

# Changes in nutrient intake requirements of terminally ill patients

**Chen Siying**

Shanghai Pinghe School, Shanghai, China, 201206

chensiying@shphschool.com

**Abstract.** The healthcare system is confronted with a growing issue in providing high-quality end-of-life care as the world population through a process of aging. Nutritional support constitutes a crucial element of the care provided to individuals in final stages of illness. However, it is noteworthy that the existing body of research on the precise dietary requirements of terminally ill patients is surprisingly small. The present study conducts a comprehensive evaluation of the literature, rigorously examining a diverse array of academic publications, medical journals, and clinical studies published throughout 1990 to 2021. The paper diligently extracts and amalgamates pertinent information concerning how nutrient intake requirements evolve as patients approach the terminal phase of their illnesses. It underscores significant findings related to shifts in these nutritional needs, considering variables such as disease type, disease stage, and patient-specific factors. Furthermore, the paper delves into the challenges and opportunities associated with providing appropriate nutritional support to terminally ill individuals. This research illuminates the evolving dietary necessities of terminally ill patients, furnishing invaluable insights for healthcare providers, caregivers, and policymakers alike. An understanding of these changes is pivotal for enhancing the quality of life, symptom management, and optimizing the care offered to individuals nearing the end of their lives. Ultimately, this study contributes to the overarching goal of enhancing end-of-life care, ensuring a dignified and comfortable transition for terminally ill patients.

**Keywords:** End-Of-Life Care, Nutritional Support, Terminally Ill Patients.

## 1. Introduction

In an epoch characterized by a progressively aging worldwide populace, the healthcare system encounters a compelling predicament in delivering empathetic and efficacious end-of-life care. One sometimes disregarded facet of this care pertains to the provision of dietary support. As individuals go towards the terminal phase of their illnesses, there might be significant alterations in their nutritional needs. Nevertheless, a significant void may be observed in the current body of scholarly work pertaining to the precise modifications in these stipulations. The objective of this study is to fill the existing gap in knowledge by performing a comprehensive evaluation of relevant literature in order to gain a better understanding of the changes in nutrient intake requirements among individuals who are in the advanced stages of illness.

This study employs a rigorous systematic approach, utilizing an exhaustive review of scholarly articles, peer-reviewed medical journals, and clinical studies spanning the years from 1990 to 2021. The

review meticulously identifies and synthesizes pertinent data regarding the fluctuations in nutrient intake requirements experienced by individuals as they approach the terminal stages of their illnesses. This comprehensive literature review unveils a myriad of crucial findings concerning the nuanced shifts in nutrient intake requirements among terminally ill patients. It meticulously examines the impact of variables such as the type of disease, disease stage, and individual patient factors on these nutritional needs. Moreover, it delves into the multifaceted challenges and opportunities that healthcare providers, caregivers, and policymakers must grapple with when addressing the nutritional needs of those nearing the end of their lives.

This review sheds light on a significant aspect, namely the considerable variation in nutritional intake needs reported among various disorders. For example, individuals diagnosed with cancer may encounter changes in their metabolic processes and heightened requirements for nutrients as a result of the aggressive characteristics of the illness and the adverse effects of therapy. Conversely, individuals suffering from progressive neurodegenerative disorders may encounter reduced appetites and challenges with swallowing, thus necessitating modified dietary approaches.

Additionally, the research highlights the importance of taking into account the distinct attributes and individual preferences of every individual who is in the advanced stages of a terminal illness. Various individual circumstances might significantly impact the requirements for nutrient intake. The customization of nutritional support by healthcare personnel is of utmost importance, as it necessitates the consideration of cultural, psychological, and ethical aspects in order to meet the unique requirements and preferences of each patient.

The findings derived from this extensive analysis hold great importance for multiple stakeholders within the healthcare ecosystem. The comprehension of the changing dietary requirements of individuals with terminal illnesses holds great significance for healthcare professionals, as it empowers them to administer tailored healthcare services that improve the overall well-being, alleviate symptoms, and facilitate the process of approaching death. The acquisition of this knowledge confers advantages upon caregivers, as it enhances their ability to offer significant assistance, thereby cultivating a sense of dignity and solace for patients.

