

Polypharmacy and malnutrition in older people: A narrative review

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A B S T R A C T

Polypharmacy is the simultaneous use of multiple medicines, usually more than five. Polypharmacy is highly prevalent among older individuals and is associated with several adverse health outcomes, including frailty. The role of polypharmacy in nutritional status seems to be crucial: although a clear association between polypharmacy and malnutrition has been widely reported in older people, the magnitude of the effect of increased number of drugs in combination with their type on the risk for malnutrition remains to be largely explored. Therefore, this review aims to discuss the association between polypharmacy and malnutrition in older people and to provide suggestions for its management. Polypharmacy is prevalent among malnourished frail patients, and the relative contribution of comorbidities and polypharmacy to malnutrition is difficult to be determined. Several mechanisms by which commonly used medications have the potential to affect nutritional status have been identified and described. Deprescribing (i.e., a systematic process of identification and discontinuation of drugs or a reduction of drug regimens) could be an essential step for minimizing the effects of polypharmacy on malnutrition. In this regard, the literature suggests that in older patients taking several medications, the best method to solve this problem is the comprehensive geriatric assessment, based on a holistic approach, including drug review, to find potential unnecessary and inappropriate medications. Nutritional and deprescribing interventions must be tailored to patient needs and to the local context to overcome barriers when applied in different settings.

Polypharmacy in older people

Polypharmacy is the simultaneous use of multiple medicines. A wide range of different definitions of polypharmacy can be found

in the current literature. The most reported is the use of five or more drugs daily, whereas other numerical categorizations are less frequent [1]. Different classifications include the association of the number and duration of therapies, and descriptive definitions, which show considerable heterogeneity and are more difficult to compare. Among the latter, the distinction between appropriate and inappropriate medications is a qualitative definition and explores abuse, underuse, and duplication of drugs [2]. Polypharmacy is common in older patients with multimorbidities

This work is a product of the Collaborative Working Group of SINPE (Società Italiana Nutrizione Artificiale e Metabolismo) and SIGOT (Società Italiana di Geriatria Ospedale e Territorio).

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(i.e., the coexistence of multiple chronic conditions in the same individual) [3]. The number of chronic medical conditions requiring multiple pharmacologic treatments may increase with advancing age.

Nonetheless, interactions between various pharmacologic principles cannot be excluded, whereas adverse drug reactions could be misdiagnosed. This misinterpretation can lead to the prescription of new other drugs, which places the patient at risk for developing additional adverse events. This process is known as the *prescribing cascade* [4]. Indeed, the effects of medication-related harm on older people can be considered a geriatric syndrome [4]. Mention should be given to the potentially inappropriate prescriptions, including drug–drug interactions, disease–drug interaction, under- and overprescribing, and the prescribing cascade [5].

A primary concern is the association between polypharmacy and adverse health outcomes, such as falls, functional impairment, increased hospital length of stay, readmissions, and mortality [6]. Indeed, the association between polypharmacy and frailty in older adults appears bidirectional. On one side, several tools to screen and measure frailty include the number of drugs taken by the patient as a crucial parameter of frailty [7]; on the other, the likelihood of being frail increases with the increasing number of medications prescribed to or taken by the patient [8]. Frailty is indeed linked to chronic conditions and multimorbidities related to polypharmacy, confirming that the frailty condition is multidimensional, with functional, cognitive, psychosocial, and biological factors modulated by the presence and severity of diseases and polypharmacy. For this reason, a multidimensional diagnostic and management approach with multicomponent interventions is necessary [9].

A large U.S. longitudinal study conducted with >4400 older community-dwelling participants free from frailty at baseline reported that polypharmacy, categorized in three classes as reported by the Multidimensional Prognostic Index (i.e., 0–3, 4–6, or ≥ 7 medications) [10], was associated with a higher incidence of frailty over 8 y of follow up [11]. A study from Spain with 773 participants >70 y and followed up to 5.5 y showed that polypharmacy, defined as the chronic use of five or more drugs, was associated with mortality, incident disability, hospitalization, and emergency department visits in frail and prefrail older adults, but not in non-frail adults [12].

