

# Enteral nutrition for elderly patients in intensive care unit settings

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## Abstract

Nutrition plays a fundamental role in the management of frail elderly patients. Indeed, effective management can reduce common pathological situations, such as malnutrition, refeeding syndrome, and aspiration pneumonia, which can increase morbidity and mortality in intensive care unit settings. To optimize

this management, it is essential to have knowledge of basic aspects such as timing, route, and composition of nutrition, as well as the prevention and management of the most common adverse events.

## Introduction

Recent guidelines published by various scientific societies demonstrate the extensive study of the role of nutrition in the management of frail elderly patients admitted to intensive care units (ICU) in recent years.<sup>1-3</sup> In 2009, Alberda *et al.*, studying patients in 167 ICU, showed that increased intakes of energy and protein are associated with improved clinical outcomes in critically ill patients.<sup>4</sup>

This review focuses on “nutritional therapy”. The management of malnutrition is an important contribution to frailty management, which is central considering the connection observed between frailty and mortality, as well as the loss of autonomy and increased length of recovery in surviving patients.<sup>5,6</sup> Some effects of nutritional therapy on frailty were also described in the literature: a frailty reduction was observed in patients fed with enteral nutrition (EN) enriched with omega-3 fatty acids and eicosapentaenoic acid [312] and in patients receiving >1 g/kg of protein per day, as 20% of the calories. An expert working group of the European Society for Clinical Nutrition and Metabolism recommends 1.2-1.5 g/kg/day of protein in older people who are malnourished or at risk of malnutrition because they have acute or chronic illness, with even higher protein intake for individuals with severe illness or injury. In this type of patient, where protein malnutrition is often present, a common critical illness can lead to dangerous effects, inducing a systemic inflammatory response that results in severe catabolism. More precisely, the persistence of an illness leads to a 10% loss of body weight each month, favoring the onset of widespread geriatric diseases (such as anemia, hypoalbuminemia, immune decline, urinary infections, and ultimately entrapment and death),<sup>4</sup> as represented in Figure 1.

Moreover, incorrect administration of artificial nutrition can lead to other diseases unrelated to caloric-protein intake, such as refeeding syndrome, inhalation pneumonia, and venous catheter-related infections, which can lead to serious complications of the general condition up to being responsible for death. This risk increases in elderly frail patients, making it essential to take care of every detail of nutrition, as perfectly reported in a guide to EN published by a group of experts to complete current guidelines.<sup>7</sup>

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Key words: enteral nutrition, intensive care unit, elderly, malnutrition.

Contributions: all the authors made a substantial intellectual contribution, read and approved the final version of the manuscript, and agreed to be accountable for all aspects of the work.

Conflict of interest: the authors declare no potential conflict of interest.

Ethics approval and consent to participate: not applicable.

Funding: none.

Availability of data and materials: data are available from the corresponding author upon request.

Received: 2 September 2023.

Accepted: 8 April 2024.

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*Geriatric Care* 2024; 10:11712  
doi:10.4081/gc.2024.11712

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## Routes

EN has many advantages. It maintains the integrity of the intestinal mucosa, improves the utilization of nutrients, and is easier, cheaper, and safer to administer. It should always be preferred if no contraindications are present, such as a lack of adequate intestinal absorption, impaired intestinal transit, or denied consent. Recently, the importance of even a minimum caloric enteric intake, not for nutritional purposes but trophic for enterocytes, has been better defined (minimal enteral feeding).

EN should start early, after 24-48 hours, to counteract the catabolic effects and should be delayed only in cases of uncontrolled

shock or risk of bowel ischemia. The main clinical conditions in which EN is generally contraindicated are i) chronic intestinal occlusion/subocclusion of mechanical origin; ii) severe intestinal ischemia on a non-hypovolemic basis; iii) high-flow jejunal or ileal fistulas (output >400 mL/day); iv) severe intestinal function alteration secondary to enteropathies or insufficiency of the absorbent surface, such as not allowing the maintenance of an adequate nutritional status. In cases of an intended duration shorter than 2 months, a nasogastric or nasoduodenal feeding tube should be used. If the duration is longer, a stoma should be programmed. Parenteral nutrition should be added if EN is insufficient. In the case of parenteral nutrition adoption, a peripheral or central route should be adopted if the intended administration is greater or lower than 15 days (Figure 2).

