# Nutrition and aging: assessment and treatment of compromised nutritional status in frail elderly patients



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**Abstract:** Nutrition is an important determinant of health in persons over the age of 65. Malnutrition in the elderly is often underdiagnosed. Careful nutritional assessment is necessary for both the successful diagnosis and development of comprehensive treatment plans for malnutrition in this population. The purpose of this article is to provide clinicians with an educational overview of this essential but often underecognized aspect of geriatric assessment. This article will review some common issues in nutrition for the elderly in both hospital and community settings. The complexity and impact of multiple comorbidities on the successful nutritional assessment of elderly patients is highlighted by using case scenarios to discuss nutritional issues common to elderly patients and nutritional assessment tools. Three case studies provide some context for an overview of these issues, which include the physiology of aging, weight loss, protein undernutrition, impaired cognition, malnutrition during hospitalization, screening procedures, and general dietary recommendations for patients 65 years of age and older.

**Keywords:** nutrition, elderly, weight loss, vitamin and mineral supplementation

## Introduction

Nutrition is an important determinant of health in elderly patients. Over the past decade, the importance of nutritional status has been increasingly recognized in a variety of morbid conditions including cancer, heart disease, and dementia in persons over the age of 65 (Basran and Hogan 2002; Tessier 2002; Keller et al 2003; Takashashi et al 2003; Coombs et al 2004; Van Wymelbeke et al 2004). Although there is no uniformly accepted definition of malnutrition in the elderly, some common indicators include involuntary weight loss, abnormal body mass index (BMI)[1], specific vitamin deficiencies, and decreased dietary intake (Reuben et al 2004). Malnutrition in older patients is regularly underdiagnosed (Gariballa 2000), and many physicians have expressed their need for more education regarding nutritional status in older patients (Mihalynuk et al 2004). For example, health practitioners may not readily recognize weight loss in the elderly as a morbid symptom of malnutrition because some weight loss may be associated with age-related reductions in muscle mass (Kane et al 1994). Similarly, elderly patients with concurrent obesity often have protein undernutrition that may be overlooked.

Many elderly patients have an increased risk for malnutrition compared with other adult populations. It is estimated that between 2%–16% of community-dwelling elderly are nutritionally deficient in protein and calories (Whitehead and Finucane 1997). If mineral and vitamin deficiencies are included in this estimate, malnutrition in persons over the age of 65 may be as high as 35% (Chandra 2002). The situation

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for hospitalized seniors is also disturbing. Studies of hospitalized older patients suggest that between 20%–65% of these patients suffer from nutritional deficiencies (Elmstahl et al 1997; Sullivan and Lipschultz 1997; Hall et al 2000), and the prevalence of malnutrition in long-term care facilities is estimated to be between 30%–60% (Rudman and Feller 1989). The elderly also often have multiple comorbidities that contribute to overall nutritional compromise. Given these complex contributing factors, a careful nutritional assessment is necessary for both the successful diagnosis of malnutrition in the elderly and the development of appropriate and comprehensive treatment plans.

This article reviews some issues in nutrition common to hospitalized and community-dwelling seniors. Three introductory case studies provide context for a discussion of the complexity of nutritional assessment of elderly patients, including the physiology of aging, weight loss, protein undernutrition, cognitive impairment and vascular risk factors, malnutrition during hospitalization, and general dietary recommendations for patients 65 years of age and older. Each of these sections conclude with key points emphasizing the significance of these issues to a comprehensive nutritional assessment in the elderly patient. Following this discussion, we will return to the case studies to suggest how specific clinical strategies can improve the functional status of these patients.

## Case studies

The following three case studies highlight common complications in malnourished elderly patients. Consider these cases as we discuss major principles of nutritional assessment of elderly patients. Each scenario is comprehensively addressed at the end of the article.

### Case 1

Mrs E is a 79-year-old female with Alzheimer-type dementia living alone in her own home with assistance only for heavy housework. She has maintained her weight for one year while taking a cholinesterase inhibitor. She sees her family doctor every 6 months. Her most recent check-up revealed a weight reduction of 3 kg from her previous visit. Patient height 160 cm; weight 48 kg [BMI = 19 kg/m$^2$].

