

# Chapter 47

## Approach to Nutrition in the ICU



### 47.1 Introduction

Proper nutritional support is a crucial aspect of managing critically ill patients in the ICU. Adequate nutrition can significantly influence recovery, immune function, and overall outcomes. In the ICU, a structured approach is essential to assess nutritional risk, determine the appropriate method of feeding, and adjust caloric and protein intake [1, 2] [Ref: Algorithm 47.1].

### 47.2 Assess Nutritional Risk

- Tools: Use validated scoring systems such as the NUTRIC or NRS 2002 score to evaluate a patient's risk for malnutrition.
- Purpose: Identifying high-risk patients allows early intervention, which is critical to prevent further nutritional decline.
- Considerations: It's also important to check for contraindications to enteral nutrition (EN), such as bowel ischemia, which could necessitate alternative feeding strategies.

### 47.3 Determine Feeding Ability

Can the Patient Feed Orally?

- Yes: If the patient can feed orally, initiate oral intake but ensure it meets their caloric needs. This is often limited to patients with intact swallowing reflexes and a stable mental status.

- No: If the patient cannot feed orally due to critical illness or other factors, consider other methods like enteral feeding.

## **47.4 Enteral Feeding Pathway**

- High-Risk Patients.
  - For patients identified as high-risk, proceed directly to enteral feeding (EN) unless contraindicated. EN should be initiated early, ideally within 24–48 hours, to help maintain gut integrity and reduce infection risks.
- Not High-Risk Patients.
- Assess whether the patient can tolerate oral feeding. If not, transition to enteral feeding as a primary method, with the same emphasis on early initiation.

## **47.5 Start Enteral Feeding**

- Begin EN with a Hypocaloric Approach: Start feeding within the range of 12–25 kcal/kg/day during the initial 7–10 days. Prefer hypocaloric feeding (up to 70% of energy needs), especially in the first 48–72 hours to prevent overfeeding.
- Rationale: This gradual increase helps avoid complications like hyperglycemia and refeeding syndrome, allowing metabolic adaptation during the critical illness phase.
- Special Conditions: EN is recommended even in certain complex clinical scenarios such as traumatic brain injury, therapeutic hypothermia, and severe acute pancreatitis. Tailoring EN in these cases supports gut function while considering specific clinical needs.
- EN may be withheld in a setting of hemodynamic compromise or instability. EN should be started as soon as possible when the patient gets stable or with caution when there is initiation of withdrawal of vasopressor support.

## **47.6 Caloric Delivery Monitoring**

- Ensure 70% of caloric intake by day 3/7.
- Goal: Achieve 70% of the calculated caloric target by day 3 for high-risk patients or by day 7 for lower-risk patients to prevent caloric deficits.
- If Not Achieved: Supplemental parenteral nutrition (PN) should be considered to meet the deficit.
- Rationale: A hypocaloric approach initially followed by progressive increases ensures caloric needs are met without overfeeding, helping to balance energy requirements with the body's metabolic state.

## 47.7 Timing of Parenteral Nutrition (PN)

- ASPEN guidance: there was no clinically significant difference in outcomes between exclusive PN and EN during first week of critical illness. It must be noted that PN was not found to be superior to EN, and both had similar risk profiles with improved catheter care, glycemic control, and avoidance of overfeeding energy in PN. It must be kept in mind that PN must be started early (within first 3 days of ICU admission) and must be continued for a shorter duration (5–7 days) and not for longer periods (weeks). This is for the cohort that may be candidates for EN and is to be followed in first week of ICU therapy. However, there is no role for supplemental parenteral nutrition to EN during the first week of ICU stay.
- ESPEN guidance: Start PN if needed: PN should be initiated cautiously, preferably after all strategies to improve EN tolerance have been exhausted. For most patients, initiating supplemental PN before day 7 is not recommended unless they are severely malnourished. PN should be initiated within 3–7 days if there is contra-indication to oral and EN. In patients who do not tolerate full-dose EN during the first week in the ICU, the safety and benefits of initiating PN should be weighed on a case-by-case basis.
- Rationale: Delaying PN helps minimize the risks of infections and hyperglycemia associated with early PN, allowing time for EN tolerance to develop.

## 47.8 Provision of Dextrose and Amino Acids

- Indication: For patients who cannot receive EN or oral feeds, dextrose and amino acids can be used as temporary measures to provide basal energy and protein requirements.
- Rationale: This ensures that even in the absence of full caloric support, the patient receives some macronutrients to support metabolic functions.

## 47.9 Provision of Fats/Lipids

### ASPEN Guidance

- There is a weak recommendation against a backdrop of low evidence to provide either mixed-oil lipid injectable emulsion (ILE) or 100% soybean oil (SO) ILE to critically ill patients who are appropriate candidates for initiation of PN, including within the first week of ICU admission. It should be limited to a maximum of 100 g/week if there is suspicion of deficiency of essential fatty acids.