Furthermore, policymakers have the opportunity to utilize these research findings in order to shape healthcare laws and standards, thereby guaranteeing that nutritional care at the end of life is grounded in empirical facts and demonstrates empathy towards patients. This research ultimately makes a substantial contribution to the overarching objective of enhancing the end-of-life encounter for individuals with terminal illnesses, emphasizing the significance of providing compassionate and comprehensive care during this deeply susceptible stage of life.

## **2. The nutritional requirements of chronic hospice patients**

The importance of optimal nutrition is paramount in the care of patients who are confronted with life-limiting conditions. The relevance of this phenomenon extends beyond the mere fulfillment of the body's physiological requirements, including a wide range of social, cultural, and psychological benefits. The determination to provide nutritional aid relies on a thorough awareness of patients' preferences, along with respectful consideration of their preferences, as well as a deep comprehension of their expectations and the benefits and potential drawbacks connected with such assistance. In order to streamline this process, it is crucial for patients, their families, and healthcare practitioners to actively participate in transparent and timely dialogues concerning the goals of nutritional treatment and support. It is advisable to initiate these discussions well in advance, rather than postponing them until patients become unable of expressing their wishes to their loved ones and caretakers [1].

### **2.1. Protein, carbohydrate and lipid requirements**

According to ESPEN guidelines [2], the suggested protein intake ranges from 1.3 to 1.5 grams per kilogram of ideal body weight per day ( $\text{g} \cdot \text{kg ideal BW}^{-1} \cdot \text{d}^{-1}$ ) [3]. These guidelines, however, have a limitation as they are based on findings from two small-scale studies, which indicated that maximum protein synthesis occurs at an intake of  $1.5 \text{ g} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$ . Nonetheless, it remains uncertain whether these

outcomes from limited studies can be broadly applicable to a diverse patient population with varying diseases, energy requirements, and nitrogen losses [4].

The ASPEN guidelines propose a protein intake of  $1.2\text{--}2.0\text{ g}\cdot\text{kg ideal BW}^{-1}\cdot\text{d}^{-1}$  for patients with a BMI less than 30 and  $2.0\text{--}2.5\text{ g}\cdot\text{kg ideal BW}^{-1}\cdot\text{d}^{-1}$  for patients with a BMI over 30 [3]. A common issue with both sets of guidelines is the absence of studies that precisely match protein intake to energy expenditure [4].

Furthermore, the clinical care guidelines of the Society of Critical Care Medicine also advocate for protein or amino acid intake as high as  $2.0\text{ g}\cdot\text{kg}^{-1}\cdot\text{d}^{-1}$  [5]. These guidelines recommend a minimum protein intake of  $2.0\text{ g}\cdot\text{kg ideal BW}^{-1}\cdot\text{d}^{-1}$  for patients with severe burns or multiple traumas and for permissively underfed obese patients, and a minimum of  $2.5\text{ g}\cdot\text{kg ideal BW}^{-1}\cdot\text{d}^{-1}$  for critically ill individuals and permissively underfed morbidly obese patients [6].

In contrast, a higher level of protein intake at 1.9 grams per kilogram per day ( $\text{g}\cdot\text{kg}^{-1}\cdot\text{d}^{-1}$ ) did not yield improved protein sparing effects, as demonstrated in Ishibashi et al.'s study, where they identified 1.2 grams of protein per kilogram per day ( $1.2\text{ g protein kg}^{-1}\cdot\text{d}^{-1}$ ) as the optimal amount. It's worth noting that a drawback of this study is its retrospective nature.

Additionally, there have been other unforeseen discoveries that have come to light. In a study involving 12 patients, the relationship between defective autophagy and the quantity of infused amino acid calories was observed in postmortem muscle biopsies. Additionally, it was noted that the administration of cumulative protein and amino acid intake during the early period of the ICU stay was linked to a delay in recovery. Finally, a limited observational study demonstrated a positive association between increased muscle atrophy and elevated protein consumption [2].

