly by promoting hormonal secretion which all together prohibit bacterial translocation and decrease rate of infection [8].

Enteral nutrition (EN) should be initiated early (within 48 hours) from the time of admission to ICU in patients who are unable to maintain oral intake independently [1,9-10]. Although EN should provide 25 to 30 kcal/kg/day and 1-2 g/kg/day protein to most critically ill patients, nutritional support should also be adjusted according to patient's overall clinical status and body habitus. For instance, morbidly obese patients should receive less total caloric intake (between 14 to 18 kcal/kg/day and 2.5 g/kg/day protein).

"Bowel rest" is a misguided myth being used especially in some disorders such as inflammatory bowel disease, diverticulitis, acute and chronic pancreatitis believing that removal of stimulus will cause less damage and inflammation to the gastrointestinal tract. However, protein and lipid rich formula may have an anti-inflammatory effect on gastrointestinal mucosa and initiating early EN might improve patient outcome [11-12].

Moreover, hemodynamic stability is an important aspect in ICU patients and could be maintained by vasopressors with shunting blood from peripheral circulation to the brain and heart. Clinicians speculated that decrease blood flow to the gut together with the introduction of enteral feeding would lead to intestinal ischemia. However, Berger et al showed that even in hemodynamically unstable cardiac surgery patients receiving EN, intestinal absorption was preserved during vasopressor administration [13]. Never the less, it is still recommended to hold EN in hemodynamically unstable patients requiring escalating doses of vasopressors. Furthermore, many mechanically ventilated ICU patients have delayed nutrition, since intensivists are dealing with other acute emerging issues during patient care. However, Barr et al showed that early nutritional management was associated with early weaning from mechanical ventilation and decreased risk of death [14].

Many nurses and physicians are often reluctant to resume EN when there is an increase in gastric residual volume (GRV) as it might be a risk for aspiration pneumonia. This will cause lower caloric intake in such critically ill patients. However, Mc Clave et al showed that the prevalence of aspiration was similar between a group of patients with GRV more than 200 ml and those with GRV of more than 400 ml [15]. Furthermore, ventilator associated pneumonia rates were similar in patients with and without frequent GRV monitoring [16]. Although it was believed that bowel sounds are needed to initiate caloric feeding, guidelines recommend that in ICU patients neither bowel sounds nor passage of flatus is required for caloric feeding [1].

Furthermore, early post-operative enteral feeding might be well tolerated in patients who had recent gastrointestinal surgery and had shown to decrease post-operative complications such as infections, improve wound healing and decrease hospital stay [17-18]. However, EN should be stopped if abdominal distension, vomiting and pain develop.

It was believed that in patients who develop acute pancreatitis, total parenteral nutrition (TPN) and bowel rest were the treatment of choice. Multiple randomized controlled trials and meta-analyses have shown that early EN is associated with less infectious complications, organ failure, hospital stay and mortality when compared with parenteral feeding [19-20] Table 1 summarizes EN recommendations for critically ill patients.

## Total Parenteral Nutrition

TPN, developed in the 1960s, is mostly indicated when enteral or oral routes cannot provide adequate nutrients to patients. It is

**Table 1:** Enteral Nutrition for Critically Ill Patients.

Initiate enteral nutrition early within 48 hours of admission
Usually provide 25 to 30 kcal/kg/day and 1-2 g/kg/day protein
Rely on clinical signs for evidence of feeding intolerance (regurgitation and vomiting) or high gastric residual volume (>300 ml)
Avoid total parenteral nutrition
Presence of bowel sounds and/or evidence of passage of flatus and stool are not required for initiation of enteral nutrition
Use promotility agents if needed

delivered via central vein by passing the gastrointestinal tract. The choice of whether to initiate TPN, EN or both in critical care patients had been a dilemma. However, a recent trial showed higher morbidity and mortality rate in patients receiving TPN with EN as compared to EN alone [21]. Also, TPN is associated with several complications such as catheter related infections, catheter venous thrombosis, immune suppression and gastrointestinal atrophy. It should be considered very cautiously when other route of feeding is impossible.

## Conclusion

Optimal nutritional support should be given to critically ill patients early. Evidence has shown that initiating EN early will improve outcome in the critically ill patients. TPN might be considered in very few cases such as short gut syndromes, GI fistulas and prolonged inability to tolerate EN.

