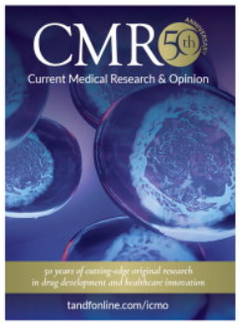

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REVIEW ARTICLE

Nutritional care in older adults: are we doing everything? An expert opinion review

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ABSTRACT

Malnutrition is a prevalent, yet often underdiagnosed and undertreated, condition in older adults. It is characterized by weight loss and/or reduced muscle mass due to diminished caloric intake, inflammation, and/or disease burden. In return, malnutrition can lead to diminished skeletal muscle functionality and disability, among others. Malnutrition plays a crucial role in the pathogenesis of two prevalent geriatric syndromes, namely sarcopenia and frailty. The complex interplay between malnutrition, sarcopenia, and frailty significantly impacts the older population, leading to increased morbidity, mortality, hospitalization rates, quality-of-life, and healthcare costs. Given the prognostic significance of malnutrition in geriatric care, recent guidelines emphasized the role of nutritional support in vulnerable populations. A group of vulnerable populations to malnutrition, sarcopenia, and frailty are older patients with hip fractures, cancer patients, and those with sarcopenic dysphagia. This article highlights the importance of individualized nutritional assessment and treatment in the management of vulnerable populations such as older patients with hip fractures, cancer, and those suffering from sarcopenic dysphagia. It presents practical protocols and guidelines that can be instrumental in enhancing the nutritional care of these groups, thereby improving their overall health outcomes.

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Ageing; malnutrition; frailty; Sarcopenia; geriatrics; nutritional interventions

Introduction

Despite the considerable progress in geriatric care, malnutrition remains challenging for older adults. Previous reports suggested that 3.2% and 23.4% of community-dwelling older adults in Europe are malnourished or at risk of malnutrition, respectively[1]. Additionally, the prevalence of malnutrition increases progressively with declined functional dependency, affecting nearly 40% of hospitalized patients and 50% of those in rehabilitation[2].

The development of malnutrition in older adults is multifaceted. Ageing is inherently associated with physiological, psychological, and social changes, directly affecting nutritional status and dietary needs[3]. Age-related physiological changes, such as altered digestive functions, changes in taste and smell, decreased physical activity, depletion of lean body mass, poor muscle health, and declining mental status, significantly impact dietary intake and lead to progressive nutritional deterioration[4,5]. Furthermore, chronic inflammatory diseases and swallowing disorders, which are more common in older adults, often affect appetite and food intake and induce skeletal muscle catabolism, leading to malnutrition[3,6]. From a clinical standpoint, malnutrition in older adults is associated with an increased risk of mortality, prolonged hospitalization, impaired recovery from acute illness or surgery, falls and fractures, impaired immunity, and recurrent infections[7]. The humanistic burden of malnutrition is also substantial in older adults; previous reports showed that malnutrition increased the risk of poor health-related quality-of-life (HRQoL) and impaired individual independence[8–10]. Additionally, malnutrition generates an economic burden due to increased hospitalizations and healthcare resource utilization (HCRUs)[11,12].

According to the Global Leadership Initiative on Malnutrition (GLIM) consensus, reduced muscle mass is one of the phenotypic criteria that defines malnutrition[13]. In return, malnutrition plays a crucial role in the pathogenesis of two distinct geriatric syndromes, namely sarcopenia and frailty. Sarcopenia was formally recognized as a disease in 2016 (ICD-10-CM code: M62.84) and is defined as an age-related loss of muscle mass and strength, affecting primarily functional outcomes[14,15]. Sarcopenia is closely associated with malnutrition; the synergy between age-related loss of

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muscle mass and function (a hallmark of sarcopenia) and protein deficiency creates a vicious cycle of malnutrition-sarcopenia syndrome, in which reduced protein intake exacerbates muscle loss, further diminishing the capacity to consume and utilize nutrients effectively[16,17]. Previous reports showed that nearly one-third of older adults at nutritional risk were sarcopenic[18].

Likewise, frailty, a condition characterized by decreased physiological reserve and increased vulnerability to stressors, is both a consequence and a contributor to the cycle of malnutrition and sarcopenia. The interplay of malnutrition and sarcopenia significantly escalates the risk and severity of frailty[19]. The risk of malnutrition was reported in up to 64% of frail older adults and 66% of sarcopenic patients in the community setting[20,21]. Malnutrition, sarcopenia, and frailty in older adults significantly increase the risk of serious consequences, including disability, prolonged hospitalization, falls and fractures, impaired HRQoL, and mortality[22–27]. On the other hand, low physical activity plays a key role in the development of sarcopenia and frailty[28], and it is identified as a relevant modifiable risk factor[29]. This is particularly relevant given the high burden of low physical activity globally and its association with mortality and disability-adjusted life years[30].

The interconnected nature of malnutrition, sarcopenia, and frailty, as well as their deleterious consequences, highlights the need for a multifaceted approach to the nutritional management of older adults, particularly those with chronic diseases or acute events exacerbating the risk of nutritional deficiencies. Various clinical guidelines recommend personalized nutritional assessment and treatment, including supplementation when necessary, for older adults experiencing malnutrition or at risk of it. These guidelines emphasize the significance of an integrated and tailored nutritional approach across different clinical contexts, underscoring its role in enhancing health outcomes[31,32]. Still, malnutrition remains under-recognized and unaddressed in clinical practice. Furthermore, the availability of multidisciplinary teams, including dietitians, physiotherapists, and speech therapists, varies in different healthcare settings, presenting additional challenges. These disparities necessitate the customization of nutritional care plans tailored to the resources and circumstances of each setting. There is also a need to improve nutritional education and awareness among healthcare providers. Overcoming these challenges is imperative for clinicians committed to effectively addressing nutritional care. In this article, we review three clinical scenarios – hip fracture, cancer, and oropharyngeal dysphagia (OD) – which pose significant nutritional risks in older adults, and provide specific practical protocols to address these concerns.