The presently recommended carbohydrate dosage in parenteral nutrition (PN) ranges from 3 to 3.5 grams per kilogram per day ( $\text{g}\cdot\text{kg}^{-1}\cdot\text{d}^{-1}$ ). However, for individuals with a high risk of experiencing hyperglycemia, such as critically ill patients, those with diabetes, septic patients, or those undergoing steroid treatment, lower doses are advised. These patients should ideally receive around 1 to 2 grams of carbohydrates per kilogram per day ( $1\text{--}2\text{ g carbohydrates}\cdot\text{kg}^{-1}\cdot\text{d}^{-1}$ ) [7], and the rate of glucose delivery should not exceed 6 grams per kilogram per day (not  $> 6\text{ g}\cdot\text{kg}^{-1}\cdot\text{d}^{-1}$ ) at a rate slower than 5 milligrams per kilogram per minute (at a rate  $< 5\text{ mg}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ ) [8].

Based on the existing body of research, it may be inferred that a direct metabolic intervention utilizing insulin has the potential to restore blood glucose levels to a state of normalcy, hence resulting in improved survival rates and decreased incidence of illness in patients experiencing critical medical conditions. Nevertheless, the precise mechanism by which insulin decreases blood glucose levels in these individuals remains unclear. An analysis of liver and skeletal muscle biopsies, conducted promptly following the demise of patients in critical condition, has revealed that the principal mechanism by which insulin reduces blood glucose levels is through the augmentation of glucose absorption in skeletal muscles. The implications of these findings suggest that adipose tissue and skeletal muscle may exhibit a degree of insulin responsiveness, whereas the liver has a higher level of resistance to insulin effects [9].

## 2.2. Energy needs of dying patients

As per ESPEN guidelines [3], the primary objective of nutritional support is to provide an energy supply that closely aligns with the measured energy expenditure, aiming to reduce negative energy imbalances. In situations where indirect calorimetry is unavailable, ESPEN recommends a maximum of  $\leq 25$  calories per kilogram of actual body weight per day ( $\text{kcal}\cdot\text{kg actual BW}^{-1}\cdot\text{d}^{-1}$ ) during the acute phase (within 48 hours after ICU admission) and  $\leq 30\text{ kcal}\cdot\text{kg actual BW}^{-1}\cdot\text{d}^{-1}$  during the postacute phase ( $\geq 4$  days after admission) [10]. For severely malnourished patients receiving parenteral nutrition (PN), the initial intake should be set at  $10\text{ kcal}\cdot\text{kg actual BW}^{-1}\cdot\text{d}^{-1}$ , with a gradual increase to reach  $25\text{--}30\text{ kcal}\cdot\text{kg actual BW}^{-1}\cdot\text{d}^{-1}$  over 3–4 days. In obese or overweight patients, energy requirements can be estimated at  $15\text{ kcal}\cdot\text{kg actual BW}^{-1}\cdot\text{d}^{-1}$  or  $20\text{ kcal}\cdot\text{kg ideal BW}^{-1}\cdot\text{d}^{-1}$ . Similarly, ASPEN recommends the use

of indirect calorimetry when available. In its absence, predictive equations or simplified weight-based equations ( $25\text{-}30 \text{ kcal} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$ ) should be employed to determine energy needs.

When enteral nutrition (EN) is well-tolerated, severely malnourished patients or those at high nutritional risk should receive over 80% of their estimated or calculated energy goals during the first week of hospitalization. In cases where parenteral nutrition (PN) is necessary due to the inability to tolerate EN and a high risk of severe malnutrition, a hypocaloric PN approach ( $\leq 20 \text{ kcal} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$  or 80% of estimated energy needs) with adequate protein doses ( $\geq 1.2 \text{ g} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$ ) is recommended during the first week of ICU hospitalization. For obese patients with a BMI over 30, permissive underfeeding or hypocaloric feeding with EN is suggested. This means that calorie administration should not exceed 65-70% of energy requirements or  $11\text{-}14 \text{ kcal} \cdot \text{kg actual BW}^{-1} \cdot \text{d}^{-1}$  (or  $22\text{-}25 \text{ kcal} \cdot \text{kg}^{-1} \text{ ideal BW}^{-1} \cdot \text{d}^{-1}$  for those with a BMI over 50) [2].

