

# NUTRITIONAL REQUIREMENTS

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Patients who are considered to be unable to consume enough nutrition via dietary means will need to be considered for either enteral or parenteral nutrition. Provision of enteral and parenteral nutrition should take into account not only macronutrients, such as carbohydrate, fat and protein, but also vitamins, trace elements, electrolytes and water. Planning of the feeding regimen will require the patient's weight as well as daily energy and protein requirements, which can be calculated based on standard tables. These regimens will need to be assessed on a daily basis and adjusted according to any changes in requirements, as overfeeding is one of the most common causes of complications regardless of the route of nutrient delivery. Regular biochemical monitoring is also mandatory as electrolyte and nutrient requirements can vary based on plasma levels (Table 25.4).

TABLE 25.4 Recommended schedule for monitoring feeding regimens.

Parameter	Frequency					
Daily Observations including: pulse, blood pressure and temperature	Daily					
body weight	Daily					
fluid balance, including volume of urine and/or urine and intestinal losses	Daily					
quantity and type of food consumed, if allowed to eat	Daily					
Plasma levels: sodium, potassium, urea and creatinine	Daily					
blood glucose	Daily					
magnesium and phosphate (if at risk of refeeding syndrome)	Daily					
liver function tests	Weekly					
C-reactive protein	Weekly					
Plasma levels: fortnightly full blood count	Fortnightly					
calcium, zinc, copper	Plasma proteins including albumin	thiamine	triglycerides	vitamin B12	folic acid	3-6 monthly
Ferritin	Selenium, manganese	25-hydroxyvitamin D	a	Could be converted to weekly once the patient is established on a stable feeding regimen.		

Total energy intake In a normal state of health, the basal metabolic rate (BMR) can be calculated using the Harris-Benedict equation: Men  $BMR = (10 \times \text{weight in kg}) + (6.25 \times \text{height in cm}) - (5 \times \text{age in years}) + 5$  Women  $BMR = (10 \times \text{weight in kg}) + (6.25 \times \text{height in cm}) - (5 \times \text{age in years}) - 161$  In the unwell patient population (acute or chronic disease), a degree of hypermetabolism exists, but no more than 120% of the predicted values. Stable patients with a normal or only moderately increased nutritional need should therefore be provided with a corresponding energy intake of 20-30 kcal for every kilogram of ideal body weight per day. Daily energy expenditure and thus requirements can be severely overestimated in obese patients, hence the ideal body weight should be used in these calculations rather than the actual body weight. Nutrient requirements may increase to 30 kcal/kg ideal body weight per day under conditions of severe stress. However, the introduction of nutrition should be cautious in these patients as well as in those at risk of refeeding syndrome; nutrition should be started at no

more than 50% of the estimated target energy needs. This can be increased to the full requirement over 24–48 hours, according to tolerance. Patients at risk of refeeding syndrome (discussed in more detail in Refeeding syndrome) should have a maximum of 50% of their target requirements for the first 48 hours; this is subsequently increased only if clinical and biochemical monitoring shows no evidence of refeeding syndrome. Carbohydrate Glucose is the main substrate for the central nervous system and certain haematopoietic cells, which require the equivalent of 2 g/kg of glucose per day. Dietary guidelines therefore recommend that carbohydrates form 45–65% of the total caloric intake per day. Protein In the ill patient population, daily nitrogen requirements increase from approximately 0.15 g/kg per day to 0.25 g/kg per day. This is equivalent to a daily protein intake of 1.5 g/kg ideal body weight or around 20% of total energy requirements, in order to reduce nitrogen losses at times of illness. Fat Dietary fat consists of triglycerides of saturated and unsaturated fatty acids. Of these, the unsaturated fatty acids linoleic acid and linolenic acid are particularly notable, as they cannot be synthesised in vivo from non-dietary sources and are therefore essential. J Arthur Harris, 1880–1930, botanist and biometrician, head of the Department of Botany, University of Minnesota, St Paul, MN, USA (1924–1930). Francis G Benedict, 1870–1957, American chemist, physiologist and nutritionist, developed a calorimeter and a spirometer used to determine oxygen consumption and measure metabolic rate. Burrill Bernard Crohn, 1884–1983, gastroenterologist, Mount Sinai Hospital, New York, NY, USA, described regional ileitis in 1932. triglycerides are now routinely used in parenteral nutrition, in which a mixture of glucose (a minimum of 100–200 g per day) and fat (100–200 g per week) is delivered. The combination of fat and glucose delivery minimises metabolic complications associated with parenteral nutrition, improves substrate utilisation and reduces fluid retention and carbon dioxide production. Vitamins, minerals and trace elements Vitamins B and C are important in optimising recovery from illness, in particular for collagen formation and wound healing. Vitamin C requirement in the postoperative period increases to 60–80 mg per day. It is important to consider the need for supplemental vitamin B12, especially in patients who have undergone gastric surgery and in those with a history of alcohol dependence. Surgical procedures or medical conditions associated with a reduction in pancreatic or biliary enzymes in the intestinal tract (e.g. obstruction of the biliary or pancreatic ducts) will result in malabsorption of the fat-soluble vitamins A, D, E and K. Increased intestinal losses such as in chronic diarrhoea can cause hyponatraemia, hypokalaemia and hypophosphataemia, which will all need monitoring and replacement. Trace elements such as magnesium, zinc and iron are important cofactors in metabolic processes and may be reduced as part of the inflammatory response. Replacement of these elements is necessary to ensure appropriate utilisation of amino acids and avoidance of refeeding syndrome. ) NUTRITIONAL REQUIREMENTS

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