Review development

This review article is based on the scientific contents of a satellite symposium conducted at the 19th Congress of the European Union Geriatric Medicine Society (EuGMS), Helsinki, Finland. The symposium was held on September 21, 2023, and aimed to discuss recent updates in nutritional care for older adults at risk due to acute events or chronic diseases. During this symposium, the consequences of malnutrition and nutritional management protocols for the following vulnerable populations were discussed: older adults with hip fractures, cancer patients, and those with sarcopenic dysphagia.

An online bibliographic search was conducted in Medline *via* PubMed from its inception to November 2023 to support the development of this article. A MeSH-based search strategy was employed as follows: ("Geriatrics" [MeSH Terms]) AND (("Malnutrition" [MeSH Terms]) OR ("Sarcopenia" [MeSH Terms]) OR (frail older) OR "Geriatric Nutrition")) AND (("Chronic Disease" [MeSH Terms]) OR "hip fracture" OR "Cancer" OR "Sarcopenic dysphagia"). Additionally, supplementary keywords were included alongside MeSH terms, such as "elderly nutritional care", "aging and dietary needs", and "geriatric dietary interventions". Clinical trials, real-world studies, reviews, and guidelines documents were reviewed, and relevant data were extracted.

Changing the patterns of nutritional care in the orthogeriatric wards

Hip fractures represent a major public health burden, with a global incidence of ten million cases per year. As the population ages, the incidence of hip fractures is expected to increase significantly, approaching 21 million cases by 2050[33,34]. The current body of evidence shows a rising trend of hip fractures with advancing age; recent reports showed that the incidence of hip fractures among older adults ranged from 95–316 per 100,000 population, which is expected to double by 2050 as the population ages[35]. While the incidence of hip fractures is constantly higher in adults older than 65 years compared to younger age groups, there are observed variations in the incidence of hip fractures among older adults based on sex (higher incidence in females due to osteoporosis[36]) geographical location (increasing trends in Asia[37]), comorbidities, and lifestyle[35]. Several factors contribute to the high risk of falls and hip fractures with aging, including loss of bone mineral density, osteoporosis and osteopenia, thyroid disorders, and accidental falls from conditions impairing balance, such as Parkinson's disease, stroke, and peripheral neuropathy[38,39].

Over the years, hip fractures have become a true geriatric syndrome, with significant medical and socioeconomic consequences due to the complexity of care required and the profound impact on mortality, morbidity, HRQoL, and HCRUs[40]. The median age at the onset of hip fractures in developed countries was found to be 83–84 years old[36,41], a group that is inherently vulnerable to impaired recovery, complications, and a higher risk of mortality. Hip fractures are notably associated with increased mortality rates in older adults; the 1-year mortality rate following a hip fracture is particularly high, ranging from 14.4–34.8%[35,42]. Patients with hip fractures have a 5–8-times greater mortality rate than patients without fractures within the first 3 months of the event[43].

Alongside the high mortality, hip fractures in older adults are associated with a substantial morbidity burden. Older adults with hip fractures exhibited an increased risk of serious complications, including recurrent infections, prolonged hospitalization, chronic pain, delirium, pressure sores or ulcers, and increased risk of new fractures[44]. Notably, it was found that >50% of older adults who suffer a hip fracture never recover their baseline functional status[45]. This decline in functionality often results in impaired mobility, leading to a loss of independence and the need for long-term care or assistance with daily activities. Previous reports showed that patients with a hip fracture are 4.2-times more likely to have mobility limitations in the community 2 years after fracture[46], while only 40–70% of patients return to their pre-fracture level of independence[47]. Additionally, patients who experience a hip fracture are 5.6-times more likely to require institutionalization in the following year post-fracture[48]. The overall HRQoL of these patients was also found to be significantly impacted[49].

The burden of malnutrition is another prevalent concern in older adults with hip fractures (Figure 1). In a recent systematic review of nine studies ($n = 1{,}665$ participants, mean age 79.9–86.1 years old), the reported prevalence of malnutrition, as diagnosed by the Mini Nutritional Assessment (MNA®), among hip fracture patients ranged from 4–39%[56]. Another report showed that nearly 58% of those admitted to a rehabilitation ward were at risk of malnutrition[57]. The relationship between malnutrition and the incidence of falls and hip fractures in older adults can be described as a cause-and-effect cycle that exacerbates both conditions. As previously mentioned, malnutrition contributes to the loss of skeletal muscle mass and functionality, mobility impairment, and accidental falls[7,50]. On the other hand, patients with hip fractures suffer from mobility impairment and prolonged hospitalization[46], which can exacerbate muscle loss and lead to poor nutritional intake[51].

Malnutrition can have a profound negative impact on the outcomes of older adults with hip fractures. The cumulative body of evidence suggests that pre-existing malnutrition is an independent predictor of mortality[58,59]. In a recent report of 318 hip fracture patients aged >50 years old, malnutrition was significantly associated with shorter survival time, and it independently predicted 6-month mortality[60]. Additionally, among older adults with hip fractures, malnutrition significantly increased the risk of postoperative delirium[61], impaired cognition[58], worse rehabilitation outcomes, poor functional status, impaired gait at discharge[57,62,63], impaired recovery to pre-fracture daily activities and walking ability[52], and functional dependence[64].

Given these profound effects, it is not surprising that a growing number of published studies evaluated the impact of nutritional interventions on the outcomes of older adults with hip fractures and increased risk of malnutrition. Initially, a systematic review of 18 trials by the Cochrane Group found no significant impact of oral nutritional supplements (ONS) on mortality; however, the use of ONS was associated with a reduced risk of complications – such as infection and thrombosis – and unfavorable outcomes[65]. Nonetheless, these findings were based on low-quality evidence, and most included studies had a high risk of selection bias[66]. More recently, a systematic review by Takahashi et al. included ten trials that evaluated nutritional supplements in older adults with hip fractures ($n = 1119$ patients). The pooled analysis showed that nutritional supplements were associated with significantly lower risks of mortality (risk ratio [RR] = 0.61) and complications (RR = 0.67), as well as improved skeletal muscle functions[67]. Another recent meta-analysis showed similar