In this context, the role of polypharmacy in nutritional status appears crucial; a clear association between polypharmacy and malnutrition has been widely reported in older individuals [13]; however, the magnitude of the effect of the increased number of drugs in combination with the type of drugs, on the risk for malnutrition remains unexplored also considering that polypharmacy is one of the potentially modifiable determinants of malnutrition especially in high-risk frail older individuals [14]. The present review will discuss the potential association between polypharmacy and malnutrition in older individuals. To address the topic, we critically evaluated the literature from January 2010 to December 2022. Databases searched included Pubmed and SCOPUS. Only articles in English were selected. The following terms were included: *polypharmacy*, *older adults*, *malnutrition*, and *nutritional status*. Authors were asked to identify further references from their selection of literature, and they chose the most relevant papers for inclusion in the present review. Each author then drafted a section of the manuscript, incorporating the evidence from the literature and a critical appraisal according to personal clinical and scientific experience. Each contribution was then reviewed and included in the final draft, which was shared and approved by all the authors.

Malnutrition in older people

The aging process is characterized by a progressive accumulation of molecular and cellular damage with an increased risk for developing frailty and acute and chronic diseases. It is now well known that adopting a healthy lifestyle, including regular physical activity and a nutritious diet, is a preventive factor against many pathologies and disabilities of older adults. Therefore, nutrition is an essential aspect of the health of older adults.

Nutritional status results from the balance between caloric intake and energy expenditure incurred by the body to ensure vital processes. Hence, *malnutrition* is a condition characterized by an imbalance in energy, protein, or other nutrients responsible for adverse effects on body composition, physical function, and clinical outcomes [15]. A wide range of causes can contribute to the altered nutritional status related to the aging process, such as edentulism, dysgeusia, dysphagia, motor and visual impairment, and anorexia [16]. From a physiologic standpoint, many central neurally mediated stimuli lead to the search and consumption of food, reinforced by further sensory stimuli (smell, taste, sight, or imagination), but also cultural and social inputs [17]. This drive is counterbalanced by neurohormonal signals coming mainly from the digestive system. Filling the stomach and activating the digestive process simultaneously cause satiation and inhibit further food intake. Unlike in younger patients, older people experience a progressive prevalence of satiety signals over those of hunger [17]. This condition is known as *anorexia of the elderly* and is a primary risk for malnutrition [18]. Other factors, such as increased frequency and severity of acute and chronic diseases and polypharmacy (responsible for malabsorption, gastrointestinal disorders, loss of appetite), have a recognized etiologic role, as do psychosocial causes such as isolation, poverty, cognitive decline, dementia, and depression [16]. The most striking phenotypic manifestation of malnutrition is weight loss sustained by fat and lean mass depletion. It is precisely the loss of lean mass that represents the actual pathologic event of malnutrition. Indeed, the organism seeks alternative energy substrates, thus triggering protein catabolism with conversion into glucose of the carbonaceous skeleton of amino acids, subsequently used for oxidative purposes [19]. Protein-calorie malnutrition, therefore, is characterized by a marked alteration in body composition and, in addition to a reduction in lean body mass, involves an increase in extracellular space, inflammation, depression of the immune response (whether cell-mediated and humoral), susceptibility to infection, reduced wound healing, physical function impairment, and cognitive deficit [16]. All these factors increase the risk for morbidity and mortality by altering the functional status and quality of life of the malnourished individual, leading to prolonged hospital stay, early institutionalization, and higher health care costs.

Furthermore, malnutrition plays a crucial role in the pathogenesis of both sarcopenia and frailty. However, the high prevalence of obesity (malnutrition by excess) and the effects of sarcopenic obesity on disability found in geriatric patients should not be forgotten.

