

Nutritional strategies for optimizing surgical wound healing in older adults: a scoping review

Estratégias nutricionais para otimização da cicatrização de feridas operatórias na pessoa idosa: revisão de escopo

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ABSTRACT

Objective: to map the nutritional strategies employed in the healing process of surgical wounds in elderly people. **Methods:** a scope review was conducted in the following databases: MEDLINE via PubMed, CINAHL, LILACS, Web of Science, SCOPUS, EMBASE, and gray literature sources: Google Scholar and ProQuest Dissertations & Theses, in addition to the Consensus AI platform, with no time or language restrictions. **Results:** of the 4,882 studies identified, 6 met the eligibility criteria and addressed nutritional strategies and surgical wound healing in older adults. Sources included primary and secondary studies, dissertations, and theses. Studies using non-pharmacological technologies were excluded. The main strategies involved oral or enteral supplementation with hypercaloric and hyperprotein formulas enriched with essential micronutrients and the use of supplementation containing immunonutrients (arginine, omega-3, glutamine, and nucleotides). **Conclusion:** nutritional interventions showed potential to reduce postoperative complications and promote healing in older adults, although the methodological heterogeneity of the studies requires caution in interpreting the results. **Contributions to practice:** the findings reinforce the importance of individualized planning and the development of nutritional protocols targeted at older adults. **Descriptors:** Elderly Nutrition; Wound Healing; Dietary Supplements; Surgical Wound.

RESUMO

Objetivo: mapear as estratégias nutricionais empregadas no processo de cicatrização de feridas cirúrgicas em pessoas idosas. **Métodos:** revisão de escopo realizada nas bases: MEDLINE via PubMed, CINAHL, LILACS, *Web of Science*, SCOPUS, EMBASE, nas fontes de literatura cinzenta: *Google Scholar* e *ProQuest Dissertations & Theses*, além da plataforma Consensus IA, sem restrição de tempo ou idioma. **Resultados:** dos 4.882 estudos identificados, seis atenderam aos critérios de elegibilidade, abordando estratégias nutricionais e cicatrização de feridas cirúrgicas em pessoas idosas. As fontes incluíram estudos primários e secundários, dissertações e teses. Foram excluídas pesquisas com uso de tecnologias não farmacológicas. As principais estratégias envolveram suplementação oral ou enteral com fórmulas hipercalóricas e hiperproteicas enriquecidas com micronutrientes essenciais e o uso de suplementação contendo imunonutrientes (arginina, ômega-3, glutamina e nucleotídeos). **Conclusão:** as intervenções nutricionais apresentaram potencial para reduzir complicações pós-operatórias e favorecer a cicatrização em pessoas idosas, embora a heterogeneidade metodológica dos estudos exija cautela na interpretação dos resultados. **Contribuições para a prática:** os achados reforçam a importância do planejamento individualizado e da elaboração de protocolos nutricionais direcionados ao público idoso. **Descritores:** Nutrição do Idoso; Cicatrização; Suplementos Nutricionais; Ferida Cirúrgica.

Introduction

Population aging is a global phenomenon that, in Brazil, has unique characteristics and social inequalities⁽¹⁾, altering the epidemiological profile. According to legislation⁽²⁾, an elderly person is defined as an individual aged 60 years or older. This scenario implies greater use of health services⁽³⁾, as well as an increase in surgical treatments, which represent a significant clinical challenge. During aging, physiological changes can affect immunity and metabolism, negatively influence tissue recovery and increase the risk of postoperative complications and mortality⁽⁴⁾.

Surgical procedures trigger numerous metabolic responses that increase the body's nutritional needs. In this context, malnutrition has been consistently associated with an increased risk of postoperative complications⁽⁵⁾. This clearly predisposes the elderly to poor wound healing, as they often present nutritional risk or poor nutritional status due to inadequate nutrient intake⁽⁶⁾.

Perioperative nutrition plays a key role in optimizing surgical outcomes. Poor nutritional status, common in the elderly, is directly associated with serious complications such as infections and delayed wound healing⁽⁷⁾. For this reason, current clinical guidelines recommend systematic nutritional risk screening and an individualized nutritional approach⁽⁸⁾. The implementation of these procedures is considered crucial for reducing hospital stays, morbidity, and hospital costs⁽⁹⁾.