### Case 2

Mrs A is an 82-year-old female living alone, independent in her activities of daily living, and instrumental activities of daily living[2]. She has a history of non-insulin-dependent diabetes mellitus requiring insulin, hypothyroidism, osteoarthritis, hypertension (HTN), ischemic heart disease (IHD), obesity, and gastroesophageal reflux disorder (GERD). Mrs E recently suffered a hip fracture following a fall for which she underwent a hip-replacement surgery. Her postoperative course is complicated by a urinary tract infection (UTI) and two episodes of *clostridium difficile* (*C. difficile*) colitis. She was transferred to a geriatric rehabilitation unit. Patient height 160 cm; weight 94 kg [BMI = 37 kg/m$^2$].

### Case 3

Mr T is an 83-year-old male who has been living in a nursing home for the past 12 months since suffering a right middle cerebral artery stroke. During this time he has had trouble feeding himself and has lost 10 kg. He has a coccyx ulcer. Patient height 180 cm; weight 55 kg [BMI = 17 kg/m$^2$].

## Issues in nutrition relevant to frail elderly patients

### Physiology of aging and nutritional status

#### Metabolic rate and energy requirements

Age-related changes in body composition result in a slight decline in lean body mass. This decline is usually more dramatic after the age of 60. Consequently, basal metabolism or energy requirements for the elderly diminish by about 100 kcal/day per decade. For some seniors it may be difficult to meet daily micronutrient requirements with this reduced caloric intake (Hazzard et al 1994; Morley 1997; Compher et al 1998). To combat this, a multivitamin supplement for seniors is recommended (Malouf and Grimley 2003; Malouf et al 2003; Clarke et al 2004), especially for those whose caloric intake is less than 1500 kcal/day (Compher et al 1998).

Cardiovascular, pulmonary, and neurological diseases, as well as osteoarthritis and osteoporosis, may alter energy requirements in the elderly either by increasing energy expenditure or reducing requirements through muscle loss related to inactivity. Actual energy needs may vary widely from calculated energy needs because of these factors (Compher et al 1998; Houwing et al 2003). This makes the elderly a heterogeneous group and more difficult to assess nutritionally. An increase in metabolic requirements has not been associated with pressure ulcers (an unfortunately

common condition in hospitalized elderly patients), although frequently concomitant conditions such as infection might encourage weight loss in older patients as a result of increased energy expenditure, decreased albumin, and protein undernutrition (Houwing et al 2003; Dambach et al 2005).

### Age-related changes to the gastrointestinal tract

Alterations in taste and smell are associated with aging. It is unclear if these normal physiological changes contribute to decreased food intake (Refai and Seidner 1999; Westenhoefer 2005). Other gastrointestinal changes occur with age and may affect oral intake. For example, greater satiation after a meal and a delay in gastric emptying has been shown in older people (Morley 1997). Appetite after an overnight fast is often lower in the elderly. Oral and dental issues, esophageal motility, and atrophic gastritis may also affect nutritional status. The latter may be implicated in impaired vitamin B12 and iron adsorption (Refai and Seidner 1999). Dental problems (including poorly-fitting dentures) are often associated with nutrition problems (Morais et al 2003).

### Age-related renal impairment

In addition to gastrointestinal physiological changes, renal function declines with age. This decreases responsiveness to antidiuretic hormone, which often results in an increased risk for dehydration in older patients. This impaired thirst drive makes it difficult to replete fluid losses by oral intake alone. Renal impairment may also affect vitamin D metabolism and result in a reduction of vitamin D levels, which contributes to osteoporosis in the elderly (Compher et al 1998).

### Reduced immunity

Nutrition has an impact on the immune system of patients over the age of 65. The elderly are more likely to die of infections than young adults (High 2001), and malnutrition is related to an increased risk of sepsis in the elderly (Potter et al 1995). Impaired T-cell response, changes in phagocyte and macrophage function, and reduced delayed-hypersensitivity response contribute to an overall decline in age-related immune function (High 2001; Chandra 2002). Infections of all kinds increase metabolic rate, making it more difficult for older persons to eat enough to keep up with elevated energy demands (Sullivan and Lipschultz 1997).

Studies have shown that in community-dwelling seniors randomized to vitamin and mineral supplements or placebo, supplemented seniors exhibited less nutritional deficiencies (High 2001), improved immune cell function (High 2001; Chandra 2002), fewer sick days, and less antibiotic use than those patients randomized to placebo. Additionally, improved post-vaccination immune responses have been demonstrated in subjects given nutritional supplements rather than placebo (Chandra 2002). Potentially, nutritional supplements may have other value in the senior population (Yen 2003), as cost-benefit analyses have shown that multivitamin supplementation may reduce healthcare expenditures associated with medical care consumption (including length of stay in hospital, nurse visits, and medication intake) in community-dwelling elderly persons (Arnaud-Battandier et al 2004).