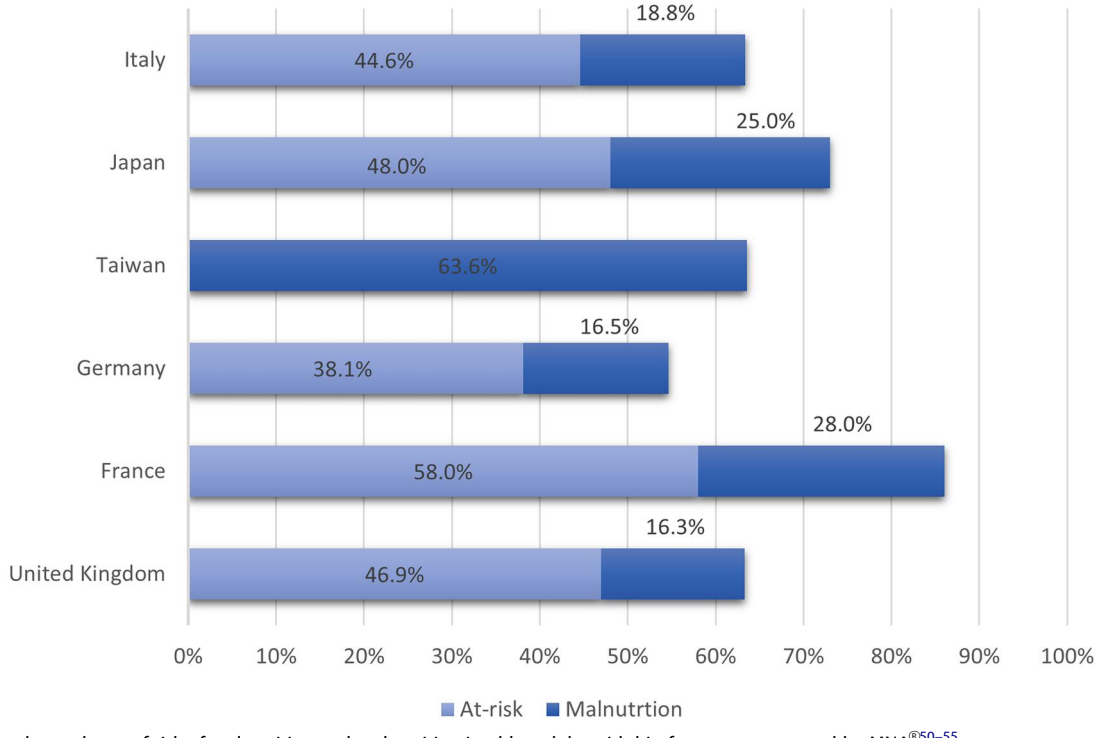

Figure 1. Reported prevalence of risk of malnutrition and malnutrition in older adults with hip fracture, as assessed by MNA®[50–55].

findings[64]. A systematic review concluded that nutritional therapy in older adults with hip fractures was cost-effective and improved functional recovery[59].

These findings reflect the crucial role of addressing malnutrition in the context of hip fractures. The management of hip fractures in geriatric patients is not only a matter of surgical intervention but also involves comprehensive postoperative care (i.e. orthogeriatric care), where nutrition plays a pivotal role. Several orthogeriatric care models, including nutritional intervention, were proposed for managing hip fracture patients, with generally favorable impacts on the mortality and morbidity of the patients[68–70]. In a recent meta-analysis of 37 studies on patients with hip fractures, orthogeriatric care significantly reduced the length of stay (mean difference [MD] = −1.55 days), in-hospital mortality (risk difference [RD] = 28%), 1-year mortality (RD = 14%), and delirium (RD = 19%). The effect of orthogeriatric care was more prominent in the shared care model[71].

In return, multiple clinical guidelines recommend nutritional therapy as part of multidisciplinary orthogeriatric care for at-risk patients with hip fractures. Integrated into a multidimensional, multidisciplinary management plan, the European Society for Clinical Nutrition and Metabolism (ESPEN) recommends postoperative ONS for geriatric patients with hip fractures to reduce the risk of complications[32]. Similar recommendations were provided by the Japanese Association of Rehabilitation Nutrition[72], the Italian intersociety consensus[73], and the Finnish Current Care Guidelines[74], among others[75,76]. However, strategies to address malnutrition and improve clinical outcomes as an integral part of orthogeriatric care of patients with hip fractures remain under-recognized in clinical practice. Addressing the challenge of malnutrition in older adults with hip fractures requires a proactive, multifaceted approach.

In the practice of one of the authors (AJCJ), we follow a nutritional pathway incorporating geriatrician-led multidisciplinary integrated orthogeriatric care for older adults with hip fractures (Figure 2). This approach prioritizes early nutritional screening and dysphagia assessment on admission. We also recommend specific ONS (with high-quality protein, essential amino acids, calcium, and vitamin D) for 3 months for all patients, alongside assessing and treating the causes of malnutrition. The multidisciplinary team revises the nutritional status at 3 months to optimize the nutritional support for those who still have nutritional problems. Rehabilitation and physical therapy play a key role in functional and nutritional recovery. All nutritional plans should be part of a multifaceted intervention that includes physical therapy[72,77].

In this model, nutritional treatment plans are followed up at primary care to ensure their effectiveness and continuity, with primary care playing a crucial role in maintaining and adjusting the nutritional interventions according to the patient's evolving needs, ensuring a seamless transition from hospital to home care. This model may be helpful to others in changing the patterns of nutritional care in hip fracture care in a quest to improve patient outcomes.

Malnutrition, sarcopenia, and frailty: the cornerstone in the management of the oncogeriatric patient

Cancer is predominantly a disease of older individuals, with a significant proportion of cancer diagnoses occurring in those aged ≥65 years. Epidemiological data reveal that the incidence and mortality rates of cancer increase dramatically with age; nearly 60% of all new cancer cases and 70% of cancer-related deaths occur in older adults[78]. Additionally, recent estimates projected a notable increase in cancer incidences among older adults parallel to the increase in the global older adult population. It was estimated that cancer incidence among older adults will increase from 6.7 million