Polypharmacy and nutritional status in older adults

Several reports suggest that polypharmacy, defined by the number of daily drugs or prescription inappropriateness, contributes to malnutrition in older people. A systematic review including six longitudinal studies conducted in community-dwelling and institutionalized older adults reported that five of the studies identified polypharmacy among the risk factors for malnutrition [20].

More recent evidence confirms this association. A Japanese cross-sectional study performed with a cohort of older users of daycare facilities found that malnutrition diagnosed with the Global Leadership Initiative on Malnutrition (GLIM) criteria was associated with polypharmacy defined as at least five drugs per day and specifically with proton pump inhibitors, anti-constipation, and antihypertensive medications [21]. Another study conducted in a cohort of older outpatients identified a cutoff value of 6.5 drugs for being malnourished [22]. Previously, a prospective study conducted in a cohort of older community-dwelling adults demonstrated that, after correcting for comorbidities, a significant relationship existed between excess polypharmacy, defined as ≥ 10 drugs (but not 6–9) and poor nutritional status, impaired functional ability and cognitive status [23]. Because multiple diseases and multimorbidities lead to polypharmacy [24], the results of the latter investigation suggest an independent contribution of comorbidities to the association between malnutrition and polypharmacy. Indeed, a recent study showed in a cohort of 597 hospitalized older adults, a higher Charlson Comorbidity Index score in those malnourished than those without malnutrition [25]. Thus, as polypharmacy increases with the prevalence of chronic conditions, the risk for malnutrition may exponentially rise because of the direct and indirect effects of multidrug regimens. In 2017, Little et al. [26] reported that >250 drugs could negatively affect nutritional status via multiple mechanisms that include taste and smell alterations, xerostomia, and gastrointestinal symptoms (anorexia, diarrhea, nausea, and vomiting) [27–29]. Although these side effects are not age-specific, they may be magnified in older people because, in polypharmacy, several drugs may insist on the same system or organ or because of drug–drug interactions. As for anorexia, some medications can negatively affect food intake by directly reducing the stimulus of hunger, reducing its sensory reinforcement, slowing down the digestive and motility processes, or enhancing the signals of satiety. Several gastrointestinal symptoms, including motility disorders, nausea and vomiting, gastroesophageal reflux, and malabsorption, have been increasingly reported in association with the intake of commonly used medications in older patients [30]. Food intake may be reduced significantly by medications that reduce salivation. Drug-induced xerostomia is a risk factor for impaired masticatory function, oropharyngeal dysphagia and taste disorders [28]. A review describing the mechanisms of medication-induced taste and smell disturbances reported that >350 drugs may induce dysgeusia, involving 50% of the most used 100 medications in the United States [27]. Also, antibiotic use has been associated with taste disturbances and other gastrointestinal symptoms (diarrhea, dyspepsia, nausea, vomiting, ageusia/hypogeusia) and with the risk for the potential depletion of specific micronutrients [31]. As for swallowing disorders, a cross-sectional retrospective study including 200 patients admitted to a geriatric hospital showed a higher incidence of oropharyngeal dysphagia in those treated with antipsychotics, anti-Parkinson drugs, benzodiazepines, and antidepressants after adjustment for neurologic diseases [32]. Reduced food intake may be associated with benzodiazepines that induce sedation [33]. In the context of polypharmacy, drugs' small, ordinarily irrelevant effects can seriously affect energy balance, leading to malnutrition in the older population. These may be exacerbated by changes in pharmacokinetics typical of older age, such as decreased hepatic clearance, altered drug distribution due to changes in body composition related to aging and progressive decrease of renal function [33]. Kose et al. [34] and Ortolani et al. [33] reported a comprehensive list of the effects of drugs and their interactions with nutrients.