*Keypoint*. Age-related changes in physiology and immunity may result in a greater need for vitamin and mineral supplementation in the elderly.

## Protein undernutrition

There is no consensus on the definition of protein energy malnutrition (PEM) in elderly people (Kane et al 1994). One view categorizes PEM as an inadequate intake of calories and protein (marasmus-type malnutrition). Another suggests PEM arises from a response to a biological stress (low-albumin malnutrition). Classically, in marasmus-type malnutrition the patient loses weight by decreasing body fat and muscle mass while maintaining a normal serum albumin. This type of weight loss is more typical of a senior living either in the community or in the long-term care setting. Low-albumin malnutrition is more typical of a hospitalized patient such as Mrs A, and results from an acute infection or inflammatory state. For the purposes of this article, we shall use the term "protein undernutrition" to refer to deficient protein intake in elderly patients.

The metabolic stress of insufficient protein intake, as well as the effects of hepatic, renal, or bowel disease, will further impair an older patient's overall nutritional state. Protein undernutrition has been associated with an increased risk of injury in elderly patients (Muhlberg et al 2004; Perier et al 2004), while protein supplementation has been shown to help reduce unfavorable outcomes following injury in patients over the age of 65 (Avenell and Handoll 2003; Collins et al 2005).

*Keypoint.* Protein undernutrition is common in elderly patients, regardless of body weight or domiciliary status.

## Weight loss

Weight loss in the elderly is a worrisome clinical sign. Weight loss in the elderly due to voluntary or involuntary causes has been associated with mortality (Himes 1999; Newman et al 2001; Baldwin et al 2002). Although lean body mass may decline because of normal physiological changes associated with age (Lissner et al 1991), a loss of more than 4% per year is an independent predictor of mortality (Wallace et al 1995). Rapid weight loss of 5% or more in one month is considered significant and needs to be immediately evaluated by a physician (Jensen et al 2001; Dryden et al 2002). It has been shown that even moderate declines of 5% or more over three years is predictive of mortality in older adults (Newman et al 2001). However, early identification, assessment, and treatment of weight loss and nutritional deficiencies may prevent the morbid sequelae of malnutrition.

Functional, psychological, social, and economic issues associated with concomitant medical problems may all contribute to poor nutrition and weight loss in the frail elderly patient (Bartali et al 2003). A multidisciplinary geriatric assessment can be helpful to fully address all the complex interacting issues of the frail senior, such as Mrs E, who experiences rapid weight loss as a result of malnutrition. This type of comprehensive assessment may include the services of physicians, nurses, dieticians, occupational and physical therapists, speech and language pathologists, and social workers, each of which can lend their respective expertise to the effective diagnosis of the functional, psychological, and socioeconomic contributors to malnutrition in older patients.

Table 1 lists some of the contributing factors to weight loss and malnutrition in the elderly. One complicating factor is that diseases tend to present atypically with non-specific complaints in the elderly patient, making detection and diagnosis of physiological reasons behind malnutrition a greater challenge. For example, hyperthyroidism or new-onset diabetes are classic examples of medical conditions causing weight loss. Progressive renal or hepatic insufficiency may also cause anorexia, a malnutritive condition with highly morbid implications in the elderly. Weight loss related to poor oral intake is also associated with peptic ulcer disease, GERD, and congestive heart failure, as well as dental or chewing problems (Morais et al 2003; Palmer 2003; Paillaud et al 2004). Decreased oral intake may occur slowly in the setting of slowly progressive chronic diseases such as Parkinson's disease, chronic obstructive pulmonary disease, or Alzheimer disease. Oral supplementation, a consideration for Mrs E, has been shown to significantly improve body weight in patients with Alzheimer disease at risk for malnutrition (Lauque et al 2004).