### **3. The influence of malnutrition on chronic hospice patients**

#### *3.1. Effects of malnutrition on physical health*

Around 60-65% of hospitalized patients undergo a decline in their nutritional condition in comparison to persons who are in a state of excellent health [11, 12]. Hospitalization results in substantial changes to an individual's typical nutritional consumption as a consequence of multiple circumstances, such as limited meal timings, diminished desire for food, adverse effects of drugs, and required intervals of abstaining [13]. A previous research investigation demonstrated that despite patients being prescribed a protein intake of 1.0 gram per kilogram of body weight per day, their effective protein consumption during their hospitalization was reduced as a result of diminished intake from both the meals supplied and oral nutritional supplements. The prevailing preventable factors contributing to hospital-acquired malnutrition (HAM) are diminished appetite, patients' rejection of hospital meals, and fasting associated with medical interventions. It is noteworthy that the risk of malnutrition is elevated when evaluated throughout a hospitalization period as opposed to the time of hospital admission. The findings of a prospective observational study indicate a notable correlation between a decrease in nutritional status and weight loss, and extended durations of hospitalization. This link remains significant irrespective of a patient's demographic attributes or the severity of their disease. In contrast, it is worth noting that malnutrition exerts an adverse influence on the duration of hospitalization, alongside a range of clinical and economic consequences. According to a recent retrospective study, it was shown that malnutrition was observed in 1% of patients who were hospitalized for a duration exceeding 14 days [14]. Additionally, it was observed that Hospital-Acquired Malnutrition (HAM) was substantially associated with prolonged hospital stays, cognitive decline, pressure ulcers, and incidents of falls during the hospitalization period [14].

#### *3.2. The influence of malnutrition on the mental health of hospice patients*

Roughly 60-65% of individuals admitted to hospitals experience a decline in their nutritional well-being compared to those in good health. Hospitalization brings about significant changes in an individual's regular dietary habits due to several factors, including restricted meal schedules, decreased appetite, adverse medication effects, and prescribed fasting periods. A prior research investigation has illustrated that patients, although being prescribed a daily protein allocation of 1.0 gram per kilogram of body weight, experienced a decreased real protein intake during their hospital stay. This decrease in intake was attributed to reduced consumption of both given meals and oral nutritional supplements. Insufficient appetite, patients' refusal of hospital meals, and fasting associated with medical procedures are the primary preventable factors contributing to hospital-induced malnutrition (HAM). It is of significant importance to acknowledge that the likelihood of malnutrition is elevated when evaluated during the period of hospitalization as opposed to the assessment conducted upon arrival to the hospital. The findings of a prospective observational study revealed a significant association between a decrease in nutritional status and weight loss during extended hospital stays, regardless of a patient's demographic features or the severity of their illness. In contrast, malnutrition exerts a detrimental effect on the length

of hospital stay, as well as a range of further clinical and economic ramifications. According to a recent retrospective study, there was a documented incidence of malnutrition in 1% of patients who were hospitalized for a duration exceeding 14 days. The study also found a strong correlation between malnutrition and prolonged hospital stays, cognitive impairment, pressure sores, and falls occurring during the hospitalization period.

#### **4. Solutions for the nutritional problems of chronic hospice patients**

Nutritional problems are common among chronic hospice patients, and addressing these issues is crucial to improve their quality of life and overall well-being. Here's a discussion of solutions to these problems, including nutrition assessment, individualized nutrition program development, diet education, nutrition monitoring implementation, and nutrition intervention and support intervention: Firstly, it is imperative to perform a thorough nutrition assessment for every individual under hospice care. The comprehensive assessment should encompass an evaluation of the individual's medical background, present state of health, personal dietary inclinations, as well as any dietary limitations influenced by cultural or religious factors. Conduct a comprehensive physical examination to evaluate the presence of indicators associated with malnutrition, including but not limited to muscular atrophy, reduction in body mass, and the occurrence of edema. Employ proven nutrition assessment instruments, such as the Mini Nutritional Assessment (MNA) or Subjective Global Assessment (SGA), to impartially examine the nutritional state of the patient. The assessment of the patient's functional status and their capacity for autonomous eating should be taken into consideration.