The nutritional approach to wound healing is recognized as an integral part of the multidisciplinary management necessary to achieve optimal tissue repair results⁽¹⁰⁾. Nutritionists are professionals with technical and scientific knowledge of nutrient-based interventions and dietary strategies. Their participation is crucial to transforming the therapeutic plan into a more comprehensive, safe, and evidence-based approach.

However, for nutritionists to intervene assertively in this scenario, they must deepen their knowled-

ge of the most effective practices for surgical wound healing, particularly in elderly patients. Knowing the essential nutrients involved in this process enables professionals to adjust macro and micronutrient intake to the patient's clinical needs, thereby accelerating healing, reducing postoperative complications, and improving overall recovery.

Given the above, the objective of this review is to map the nutritional strategies employed in the healing process of surgical wounds in elderly people.

Methods

Type of study

This is a scoping review developed in accordance with the JBI structuring recommendations⁽¹¹⁾ and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist⁽¹²⁾, which establishes six steps: (1) formulating the research question, (2) searching the literature, (3) removing duplicates, (4) selecting studies, (5) extracting and summarizing data, and (6) presenting results. The protocol was previously registered on the Open Science Framework under the DOI 10.17605/OSF.IO/Z9A8C.

Research question

The population, concept, and context (PCC) mnemonic strategy was used. The population was defined as elderly people (≥ 60 years), the concept as nutritional strategies, and the context as surgical wound healing. Thus, the following guiding question was developed: "What evidence is available on nutritional strategies aimed at surgical wound healing in older adults?"

Eligibility criteria

The studies addressed nutritional strategies and surgical wound healing in elderly people (≥ 60 ye-

ars), with no language or publication year restrictions. Studies in which patients used non-pharmacological technologies such as laser, negative pressure therapy, or ozone therapy concomitantly with nutritional therapy were excluded to isolate the effect of nutritional intervention on wound healing, avoiding the influence of adjuvant treatments and allowing the results to reflect the impact of nutrition on the healing process more accurately.

Databases and sources of information

The search was conducted on October 15, 2024, in the Medical Literature Analysis and Retrieval System Online (MEDLINE) via PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Health Sciences Literature (LILACS), Web of Science, SCOPUS, and EMBASE, and gray literature (Google Scholar, ProQuest Dissertations & Theses). In Google Scholar, the first 100 studies were considered, and in ProQuest Dissertations & Theses, the articles were accessed via the Coordination for the Improvement of Higher Education Personnel (CAPES) portal. The same descriptors and eligibility criteria used for traditional databases were applied, and selection was made after reading the title/abstract and full text. The Consensus (AI) platform was used as a complementary source to support the traditional search. This is an innovative tool that uses artificial intelligence to search for studies and provide better results. After entering the research question into the search engine, several existing articles on the topic were listed. Only those who answered the research question were selected. Studies from peer-reviewed open access journals were also considered, provided they met the established eligibility criteria.

The sources of information included were primary studies (such as observational studies, intervention studies, clinical trials, and case reports); secondary studies (such as narrative reviews, integrative reviews, meta-analyses, and systematic reviews); dissertations and theses.

Search strategy

Based on the PCC strategy, the following descriptors were selected from Medical Subject Headings (MeSH), Health Sciences Descriptors (DeCS), and Emtree: “elderlynutrition,” “*nutrição do idoso*” (elderly nutrition), “wound healing,” “*cicatrização de feridas*” (wound healing), “Dietary Supplements,” “*suplementação nutricional*”, and “surgical wound” “*ferida cirúrgica*”, as well as their synonyms, combined with the use of Boolean operators (OR and AND) and adapted for each database. The complete search strategies for each database are available in the supplementary material.

Selection of sources of evidence

The studies found were exported to the bibliographic reference manager EndNote Web (Clarivate Analytics, USA), for identification and exclusion of duplicates. The studies were then exported to the Rayyan® software, and any other duplicates were removed. The selection process was conducted by two independent reviewers, with 92% agreement. Divergences were resolved by a third reviewer in accordance with the JBI protocol. The process of selecting studies is presented in a flowchart adapted from the PRISMA-ScR Checklist⁽¹²⁾.

Data extraction

For data extraction, the reviewers developed a form to systematize the scope review data, including the main information collected in the studies, such as author, year of publication, study type, population (n), mean age of participants, nutritional strategies used, and results.

Data analysis and synthesis

The data were analyzed descriptively and thematically and then categorized based on the similarity of the interventions’ content and objectives.