In addition to the number of daily medications, available literature on the contribution of polypharmacy to impaired nutritional status includes some reports analyzing the association of inappropriate drug prescription with malnutrition. The link between inappropriate drug prescription and malnutrition, which increases with polypharmacy, has been demonstrated in a cohort of 643 older patients undergoing rehabilitation. A higher number of potentially inappropriate drugs defined by the 2015 Beers criteria was independently associated with worse nutritional status at discharge [35]. Medications increasingly prescribed during rehabilitation stay include antipsychotics, benzodiazepines, proton pump inhibitors, and nonsteroidal anti-inflammatories. Others confirmed the association between potentially inappropriate drug prescription and malnutrition by using the same criteria [36] or the screening tool of older people's prescriptions (STOPP) and screening tool to alert to right treatment (START) criteria [37]. These studies demonstrate another potential indirect mechanism by which polypharmacy affects nutritional status and suggest several actions to take when revising medical prescriptions in malnourished older patients.

Finally, in addition to protein-energy malnutrition, polypharmacy has been linked to the reduced intake of selected macro- and micronutrients in older adults, including soluble and insoluble fiber, vitamins A, D, and E, niacin, biotin, and thiamine [38].

Nutritional care in older adults with polypharmacy

Because of the potential adverse effects of polypharmacy on nutritional status [13], nutritional care for older adults at risk of or with malnutrition should be delivered using an integrated and individualized approach to improve nutritional status. Nutritional care should be administered in parallel with identifying and eliminating dietary problems caused by polypharmacy. Such an approach should be multidisciplinary, integrating geriatric and nutritional competencies to provide appropriate nutritional care to older adults with multiple chronic diseases. Nutritional care should be based on the results of a comprehensive geriatric assessment (CGA) inclusive of malnutrition risk screening and medication review.

The nutritional care process involving screening for malnutrition, nutritional assessment, care plan, and treatment followed by monitoring and reassessment should be applied with some integrations [39]. Nutrition screening should be performed at hospital admission and patient contact in the community and repeated periodically [39]. The Mini Nutritional Assessment (MNA), a simple and validated nutritional screening tool for older adults, is recommended for routine geriatric assessment [40]. The MNA is an assessment tool that specifically addresses the number of drugs but not their type. A recent cross-sectional study conducted with a cohort of 150 older outpatients compared the performance of three different malnutrition screening/assessment tools (MNA short form [MNA-SF], MNA long form, and the GLIM criteria) toward the association among malnutrition, polypharmacy, and potentially inappropriate medications. All three screening tools correlated with polypharmacy and the number of drugs; however, only MNA-SF was independently associated with potentially inappropriate medications [22]. Based on these results, MNA-SF is the best malnutrition assessment tool when evaluating the relationship between malnutrition and polypharmacy.

A revision of potentially modifiable factors causing malnutrition should be performed in parallel with malnutrition screening and assessment. Based on a recent review [14], eating dependency, low appetite, impaired physical functioning, and low self-perceived

health are determinants of malnutrition. The available evidence is conflicting regarding oral health (including swallowing function), cognitive impairment, residential status, and polypharmacy. This contrasts with two previous reviews that identified polypharmacy, depression, and dysphagia among the determinants of malnutrition [20,41]. Therefore, all these factors should be addressed appropriately and managed in older adults with polypharmacy. In parallel, a review of medications with potential adverse effects on nutritional status should be performed. This step should be associated with the systematic search of signs and symptoms related to polypharmacy and potentially affecting nutritional status, especially in those scoring at risk for or with malnutrition. To this aim, a set of parameters should be evaluated (Table 1).

