Management of Enteral Nutrition in Critically Ill Geriatric Patients

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ABSTRACT

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Introduction: Elderly patients admitted to the intensive care unit (ICU) exhibit distinct physiological, immunological, and metabolic vulnerabilities that necessitate a tailored nutritional approach. Enteral nutrition (EN) is the preferred strategy over parenteral nutrition due to its physiological benefits, but its implementation in critically ill geriatric patients is met with multiple challenges, including sarcopenia and anabolic resistance.
Methods: This study is a narrative literature review based on scientific journals, textbooks, and recent clinical guidelines. It aims to provide a comprehensive overview of the principles of enteral nutrition in critically ill geriatric patients, covering physiological differences, selection of routes and formulas, and determination of nutritional requirements.
Results: Older adults experience significant metabolic alterations, such as anabolic resistance, pre-existing sarcopenia, and gut dysbiosis, which influence their nutritional needs and response to EN. Evidence shows that early EN initiation (within 24-48 hours of ICU admission) improves clinical outcomes, including reduced infection rates and length of stay, but must be individualized. Energy-dense, high-protein formulas are generally recommended to counteract muscle loss, with a protein target of 1.2-1.5 g/kg/day. Close monitoring for complications such as refeeding syndrome, aspiration, and gastrointestinal intolerance is critical. The selection of the feeding route (gastric vs. jejunal) should be guided by the patient's clinical status and aspiration risk.
Conclusions: Enteral nutrition strategies in critically ill geriatric patients must be individualized, evidence-based, and account for age-related physiological changes to optimize functional recovery and improve clinical outcomes. A careful, stepwise approach is essential to maximize benefits while minimizing risks in this vulnerable population.

Keywords: Enteral Nutrition; Geriatric; Nutrition; Sarcopenia

INTRODUCTION

Medical nutrition therapy is a cornerstone of management for critically ill patients, aimed at mitigating the catabolic stress response, preserving organ function, and improving clinical outcomes [1, 2]. The intensive care unit (ICU) population is increasingly composed of older adults, with more than half of all ICU patients now being over the age of 65 [3, 4]. This demographic shift presents a significant clinical challenge, as elderly patients exhibit a unique constellation of physiological characteristics that differentiate them from their younger counterparts. The aging process is associated with a decline in physiological reserves, immunosenescence (age-related immune decline), and a higher prevalence of pre-existing malnutrition and sarcopenia [5, 6]. When subjected to the profound metabolic stress of critical illness, these vulnerabilities are amplified, leading to accelerated muscle loss, impaired functional recovery, and a higher risk of morbidity and mortality [7, 8].

Despite the clear importance of nutritional support in this population, a significant gap exists in the form of specific, comprehensive, and evidence-based guidelines for the critically ill geriatric patient. While major societies like ESPEN and ASPEN provide robust recommendations for the general adult ICU population, these often do not fully address the distinct metabolic needs and tolerances of older adults [9, 10]. Issues such as anabolic resistance—a blunted muscle protein synthesis response to nutritional stimuli—and the high risk of refeeding syndrome necessitate a more cautious and tailored approach than is typically applied to younger patients. This gap in targeted guidance can lead to suboptimal nutritional delivery, with clinicians facing uncertainty regarding the optimal timing, composition, and energy targets for this vulnerable group.

This review aims to provide a comprehensive overview of the management of enteral nutrition in critically ill geriatric patients. It will explore the key physiological differences between older and younger patients, detail the principles of initiating and advancing enteral feeding, and discuss strategies to optimize nutritional delivery while minimizing complications, thereby bridging the gap between general ICU nutrition guidelines and the specific needs of the elderly.

METHODS

This article is a narrative literature review based on scientific journals, books, and recent clinical guidelines published within the last ten years. The objective is to provide a comprehensive overview and a practical framework for clinicians on the management of enteral nutrition in critically ill geriatric patients. This review synthesizes current evidence, focusing on the key physiological and metabolic differences in older adults that necessitate a tailored nutritional approach, such as anabolic resistance and sarcopenia. It covers the principles of initiating and advancing enteral feeding, including the benefits of early enteral nutrition (EEN); recommendations for determining nutritional requirements for energy and protein; guidance on selecting appropriate enteral formulas and administration routes based on clinical status; and strategies for monitoring and managing potential complications, such as gastrointestinal intolerance and refeeding syndrome.