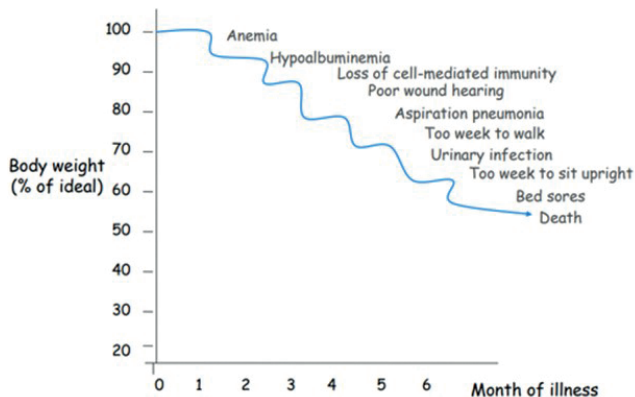


Figure 1. Illness-related weight loss and geriatric diseases.

## Composition

A patient's baseline nutritional status must always be evaluated, such as disease severity, using tools such as the mini nutritional assessment. In any case, the main parameter used to assess the extent of malnutrition is the loss of body weight. Although there is disagreement in the literature regarding minimal weight loss with impact on clinical conditions, most experts agree that an involuntary weight loss in the last 6 months of >10% of usual weight is significant, or greater than 5% in a month.

It is commonly recognized that fully targeted medical nutrition must achieve more than 70% of resting energy expenditure (REE) but less than 100%. Anyway, there is currently no uniformity on what the best way is to measure energy expenditure. Ideally the most accurate measurement of REE, according to current guidelines, could be achieved using indirect calorimetry (IC);<sup>1</sup> however,