Furthermore, it is essential to create an individualized dietary regimen that takes into account the unique requirements and objectives of the patient. It is important to take into account the dietary choices as well as the cultural or religious beliefs of the patient. The determination of nutrient requirements involves the utilization of many factors, including age, gender, weight, and activity level, to do calculations. It is advisable to engage in a collaborative effort with a licensed dietitian or nutritionist in order to develop a comprehensive and balanced dietary regimen that effectively addresses any existing nutritional deficits or specific dietary requirements. Modify the proposed course of action in response to alterations in the patient's medical state.

In addition, it is imperative to offer educational resources to both the patient and their carers regarding the significance of nutrition in effectively treating their disease. Provide recommendations for meal options that are convenient to prepare and consume, taking into account any potential physical restrictions experienced by the individual. This paper aims to discuss and clarify problems and misconceptions pertaining to nutrition, with a particular focus on situations where individuals may experience reduced appetite or swallowing difficulties. This study aims to provide caregivers with comprehensive knowledge regarding appropriate feeding strategies and the significance of upholding oral hygiene practices.

Moreover, it is essential to consistently assess the patient's nutritional condition and make appropriate modifications to the dietary regimen as needed. It is imperative to monitor alterations in body weight, muscle mass, and other pertinent indications of nutritional well-being. Employ various methods such as food diaries or appetite logs to monitor dietary consumption and discern any recurring patterns or concerns. It is advisable to contemplate the use of nutritional supplements, if deemed required, with the supervision and assistance of a healthcare physician or registered dietitian.

Lastly, offering nutritional interventions tailored to the patient's needs is of great importance. This may involve suggesting alterations to food textures or prescribing therapeutic diets for individuals experiencing issues with swallowing. The administration of enteral or parenteral nutrition is indicated in cases where patients are unable to achieve their nutritional requirements through oral intake. This study aims to examine the potential effects of specific symptoms, such as nausea, vomiting, and constipation, on individuals' food consumption. Offering emotional and psychosocial assistance to patients and their families is crucial, since it has been seen that emotional discomfort can have an impact on appetite and eating patterns. Engage in interdisciplinary collaboration with a diverse healthcare team

of physicians, nurses, and social workers, in order to comprehensively address the multifaceted needs of the patient.

## 5. Conclusion

In short, the consideration of the nutritional requirements of those receiving hospice care is of utmost importance in delivering comprehensive end-of-life support. This study has examined the precise dietary needs for protein, carbs, fats, and energy consumption within the framework of hospice care. Furthermore, our investigation has explored the extensive implications of starvation on the physiological and psychological welfare of those receiving long-term care in hospice settings. The presence of malnutrition within this susceptible demographic might intensify symptoms, compromise immunological responses, and reduce overall quality of life. It is of utmost importance that healthcare providers, carers, and the wider healthcare community acknowledge the paramount importance of treating dietary concerns within the context of hospice care. In order to address the consequences of malnutrition, a range of tactics and solutions have been deliberated upon. The interventions encompass the formulation of personalized dietary regimens, the distribution of oral nutritional supplements, the dissemination of knowledge to patients and their families, and the cooperation among multidisciplinary healthcare groups. These interventions have the potential to effectively preserve or enhance the nutritional health of individuals under hospice care, while simultaneously honoring their autonomy and end-of-life choices.

It is crucial to emphasize that nutritional care in hospice is not solely about sustaining life but enhancing the comfort, dignity, and overall well-being of patients in their final days. The integration of palliative care principles into nutritional support is essential, as it aligns with the overarching goals of hospice care, focusing on symptom management, quality of life, and patient-centered decision-making.

This study currently lacks significant clinical exploration and research. The author expresses a desire to take advantage of future possibilities to carry out thorough clinical research in order to provide further evidence for the conclusions given in this work. In light of the intricate issues presented by malnutrition in hospice care, it is imperative to emphasize the significance of more research, interdisciplinary collaboration, and continuous education. Through the ongoing exploration of novel methodologies and the enhancement of our comprehension about dietary requirements within this particular setting, we can provide a more comprehensive and empathetic framework for hospice care, so ultimately enhancing the overall encounters of individuals confronting terminal illnesses.

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