RESULTS

Physiological Differences and Increased Vulnerability

Critically ill older adults present with a distinct pre-ICU metabolic phenotype characterized by lower muscle mass and quality (sarcopenia), higher fat mass, anabolic resistance, and a state of chronic low-grade inflammation ("inflammaging") . The aging process leads to a decline in physiological reserves across multiple organ systems, including cardiovascular, pulmonary, renal, and gastrointestinal functions, making this population more vulnerable to the stressors of critical illness . A key finding is the central role of sarcopenia, which is often present before ICU admission and is rapidly exacerbated by catabolic states, leading to prolonged mechanical ventilation, longer ICU stays, and increased mortality . Furthermore, older adults exhibit anabolic resistance, a blunted muscle protein

synthesis response to protein intake, meaning they require a higher protein supply to achieve a positive nitrogen balance compared to younger patients.

Nutritional Assessment and the Importance of Early Initiation

Malnutrition is highly prevalent in the geriatric ICU population, affecting between 38% and 78% of patients, and is strongly associated with adverse outcomes. Guidelines recommend that all patients expected to stay in the ICU for more than 48 hours be considered at nutritional risk and undergo screening. While tools like the Nutrition Risk Screening 2002 (NRS-2002) and the Nutrition Risk in the Critically Ill (NUTRIC) score are used, they were not specifically designed for the geriatric population. Early Enteral Nutrition (EEN), initiated within 24-48 hours after achieving hemodynamic stability, is strongly recommended by both ESPEN and ASPEN guidelines. The benefits of EEN are well-documented and include maintaining gut mucosal integrity, reducing bacterial translocation, lowering the risk of nosocomial infections, and potentially shortening the length of ICU stay .

Nutritional Requirements and Formula Selection

- Energy: The gold standard for determining energy needs is indirect calorimetry. When unavailable, a stepwise approach is recommended. Initial feeding should be hypocaloric, providing less than 70% of estimated needs (around 15-20 kcal/kg/day) to avoid overfeeding and refeeding syndrome . After the initial acute phase (typically after day 3), energy delivery can be progressively increased to meet 80-100% of measured or estimated needs (25-30 kcal/kg/day).
- Protein: Due to anabolic resistance and high catabolic rates, protein requirements are elevated. A target of 1.2-1.5 g/kg of actual body weight per day is recommended, with the potential to increase to 2.0-2.5 g/kg/day in cases of severe catabolism such as major burns or trauma.
- Formula: High-protein, energy-dense formulas (≥1.5 kcal/mL) are often preferred to meet the increased protein and energy needs within a limited fluid volume, which is particularly relevant for patients with heart or kidney failure. In cases of gastrointestinal intolerance or malabsorption, semi-elemental formulas containing hydrolyzed proteins and medium-chain triglycerides (MCTs) may be better tolerated .

Administration, Monitoring, and Complication Management

- Route: Gastric feeding via a nasogastric tube (NGT) is the standard initial approach. However, in patients with a high risk of aspiration, gastroparesis, or severe reflux, post-pyloric feeding (e.g., nasojejunal tube) is recommended to improve safety and tolerance .
- Method: Continuous infusion is generally favored over bolus feeding in the acute ICU setting as it is associated with better gastrointestinal tolerance and a lower risk of diarrhea .
- Monitoring and Complications: Close monitoring is essential. This includes assessing for gastrointestinal intolerance by checking for abdominal distension or high gastric residual volumes (GRV >500 mL). One of the most severe complications is refeeding syndrome, characterized by severe electrolyte shifts (hypophosphatemia, hypokalemia, hypomagnesemia) upon re-initiation of nutrition in a malnourished patient. Prevention involves a "start low, go slow" approach to feeding, prophylactic thiamine administration, and frequent electrolyte monitoring during the first 72 hours

DISCUSSION

The management of nutrition in critically ill geriatric patients represents one of the most complex and nuanced challenges in modern intensive care. The demographic reality of an aging global population means that most ICU beds are now occupied by older adults, a group that brings with it a unique constellation of physiological vulnerabilities that demand a departure from standard nutritional protocols [3, 4]. This review synthesizes a body of evidence that collectively argues for a highly individualized, cautious, yet paradoxically aggressive nutritional strategy. The core challenge is not merely providing calories and protein but doing so in a way that navigates the treacherous intersection of age-related physiological decline—characterized by pre-existing sarcopenia, frailty, and immunosenescence—with the profound hypermetabolic and hypercatabolic storm of acute critical illness [5, 6].

While foundational principles of critical care nutrition, such as the preference for the enteral route, remain steadfast, their application requires significant modification to address the diminished reserves and altered metabolic responses inherent to the aging process [8, 10].