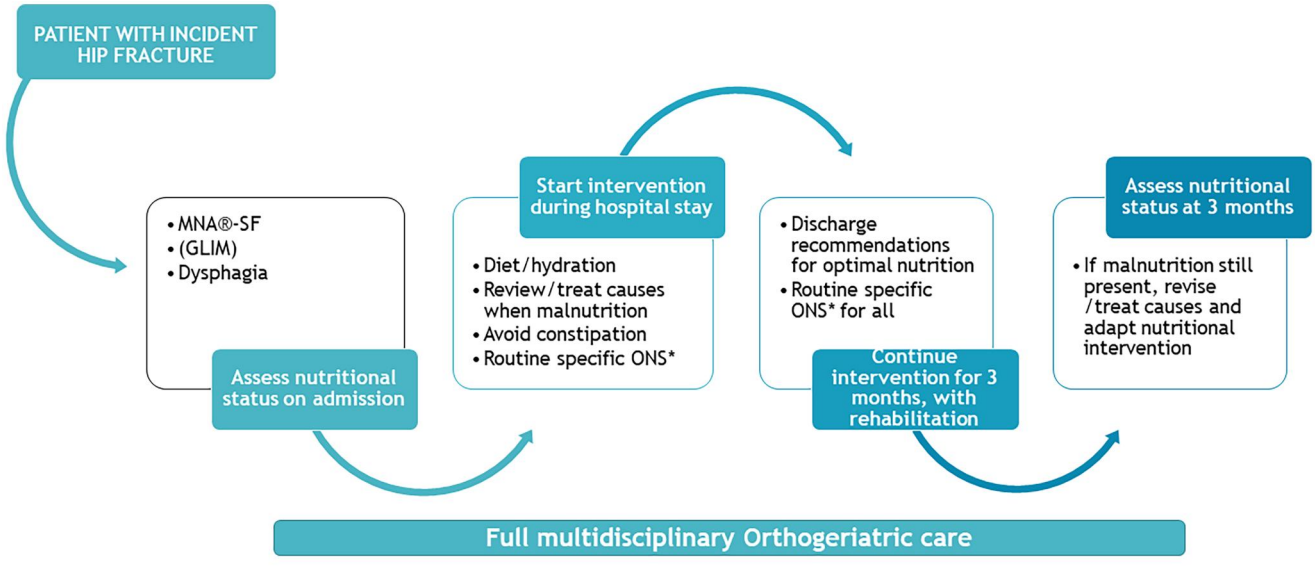

Figure 2. A proposed nutritional pathway for hip fractures in a geriatrician-led integrated orthogeriatric unit. Abbreviations: MNA®-SF, Mini Nutritional Assessment–short form; MN, malnutrition; ONS, oral nutritional supplement.

cases in 2012 to 14 million cases by 2035, with the highest predicted increase in the Middle East and Northern Africa (+157%) and in China (+155%)[79]. Other estimates revealed that, among adults aged ≥ 80 years, cancer incidence will increase from 2.3 million cases in 2018 to 6.9 million cases in 2050 (20.5% of all cancer cases)[80]. The high burden of cancer incidence in older adults is attributed to various factors, including age-related changes in the immune system and the increased prevalence of other risk factors, such as obesity and smoking during their life course, in older individuals[81].

Older adults with cancer often present with unique challenges. Previous reports demonstrated that 40% of older adults with cancer present with at least one comorbidity, particularly cardiovascular disease or diabetes[82]. Older adults usually present with more advanced disease stages, a lower probability of resectable disease, and a lower chance of receiving chemotherapy/radiotherapy[83]. Compared to younger populations, older adults have a higher risk of cancer mortality and shorter survival time[84].

Growing evidence suggests an alarming prevalence of malnutrition in patients with cancer, particularly in older adults. Previous reports suggested that nearly 20–70% of patients with cancer are malnourished or at risk of developing malnutrition, with a higher incidence in patients with advanced stages and/or systemic inflammation[85]. In older adults (mean age = 65 years) with cancer, the prevalence of malnutrition was found to be 34%; of these, 89% had moderate-to-severe malnutrition that requires urgent nutritional support[86]. Other reports indicated that the prevalence of moderate-to-severe malnutrition was as high as 58% in patients with cancer aged ≥65 years[87]. Alongside age-related changes, the development of malnutrition in patients with cancer is multifaceted and attributed to several cancer-related, treatment-related, and patient-specific factors[85]. Cancer patients may have an impaired desire to eat or eating difficulties due to the local tumor effects or treatment toxicities. In addition, cancer-mediated metabolic alterations can disrupt normal nutrient metabolism, impacting the digestion and absorption of nutrients[86,88].

Malnutrition can have devastating consequences in older adults with cancer. Previous reports showed that malnutrition was significantly associated with poor survival outcomes. Malnourished patients with head and neck tumors (median age = 61 years) were found to have significantly shorter overall survival (OS) and disease-free survival (DFS) than well-nourished patients; in the adjusted Cox regression model, malnutrition was found to be an independent predictor of OS[89]. Another multivariate analysis showed that weight loss ≥5% was significantly associated with shorter progression-free survival (PFS)[90]. Malnourished patients with cancer often experience higher toxicity rates and lower tolerance to chemotherapy, necessitating dose reductions or interruptions[91,92]. Furthermore, malnourished patients were found to have a higher risk of infections, postoperative complications, prolonged hospitalization, and unplanned hospital visits[92–94].

Perhaps one of the major consequences of malnutrition in older adults with cancer is the increased risk of muscle-related conditions, i.e. sarcopenia and cachexia, due to the potential synergistic adverse effects. In patients with head and neck cancer, it was found that 28.6%, 24.2%, and 43.8% of the patients with sarcopenia, frailty, and cachexia were malnourished, respectively[95]. Malnutrition has a complex and often cyclic interplay with sarcopenia, frailty, and cachexia, attributed to the interconnected etiological factors[96,97], as inadequate nutritional intake can exacerbate the decline in muscle mass and function, worsening frailty and sarcopenia; both conditions are already common in cancer patients due to multimorbidity, chronic systemic inflammation, oxidative stress, age-related metabolic changes, and limited mobility[98]. Likewise, poor nutrient intake and nutritional deterioration can worsen cachexia, a prevalent, life-threatening condition in cancer patients characterized by skeletal muscle and/or adipose tissue wasting due to a negative protein and energy balance and metabolic derangements[99]. Malnutrition thus becomes more severe in patients with cachexia[100].