**Table 1** Selected causes of weight loss associated with malnutrition in the elderly

| | |
|---|---|
| Alcohol and drug misuse | Dental problems |
| Medical problems | Poor vision |
| Dementia | Medication side-effects |
| Social isolation | Functional dependencies |
| Depression and other psychiatric disorders | Environmental factors |
| Poverty | Limited access to or intake of food |
| Food attitudes and cultural preferences | Elder abuse |

A comprehensive geriatric assessment also addresses psychosocial, environmental factors, and affective symptoms of weight loss in the elderly. The loss of a caregiver, the inability to drive a motor vehicle, or moving into a new apartment or residence may precipitate a decline in oral intake and cause weight loss. Depressive symptoms such as these are important considerations when evaluating the nutritional health of a senior patient (Hazzard et al 1994; Kane et al 1994; Williams 1995; Refai and Seidner 2001). It is especially important to ask older patients about alcohol intake, which may replace or suppress the consumption of foods with superior nutritional value. Alcohol misuse in the elderly is associated with impaired functional status, poor self-rated health, and depressive symptoms (St John et al 2002).

*Keypoints.* Even slight weight loss in the elderly is an independent predictor of morbidity and mortality. The medical causes of weight loss may be compounded by psychosocial and environmental factors.

## Nutritional issues associated with cognitive impairment and vascular risk factors

Malnutrition has been associated with compromised cognitive capacity in the elderly. The decreased ability to prepare a meal, which may adversely affect an elderly patient's ability to ensure sufficient nourishment, has been cited as one of the earliest signs of mild cognitive impairment (MCI), a pre-Alzheimer disease condition (Borrie et al 2003). For persons with moderate to severe Alzheimer disease, forgetting to eat, inability to access food, and apraxia

with utensils may further impair oral intake. Living alone, as Mrs E does, further compounds the risk of malnutrition.

Vitamin deficiencies, particularly vitamin B12, B6, and folate, are associated with cognitive impairment (Nilsson et al 2001; Gill and Alibhai 2003; Lehmann et al 2003). Deficiencies in these vitamins are also associated with hyperhomocysteinemia, which is an independent vascular risk factor. The association of hyperhomocysteinemia with vascular disease is a direct dose-response association (Stamphler et al 1992; Selhub et al 1995). Treatment with folate, vitamin B6, and vitamin B12 has been shown to reduce homocysteine levels (Omran and Morley 2000; Nillson et al 2001; Lehmann et al 2003; Scott et al 2004), improve vascular function in hyperhomocysteinemic patients with coronary artery disease (Willems et al 2002), and result in cholesterol plaque regression (Marcucci et al 2003). Although a recent secondary prevention randomized controlled trial failed to demonstrate a decrease in morbid vascular outcomes in stroke patients following supplementation with vitamins B6, B12, and folate over two years, it was suggested that confounding factors (such as the initiation of folate fortification in grain supply concurrent with the study) might explain the null findings (Toole et al 2004). More research is needed to clarify the complex interactions between these vitamins and the modification of vascular risk factors.

The intriguing concept of the polypill (Wald and Law 2003; Robinson and Maheshwari 2005) in the treatment of cardiovascular disease has potential for the primary and secondary prevention of cognitive impairment in elderly patients. A vitamin polypill (containing a statin class of cholesterol-lowering agents, three blood pressure lowering drugs (eg, a thiazide, a beta-blocker, an angiotensin-converting enzyme inhibitor, aspirin, and folic acid) might be a beneficial tool in the prevention and treatment of morbid, nutrition-related vascular conditions. This approach to prevention and treatment requires a great deal of further investigation. This novel concept incorporates the influence of nutritional factors on health, especially interventions for patients like Mr T.

Nutritional interventions have an impact on vascular disease prevention. It is well established that a diet low in fat and cholesterol is beneficial to modifying vascular risk factors. Emerging research suggests that supplementation with omega-3 fatty acids (such as those found in salmon and other cold-water fish), and consuming cruciferous vegetables (such as broccoli, cabbage, and cauliflower) are all associated with stroke prevention (Joshipura et al 1999; Mozaffarian et al 2005; Robinson and Maheshwari 2005) and may be beneficial if integrated into the diet of all elderly patients with vascular disease or vascular risk factors.

Nutritional antioxidant supplements are generally believed to be beneficial in reducing free radical cellular and DNA damage. A large epidemiological study found the concomitant use of vitamins C and E is associated with reduced incidences of Alzheimer disease (Zandi et al 2004). More generally, according to a randomized controlled trial, low blood vitamin C concentrations are strongly predictive of mortality in patients aged 75–84 years (Fletcher et al 2003). The efficacy of vitamin E in the prevention and treatment of MCI and Alzheimer disease remains controversial. Used alone in a three-year placebo-controlled study, a daily dosage of vitamin E (2000 IU) was not shown to slow the rate of progression to Alzheimer disease in patients with MCI (Petersen et al 2005). A high-dose vitamin E supplementation (>400 IU/day) has been associated with increased mortality (Miller et al 2005).