## References

- McClave SA, Martindale RG, Vanek VW, McCarthy M, Roberts P, Taylor B, et al; A.S.P.E.N: Board of Directors; American College of Critical Care Medicine; Society of Critical Care Medicine: 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 (A.S.P.E.N.). *JPEN J Parenter Enteral Nutr.* 2009; 33: 277–316
- Marik PE, Zaloga GP. Early enteral nutrition in acutely ill patients: a systematic review. *Crit Care Med.* 2001; 29: 2264-2270.
- Artinian V, Krayem H, DiGiovine B. Effects of early enteral feeding on the outcome of critically ill mechanically ventilated medical patients. *Chest.* 2006; 129: 960-967.
- Doig GS, Heighes PT, Simpson F, Sweetman EA, Davies AR. Early enteral nutrition, provided within 24 h of injury or intensive care unit admission, significantly reduces mortality in critically ill patients: a meta-analysis of randomised controlled trials. *Intensive Care Med.* 2009; 35: 2018-2027.
- Wilmore DW, Smith RJ, O'Dwyer ST, Jacobs DO, Ziegler TR, Wang XD. The gut: a central organ after surgical stress. *Surgery.* 1988; 104: 917-923.
- Simpson F, Doig GS. Parenteral vs. enteral nutrition in the critically ill patient: a meta-analysis of trials using the intention to treat principle. *Intensive Care Med.* 2005; 31: 12-23.
- Malone A. Clinical guidelines from the American Society for Parenteral and Enteral Nutrition: best practice recommendations for patient care. *J Infus Nurs.* 2014; 37: 179-184.
- Seron-Arbeloa C, Zamora-Elson M, Labarta-Monzon L, Mallor-Bonet T. Enteral nutrition in critical care. *J Clin Med Res.* 2013; 5: 1-11.
- Kreymann KG, Berger MM, Deutz NE, Hiesmayr M, Jolliet P, Kazandjiev G, et al. ESPEN Guidelines on Enteral Nutrition: Intensive care. *Clin Nutr.* 2006; 25: 210-223.
- Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P. Canadian Critical Care Clinical Practice Guidelines Committee: Canadian clinical Practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. *JPEN J Parenter Enteral Nutrition.* 2003; 27: 355–373.
- Lubbers T, de Haan JJ, Luyer MD, Verbaeys I, Hadfoune M, Dejong CH, et al. Cholecystokinin/Cholecystokinin-1 receptor-mediated peripheral activation of the afferent vagus by enteral nutrients attenuates inflammation in rats. *Ann Surg.* 2010; 252: 376-382.
- Marik PE, Zaloga GP. Meta-analysis of parenteral nutrition versus enteral nutrition in patients with acute pancreatitis. *BMJ.* 2004; 328: 1407.
- Berger MM, Berger-Gryllaki M, Wiesel PH, Revelly JP, Hurni M, Cayeux C, et al. Intestinal absorption in patients after cardiac surgery. *Crit Care Med.* 2000; 28: 2217-2223.
- Barr J, Hecht M, Flavin KE, Khorana A, Gould MK. Outcomes in critically ill patients before and after the implementation of an evidence-based nutritional management protocol. *Chest.* 2004; 125: 1446-1457.
- McClave SA, Lukan JK, Stefater JA, Lowen CC, Looney SW, Matheson PJ, et al. Poor validity of residual volumes as a marker for risk of aspiration in critically ill patients. *Crit Care Med.* 2005; 33: 324-330.
- Reignier J, Mercier E, Le Gouge A, Boulain T, Desachy A, Bellec F, et al. Effect of not monitoring residual gastric volume on risk of ventilator-associated pneumonia in adults receiving mechanical ventilation and early enteral feeding: a randomized controlled trial. *JAMA.* 2013; 309: 249-256.
- Lewis SJ, Egger M, Sylvester PA, Thomas S. Early enteral feeding versus "nil by mouth" after gastrointestinal surgery: systematic review and meta-analysis of controlled trials. *BMJ.* 2001; 323: 773-776.
- Osland E, Yunus RM, Khan S, Memon MA. Early versus traditional postoperative feeding in patients undergoing resectional gastrointestinal surgery: A meta-analysis. *JPEN J Parenter Enteral Nutr.* 2011; 35: 473–487.
- Petrov MS, van Santvoort HC, Besselink MG, van der Heijden GJ, Windsor JA, Gooszen HG. Enteral nutrition and the risk of mortality and infectious complications in patients with severe acute pancreatitis: a meta-analysis of randomized trials. *Arch Surg.* 2008; 143: 1111-1117.
- Powell JJ, Murchison JT, Fearon KCH, Ros JA, Siriwardena AK. Randomized controlled trial of the effect of early enteral nutrition on markers of the inflammatory response in predicted severe acute pancreatitis. *British Journal of Surgery.* 2000; 87: 1375–1381.
- Casaer MP, Mesotten D, Hermans G, Wouters PJ, Schetz M, Meyfroidt G, et al. Early versus late parenteral nutrition in critically ill adults. *N Engl J Med.* 2011; 365: 506-517.