Results

A total of 4,882 articles were identified across databases and gray literature; after removing duplicates, 3,707 remained. In the initial screening, after reading the title and abstract, 38 studies were selected for the next stage. At this stage, after reading the full

texts, five were chosen according to the eligibility criteria defined for inclusion in this review. After searching the Consensus artificial intelligence platform, one study was selected, in line with the requirements established to compose the final sample, bringing the total to six articles. The selection process flowchart is shown in Figure 1.

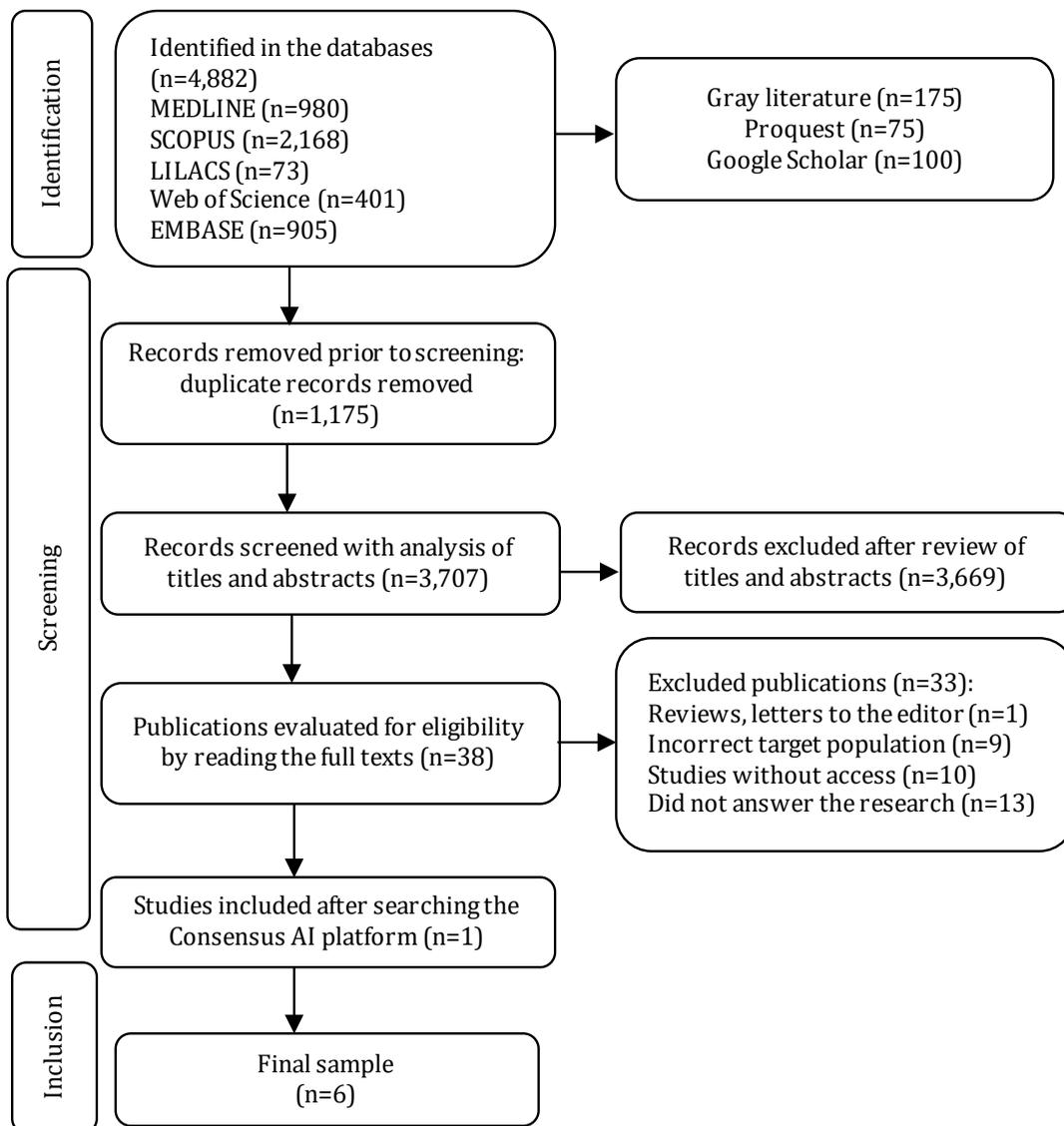


Figure 1 – Flowchart of the search and selection of studies on nutritional strategies aimed at surgical wound healing in older adults. João Pessoa, PB, Brazil, 2025

