Observational Study

# Nutritional support in critical care : current concepts

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**Nutritional support has become a routine part of the care of the critically ill patient. Several studies have documented suboptimal performance related to nutrition practice in the intensive care unit (ICU) setting and that there are considerable opportunities for improvement in practice. This article summarises current nutrition practices in intensive care units and determine a practical "best feasible" practice relative to evidence-based Critical Care Nutrition Clinical Practice & ESPEN guidelines. This article also stress on a need to conduct large, multi-centre studies to acquire more knowledge of the cost-benefit and cost effectiveness of nutritional support in the critically ill.** [*J Indian Med Assoc* 2018; **116:** 16-8]

***Key words*** **: Nutritional support, Intensive care unit, Clinical practice guidelines.**

The purpose of any nutrition guidelines is to improve the quality of care for patients and improve clinical effectiveness by implementation of evidence-based care in daily practice. However, the potential of guidelines for resolving clinical questions should not be overstated. Care has to be given to the quality of guidelines, effects on outcome as well as their effective implementation into daily practice. Despite high adherence to some recommendations, large gaps exist between many recommendations and actual practice in intensive care units, and consequently nutrition therapy is suboptimal. We have formulated a practical middle path or "best feasible" practice that can serve as targets for future quality improvement initiatives.

## Goal Directed Treatment :

The primary goal of nutritional support is to supply the substrate necessary to meet the metabolic needs of critical illness. These needs vary with the phase of critical illness:

- Acute critical illness is characterized by catabolism exceeding anabolism[1-3]. Carbohydrates are the preferred energy source during this period because fat mobilization is impaired[4]. Nutritional support supplies the carbohydrates necessary to meet the demands of the catabolic state. This is hoped to mitigate the usual metabolic response to the inflammatory state that accompanies critical illness, the breakdown of muscle proteins into amino acids that serve as the substrate for gluconeogenesis[5].
- Recovery from critical illness is characterized by anabolism exceeding catabolism. Nutritional support provides substrate for the anabolic state, during which the body corrects hypoproteinemia, repairs muscle loss, and replenishes other nutritional stores[6].

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Another goal of nutritional support is to alter the course and outcome of the critical illness. The positive effects of nutritional support on clinical outcomes are the most important objective of any nutritional team.

***Outcomes*** — Enteral and parenteral nutrition appear to confer different clinical outcomes in critically ill patients. This is the evidence that guides our approach to selecting patients for nutritional support.

***Enteral Nutrition*** — **All patients who are not expected to be on a full oral diet within three days should receive nutritional support.** Enteral nutrition may decrease the incidence of infection in critically ill patients if provided early in the course of critical illness[7-10]. This effect has been demonstrated in clinical trials that compared patients who received early enteral nutrition (usually defined as within 48 hours) to patients who received either delayed enteral nutrition or intravenous fluids only.

This 'gut hypothesis of multiple organ failure' has led to the recommendation that enteral nutrition be started as soon as possible after surgery or in nonsurgical patients after admission to the intensive care unit. It is hoped that enteral nutrition will preserve splanchnic flow and prevent mucosal breakdown[11].

A meta-analysis of 15 randomised controlled trials[9] evaluated the effects of early EN in adult patients after surgery, trauma, head injury, burns or suffering from acute medical conditions. Early EN was associated with a significant reduction in infectious complications and length of stay. Owing to the heterogeneity between the studies however, the results of this meta-analysis have to be interpreted with caution.

In summary, the evidence supports a clinically important and statistically significant reduction in infection when enteral nutrition is administered early to critically ill surgical patients, as well as a clinically important and almost statistically significant reduction in mortality. Potential benefit of early enteral nutrition outweighs the likelihood of harm and it should be prescribed for most critically ill patients who do not have contraindications to enteral feeding.

## Parenteral nutrition :

There is no evidence that parenteral nutrition improves important clinical outcomes in critically ill patients. A meta-analysis of 69 randomized trials (3750 patients) compared the clinical outcomes of patients who received parenteral nutrition to those who received either no nutrient intake or only dextrose-containing intravenous fluids[12]. Among all patients, there was no favourable difference in mortality or any other clinical outcome. Patients who received parenteral nutrition had a 5 percent increase in the incidence of infection.

***Enteral versus parenteral*** — Direct comparisons of enteral nutrition to parenteral nutrition indicate that enteral nutrition is associated with a lower incidence of infection, but not mortality. It is intuitive, however, that the eventual goal in critically ill patients is to feed them enterally as soon as they are able to tolerate such intake. The problem is that enteral feeding is fraught with both technical and physiological challenges. These often result in inadequate caloric intake, especially upon starting the nutrition. Therefore, it may be necessary to supplement the enteral intake with parenteral nutrition.