A central theme emerging from the literature is the profound physiological distinction between younger and older critically ill patients, which forms the basis for a specialized approach [5]. The concept of anabolic resistance is particularly crucial; this refers to the blunted muscle protein synthesis (MPS) response of aging muscle to anabolic stimuli like amino acids and exercise [7]. In practical terms, this means that an older patient requires a significantly higher dose of protein to achieve the same degree of muscle repair and synthesis as a younger individual, a fact that directly informs the higher protein targets recommended for this group [8, 13]. This anabolic resistance is compounded by the high prevalence of pre-illness sarcopenia, the age-related loss of muscle mass and function. An older patient often enters the ICU with already depleted muscle reserves, making them exquisitely vulnerable to the accelerated proteolysis that defines critical illness. This "double hit" of pre-existing muscle loss and an impaired ability to rebuild muscle creates a rapid trajectory towards severe ICU-acquired weakness, prolonged dependency on mechanical ventilation, and poor long-term functional outcomes [7, 13]. Furthermore, the background state of chronic, low-grade inflammation known as "inflammaging," coupled with age-related immune decline (immunosenescence), primes the geriatric patient for a more dysregulated and damaging response to the acute inflammatory insult of critical illness, further fueling the catabolic fire [5, 10].

In this context, the principle of early enteral nutrition (EEN), initiated within 24-48 hours of ICU admission, remains a cornerstone of therapy, as strongly advocated by both the European Society for Clinical Nutrition and Metabolism (ESPEN) and the American Society for Parenteral and Enteral Nutrition (ASPEN) [8, 21]. The rationale is robust: early feeding preserves the integrity of the gut mucosal barrier, mitigates the risk of bacterial translocation, modulates the systemic inflammatory response, and has been associated with a reduction in infectious complications and overall length of stay [12]. However, the application of this principle in the elderly must be tempered with exceptional caution. Older adults possess diminished cardiovascular reserves and are more susceptible to non-occlusive mesenteric ischemia if enteral feeding is initiated too aggressively during periods of hemodynamic instability [5, 15]. Therefore, the decision to start EN is contingent upon the confirmation of a stabilized circulatory status, typically defined by adequate mean arterial pressure and waning vasopressor requirements. This highlights a critical clinical judgment point where the well-established benefits of EEN must be carefully weighed against the heightened risk of gut hypoperfusion in a vulnerable patient.

Once EEN is initiated, the provision of energy becomes a delicate tightrope walk between preventing starvation-induced catabolism and avoiding the dangers of overfeeding [9]. The literature strongly supports a "start low, go slow" approach. Overfeeding in a critically ill older adult can precipitate a cascade of metabolic complications, including hyperglycemia, hypertriglyceridemia, hepatic steatosis, and increased carbon dioxide production, which can complicate weaning from mechanical ventilation [8]. More perilous is the risk of refeeding syndrome, a potentially fatal condition caused by rapid electrolyte shifts—most notably severe hypophosphatemia—upon the reintroduction of nutrition in a malnourished individual [15]. Given the high prevalence of pre-existing malnutrition in the community-dwelling elderly, this risk is particularly pronounced in the geriatric ICU population [11]. Consequently, guidelines recommend an initial hypocaloric feeding strategy, often starting at 10-15 kcal/kg/day or less than 70% of estimated energy expenditure, with gradual advancement over the first week of admission [8, 9]. The gold standard for personalizing energy targets remains indirect calorimetry, which measures actual energy expenditure. When this technology is unavailable, clinicians must rely on predictive equations while remaining vigilant for the signs of overfeeding, underscoring the importance of meticulous metabolic monitoring [1, 9].

In stark contrast to the cautious approach to energy provision, the strategy for protein delivery must be aggressive. To counteract the dual challenges of anabolic resistance and severe catabolism, critically ill older adults require a significantly higher protein intake, with consensus guidelines recommending a target of 1.2 to 1.5

g/kg/day, and potentially higher in specific conditions like major trauma or burns [8, 13]. Achieving this target is paramount for mitigating the devastating loss of lean body mass. This principle has fueled the development and preference for high-protein, energy-dense enteral formulas, which enable adequate protein delivery within a manageable fluid volume—an important consideration for older patients who often have concurrent cardiac or renal dysfunction that necessitates fluid restriction [13]. This focus on protein delivery is a key component of the broader concept of "rehabilitation nutrition," which frames nutritional therapy not just as a supportive measure but as an active intervention aimed at preserving and restoring physical function [20].