Sarcopenia and frailty in patients with cancer are associated with increased treatment toxicity, postoperative complications, and worse survival outcomes[101,102]. These adverse effects can be further exacerbated by malnutrition; a previous report demonstrated that the concurrent presence of malnutrition risk and sarcopenia was associated with a 2-fold increase in mortality among hospitalized patients[103]. Additionally, cachexia was found to be associated with worse OS[100]. While it is plausible to predict a synergistic adverse effect when malnutrition co-occurs with cachexia, this cumulative effect remains unclear and needs further research.

Despite the profound impact of malnutrition on older adults with cancer, it remains largely under-diagnosed and untreated in clinical practice. Nutritional care should be an integral part of cancer care, and there is a need for a tailored multimodal care intervention in managing oncogeriatric patients with poor nutritional status, particularly considering the interplay between malnutrition, frailty, sarcopenia, and cachexia[104]. In older adults with cancer, malnutrition, sarcopenia, frailty, and cachexia should not be seen as isolated conditions but as disorders that can co-exist or occur sequentially (31% of the patients had at least two concurrent conditions[95]) in which malnutrition represents a common factor[13,96].

Thus, early nutritional support can potentially reduce the risk of muscle-related conditions (i.e. sarcopenia, cachexia, and frailty), treatment-related adverse events, treatment interruptions or discontinuation, and poor survival[105–108]. Nutritional screening and intervention should start during the initial work-up, and the objectives of nutritional therapy are to recover or maintain adequate nutritional status, correct nutritional deficits, reduce the frequency and duration of treatment interruptions or rehospitalizations, and enhance the overall functional status of the patient[109]. The ELCAPA (ELderly CAncer PAtients) survey identified malnutrition in older adults with cancer by the presence of one of the following criteria: "at least 10% weight loss in 6 months or 5% in 1 month and/or body mass index less than 21 kg/m^2 and/or Mini-Nutritional Assessment score less than 17/30 and/or serum albumin level less than 35 g/L". This profile can help

physicians select patients indicated for urgent nutritional intervention[110].

Although the optimal nutritional support for older adults with cancer and malnutrition is still not defined, the guidelines of the European Society of Medical Oncology (ESMO) and European Society for Clinical Nutrition and Metabolism (ESPEN) stress the need for maintaining an adequate energy intake and assuring the correct amount of protein[104,111]. Due to the expected anabolic resistance in older patients with cancer, a higher range of protein intake (1.2–1.5 g/kg/day) is recommended to promote muscle mass balance and energy (25–30 Kcal/kg/day)[112]. Nutritional interventions can encompass dietary advice, treatment of underlying causes and symptoms, and offer high energy-dense ONS ($\geq$2 kcal/ml) in symptomatic patients to improve compliance[109,111]. Recently, the American Society for Clinical Oncology (ASCO), in collaboration with the Cancer and Aging Research Group (CARG) and the International Society of Geriatric Oncology (SIOG), developed a practical guideline with a multidimensional approach to provide care for all older patients with cancer, incorporating nutritional care[113]. In addition to nutritional care, rehabilitation and physical activity play important roles in the multidimensional approach[111]. The current evidence shows that the combination of nutritional interventions and physical activity significantly improves functional status and HRQoL and potentially mitigates the risk of treatment-related adverse events[72,114,115].

A group of experts in nutrition, in a collaborative project between Catolica Medical School, Portuguese Institute of Oncology, and CUF Hospital, developed a practical protocol based on clinical evidence and clinical practice that allows healthcare professionals caring for patients with cancer to identify patients with or at risk of malnutrition and/or muscle depletion for subsequent evaluation and follow-up by a multidisciplinary team (Figure 3), currently submitted for publication. Cooperation between specialized professionals in cancer care is essential to assess and improve treatment efficiency and patient care. This cooperation should also involve primary care as an integral part of following up and monitoring the effectiveness of the nutritional plans.

As we look toward the future in the management of cancer patients, particularly in the context of malnutrition, it becomes evident that a one-size-fits-all approach is inadequate. Cancer patients represent a highly heterogeneous population with varying combinations of comorbidities, physiological reserves, nutritional deficiencies, and geriatric syndromes. This diversity necessitates individualized, multifaceted nutritional strategies tailored to each patient's unique needs.

Challenges in the care of sarcopenic dysphagia in older adults

OD is a highly prevalent condition in older adults, particularly among those aged $\geq$75 years. Previous reports demonstrated that nearly 46% of the geriatric population suffers from OD[116], with higher prevalences in institutionalized individuals (40–60%[117,118]), people in geriatric care units (44%[119]), hospitalized patients aged $\geq$ 80 years old (82.4%[120]), older adults with hip fractures (55%[121]), and patients with cancer (54%[122]). In frail patients, the prevalence of OD was reported to be 47.4%[123]. In fact, aging is characterized by anatomical and functional changes in the swallowing mechanism, referred to as presbyphagia, increasing the risk of OD[124]. Patients with OD are at increased risk of recurrent respiratory infection and aspiration pneumonia (odds ratio [OR] = 2.07)[116,120]; previous reports demonstrated that older adults aged $\geq$75 years old accounted for 76.0% of aspiration pneumonia-related deaths[125]. Additionally, OD was found to significantly increase the risk of malnutrition (OR = 2.21), delirium (OR = 2.23), and mortality (OR = 2.73)[116].

Despite its high prevalence and severe consequences, OD is poorly recognized in clinical settings and is usually diagnosed at a late stage when related complications happen[126].

OD is acknowledged as a geriatric syndrome, demanding a comprehensive and interdisciplinary evaluation to diagnose and treat the causes of the condition[127,128]. OD in older adults can result from age-related neurodegenerative diseases; the most common conditions leading to OD include stroke (with reported prevalences of 51–55% with clinical testing and 64–78% with instrumental tools[129]) or progressive neurologic disease (e.g. dementia, amyotrophic lateral sclerosis, Parkinson's disease)[130]. Recent research has identified sarcopenia as one of the potential causes of oropharyngeal dysphagia in older adults, leading to the concept of sarcopenic dysphagia.