Regarding the study type, the sample consisted of randomized clinical trials (n=2; 33.3%), systematic reviews (n=1; 16.6%), and 50% narrative reviews (n=3). The articles selected for the sample present levels of evidence 1 and 2 (randomized clinical trials and systematic review), but there are few (n=3); this suggests that the evidence base on the topic is still limited and may reduce the strength of the conclusions. The other articles were narrative reviews that provided a theoretical basis and contextualized the topic

within the elderly population⁽¹³⁾. The studies were conducted in the United States (n=2), Australia (n=1), Italy (n=1), and China (n=1). It was not possible to identify the location of a narrative review of the sample. Regarding the year of publication, the final sample included two studies published before 2020 and four studies published from 2020 onwards.

The descriptive characteristics and main results of the selected studies are summarized in Figure 2.

Author/Year	Type of study	Population (n)	Average age	Nutritional strategies for surgical wound healing in the elderly	Key findings
Snyderman, et al ⁽¹⁴⁾ 1999	Randomized clinical trial	136	63 / 61	Use of immunonutrition versus standard formula alone in the preoperative and postoperative periods	Significant reduction in postoperative infections following head and neck surgery in patients who received immunonutrition pre- and postoperatively.
Collins, et al ⁽¹⁵⁾ 2005	Randomized clinical trial	50	≥60	Normocaloric and hyperproteic/hypercaloric oral dietary supplements with added iron, zinc, and vitamin C.	Elderly individuals who used a high-calorie, high-protein oral dietary supplement, combined with micronutrients, showed improved healing and cognitive performance.
Gao, et al ⁽¹⁶⁾ 2020	Systematic review/meta-analysis	966	51 a ≥ 65	Oral supplement with omega-3 fatty acids, glutamine, arginine, and nucleotides	Perioperative immunonutrition reduces complications, including infections, and shortens the hospital stay in patients undergoing hepatectomy.
Antonescu, et al ⁽¹⁷⁾ 2021	Narrative review	-	-	Oral nutritional supplement or enteral nutrition before and after surgery; early feeding; correction of deficiencies (vitamins B12, D, minerals)	Emphasizes nutritional support before and after surgery, especially in malnourished elderly patients, with better surgical outcomes.
Arensberg, et al ⁽¹⁸⁾ 2024	Narrative review	-	-	Macronutrients, amino acids, specific vitamins and minerals; specialized oral dietary supplement	High-protein oral dietary supplements, combined with dietary guidance, promote adequate nutrient intake for healing.
Boccardi; Marano ⁽¹⁹⁾ 2024	Narrative review	-	-	Oral dietary supplements with immunonutrients, vitamins, and minerals (vitamins C, E, selenium, and zinc)	Greater effectiveness of immunonutrition when administered pre- and post-operatively, regardless of initial nutritional status.

Figure 2 – Descriptive characteristics, nutritional strategies, and main results of the included studies (n=6). João Pessoa, PB, Brazil, 2025

Among the studies selected for the sample, three demonstrated that immunomodulatory nutritional intervention is a strategy to optimize postoperative outcomes. The randomized clinical trial⁽¹⁶⁾ evaluating the clinical efficacy of perioperative immunonutrition in patients undergoing hepatectomy analyzed 9 studies involving a total of 966 patients,

most of whom were elderly. It was found that immunonutrition significantly reduced the incidence of general postoperative complications, infectious complications, and surgical incision infection, and shortened the length of hospital stay. Despite showing positive results, the studies used different immunonutrition supplementation regimens and only one type of im-

munonutrient (omega-3 fatty acids), which may have led to heterogeneity in the results.

Nutritional therapy with oral immunomodulatory supplementation containing all immunonutrients and a standard formula was used perioperatively and only postoperatively, this time in patients who were candidates for head and neck cancer surgery. It was found that using both formulas only in the preoperative period did not reduce the incidence of infectious or other complications, such as wound-healing complications. As for the results, patients who used only immunostimulant formulas pre- and postoperatively had a significant reduction in postoperative complications compared with those who received only the standard formula during the same period. Further studies are needed to explore the use of this nutritional therapy in the preoperative period, the route of administration, and the dietary composition required in elderly people undergoing head and neck surgery⁽¹⁴⁾.

