

## New developments in clinical practice guidelines

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### Abstract

During the last four years revised clinical practice guidelines on nutritional support have been published by the major nutritional societies worldwide. The aim of these guidelines is to promote the safe and effective care of patients who need nutritional support as part of their overall management. All guidelines are based on the available “best evidence” in order to assist nutrition professionals in making decisions on the appropriate and cost-effective nutritional practices. Although such guidelines are a useful tool to patient management, they are meant to support, not replace, the clinical judgment and experience of nutrition professionals.

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During the last four years revised clinical practice guidelines have been published by the major nutritional societies: The American Society of Enteral and Parenteral Nutrition (ASPEN),<sup>1</sup> the European Society for Clinical Nutrition and Metabolism (ESPEN)<sup>2-11</sup> and the Canadian Critical Care Clinical Practice Guidelines Committee (CCPG)<sup>12</sup> with latest updates from [www.criticalcarenutrition.com](http://www.criticalcarenutrition.com).

These guidelines agree on most points concerning the nutritional support of critical ill patients and will be outlined in a short form. Any discrepancies will be highlighted. This outline follows the structure of the most recent ASPEN guideline.<sup>1</sup> Due considerations relating to special diagnoses have not been incorporated in this paper.

### Enteral nutrition

#### Which patient

**All:** Enteral nutrition (EN) is the preferred form of nutrition support in the critical ill patient who is unable to maintain volitional intake.

**ESPEN:** It should be given to all patients who are not expected to be on a full oral diet within 3 days.

#### Timing of enteral nutrition

**All:** EN should be started within the first 24–48 hours following admission.

#### Route of enteral feeding

**All:** Either gastric or small bowel feeding is acceptable in the ICU setting. Critically ill patients should be fed via an enteral access tube placed in the small bowel if at high risk for aspiration or after showing intolerance to gastric feeding (high gastric residual volumes). According to ESPEN, jejunal feeding is likely to be the best

option when it can be easily implemented (post abdominal trauma or elective abdominal surgery).

**CCPG:** The routine use of small bowel feedings is recommended in units where obtaining small bowel access is feasible.

#### Dosage of enteral feeding

**ASPEN:** The feedings should be advanced toward the patient's goal over the next 48–72 hours. Energy requirements may be calculated by predictive equations or measured by indirect calorimetry. Efforts to provide > 50%–65% of goal energy should be made in order to achieve the clinical benefit of EN over the first week of hospitalisation.

**ESPEN:** No general amount can be recommended as EN therapy has to be adjusted according to the progression/course of the disease and to gut tolerance. During the acute and initial phase of critical illness an exogenous energy supply in excess of 20–25 kcal/kg BW/day may be associated with a less favourable outcome. During recovery (anabolic flow phase), the aim should be to provide 25–30 total kcal/kg BW/day.

#### Controversy:

**ASPEN/CCPG:** If unable to meet energy requirements (100% of target goal energy) after 7–10 days by the enteral route alone, consider initiating supplemental parenteral nutrition (PN). Initiating supplemental PN prior to this 7–10 day period in the patient already receiving EN does not improve outcome and may be detrimental to the patient.

**ESPEN:** All patients who do not meet their nutritional needs after 2 days should receive supplemental PN.

### Protein requirements

**ASPEN:** In patients with body mass index (BMI) < 30, protein requirements should be in the range of 1.2–2.0 g/kg actual body weight per day, and may likely be even higher in thermally injured or multi-trauma patients.

### Obese patients

**ASPEN:** In the critically ill obese patient, permissive underfeeding or hypocaloric feeding with EN is recommended. For all classes of obesity where BMI is > 30, the goal of the EN regimen should not exceed 60%–70% of target energy requirements or 11–14 kcal/kg actual body weight per day (or 22–25 kcal/kg ideal body weight per day). Protein should be provided in a range  $\geq$  2.0 g/kg ideal body weight per day for Class I and II obese patients (BMI 30–40), and  $\geq$  2.5 g/kg ideal body weight per day for Class III obese patients (BMI  $\geq$  40).