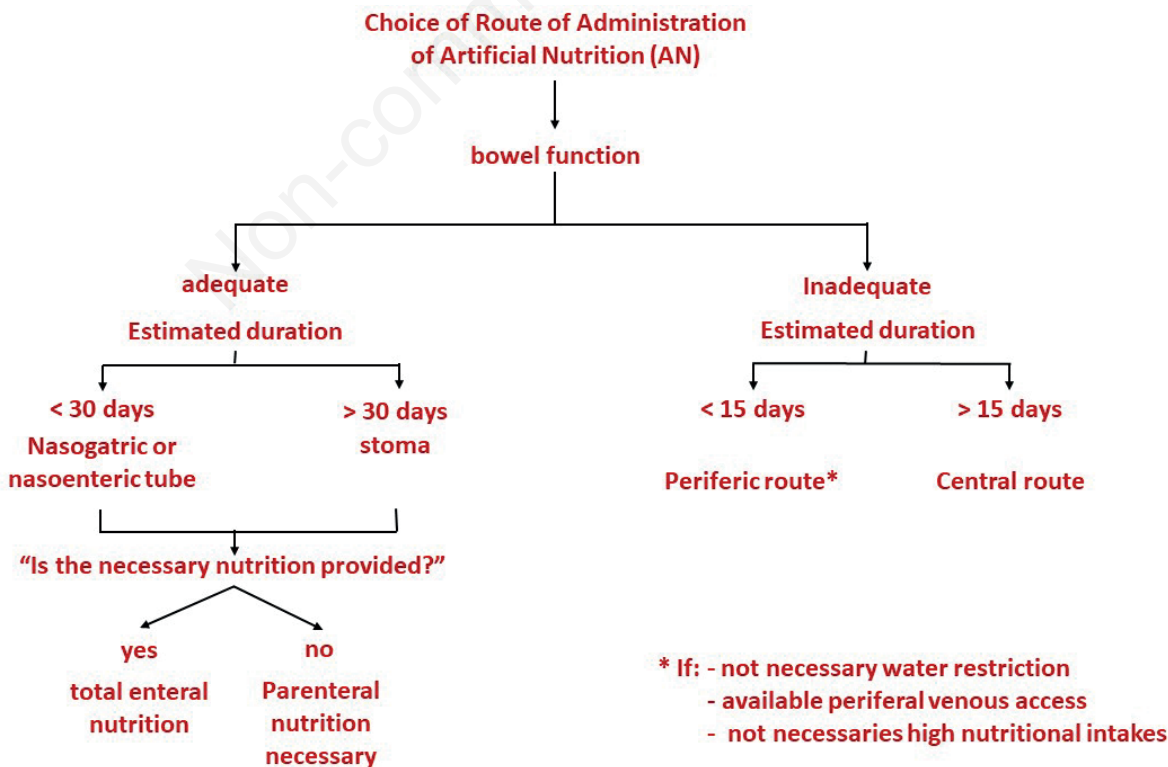


Figure 2. Methods and timing of artificial nutrition.

the limitations are multiple. IC is rarely available, and nutritional therapy guided by IC did not convincingly improve results.<sup>8</sup> In the absence of calorimetry, if the patient is ventilated, oxygen consumption from the pulmonary arterial catheter or carbon dioxide production ( $VCO_2$ ) derived from the ventilator may be used to measure the REE ( $REE=VCO_2 \times 8.19$ ). If not ventilated, predictive equations have been formulated to estimate REE, but they have been shown to be associated with significant inaccuracy (up to 60%), leading to over- or under-evaluation.<sup>9,10</sup>

In some diseases that determine increased metabolic consumption (e.g., respiratory failure, sepsis), the caloric intake must be reduced.<sup>11</sup> Individual energy goals should be reached progressively in the early phase (4-7 days). Calories must be divided into 50% carbohydrates and 50% lipids.

Protein intake is important to counteract the catabolic response, reducing ICU-acquired weakness and sarcopenia. The catabolic response leads, in fact, to marked mass loss of up to 1 kg per day over the first 10 days in the ICU. On the contrary, an excessive dose can be harmful. Hence, the correct initial protein intake must be 0.8 g/kg/day, progressively increasing until 1.2-1.3 g/kg/day. Only during the following rehabilitation period can the dosage be increased.<sup>1,12</sup>

The water requirement, specific to each patient, is influenced by the degree of physical activity and also varies with food intake and pathological states. Moreover, in elderly, frail patients, the water requirement is also lower than in adults. In fact, if the water requirement of the adult in the absence of leaks and pathological or organ failure (with renal, cardiorespiratory, and normal hepatic functions) varies between 30 and 40 mL/kg/day, in the elderly the water supply must be reduced to 25 mL/kg/day.<sup>3</sup>

Micronutrients must be added only in cases of prior deficiency, considering that they are essential for normal metabolism, immunity, and antioxidant defense, and 24 of them are obtained only