Sarcopenic dysphagia refers to swallowing difficulties due to sarcopenia of the swallowing and generalized skeletal muscles. A recent position statement proposed a diagnostic algorithm for sarcopenic dysphagia in older adults[131]. The Japanese Society of Dysphagia Rehabilitation diagnostic criteria confirm sarcopenic dysphagia if both OD and sarcopenia are present after excluding other causes of OD. The diagnostic workup for sarcopenic dysphagia starts with the assessment of physical function and total muscle mass to diagnose sarcopenia (Figure 4)[132]. Once sarcopenia is confirmed, swallow function should be assessed using any clinical or instrumental swallowing examinations. Muscle strength should be assessed by examining tongue pressure[133,134], considering a tongue pressure of $\leq$ 20 kPa to confirm a probable diagnosis[133,134]. The oropharyngeal muscle mass can be measured through various imaging techniques such as ultrasound (US) and computed tomography (CT). These methods provide a visual representation of the muscles, allowing for an assessment of their size and condition[135,136]. Although some studies suggest using these imaging tests to examine swallowing muscles, there is currently no established cut-off point to determine the loss of swallowing muscle mass. Consequently, evaluating the decrease in swallowing muscle mass using these imaging tests and making a definitive diagnosis for sarcopenic dysphagia, a condition characterized by muscle loss and swallowing difficulties, remains a challenging task.

A growing number of studies have investigated the prevalence of sarcopenic dysphagia in older adults. A recent report found that the prevalence of sarcopenic dysphagia

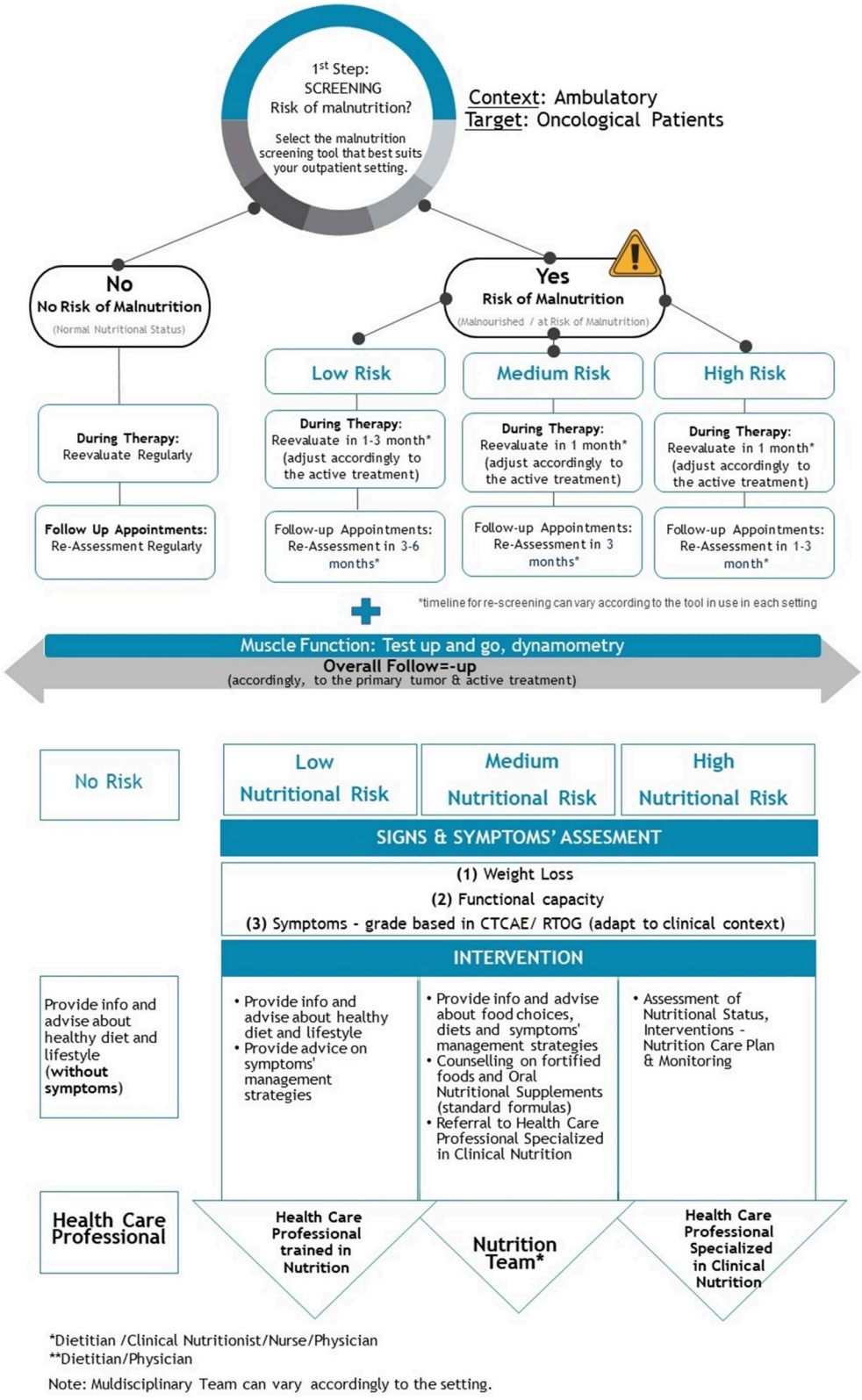

Figure 3. Early identification and intervention according to the nutritional risk in patients with cancer (submitted).

among hospitalized older adults was 22.8%[137]. Other reports showed that 5.6% of older adults living in the community had sarcopenic dysphagia[138]. Furthermore, nearly 32% of the patients undergoing dysphagia rehabilitation had sarcopenic dysphagia[139]. In recent meta-analyses, the pooled OR for the association between sarcopenia and OD ranged from 3.1 to 4.06 ($p < 0.05$)[116,140]. It should be noted that most of these studies were limited by a non-instrumental assessment of swallowing[141].