## Patient Selection :

- For most critically ill patients who have no contraindications to enteral nutrition, begin enteral feeding within 48 hours because the potential benefits of early enteral feeding outweigh its risks.
- For adequately nourished patients who have contraindications to enteral nutrition, **DO NOT initiate parenteral nutrition** until the patient has had little or no nutritional intake for an extended period (approximately two weeks). This reflects the lack of evidence that early parenteral nutrition is beneficial to patients who are nourished[13].
- For malnourished patients who have contraindications to enteral nutrition, initiate parenteral nutrition. As a general guideline, it is reasonable to assume that malnutrition is impending in any patient who has had little or no nutritional intake for two weeks.

***Contraindications*** — Early enteral nutrition is contraindicated in critically ill patients who are hemodynamically unstable and have not had their intravascular volume fully resuscitated, since such patients may be predisposed to bowel ischemia[14]. Other contraindications to enteral nutrition include bowel obstruction, severe and protracted ileus, major upper gastrointestinal bleeding, intractable vomiting or diarrhea, hemodynamic instability, gastrointestinal ischemia, a high output fistula, and a new gastrointestinal anastomosis distal to the infusion site that the surgeon feels is at risk of dehiscence.

Some conditions previously considered contraindications to enteral nutrition are no longer considered as such. Examples include hyperemesis gravidarum and the absence of bowel sounds or flatus following routine colorectal surgery or surgery for bowel perforation[15]. While such patients remain at increased risk for vomiting, enteral nutrition may confer an overall benefit since it may decrease the risk of infection[16].

Contraindications to parenteral nutrition include hyperosmolality, severe hyperglycemia, severe electrolyte abnormalities, volume overload, and inadequate attempts to feed enterally. Sepsis or systemic inflammatory response syndrome is a relative contraindication to parenteral nutrition.

***Nutritional Requirements*** — Once it has been determined that a critically ill patient will receive nutritional support, the patient's nutritional requirements must be determined. These requirements are used to select the appropriate formulation and rate of administration.

***Based on BMI*** — For patients who are underweight (body mass index [BMI] <18.5 kg/m$^2$), use the current weight as the dosing weight. The reason is that calculation of caloric intake based on ideal body weight could lead to the administration of excess calories and induce refeeding syndrome[17].

For patients whose weight is normal (BMI 18.5 to 24.9 kg/m$^2$) or who are overweight (BMI 25 to 29.9 kg/m$^2$), literature suggests using the current weight as the dosing weight. An effort should be made to subtract the estimated weight of any peripheral edema.

For patients who are obese (BMI ≥30 kg/m$^2$), literature suggests that the dosing weight be adjusted. The purpose of adjusting the dosing weight of patients who are obese is to account for the absence of metabolic requirements by fat tissues.

***Calories*** — Patients burn more calories during critical illness, but may do worse when provided excess calories. A safe starting point for most critically ill patients is **18 kcal/kg per day**[18]. Initially underfeeding patients who are critically ill is controversial, but there is some evidence that it may improve clinical outcomes. Attempting to achieve a goal of 25 to 30 kcal/kg per day within one week is reasonable for most stable patients. A goal of 35 kcal/kg per day is an acceptable goal if weight gain is desired. Weight gain should not be attempted until the patient is stable and in a lower inflammatory state. Keep the caloric goal at 25 kcal/kg per day or less if extubation is imminent.

***Protein*** — Protein requirements increase as illness becomes more severe. Thus, patients with only mild to moderate illness require only 0.8 to 1.2 g/kg per day. Critically ill patients generally require 1.2 to 1.5 g/kg per day and patients with severe burns may need as much as 2.0 g/kg per day.

## Immunonutrition :

Immunonutrition is a relatively new concept in critical care feeding to which there is a growing body of evidence reporting benefits. Such feeds may contain arginine, omega-3 fatty acids, nucleotides and glutamine. Patients with a mild sepsis (APACHE 11 to 15) should receive immune modulating EN with such a formula. No benefit could be established in patients with severe sepsis, in whom an immune modulating formula may be harmful and is therefore not recommended[19, 20].

## Conclusions :

- Patients are selected for nutritional support on the basis of whether they have contraindications to enteral nutrition, as well as whether there is existing or impending malnutrition.
- For stable, critically ill surgical and medical patients without contraindications to enteral nutrition, early (eg, within 48 hours) enteral nutrition is recommended.
- For critically ill patients with contraindications to enteral nutrition who have existing or impending malnutrition, parenteral nutrition is recommended.
- For critically ill patients with contraindications to enteral nutrition who are adequately nourished, NO parenteral nutrition is recommended. If such patients have little or no nutritional intake for a period of two weeks, consider them to have impending malnutrition and initiate parenteral nutrition as above.
- A reasonable approach is to target 60 percent of the initial nutritional goal during the first week, with advancement as tolerated during the following week. An acceptable initial nutritional goal is 18 kcal of calories/kg per day and 1.5 grams of protein/kg per day.

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