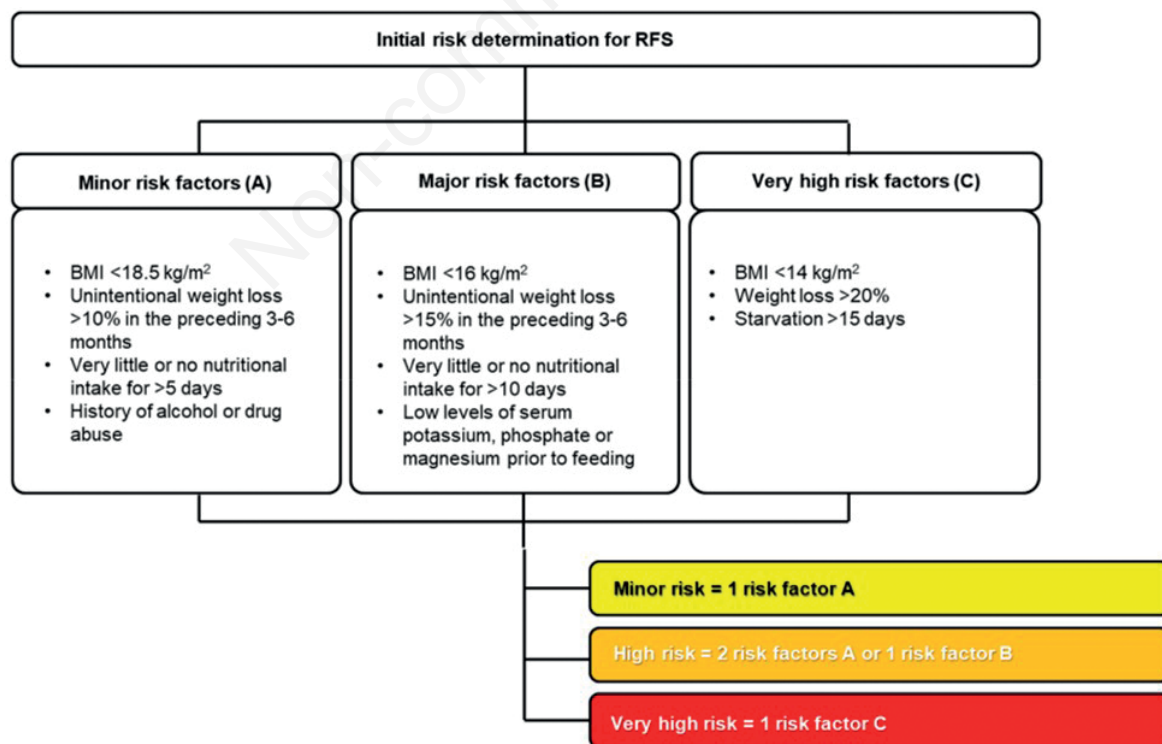
through nutrition. Furthermore, their importance increases during the first days when the antioxidant stress is maximal.<sup>13</sup>

## Prevention of complications

The main complications connected with EN are refeeding syndrome and inhalation pneumonia. Refeeding syndrome is a disease that is responsible for high mortality and is determined by an electrolyte imbalance resulting from the consumption of fats and proteins back to carbohydrate metabolism. This brings about increased insulin levels, thiamine depletion, and reduction in phosphate plasma levels. It is characterized by increased serum glucose, electrolyte disturbances (particularly hypophosphatemia, hypokalemia, and hypomagnesemia), vitamin depletion (especially vitamin B1 thiamine), fluid imbalance, and salt retention, with resulting impaired organ function and cardiac arrhythmias.<sup>14</sup>

Unfortunately, this disease is still partially unknown, considering that the incidence reported in the literature is highly variable, also due to frequent unspecific clinical presentation, and no clinical predictor is known, even if some risk factors are commonly recognized,<sup>15-17</sup> as summarized in Figure 3.<sup>14</sup> Therefore, all critically ill patients should be considered at risk. Administration of 100-200 mg/day of thiamine for the first 3 days becomes fundamental, as does monitoring phosphate levels once a day (reducing calories to 500 kcal/day or 25% of calories in case of detection of hypophosphatemia).<sup>15</sup>

The mode of administration of the nutritional mixture is also important: the infusion volume of the mixture must gradually increase day by day during the first 5 days. In the first 2 days, in addition to the nutritional mixture, at least another 500 cc of natural water must be introduced, and the infusion rate must be pro-



**Figure 3.** Refeeding syndrome risk stratification. Reproduced from: Reber *et al.* (2019). RFS, refeeding syndrome; BMI, body mass index.

gressively increased during the first 2 weeks, going from the initial 25 cc/h up to the maximum tolerated speed (about 250 cc/h).<sup>18</sup>

Inhalation pneumonia is frequent in community dwellings and its incidence increases in geriatric acute settings and even more in institutionalized patients. In fact, its incidence is associated with the presence of dysphagia.<sup>19</sup> As with every pneumonia, the best management is based on a rapid diagnosis and the right choice of treatment. The complexity of the diagnosis derives from the absence of specific symptoms, being caught in half of them. Moreover, even if EN increases the risk of inhalation, it is possible to prevent it only to a limited extent (by reducing administration speed or using prokinetics).<sup>17</sup> For the choice of treatment, a good knowledge of common etiology is important (*Staphylococcus aureus*, *Haemophilus influenzae*, and *Streptococcus pneumoniae* in the community; gram-negative germs in hospital and long-term residence settings).

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