The effects of a normocaloric and hypercaloric oral nutritional supplement on nutritional status and wound healing, including surgical wounds, were compared over 4 weeks in elderly people receiving home care, most of whom were malnourished. The results showed improvement in some indicators of wound healing and cognition in the group that received supplements dense in energy, protein, and nutrients. Additional studies with larger samples and long-term follow-up are needed in elderly people with similar types of wounds to verify the effect on complete wound healing and the cost-effectiveness of nutritional support⁽¹⁵⁾.

As for the narrative reviews, the effect of perioperative immunonutrition in elderly surgical patients, the physiological mechanisms of immunonutrition and inflammatory response, and the synthesis of current evidence on the role of nutrition in the healing of acute and chronic wounds were addressed, analyzing the effect of macro and micronutrients on the tissue repair process. Although narrative reviews do not present primary data, they contribute to consolidating the physiological and clinical foundations that under-

pin the nutritional strategies addressed in the experimental studies included in this review⁽¹⁷⁻¹⁹⁾.

Discussion

There is an undeniable relationship between adequate nutrition, including macronutrients (carbohydrates, proteins, and fats) and micronutrients, such as vitamins and minerals, for efficient healing, as well as the preserved nutritional status of patients in the preoperative period. Dietary interventions should begin immediately upon patient admission, based on identification of nutritional risk factors, assessment, and nutritional diagnosis⁽¹⁴⁻¹⁹⁾.

In elderly surgical patients, wound healing can be impaired by several factors, including age. In this age group, wounds heal more slowly due to changes in the skin itself, physiological changes from the underlying disease, and preexisting nutritional deficiencies, making the entire process challenging until full recovery⁽²⁰⁾. Thus, the dietary interventions performed will determine the success of this journey.

The results obtained in the sample of studies indicate that the main strategies addressed are related to the availability of substrates essential for the proper functioning of the body in the postoperative period, especially proteins, specific amino acids (glutamine and arginine), resulting from the intake of protein foods; vitamins and minerals, which act as cofactors of enzymes involved in the anabolic process of healing. Specialized nutritional supplementation, composed of immunomodulatory nutrients, was the intervention most explored by the selected studies, including narrative reviews, which showed positive results in reducing postoperative complications⁽¹⁴⁻¹⁹⁾.

The first studies involving immunonutrients began in the 1980s and 1990s, but it was in the early 2000s that the concept of immunonutrition was consolidated as an effective strategy for surgical patients. An essential international guideline on clinical nutrition in surgery brings together several evidence-based recommendations on nutritional interventions

adopted to optimize the recovery of surgical patients, including elderly patients. This guideline, based on data from numerous studies, recommends the use of immunonutrition, preferably in the postoperative period after major surgery, with a significant reduction in infectious complications and hospital stay⁽²¹⁾. The guideline's recommendation corroborates the findings of the studies in the sample for the use of immunomodulatory supplementation, and further studies are needed to explore this topic.

Surgical patients who could benefit from preoperative immunonutrition were identified, demonstrating reduced inflammatory markers and fewer postoperative infectious complications. However, there were limitations regarding the composition of the immunomodulatory formulas used in the studies, which showed high variability and lacked a definition of nutrient amounts, a fact also observed in the analysis of the studies in this review⁽²²⁾.

The authors agree on favorable results regarding postoperative complications, including reduced surgical wound infections, shorter wound-healing time, and shorter hospital stays^(14,16-19).

A multidisciplinary protocol developed in Brazil presents recommendations from specialists of the Brazilian College of Surgeons and the Brazilian Society of Parenteral and Enteral Nutrition on various nutritional prescriptions for the perioperative period of elective general surgery procedures. This guideline recommends the use of dietary formulas in the perioperative period for patients at higher nutritional risk undergoing major surgery, including immunonutrients, both through oral supplements and enteral feeding, when oral feeding is insufficient or unfeasible⁽²³⁾.

In an acute geriatric setting of frail hospitalized patients, immunonutrition has been shown to improve short-term clinical outcomes by modulating key biological pathways. These improvements include reduced hospital stay and improvements in inflammatory and immunological markers, highlighting, as in the sample studies, the potential of immunonutrition to positively impact the recovery and overall health of elderly and frail patients⁽²⁴⁾.