Medication-induced xerostomia is a risk factor for chewing difficulties and oropharyngeal dysphagia [42], contributing to malnutrition in older adults [43]. Diagnosis of xerostomia includes a detailed search of signs and symptoms, using simple questionnaires [44], and inspecting the oral cavity. For management, referral to professionals (oral hygienist, dentist) may be required in case of local complications (edentulism, gingivitis, periodontitis, caries, impaired masticatory function). Along with a medication review, oral hygiene education and nutritional counseling (including information on proper hydration and avoidance of potentially irritating foods and drinks) should be delivered. Topical products may be considered to improve xerostomia; however, this approach should be individualized based on the patient's preferences and capabilities [45]. A recent study examining the effects of 6-month individualized xerostomia and nutritional intervention on a population of home-care older adults at risk for/with malnutrition demonstrated a 30% reduction in the prevalence of xerostomia and 61% in that of malnutrition [46].

Additionally, xerostomia may favor the development of oropharyngeal dysphagia, which can also be a direct side effect of medications, including benzodiazepines and psychotropic drugs [47]. Because of the potential risk for aspiration and respiratory infections, oropharyngeal dysphagia should be recognized and managed promptly by a multidisciplinary team involving speech therapists, dietitians, geriatricians, and nurses [48]. Depending on polypharmacy-induced symptoms, other professionals may be involved. Regardless of symptoms, including a clinical pharmacist in the multidisciplinary team may reduce polypharmacy and inappropriate prescribing. A pharmacist-led educational intervention has been shown to increase the discontinuation rate of inappropriate medications in older adults in a community setting [49]. In the hospital setting, optimization of medical therapy via a joint

intervention by a clinician and a pharmacist supported by a digital tool for clinical decision making resulted in a discontinuation of inappropriate medications. However, no difference was demonstrated for the first drug-related hospital readmission after 1 year, between the intervention and the control groups [50]. Thus, although the engagement of a clinical pharmacist in reducing polypharmacy and increasing prescription appropriateness appears effective, more outcomes should be included in the analysis. Nutritional evaluation should be routinely performed within the CGA and shared multidisciplinary team members.

Nutritional assessment should include screening for symptoms and causes of malnutrition and identification of the targets of nutritional intervention [51]. Quantifying energy and protein intake [40] involves the intervention of a dietitian who may also implement individualized counseling or other dietetic interventions coordinated with medical actions. Energy requirements should be calculated using current guidelines [16,52]. Physical and functional assessment (i.e., search for low muscle mass/sarcopenia) and anthropometric measurements integrate the evaluation and allow the diagnosis of malnutrition and its severity grading according to the GLIM criteria [53]. At the same time, drug prescriptions potentially associated with adverse effects on nutritional status should be interrupted, particularly in those malnourished or at risk for malnutrition. Otherwise, a therapeutic switch to alternatives with fewer side effects should be considered.

Some relevant points should be considered:

- some polypharmacy-related signs or symptoms are interconnected (i.e., dry mouth may cause dysphagia and taste disturbances) [28];
- polypharmacy is a potentially modifiable determinant of malnutrition [14]; and
- deprescribing is associated with increased energy intake in older adults. [54]

Based on current guidelines, the recommended daily energy intake is 30 kcal/kg and ≥ 1 g/kg protein [16,40,52], adjusted for physical activity levels, nutritional status, and acute and chronic diseases. Modification of dietary protein intake depending on the presence of sarcopenia or other conditions should be considered [55,56]. Protein quality and timing of ingestion are important to maximize the anabolic response [57,58], particularly in older individuals [59]. Animal-based foods are good sources of high-quality proteins, as they contain the essential amino acids (EAAs). Among the EAAs, leucine is critical to stimulating muscle protein synthesis

Table 1
Nutritional and geriatric assessment for older patients with polypharmacy