### Haemodynamically unstable patients

**ASPEN:** In the setting of haemodynamic compromise (patients requiring significant haemodynamic support including high dose catecholamine agents, alone or in combination with large volume fluid or blood product resuscitation to maintain cellular perfusion), EN should be withheld until the patient is fully resuscitated and/or stable.

### Monitoring tolerance and adequacy

**ASPEN:** In the ICU setting, evidence of bowel motility (resolution of clinical ileus) is not required in order to initiate EN in the ICU. In the ICU patient population, neither the presence nor absence of bowel sounds nor evidence of passage of flatus and stool is required for the initiation of enteral feeding.

Patients should be monitored for tolerance of EN (determined by patient complaints of pain and/or distention, physical exam, passage of flatus and stool, abdominal radiographs). Inappropriate cessation of EN should be avoided. Holding EN for gastric residual volumes < 500 mL in the absence of other signs of intolerance should be avoided.

**ESPEN/CCPG:** IV administration of metoclopramide or erythromycin should be considered in patients with intolerance to enteral feeding e.g. with high gastric residuals.

**ASPEN/CCPG:** Use of enteral feeding protocols increase the likelihood of overall attainment of percentage of goal energy provided and should be implemented.

**ASPEN:** Patients placed on EN should be assessed for risk of aspiration. Steps to reduce risk of aspiration should be employed.

In all intubated ICU patients receiving EN, the head of the bed should be elevated 30°–45°. Use of chlorhexidine mouthwash twice a day should be considered to reduce risk of ventilator-associated pneumonia. Blue food colouring and glucose oxidase strips, as surrogate markers for aspiration, should not be used in the critical care setting.

**ASPEN:** Development of diarrhoea associated with enteral tube feedings warrants further evaluation for aetiology. If there is evidence of diarrhoea, soluble fibre containing or small peptide formulations may be utilised.

### Immune-modulating enteral formulations

**ASPEN/ESPEN:** Immune-modulating enteral formulations (supplemented with agents such as arginine, glutamine, nucleic acid,  $\omega$ -3 fatty acids, and antioxidants) should be used for the appropriate patient population (major elective surgery, trauma, burns, head and neck cancer, and critically ill patients on mechanical ventilation), with caution in patients with severe sepsis. ICU patients not meeting criteria for immune-modulating formulations should receive standard enteral formulations.

To receive optimal therapeutic benefit from the immune-modulating formulations, at least 50%–65% of goal energy requirements should be delivered daily.

**CCPG:** Based on 4 level 1 (A) studies and 17 level 2 (B) studies, we recommend that diets supplemented with arginine and other select nutrients not be used for critically ill patients.

**ALL:** Patients with ARDS and severe acute lung injury (ALI) should be placed on an enteral formulation characterised by an anti-inflammatory lipid profile (i.e.  $\omega$ -3 fish oils, borage oil) and antioxidants.

### Probiotics

#### • Controversy:

**ASPEN:** Administration of probiotic agents has been shown to improve outcome (most consistently by decreasing infection) in specific critically ill patient populations involving transplantation, major abdominal surgery, and severe trauma. No recommendation can currently be made for use of probiotics in the general ICU population due to a lack of consistent outcome effect. It appears that each probiotic species may have different effects and variable impact on patient outcome, making it difficult to make broad categorical recommendations. Similarly, no recommendation can currently be made for use of probiotics in patients with severe acute necrotising pancreatitis, based on the disparity of evidence in the literature and the heterogeneity of the bacterial strains utilised.

**CCPG:** There are insufficient data to make a recommendation on the use of prebiotics/probiotics/synbiotics in critically ill patients.

### Antioxidant vitamins and selenium

**ASPEN/CCPG:** A combination of antioxidant vitamins and trace minerals (specifically including selenium) should be provided to all critically ill patients receiving specialised nutrition therapy.