Other important antioxidants with possibly beneficial outcomes include foods with high levels of phytochemicals and flavonoids. Tomatoes, citrus fruit, blueberries, and certain spices (Fusheng et al 2005) have all been linked to reducing oxidative stress and cognitive impairment. Flavonoids and antioxidants in red wine have also been shown to be beneficial in protecting against dementia (Zuccalà et al 2001; Truelson et al 2002). The increasing amount of research in this field holds promise for preventive nutritional strategies based on the benefits of naturally-occurring antioxidants.

*Keypoint.* Dietary modifications, such as including foods high in antioxidants and lowering intake of fat and cholesterol, may improve cognition and modify vascular risk factors in elderly patients.

## Nutritional issues for the hospitalized elderly patient

Although the incidence of malnutrition in the community-dwelling elderly is estimated between 2%–16%, up to 55% of elderly people admitted to hospital have pre-existing evidence of malnutrition (Williams 1995; Milne et al 2005). In the geriatric rehabilitation setting, the incidence of protein undernutrition, not including patients with micronutrient deficiencies, is estimated at 57% (Keller 1997). In addition to pre-existing malnutrition, hospitalized patients often develop further nutritional problems during their hospital stay. Nausea, vomiting, "nothing by mouth" orders,

medication side-effects, difficulty with vision and opening containers, the placement of food out of patients' reach, limited access to snacks, and ethnic or religious food preferences may all contribute to low nutritional intake in hospital (Milne et al 2005).

Malnutrition during hospitalization is also associated with an increased length of stay (Pichard et al 2004; Avenell and Handoll 2005), readmission, mortality, skin breakdown, and infection. Compromised nutritional status has also been linked to impaired immunity, respiratory and muscle function, and delays in wound healing (Aptaker et al 1994; Sullivan and Walls 1994). However, there is no consensus on the effects of supplementation on promoting wound healing. Vitamin C and zinc have shown some promise in improved outcomes relating to pressure sores (Frias Soriano et al 2004), but there exists some controversy in the literature pertaining to the efficacy of vitamin and trace mineral supplementation in their treatment and prevention. For example, studies of long-term care patients (such as Mr T) have shown that although nutritionally supplemented patients have less risk of developing pressure ulcers (High 2001; Houwing et al 2003; Dambach et al 2005), vitamin supplementation has not been found to significantly accelerate the healing of pre-existing pressure ulcers (Mathus-Vliegen 2004).

Several randomized control trials have demonstrated the benefits of oral nutritional supplementation in the hospitalized elderly. In a meta-analysis of 22 trials (n=1755), patients receiving oral nutritional supplements had a reduction in relative risk of mortality over those who did not receive supplementation (Avenell and Handoll 2005). Although there is insufficient evidence to conclude whether there exists a benefit in functional status as a result of supplementation, seven of the trials designated length of stay as an outcome measure and demonstrated that nutritionally supplemented elderly patients have a shorter overall length of stay in hospital. Oral nutritional supplements in elderly patients with hip fracture, like Mrs A, have been associated with lowered complication rates and length of stay, as well as improved clinical outcomes and nutritional indices (Potter et al 1998; Arnaurd-Battandier et al 2004). Other evidence also suggests that oral multivitamin supplementation may reduce unfavorable outcomes following injury in the elderly (Avenell and Handoll 2005).

Although more research is needed, aggressive nutritional support for the hospitalized elderly, in both the acute care and rehabilitation settings, has been shown to improve nutritional status, reduce mortality and length of stay, and may lead to better functional outcomes (Gariballa 2000; Potter et al 2001). Therefore, recognition of malnutrition in hospitalized elderly patients and referral to a dietician is an excellent strategy for many hospitalized frail seniors.

*Summary.* Hospitalized elderly patients are at particular risk for malnutrition and need to be carefully assessed and aggressively treated.

## Screening for and detecting nutritional deficits in the elderly

Numerous review papers suggest that nutrition screening for at-risk populations is essential (Elmstahl et al 1997; Sharkey and Haines 2002). Although the 1994 Canadian Task Force on Preventive Health Care acknowledges that the elderly (particularly those living alone or in institutions) have a high prevalence of nutritional deficiency, they cite insufficient evidence to recommend for or against routine screening for malnutrition. Informal screening measures such as self-administered questionnaires and food diaries can be unreliable, especially in the cognitively impaired (Patterson 1994). This emphasizes the need for physicians and allied health professionals to regularly screen for malnutrition in the elderly.