Sarcopenic dysphagia may also be an important area due to the prognostic significance of sarcopenia in frail older adults. Previous reports showed that impaired tongue

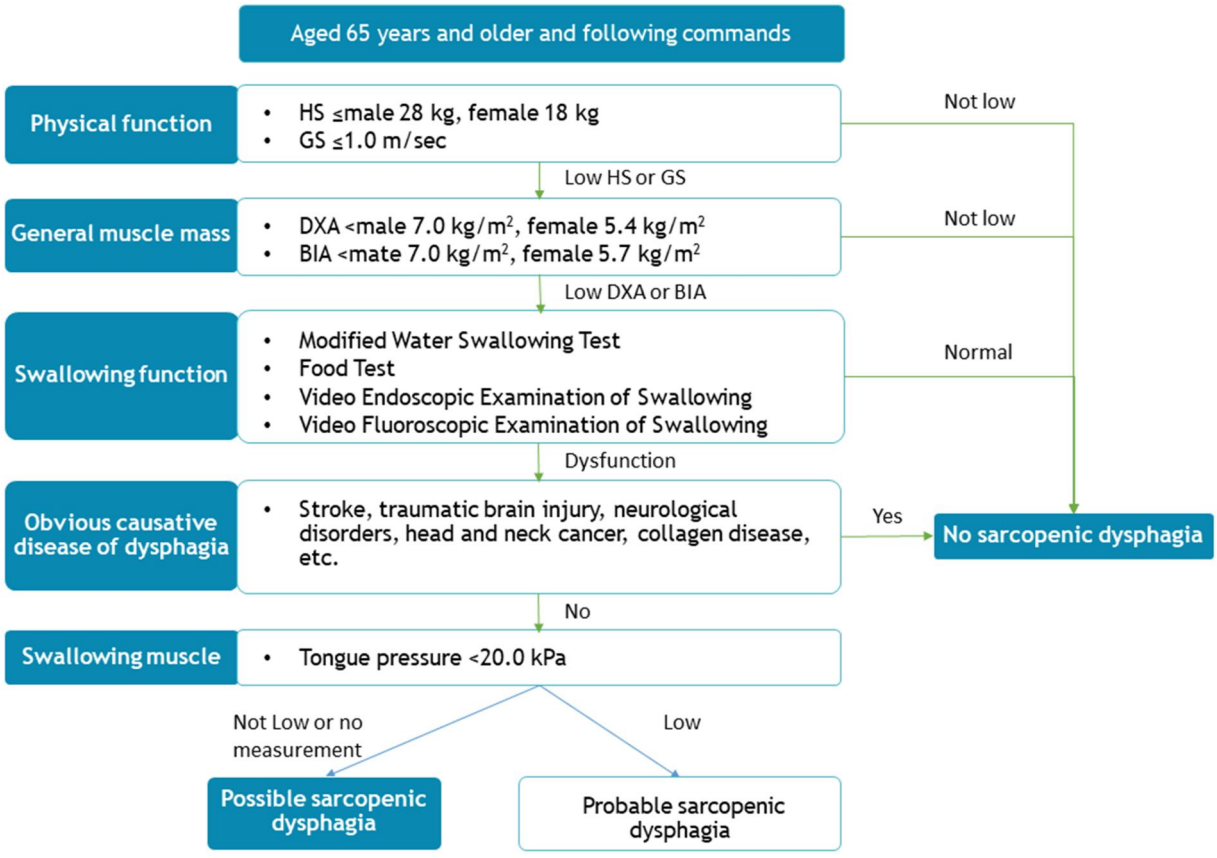

Figure 4. A proposed diagnostic algorithm for sarcopenic dysphagia. Adapted from Kakehi et al.[132]. Abbreviations: BIA, bioelectrical impedance analysis; DXA, dual-energy X-ray absorptiometry; GS, gait speed; HS, hand grip strength.

strength was associated with poor recovery, a higher risk of respiratory infection, and worse life expectancy[142]. Recent reports also showed that sarcopenic dysphagia was associated with a 1.4-times higher risk of mortality[143], poor functional capacity, malnutrition, and impaired daily activities[132]. The diagnosis of sarcopenic dysphagia may also be significant as it appears to have prognostic implications in terms of swallowing function recovery[137]. On the other hand, dysphagia results in decreased nutrient intake, leading to malnutrition and exacerbating overall muscle loss and weakness, including the muscles involved in swallowing[144,145].

Sarcopenic dysphagia can be unintentionally triggered or worsened by medical interventions. This is known as iatrogenic sarcopenia, which can occur during hospitalization and is a significant concern[146]. It can be categorized into three types: activity-related (caused by unnecessary inactivity), nutrition-related (due to inappropriate nutritional care), and disease-related (stemming from iatrogenic diseases or adverse drug events)[146]. Thus, clinicians involved in dysphagia care must emphasize preventive strategies as an integral part of their practice.

Early diagnosis and treatment may mitigate the consequences of OD, including sarcopenic dysphagia; treatment plans should be based on a multidisciplinary evaluation and tailored based on individual needs and capabilities, with active patient involvement in the decision-making process. Compensatory strategies, such as postural adjustments, swallowing maneuvers, and dietary modifications, represent a cornerstone in preventing aspiration pneumonia (see Figure 5)[147]. Additionally, rehabilitative techniques and muscle-strengthening methods are employed to enhance swallowing and tongue muscle functions[144]. Recent case reports demonstrated that rehabilitative techniques, including resistance training of the swallowing muscles, lingual resistance exercises, and/or head-lift exercises, were associated with significant improvements in swallowing function, daily activities, and oral intake[148–152].

These rehabilitative techniques should be combined with nutritional therapy to ensure adequate energy and protein intake (Figure 5)[132]. There is some promising evidence, mostly based on clinical cases, that addresses the impact of nutrition on sarcopenic dysphagia. Previous reports showed that an average daily intake of $\geq$ 30 kcal/Kg, with a protein intake of $\geq$ 1.2 g/Kg/day, improved swallowing function and tongue strength in older adults with dysphagia[153,154]. These findings align with the recommendations for older patients at risk of malnutrition according to European guidelines for older adults[32]. European guidelines recommend providing at least an energy intake of $\geq$ 30–35 kcal/kg/day and a protein intake of $\geq$ 1.2 g/kg/day[131]. Several non-European consensuses also exist for the nutritional management of OD patients and support the same recommendations[155,156]. According to the ESPEN guidelines in geriatrics and neurology, texture-modified enriched food, such as adding thickened fluids (TF)[157,158], should be offered as a compensatory strategy to older adults with signs of OD and malnutrition or risk of malnutrition[32,159].