There are insufficient data to make a recommendation regarding IV/PN selenium supplementation alone, or in combination with other antioxidants, in critically ill patients.

**Glutamine (enteral)**

**All:** The addition of enteral glutamine to an EN regimen (not already containing supplemental glutamine) should be considered in thermally injured, trauma, and mixed ICU patients.

**Soluble fibre**

**ASPEN:** Soluble fibre may be beneficial for the fully resuscitated, haemodynamically stable critically ill patient receiving EN who develops diarrhoea. Insoluble fibre should be avoided in all critically ill patients. Both soluble and insoluble fibre should be avoided in patients at high risk for bowel ischaemia or severe dysmotility.

**CCPG:** There are insufficient data to support the routine use of fibre (pectin or soy polysaccharides) in enteral feeding formulae in critically ill patients.

**Parenteral nutrition****General indication**

**ASPEN:** A critically ill ICU patient may be an appropriate candidate for PN under certain circumstances: (i) The patient is well nourished prior to admission, but if after 7 days of hospitalisation EN has not been feasible or target energy goal has not been met consistently by EN alone, (ii) On admission, the patient is malnourished and EN is not feasible, (iii) A major surgical procedure is planned, the preoperative assessment indicates that EN is not feasible through the perioperative period, and the patient is malnourished.

**ESPEN:** All patients who are not expected to be on normal nutrition within 3 days should receive PN within 24–48 h, if EN is contraindicated or if patients cannot tolerate EN.

**Patients without malnutrition**

- **Controversy:**

**ASPEN:** If early EN is not feasible or available the first 7 days following admission to the ICU, no nutrition support therapy (i.e. standard therapy) should be provided. In the patient who was previously healthy prior to critical illness with no evidence of protein-energy malnutrition, use of PN should be reserved and initiated only after the first 7 days of hospitalisation (when EN is not available).

**ESPEN:** In patients who tolerate EN and can be fed approximately to the target energy values no additional PN should be given. In patients who cannot be fed sufficient enterally the deficit should be supplemented parenterally. In patients intolerant to EN, PN may be proposed at a level equal to but not exceeding the nutritional needs of the patient. Overfeeding should be avoided.

**Patients with malnutrition**

**ASPEN:** If there is evidence of protein-energy malnutrition on admission and EN is not feasible, it is appropriate to initiate PN as soon as possible following admission and adequate resuscitation.

**ESPEN:** Patients with a severe undernutrition should receive EN up to 25–30 total kcal/kg BW/day. If these target energy values are not reached, supplementary PN should be given.

**Central or peripheral access**

**ESPEN:** A central venous access device is often required to administer the high osmolarity PN mixture designed to cover the nutritional needs fully. Peripheral venous access devices may be considered for low osmolarity (< 850 mOsmol/L) mixtures designed to cover a proportion of the nutritional needs and to mitigate negative energy balance.

**All-in-one bags**

**ESPEN:** PN admixtures should be administered as a complete all-in-one bag.

**Dosing**

**ASPEN:** In all ICU patients receiving PN, mild permissive underfeeding should be considered at least initially. Once energy requirements are determined, 80% of these requirements should serve as the ultimate energy goal or dose of parenteral feeding. Eventually, as the patient stabilises, PN may be increased to meet energy requirements. For obese patients (BMI  $\geq$  30), the dose of PN with regard to protein and energy provision should follow the same recommendations given for EN.

**ESPEN:** During acute illness, the aim should be to provide energy as close as possible to the measured energy expenditure in order to decrease negative energy balance. In the absence of indirect calorimetry, ICU patients should receive 25 kcal/kg/day increasing to the energy target over the next 2–3 days.

**CCPG:** In critically ill patients who are not malnourished, are tolerating some EN, or when PN is indicated for short term use (< 10 days), low dose PN should be considered. There are insufficient data to make recommendations about the use of low dose PN in the following patients: those requiring PN for long term (> 10 days), obese critically ill patients, and malnourished critically ill patients. Practitioners will have to weigh the safety and benefits of low dose PN on an individual case-by-case basis in these latter patient populations.