In addition to the recognition of nutritional problems, current medical literature recognizes the importance of promptly implementing a treatment plan. The physical exam does not usually aid in the detection of early malnutrition in the elderly, as some of the loss of muscle bulk may be similar to age-related processes. However, in specific nutrient deficiencies, changes in nail, hair, tongue, and angle of the mouth can be seen. These findings are usually coupled with biochemical investigations such as laboratory tests that investigate complete blood count with differential, albumin, ferritin, electrolytes, blood urea nitrogen, fasting glucose, and creatinine (Patterson 1994; Reuben et al 2004). Laboratory results can provide an objective measure of nutritional status not always possible to achieve with office screening measurements. For example, serum albumin screening has been shown to be effective in identifying patients requiring nutritional intervention for protein undernutrition (Robinson et al 2003), and has improved reliability over self-reporting.

The most widely used and extensively validated screening tool used by dieticians is the Mini-Nutritional Assessment (MNA). It is also a very useful tool for physicians involved in comprehensive geriatric assessments, and could be appropriately used in all three case studies.

One advantage of the MNA is that it is applicable to a wide range of elderly patients (ie, from those who are well to hospitalized elderly). The questions are simple and brief. It has a 96% sensitivity and 98% specificity, and a predictive value of 97% which distinguishes patients by their adequate nutritional status (score ≥ 24), risk of malnutrition (score 12–23), and malnourishment (score < 17) (Guigoz et al 1996; Vellas et al 1999). A short-form version of the MNA has been developed (MNA-SF), see Appendix 1. It contains six questions and is strongly correlated with total MNA score (r = 0.945), and is applicable for both community dwelling and hospitalized elderly (Rubenstein et al 2001; Ranhoff et al 2005).

Other screening tools have been designed to identify malnutrition in the elderly (Corish et al 2004). The simplest office measure reflecting nutrition is the body mass index (BMI = weight in kilograms (kg)/height in meters $(m)^2$). In the elderly, a convenient approximation of height is arm span (Patterson 1994). Regular weight assessment at office appointments is a simple but important way to monitor weight changes in elderly patients.

Another easy to remember mnemonic screening tool is the SCALES assessment (Nutritional Screening Initiative 2005). This asks physicians to evaluate older patients regarding: Sadness (depression); Cholesterol levels; Albumin (serum levels < 40 g/L); Loss of weight; Eating problems (cognitive and/or physical determinants); and Shopping problems or inability to prepare a meal. A problem with three or more of these areas reflects a high risk for malnutrition (Morley 1994). Another tool is the "Determine Your Nutritional Health Checklist" which can be a very useful tool in the community setting (Nutritional Screening Initiative 2005). However, it may be of limited use for seniors with cognitive impairment or poor vision because it relies on self-reporting.

In the nursing home setting, a validated tool is the amount of food left on a resident's plate. Residents who have more than 25% of their food remaining on their plate are most likely to suffer from protein undernutrition (Beck et al 2001). One estimate suggests that 84% of nursing home patients had intake less than their calculated daily caloric expenditure, and only 5% were receiving nutritional supplements. Those with lower caloric intake had a higher mortality rate than those whose intake more closely matched their caloric expenditure (Elmstahl et al 1997).

*Keypoints.* There are several effective and easy-to-use screening tools which assess for malnutrition in elderly patients. The most extensively validated tool is the Mini Nutritional Assessment (MNA), which provides an accurate assessment of elderly patients from a variety of domiciliary settings.

## Dietary recommendations

Following careful nutritional assessment, guidelines have been developed to improve and maintain nutritional status in community-dwelling and hospitalized elderly patients. For example, the Canada Food Guide recommends the following daily nutritional intake for adults:

- 5–12 servings of grains
- 5–10 servings of fruits and vegetables
- 2–4 servings of milk products
- 2–3 servings of meat or meat alternatives

Foods high in fibre and complex carbohydrates such as whole grains, vegetables, and fruits are preferred. Fat intake should be less than 30% of total caloric intake (Patterson 1994), and nutritionally compromised patients should be encouraged to consume nutrient-dense foods (Jaceldo-Siegl et al 2004). For malnourished elderly patients, counseling is effective in improving dietary habits (Willaing et al 2004; Pedersen 2005). Referral to a clinical dietician or nurse educator is recommended following general dietary advice from a physician (Patterson 1994).