However, the practical delivery of EN in this population is beset by numerous challenges. Dysphagia, often a component of sarcopenia itself ("sarcopenic dysphagia"), dramatically increases the risk of aspiration, a leading cause of morbidity in the ICU [33]. This heightened risk often necessitates consideration of post-pyloric feeding via a nasojejunal tube to bypass the stomach, although placement can be technically more challenging [8]. Gastrointestinal intolerance, manifesting as high gastric residual volumes, abdominal distension, or diarrhea, is also more common due to age-related declines in gut motility and alterations in the gut microbiome (dysbiosis) [15, 35]. These issues require proactive management, including the use of prokinetic agents and, if necessary, a transition to semi-elemental formulas that are easier to digest [8]. Finally, the ethical dimensions of initiating and continuing artificial nutrition, particularly via long-term feeding tubes like PEGs, are profoundly complex in patients with severe cognitive impairment, dementia, or a poor long-term prognosis, requiring sensitive, multidisciplinary discussions with patients and their families to ensure that interventions align with the goals of care [27, 34].

Ultimately, a significant limitation pervading this field is the paucity of high-quality randomized controlled trials conducted specifically in the critically ill geriatric population. Much of the current guidance is, by necessity, extrapolated from studies performed in younger, general adult ICU populations, which may not fully account for the unique metabolic milieu of the elderly [4, 14, 35]. This critical evidence gap means that many clinical decisions—from optimal protein dosing to the long-term impact of specific immunonutrient formulas—are based more on physiological rationale and expert consensus than on robust, age-specific data. Future research must prioritize this vulnerable and growing population, focusing not only on short-term outcomes like mortality but also on long-term functional recovery, quality of life, and the prevention of post-ICU disability. Such research is essential to move from extrapolated guidance to truly evidence-based, personalized nutritional therapy for the critically ill older adult

CONCLUSIONS

The management of enteral nutrition in critically ill geriatric patients is a complex process that requires a highly personalized and cautious approach, distinct from strategies used in younger adults. This review highlights that the unique physiological vulnerabilities of the elderly—including pre-existing sarcopenia, anabolic resistance, and diminished organ reserves—necessitate a tailored nutritional strategy to optimize outcomes.

The evidence strongly supports initiating early enteral nutrition (within 24-48 hours) once hemodynamic stability is achieved, as it is crucial for maintaining gut integrity and reducing infectious complications. However, this must be balanced with a "start low, go slow" approach to energy delivery to mitigate the significant risks of overfeeding and refeeding syndrome. A key therapeutic priority is providing a high protein intake (1.2–1.5 g/kg/day or higher) to counteract anabolic resistance and attenuate the severe muscle loss associated with critical illness.

Author Contributions

Conceptualization, T.A. and Y.H.N.; methodology, Y.H.N.; investigation, T.A.; writing—original draft preparation, T.A.; writing—review and editing, T.A. and Y.H.N.; supervision, Y.H.N.; project administration, Y.H.N. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement

No new data were created or analyzed in this study. Data sharing is not applicable to this article as it is a narrative review of existing literature. All data discussed are sourced from previously published studies, which are cited in the reference section.

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Conflicts of Interest

The authors declare no conflict of interest

References

1. Jawa RS, Patel RB, Young DH. Nutritional Assessment. Crit Care Clin. 2021;37(1):205-19.
2. Berlana D. Parenteral Nutrition Overview. Nutrients. 2022;14(21):4480.
3. Lee ZY, Loh CTI, Lew CCH, Ke L, Heyland DK, Hasan MS. Nutrition therapy in the older critically ill patients: A scoping review. Ann Acad Med Singap. 2022;51(10):629-36.
4. Darden DB, Moore FA, Brakenridge SC, Navarro EB, Anton SD, Leeuwenburgh C, et al. The Effect of Aging Physiology on Critical Care. Crit Care Clin. 2021;37(1):135-50.
5. Heffernan AJ, Talekar C, Henain M, Purcell L, Palmer M, White H. Comparison of continuous versus intermittent enteral feeding in critically ill patients: a systematic review and meta-analysis. Crit Care. 2022;26(1):308.
6. 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.
7. Wischmeyer PE, Bear DE, Berger MM, De Waele E, Gunst J, McClave SA, et al. Personalized nutrition therapy in critical care: 10 expert recommendations. Crit Care. 2023;27(1):271.
8. Akinosoglou K, Schinas G, Almyroudi MP, Gogos C, Dimopoulos G. The impact of age on intensive care. Ageing Res Rev. 2023;84:101832.
9. Domenech-Briz V, Gea-Caballero V, Czapla M, Chover-Sierra E, Juárez-Vela R, Santolalla Arnedo I, et al. Importance of nutritional assessment tools in the critically ill patient: A systematic review. Front Nutr. 2023;9:1073782.
10. Hill A, Elke G, Weimann A. Nutrition in the Intensive Care Unit-A Narrative Review. Nutrients. 2021;13(8):2851.
11. McKendry J, Thomas ACQ, Phillips SM. Muscle Mass Loss in the Older Critically Ill Population: Potential Therapeutic Strategies. Nutr Clin Pract. 2020;35(4):607-16.
12. Wissanji T, Forget MF, Muscedere J, Beaudin D, Coveney R, Wang HT. Models of Care in Geriatric Intensive Care A Scoping Review on the Optimal Structure of Care for Critically Ill Older Adults Admitted in an ICU. Crit Care Explor. 2022;4(4):e0661.
13. Brunker LB, Boncyk CS, Rengel KF, Hughes CG. Elderly Patients and Management in Intensive Care Units (ICU): Clinical Challenges. Clin Interv Aging. 2023;18:93-112.