The current trend involves applying multimodal protocols, such as Enhanced Recovery After Surgery⁽²⁵⁻²⁸⁾, to the geriatric population in clinical practice to facilitate rapid recovery and preserve cognitive function. This protocol includes perioperative nutrition as a central point in surgical care, through individualized nutritional support integrated with the multidisciplinary team⁽²⁹⁾. However, although the results are positive regarding perioperative nutritional care, including supplementation during recovery in surgical patients, there is a need to adapt this care to meet the specific needs of geriatric patients⁽³⁰⁾, which represents an explicit limitation due to the lack of study targeting this population.

Regarding the use of oral nutritional supplements, this review showed that they optimize healing by providing essential nutrients for tissue repair, especially in elderly patients at nutritional risk or malnourished. Thus, supplementation should begin preoperatively and continue after discharge, improving nutritional status and reducing hospital stay⁽¹⁵⁾. Guidelines recommend that, for malnourished elderly patients or those at nutritional risk, oral nutritional supplements should provide at least 400 kcal and 30 g of protein per day and should be maintained for at least 1 month to assess their effectiveness⁽³¹⁻³³⁾.

The results of this review corroborate evidence highlighting the central role of immunonutrition and nutritional support in modulating the inflammatory response and accelerating healing in elderly patients. They affirm that nutrients such as arginine, glutamine, omega-3 fatty acids, and nucleotides have potent effects on the healing process and cellular immunity, justifying their use in perioperative protocols^(17,19). In this sense, there are concrete clinical benefits, including reduced infectious complications, shorter hospital stays, and reduced hospital costs. However, the heterogeneity of interventions, the lack of dose standardization, and the scarcity of studies conducted exclusively with the elderly are limitations that indicate the need for new experimental research with greater methodological rigor, conducted with elderly people in the postoperative period⁽¹⁴⁻¹⁶⁾.

National and international guidelines and protocols also corroborate the results described here, highlighting the benefits of nutritional interventions and their positive effects on postoperative recovery. Another international guideline⁽³⁴⁾ refers, in its latest update for elective colorectal surgeries, to nutrition and immunonutrition as crucial fundamentals in perioperative care, reinforcing the use of immunomodulatory formulas with standardized duration and dosage, as well as the achievement of daily protein and caloric goals through oral supplements for up to five days postoperatively.

In the context of aging, the application of guideline-based protocols, such as those described in this review, that include early nutritional assessment and intervention, may represent an effective strategy for optimizing clinical outcomes in elderly patients undergoing surgical procedures, especially major procedures. The integration of evidence-based practice and the recommendations of scientific societies consolidates nutrition as a key determinant of recovery and healing, underscoring the nutritionist's central role in the care of elderly surgical patients.

The small number of studies selected for the final sample of this review limits the robustness of the results, as few comprehensive reviews isolate nutritional interventions, such as specific nutrients or formulations that act directly on the surgical wound-healing process in older adults. In preliminary searches of the PubMed database, a few articles addressing nutrition and healing in the elderly population were found, revealing the need for more consistent studies in this area.

Study limitations

The limitations observed include a scarcity of studies on this topic focused on the elderly, methodological heterogeneity, unrepresentative samples, variability in routes of administration, formula composition, and duration. Gaps remain regarding the relationship between micronutrient deficiencies and surgical outcomes in the elderly.

Contributions to practice

The data presented may support the planning of individualized nutritional strategies and the development of protocols for the elderly surgical population, thereby improving nutritional care and positively impacting the recovery and quality of life of these patients.

Conclusion

Perioperative nutritional strategies show potential to promote healing and reduce complications in elderly people undergoing surgery, but there is still no consensus on ideal protocols. Although the main published national and international guidelines support such interventions, the evidence base remains limited regarding the standardization of formulas, doses, duration, and timing of supplementation, underscoring the need for robust clinical trials and systematic reviews conducted exclusively in elderly populations.

Authors' contributions

Conception and design or analysis and interpretation of data: **Araújo PPA, Paiva GT, Moura RBB**. Drafting of the manuscript or critical revision of intellectual content: **Araújo PPA, Paiva GT, Moura RBB, Cavalcanti AM, Piagge Filho ED, Mélo CB**. Final approval of the version to be published; responsibility for all aspects of the text, ensuring the accuracy and integrity of any part of the manuscript: **Araújo PPA, Paiva GT, Moura RBB, Cavalcanti AM, Piagge Filho ED, Piagge CSLD, Mélo CB**.

Data availability

The authors declare that the data are fully available in the body of the article.

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