Formerly known as Recommended Nutritional Intake (RNI), Dietary Reference Intakes (DRI) guidelines have been revised recently and adjusted for the needs of older adults aged 51–70 years and those over 70. There are increased allowances for the elderly for calcium, magnesium, vitamin D, fluoride, niacin, folate, vitamin B12, and vitamin E, clinical studies of which have suggested improved outcomes in nutritional status in the elderly (Jensen et al 2001; Nilsson et al 2001; Gazotti 2003; Lehmann et al 2003). A complete list summary of the current DRI for Canada and the United States is listed at http://www.hc-sc.gc.ca/hpfb-dgpsa/onpp-bppn/diet_ref_e.html#3.

In lieu of consensus from specialized nutrition studies in the elderly, preventive dietary strategies for the elderly may be inferred from well documented recommendations for the adult populations regarding high cholesterol and fat intake, and their association with ischemic heart disease and diabetes (Cheng et al 2004; Ciardullo et al 2004). Increasing dietary fiber may be useful in the treatment of constipation, glucose intolerance, lipid disorders, and obesity, as well as preventing diverticular disease and colon cancers. Reduction in sodium has been shown to reduce blood pressure and also reduce the risk of developing hypertension (Patterson 1994). The recommended adult calcium intake is 1200 mg/day for

those over 50 years of age; 400 IU of vitamin D is recommended for ages 50–70, and 600 IU for those over 70 years of age. Seasonal vitamin D deficiency is recognized as highly prevalent in North American adult populations (Dawson-Hughes et al 1997; Rucker et al 2002; Levis et al 2005), and 35%–90% of the institutionalized elderly are estimated to be vitamin D deficient (Compher et al 1998). Treatment with vitamin D prevents seasonal variations in vitamin D levels and can reduce hip fractures, nonvertebral fractures, and the risk of developing osteoporosis (Hazzard et al 1994; Dawson-Hughes et al 1997; Ilich et al 2003; Holick 2003).

*Keypoint.* Dietary assessment and counseling comprise an important and effective aspect of preventing and treating a variety of morbid conditions in elderly patients.

## Case study discussion

The following case studies will provide an introduction to applying the principles of nutritional management to the care of at-risk elderly patients.

### Case 1

Mrs E has lost 6% of her body weight in six months. This is a cause for concern. Her physician needs to consider causes for weight loss such as new hyperthyroidism, diabetes, malignancy, depression, or oral problems. These can be ruled out by history, physical examination, and laboratory tests. Collateral history from family or caregivers is very important in assessing a person with dementia. Patients with dementia often have an atypical presentation of many illnesses in the elderly, especially in cases of depression.

A medication review is also an important part of the physician's assessment of this patient. For example, cholinesterase inhibitors as a class can cause nausea, vomiting, anorexia, or diarrhea and can be associated with weight loss. In Mrs E's case, she was able to maintain her weight for a year on this medication. For this reason, other causes of weight loss associated with dementia should also be considered. For example, the loss of caregiver support, social isolation, limited access to food, an inability to cook and prepare food because of cognitive problems, or inability to recognize hunger may contribute to her current malnutritive state. Collateral history from a caregiver and a home visit can provide invaluable insight into these issues. Home care nurses or occupational therapists can assist in this assessment.

A nutritional treatment plan for Mrs E may include the treatment of any newly diagnosed medical issues and the prescription of nutritional supplements. In this case, considering a referral to social and community programs (such as adult day care, home care services, or a delivered meal program) would be appropriate at Mrs E's discharge.

### Case 2

Mrs A's situation is complex and highlights some of the issues of nutritional assessments in the hospital setting. A physician is needed to immediately address Mrs A's other underlying medical problems such as obesity, IHD, GERD, and HTN, prior to her general nutritional assessment by a dietician. Diabetes can be a major issue during her hospital stay. Another possible nutritional issue associated with diabetes is substantial proteinuria brought on by diabetic renal disease. Sequelae of diabetes include autonomic dysfunction, which can result in delayed gastric emptying and poor oral intake. This condition can be exacerbated by the use of narcotics to control postoperative pain, and is further compounded by GERD. Infection and obesity often increase insulin resistance, so blood sugar control should be optimized not only for the long-term morbidity prevention, but also for wound healing.