**Parenteral nutrition supplementary to enteral nutrition**

- **Controversy:**

**ASPEN:** A critically ill ICU patient may be an appropriate candidate for PN under certain circumstances:

(i) The patient is well nourished prior to admission, but after 7 days of hospitalisation, EN has not been feasible or target energy goal has not been met consistently by EN alone.

**ESPEN:** All patients receiving less than their targeted enteral feeding after 2 days should be considered for supplementary PN.

**CCPG:** We recommend that PN not be started at the same time as enteral nutrition. In the patient who is not tolerating adequate enteral nutrition, there are insufficient data to put forward a recommendation about when PN should be initiated.

## Carbohydrates

**ESPEN:** The minimal amount of carbohydrate required is about 2 g/kg of glucose per day.

### Glucose control

**ASPEN:** A protocol should be in place to promote moderately strict control of serum glucose when providing nutrition support therapy. A range of 6–8 mg/dL may be most appropriate.

**ESPEN:** Hyperglycaemia (glucose > 10 mmol/L) contributes to death in the critically ill patient and should also be avoided to prevent infectious complications. Reductions and increases in mortality rates have been reported in ICU patients when blood glucose is maintained between 4.5 and 6.1 mmol/L. No unequivocal recommendation has been reported in ICU patients when blood glucose is maintained. There is a higher incidence of severe hypoglycaemia in patients treated to the tighter limits.

**Canadian Guidelines:** We recommend that hyperglycaemia (blood sugars > 10 mmol/L) be avoided in all critically ill patients. Based on the NICE-SUGAR study and a recent meta-analysis, we recommend a blood glucose target of around 8.0 mmol/L (or 7–9 mmol/L), rather than a more stringent target range (4.4 to 6.1 mmol/L) or a more liberal target range (10 to 11.1 mmol/L).

## Lipids

**ASPEN/Canada:** In the first week of hospitalisation in the ICU, when PN is required and EN is not feasible, patients should be given a PN formulation without soy-based lipids.

**ESPEN:** Lipid emulsions should be an integral part of PN for energy and to ensure essential fatty acid provision in long-term ICU patients. The tolerance of mixed LCT/MCT lipid emulsions in standard use is sufficiently documented. Several studies have shown specific clinical advantages over soybean LCT alone but require confirmation by prospective controlled studies. Olive oil-based PN is well tolerated in critically ill patients. Addition of EPA and DHA to lipid emulsions has demonstrable effects on cell membranes and inflammatory processes. Fish oil-enriched lipid emulsions probably decrease length of stay in critically ill patients. Intravenous lipid emulsions (LCT, MCT or mixed emulsions) can be administered safely at a rate of 0.7 g/kg up to 1.5 g/kg over 12–24 h.

## Amino acids

**ESPEN:** When PN is indicated, a balanced amino acid mixture should be infused at approximately 1.3–1.5 g/kg ideal body weight per day in conjunction with an adequate energy supply.

**Canadian Guidelines:** In critically ill patients who are receiving PN, there are insufficient data to make a recommendation regarding the use of branched chain amino acids.

### Glutamine (parenteral)

**All:** When PN is indicated in ICU patients the amino acid solution should contain 0.2–0.4 g/kg/day of L-glutamine (e.g. 0.3–0.6 g/kg/day alanyl-glutamine dipeptide).

## Micronutrients

**All:** All PN prescriptions should include a daily dose of multivitamins and of trace elements.

### Efforts to initiate enteral feeding

**ASPEN:** In patients stabilised on PN, periodically repeated efforts should be made to initiate EN. As tolerance improves and the volume of EN energy delivered increases, the amount of PN energy supplied should be reduced. PN should not be terminated until  $\geq 60\%$  of target energy requirements are being delivered by the enteral route.

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