	Parameter	Comment
Comprehensive geriatric assessment	Clinical Anamnesis	Acute and chronic diseases (number and severity), symptoms with nutritional impact (anorexia, nausea, vomiting, dysphagia, dysgeusia, xerostomia), social and environmental factors
	Physical examination	Muscle mass, edema, dry mouth, dentition, oral hygiene
	Medications	Number and type of drugs
	Anthropometry	Weight, height, BMI, recent weight loss
	Functional/Motility	Basal and instrumental activities of daily living, handgrip dynamometry, Short Physical Performance Battery Test
	Nutritional Malnutrition screening and assessment	MNA Short and Long Form, GLIM criteria
	Dietary intakes	3-d food diary or 24-h recall
	Nutritional requirements	Calorie and protein requirements according to guidelines [4,5]
	Laboratory	
	Blood tests	CRP, total proteins, albumin, complete blood count, electrolytes metabolic panel (glucose, HbA1c, lipids), renal and liver function

BMI, body mass index; CRP, C-reactive protein; GLIM, Global Leadership Initiative on Malnutrition; HbA1c, glycated hemoglobin; MNA, Mini Nutritional Assessment.

in older adults, and therefore its dietary intake should be ≥ 3 g/d. About 25 to 30 g/d of high-quality proteins should be ingested to reach the daily leucine target [60]. Total daily proteins should be evenly distributed among the three main meals to achieve the maximum stimulatory effect on muscle protein synthesis. Adequate macro- and micronutrient intake can be implemented by several modifications of usual food, including fortification and modification of texture and organoleptic properties (taste and flavor). Additional strategies include increasing the variety of food choices, offering extra snacks, considering individual preferences, and avoiding unnecessary dietary restrictions [16,40,52]. If nutritional targets are not met by food modification and nutritional counseling, oral nutrition supplements (ONS) should be prescribed. According to current guidelines, ONS should be administered for ≥ 1 month and provide a daily minimum of 400 kcal and 30 g/protein [16]. The texture, flavor, and composition of ONS should be individualized based on the patient's preferences and characteristics. Artificial nutrition should be initiated in those failing nutritional targets by the oral route. The effectiveness of nutritional intervention should be closely monitored and periodically reassessed based on the selected clinical and patient-centered outcomes. It should be noted, however, that the magnitude of the effect of nutritional interventions in older patients with polypharmacy and malnutrition is currently unknown. Also, in complex medical conditions like the polymorbid older patient with malnutrition, the effect of integrated nutritional care and deprescribing as a treatment bundle on functional, clinical, and nutritional outcomes has not been thoroughly addressed.

Table 2 presents suggested good practices and practical solutions to be implemented in older patients with malnutrition and polypharmacy.

Deprescribing: General concepts and effect on nutritional parameters

Deprescribing is a systematic process of identification and discontinuation of drugs or a reduction in drug regimens [63]. Deprescribing is proposed when apparent or potential adverse effects probably outweigh the potential benefits of one or several medications [63]. Deprescribing should consider several aspects, usually associated with multidimensional frailty, including the level of functioning, life expectancy, and values and preferences of each patient [64].

The deprescribing process is usually proposed in cases where polypharmacy is prevalent. It is estimated that about one-third of all hospitalizations in the United States could be attributable to

polypharmacy, and this phenomenon is particularly evident in older people [65], making deprescribing particularly important.