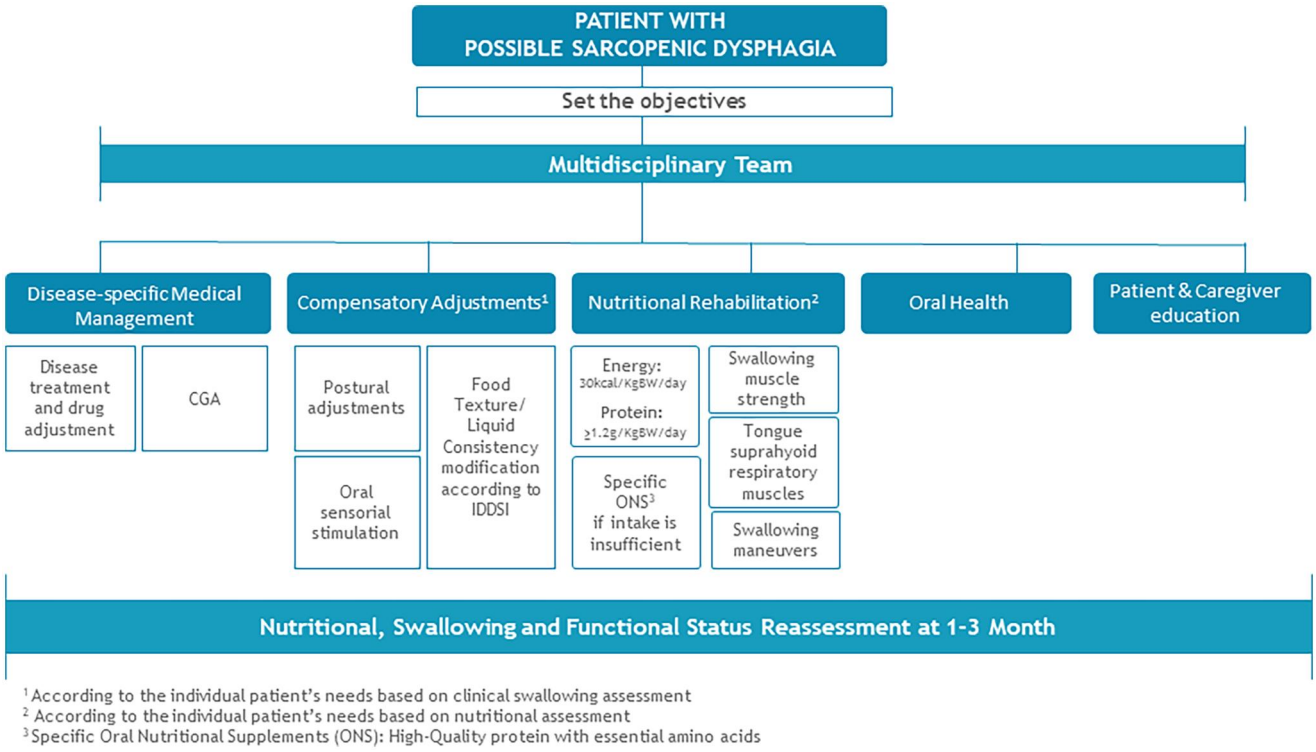

Figure 5. A proposed algorithm for the management of sarcopenic dysphagia. Abbreviations: CGA, comprehensive geriatric assessment; IDDSI, international dysphagia diet standardization initiative; ONS, oral nutritional supplement; RH, rehabilitative techniques.

Thus, adding thickened fluids (TF) is a common practice to increase ONS viscosity and allow more time to control the swallowing process[157,158]. However, modified diets are associated with lower intake and a higher risk of malnutrition, as non-compliance is common[160]. Prethickened ONS can be a useful treatment for malnutrition in people with OD when requirements are not reached despite diet enrichment strategies. Prethickened ONS might be preferred as adding thickeners to calorie and protein supplements can sometimes result in a lumpy, less palatable beverage[161]. In addition to dietary modifications, comprehensive treatment of sarcopenic dysphagia should also encompass educational efforts, integrating primary care for monitoring nutritional plan effectiveness, maintaining oral hygiene, treating periodontal diseases[162], managing xerosis, and regularly reviewing and adjusting medications[146].

Sarcopenic dysphagia has gained attention over the recent years due to its consequences on the clinical outcomes of older adults. Nutrition and rehabilitation emerge as essential aspects, so further research and clinical trials are essential for advancing our understanding and developing effective management strategies for this condition.

Conclusion

In conclusion, malnutrition presents a challenge in medical care, particularly for older adults with hip fractures, cancer, and sarcopenic dysphagia. In these groups, nutritional care is crucial in mitigating malnutrition risks and consequences, especially while recovering from acute illness. This publication discusses practical approaches for managing malnutrition in these clinical situations, including early screening for malnutrition, individualized nutrition plans, and post-intervention monitoring and adjustment to optimize nutritional outcomes and assess the need for further plans. Integrating primary care is critical to follow-up on the treatment plan and ensure a seamless transition from hospital to home care. Additionally, rehabilitation should be an integral component of nutritional treatment in oncology, hip fracture, and dysphagia due to its multifaceted benefits on patient outcomes[72,77,111,114]. This approach ensures that nutritional care is a foundational aspect of comprehensive geriatric care, offering a proactive pathway to enhance patient outcomes. By standardizing the incorporation of nutritional assessments and interventions in clinical settings, healthcare providers can more effectively address the nutritional needs of older adults. Involving and integrating the collaboration of both public and private resources may be necessary.

Nutritional management in geriatrics within developing countries presents unique challenges that require tailored strategies. To ensure adequate nutritional care for elderly patients in developing countries, it is crucial to implement early detection programs for malnutrition and chronic diseases specific to this population and train healthcare personnel in geriatric nutritional management. Developing standardized protocols in hospitals, community settings, and primary care settings, as well as forming multidisciplinary teams for comprehensive care, is essential.

As healthcare professionals, we must advocate for including dietitians and specialized rehabilitation therapists or physiotherapists in our healthcare systems. These specialists are essential for the nutritional treatment of elderly patients, particularly those with cancer, hip fractures, and dysphagia.

Continued research and clinical trials are essential for advancing our understanding and developing effective

management strategies for older adults with malnutrition or at risk of developing malnutrition.

Transparency

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