## 47.10 Miscellaneous

### ESPEN Guidance

- Postpyloric or jejunal feeds must be initiated in patients with high risk of aspiration (ASPEN definition of high risk of aspiration: inability to protect the airways, support with mechanical ventilation, age > 70 years, reduced level of consciousness, poor oral care, inadequate nurse: patient ratio, supine positioning, neurologic deficits, gastroesophageal reflux, transport out of the ICU, and use of bolus intermittent EN).
- Continuous EN is preferred to intermittent bolus EN.
- First preference is always oral feeding, followed by gastric feeding (EN).
- Prokinetic agents may be used if there is initial intolerance to gastric feeds. Intravenous erythromycin should be used as first-line prokinetic therapy. Intravenous metoclopramide can be used as a second-line agent or can be given along with Erythromycin.
- Enteral feeding should be delayed only if there is a gastric residual volume (GRV) of >500 mL over 6 hours.
- Post pyloric feeding should be initiated if there is no response to prokinetic agents.

### ASPEN Guidance

- Inappropriate cessation of EN should be avoided for diagnostic procedures or tests.
- GRV should not be used routinely to assess tolerance to EN. Even if it is routinely used at some centers, then holding feeds with GRV < 500 mL should be avoided.
- High GRV should only lead to implementation of measures to reduce risk of aspiration.
- In all intubated ICU patients receiving EN, the head of the bed should be elevated 30°–45°, and the use of chlorhexidine mouthwash twice a day should be considered. 10–20 g of a fermentable soluble fiber supplement should be given in divided doses over 24 hours as adjunctive therapy if there is evidence of diarrhea.
- EN should not be interrupted in diarrhea till evaluation of the cause.
- Standard polymeric formula should be used in EN initiation.
- Supplemental PN should be considered only after 10 days of unmet targets of energy and protein requirements (60%).
- PN should be discontinued when 60% of the requirement is achieved through EN.
- Fluid-restrictive, energy-dense formula should be used in patients with acute respiratory distress syndrome to limit total intake.
- Similar caloric and protein targets should be aimed even in acute kidney injury (AKI).
- Trophic feeds should be given in moderate to severe acute pancreatitis (after 24–48 hours) and gradually increased to achieve target energy and protein intake.
- Use of PN should be considered in severe acute pancreatitis only after 1 week.

## **47.11 Caloric, Protein, and Micronutrient Requirements**

### **1. Gradual Approach to Caloric Intake.**

- ASPEN Guidance: Feed within a range of 12–25 kcal/kg/day during the first 7–10 days to avoid overfeeding.
- ESPEN Guidance: Focus on hypocaloric feeding up to 70% of energy needs, especially in the initial 48–72 hours.
- Incorporation: Starting with a hypocaloric approach and gradually increasing to 70–100% of energy expenditure helps to reduce the risks of refeeding syndrome and metabolic complications during the early phase of critical illness.

### **2. Protein Provision Strategy.**

- ASPEN Guidance: Recommends 1.2–2.0 g/kg/day of protein.
- ESPEN Guidance: Suggests starting with 1.3 g/kg/day and progressively increasing as the patient stabilizes. Protein requirement should be increased to 2.5 g/kg/day in patients needing frequent dialysis or continuous renal replacement therapy.
- Incorporation: Clarify that protein requirements should be adjusted progressively during the first week, aligning with the patient's metabolic state and organ function. Higher targets may be needed for patients on dialysis or with significant protein loss.

### **3. Micronutrient Supplementation.**

- Include daily multivitamins to ensure micronutrient needs are met.
- Supplement with trace elements like zinc, copper, selenium, and others as part of the regimen.
- Rationale: Critical illness can lead to increased micronutrient losses, and supplementation supports overall metabolic processes.
- Glutamine should be administered to only burn and critically ill trauma patients and should be avoided in liver and renal failure patients.
- Daily dose of glutamine (0.2–0.3 g/kg/day) can be administered to critically ill trauma patients for the first 5 days and may be extended to 10–15 days in case of delayed wound healing.

