

## Nutrition in the ICU



Patients in the ICU tend to achieve clinical improvement within 3 to 7 days of stay. However, there is a subset of patients who progress to chronic critical illness. This is usually characterised by low-grade persistent inflammation and protein catabolism, also referred to as Persistent Inflammatory Catabolism Syndrome (PICS).

PICS patients have a decrease in functionality and impaired reintegration to pre-hospitalisation life. They also suffer from muscle loss, frailty, and sarcopenia 6 and 12 months post-ICU. There is also an increase in organ failure and mortality. Adequate nutritional support for patients in the ICU can change the course of their post-hospital life.

There are guidelines that outline recommendations for ICU nutrition for PICS patients and methods for providing nutritional substrates in both early and late phase of ICU hospitalisation. These recommendations also highlight the importance of early mobilisation and exercise and post-extubation support.

The chronic critical illness phase is associated with increased resting energy expenditure (REE) and severe catabolism. During this phase, insulin resistance is common, and nutrient production relies on proteolysis and lipolysis. During this phase, it is important to NOT administer full nutritional therapy as it could lead to overfeeding. Overfeeding is associated with prolonged mechanical ventilation and infection, and elevated glucose, urea, and hepatic function tests. All these factors, in turn, are associated with increased morbidity.

Both overnutrition and undernutrition are common in the ICU. Undernutrition is associated with prolonged length of stay and mechanical ventilation, infection, and mortality. A more effective way of determining the caloric requirements for REE is through the use of indirect calorimetry. This is recommended by both ASPEN and ESPEN guidelines. But since the availability of metabolic monitors for indirect calorimetry is limited, REE can be derived from VCO<sub>2</sub> (carbon dioxide production) obtained from the ventilator. It may not be as accurate as indirect calorimetry measurement, but it is still more precise than predictive models.

Zusman et al. observed that providing 70 to 100% of energy expenditure is associated with improved survival. Patients who receive in excess of 100% of measured energy requirements have demonstrated an increase in mortality. That is why it is important to avoid overfeeding.

Enteral feeding early on in the course of ICU stay is associated with a decrease in infections. It is recommended that caloric energy targets should be reached within 3 days, but caution should be taken to avoid overfeeding patients. If enteral feeding does not fulfill the needs, parenteral nutrition can be administered between days 3 and 7 to provide additional supplementation. It is important to keep a balance of macronutrients, including lipids with carbohydrates. Electrolyte status should be closely monitored. Decrease in potassium, phosphorus, or magnesium could endanger the patient. Monitoring should continue throughout the patient's stay in the ICU.

Increased protein intake should be combined with an exercise programme. While observational studies have shown protein intake to be associated with improved survival, this benefit has not been confirmed in clinical trials. Hence protein intake recommendations are dependent on the patient's clinical status. Patients with a substantial decline in muscle mass may benefit from a high protein diet, but septic patients will not derive any benefit. Survival in patients with normal renal function may also increase with high protein intake. Findings have indicated an association between exercise and muscle preservation in septic patients, but again, these findings need to be confirmed in larger studies.

When the patient is discharged from the ICU, there should be a consistent follow-up for the entire duration of their hospital stay by a nutrition team. This is because if these patients do not get good nutritional guidance and physical activity, they may suffer from additional loss of muscle and energy. It is thus important to implement a multidisciplinary approach from admission to the ICU through the hospital stay until discharge to rehabilitation.

Malnutrition is a definite risk for critically ill patients. It is important to provide nutritional support and supplementation that is tailored based on the patient's condition. The ultimate goal should be to improve metabolic condition, decrease morbidity, and optimise rehabilitation success.

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Published on : Wed, 19 Jun 2019