To face the problem of polypharmacy, the World Health Organization proposed six progressive steps for the appropriate prescription [66]. In this multistep process, deprescribing could be considered part of the good prescribing practice as an ongoing review of appropriateness every time a medication is repeated [66]. However, literature supporting deprescribing in older people is limited in magnitude and often limited to a few medication classes, such as benzodiazepines [67]. The clinical effects of deprescribing are, in fact, not univocal in terms of benefits and safety. For example, a systematic review with a meta-analysis including 38 intervention studies found that among community-dwelling older patients, medication deprescribing might slightly reduce the mortality and use of potentially inappropriate medications and practically no effect on other relevant outcomes, such as hospitalization or falls [68]. Although polypharmacy appears to be associated with a worse nutritional status [69,70], the effects of deprescribing on nutritional parameters remain largely unknown. A case report of an 87-y-old man affected by Lewy bodies dementia suggests the importance of aggressively identifying and robustly treating the reversible contributors of frailty, such as polypharmacy [71]. More specifically, after a multidimensional intervention including deprescribing, the authors observed a significant increase in body weight in a patient previously affected by malnutrition, with corresponding improvement in physical functioning [71]. In line with this case report, two retrospective studies conducted with older patients with previous strokes in a rehabilitation setting showed that deprescribing was associated with increased energy and protein intake among those with sarcopenia and polypharmacy and with functional recovery and home discharge [54,72]. At the same time, we are waiting for the results of a large randomized controlled trial tailored specifically to highlight the importance of deprescribing for nutritional parameters. The ongoing OptiNAM (Optimization of Nutrition And Medication) trial will include 200 older patients acutely admitted for any reason. The study will verify whether a multidisciplinary intervention, consisting of a medication review by a pharmacist and geriatrician in the emergency department, could improve the risk for malnutrition over 1 y of follow-up [73].

Altogether, although the evidence supporting polypharmacy on poor nutritional status and malnutrition is consistent, the actual effects of deprescribing on nutritional parameters remain to be explored and verified, even if the preliminary findings are encouraging.

Table 2

Practical algorithm for the management of older patients at risk for or with malnutrition and polypharmacy

Basic interventions	
At risk for/with malnutrition	Medication review
Identification and treatment of potential modifiable causes of malnutrition	If polypharmacy (≥ 5 drugs) routine deprescribing using validated instruments (Beers, STOPP/START criteria)
Avoidance of dietary restrictions	Search for drug-induced specific symptoms with nutritional affect
Individualized nutritional counseling by expert professional	Switch to an alternative medication if the responsible drug cannot be stopped
Nutritional intervention as part of a multimodal and multidisciplinary team intervention	
Supportive interventions	
Poor appetite/reduced intake: energy-dense meals, increased variety of foods, food fortification, additional snacks/meals, oral nutritional supplements [40]	
Dysphagia: texture-modified, enriched foods [61]	
Dry mouth: oral cavity hygiene and management by professional, proper systemic and local hydration, use of products for dry mouth (tablets, gels, sprays, mouth rinses) and to stimulate salivation [28]	
Taste and smell modifications: check for vitamin and oligoelement deficiency (vitamins A, B, and zinc) and replace; organoleptic amplification of flavor and taste in case of hyposmia and hypogeusia [62]	

STOPP/START, screening tool of older people's prescriptions and screening tool to alert to right treatment.

Barriers to implementation and practical solutions

Although guidelines and recommendations are available to address management of malnutrition and polypharmacy in older adults [16,40,52,64,66], effective implementation in clinical practice is often missed [74–76]. Various causes may be involved, including inadequate knowledge, low practicality in the local setting, lack of protocols, low adherence, lack of responsibilities, coordination, and collaboration between professionals, and insufficient human or financial resources [76–78].

Careful examination of the root causes and adoption of strategies to develop targeted solutions would address implementation barriers. Programs to disseminate guidelines and recommendations among professionals should be implemented. In structural and organizational issues, drafting protocols that include defined targets, operational guidelines, best practices, and monitoring mechanisms to tackle malnutrition and polypharmacy should be developed by the multiprofessional team. Digital tools are now available for nutritional assessment and decision support for therapy appropriateness in older patients [79,80]. Allocation of appropriate resources to ensure implementation of best practices should be ascertained with decision makers from the local organization

Conclusions

The role of medications in malnutrition is complex and clinically significant. This review summarized the current literature regarding these two prevalent conditions in older people and the potential association between these two entities. Additional studies are needed to disentangle how polypharmacy can affect malnutrition and the contrary.

There are no standard treatments for several drug-related symptoms with nutritional effects and multiprofessional interventions based on an individualized assessment should be undertaken, including referral to oral and dental care professionals, nutritional counseling, and the use of ONS and artificial nutrition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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