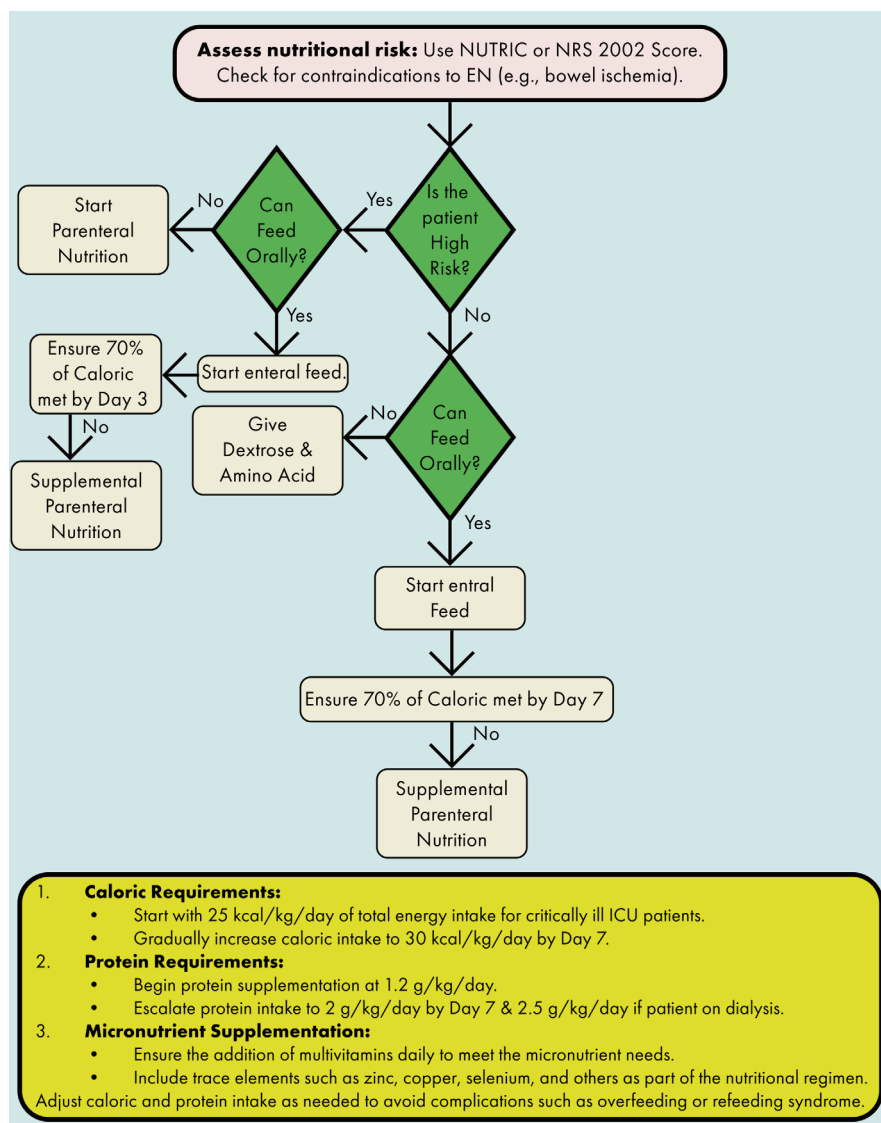
### **4. Monitoring and Adjustments.**

- ASPEN Guidance: Recommends regular monitoring of glycemic control and lipid levels during PN administration.
- ESPEN Guidance: Stresses the use of indirect calorimetry to guide energy targets and prevent overfeeding. Glucose levels must be kept below 180 mg/dL, necessitating the use of insulin otherwise. Electrolytes must be monitored daily and the blood glucose levels must be monitored every 4 hourly for the first 2 days in general.

- **Incorporation:** Emphasize the importance of using indirect calorimetry where available or other markers like CO<sub>2</sub> production to tailor energy needs. Adjustments should be made based on metabolic responses to prevent both under- and over-feeding, thereby ensuring optimal nutritional support.

## **47.12 Conclusion**

The structured approach to nutrition in the ICU aims at minimizing the risk of malnutrition, optimizing immune function, and supporting recovery. By prioritizing early enteral nutrition and delaying parenteral nutrition until necessary, it helps to ensure that the unique needs of each patient are met. Adopting a hypocaloric approach initially and gradually increasing to full caloric targets helps prevent metabolic complications. Regular monitoring and adjusting nutritional support based on clinical responses ensure the best outcomes for critically ill patients.

**Algorithm 47.1: Approach to nutrition in the ICU**

## Bibliography

1. Compher C, Bingham AL, McCall M, Patel J, Rice TW, Braunschweig C, et al. Guidelines for the provision of nutrition support therapy in the adult critically ill patient: the American Society for Parenteral and Enteral Nutrition. *JPEN J Parenter Enteral Nutr.* 2022;46(1):12–41.
2. Singer P, Blaser AR, Berger MM, Calder PC, Casaer M, Hiesmayr M, et al. ESPEN practical and partially revised guideline: clinical nutrition in the intensive care unit. *Clin Nutr.* 2023;42(9):1671–89.

## **Part IV**

# **Endocrinology**