14. De Biasio JC, Mittel AM, Mueller AL, Ferrante LE, Kim DH, Shaefi S. Frailty in Critical Care Medicine: A Review. Anesth Analg. 2020;130(6):1462-73.
15. Firth J, Conlon C, Cox T, editors. Oxford Textbook of Medicine. 6th ed. Oxford: Oxford University Press; 2020.
16. Loscalzo J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Jameson JL, editors. Harrison's Principles of Internal Medicine. 21st ed. New York: McGraw-Hill Education; 2022.
17. Feather A, Randall D, Waterhouse R, editors. Kumar and Clark's Clinical Medicine. 10th ed. London: Elsevier; 2020.
18. Nishioka S, Nakahara S, Takasaki M, Shiohama N, Kokura Y, Suzuki T, et al. The concept of aggressive nutrition therapy and clinical indication: A position paper. Clin Nutr ESPEN. 2022;52:322-30.
19. 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. J Parenter Enteral Nutr. 2022;46(1):12-41.
20. Doley J. Enteral Nutrition Overview. Nutrients. 2022;14(11):2180.
21. Hill A, Heyland DK, Ortiz Reyes LA, Laaf E, Wendt S, Elke G, et al. Combination of enteral and parenteral nutrition in the acute phase of critical illness: An updated systematic review and meta-analysis. J Parenter Enteral Nutr. 2022;46(2):395-410.
22. Alsharif DJ, Alsharif FJ, Aljuraiban GS, Abulmeaty MMA. Effect of Supplemental Parenteral Nutrition Versus Enteral Nutrition Alone on Clinical Outcomes in Critically Ill Adult Patients: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Nutrients. 2020;12(10):2968.
23. Goldman L, Schafer Al, editors. Goldman-Cecil Medicine. 26th ed. Philadelphia: Elsevier; 2020.
24. Chauhan D, Varma S, Dani M, Fertleman MB, Koizia LJ. Nasogastric Tube Feeding in Older Patients: A Review of Current Practice and Challenges Faced. Curr Gerontol Geriatr Res. 2021;2021:1-7.
25. Liebau F, Deane AM, Rooyackers O. Protein absorption and kinetics in critical illness. Curr Opin Clin Nutr Metab Care. 2021;24(1):71-8.
26. Hoffmann M, Schwarz CM, Fürst S, Starchl C, Lobmeyr E, Sendlhofer G, et al. Risks in Management of Enteral Nutrition in Intensive Care Units: A Literature Review and Narrative Synthesis. Nutrients. 2020;13(1):82.
27. Jordan EA, Moore SC. Enteral nutrition in critically ill adults: Literature review of protocols. Nurs Crit Care. 2020;25(1):24-30.
28. Penman ID, Ralston SH, Strachan MWJ, Hobson R, editors. Davidson's Principles and Practice of Medicine. 24th ed. London: Elsevier; 2022.
29. De Sire A, Ferrillo M, Lippi L, Agostini F, De Sire R, Ferrara PE, et al. Sarcopenic Dysphagia, Malnutrition, and Oral Frailty in Elderly: A Comprehensive Review. Nutrients. 2022;14(5):982.
30. Belzarez Guedez JB, Helena Lenardt M, Cechinel C, Martins Rodrigues JA, Da Silva Marques DM, Angelica Binotto M. Elderly Feeding and Nutrition during Hospitalization: An Integrative Review. Open J Nurs. 2023;13(11):735-53.
31. Tatucu-Babet O, Lambell K, Ridley EJ. Nutritional Management of the Critically Ill Older Adult. ICU Manag Pract. 2020;20(3):185-90.

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