Prior medical complications and the medications prescribed following her hip surgery are another cause for concern. Mrs A may have had poor oral intake because of her diarrheal illness, or from the side effects of antibiotics used to treat *C. difficile* arising from her UTI. Many elderly hip fracture patients have muscle deconditioning as a result of being hospitalized and consequently require increased protein supplementation. Serum prealbumin or albumin is usually used to assess nutritional status and monitor improvement through a hospital stay. Although Mrs A is obese with a BMI of 37 $kg/m^2$, she likely has a low albumin level and significant protein undernutrition based on her recent medical history. One complication in the treatment of obese patients is the provision of adequate calories and protein for wound prevention and treatment, muscle reconditioning, and therapy-related exercise while concurrently promoting a loss of total body fat. Generally speaking, achieving an optimal balance of food intake, nutritional status, and healthy body weight is a particular challenge for health practitioners (Sullivan et al 2004), particularly when treating patients with extremely high or low BMI measurements.

Finally, Mrs A's HTN and obesity suggest additional risk factors for ischemic heart disease. Her cholesterol profile prior to her hospitalization would provide additional information in planning long-term nutritional goals at

discharge. Sodium, fat, and cholesterol restrictions may be appropriate. Other nutritional goals during Mrs A's hospital stay should include ensuring that she has adequate education to both understand and follow her dietary advice. Referral to a community dietician or diabetic educator is recommended in Mrs A's discharge planning.

## Case 3

Mr T has severe malnutrition with a BMI of 17 kg/m$^2$ and a corresponding high risk of morbidity and mortality. Given his acute nutritive needs following his medical history of stroke (Dennis et al 2005), Mr T's nutritional assessment and treatment plan should include a physician, dietician, speech and language pathologist, and an occupational therapist.

The benefits of stroke rehabilitation are well documented (Gresham et al 1997). One of the first treatments often recommended immediately following a stroke is a swallowing assessment and, if necessary, training to facilitate improved swallowing. For patients who require tube feeding, it has been determined that patients with significant dysphagia who undergo gastronomy tube feeding have less risk of aspiration, earlier discharge from hospital, and higher albumen levels with gastrostomy tube feeding than those who undergo nasogastric tube feeding (Milne et al 2005). Early tube feeding following stroke has been associated with decreased mortality in older patients (Dennis et al 2005).

It is likely that Mr T had the appropriate assessment in hospital following his stroke. Nevertheless, a bedside swallowing assessment performed by a speech and language pathologist is very helpful in determining the type of food consistency that is appropriate in a person with dysphagia. Sometimes it is necessary to refer the patient for a modified barium swallow to further assess their risk for aspiration. Furthermore, positioning and seating are important requirements for successful meals. Occupational therapists can assist with this as well as the provision of special utensils, plates, or placemats in order to better facilitate self-feeding.

A number of other possibilities may contribute to Mr T's current condition. For example, Mr T may have extended his stroke resulting in worse dysphagia and subsequently decreased oral intake. Untreated dysphagia may result in protein undernutrition, which can result in compromised immunity and an increased risk of infection (Hudson et al 2000). He may have developed post-stroke depression, which often manifests a decrease in appetite. It is possible that not all of the dietary recommendations of the stroke team were followed after discharge. Sometimes this is because of patient choice; for example, a common recommendation involves restricting patients' diet to pureed foods. Some patients assess the relative risks (which include aspiration) and prefer a diet with varied textures as a quality of life consideration. Nutritional deficiencies have been suggested, but not clinically confirmed, to adversely affect vascular outcomes in stroke (Toole et al 2004).

Mr T needs a comprehensive physical and cognitive examination, and laboratory tests to exclude new medical problems as contributing causes for his weight loss. Since protein undernutrition and low vitamin C levels are associated with poor wound healing and pressure sores, a dietician should participate in Mr T's treatment plan and consider supplementation in vitamin C, zinc, and other trace minerals, in addition to increased caloric and protein intake. His albumin level should be regularly measured to provide objective monitoring of the treatment plan.

## Summary

More than other adults, patients over the age of 65 are at nutritional risk because of the greater burden of comorbid illnesses coupled with common physiological changes due to aging. Physicians need to maintain strong suspicions of malnutrition in the senior population, and should be aggressive in instituting preventive measures and treatment strategies for those at risk or those detected with malnutrition. Because of the impact of coexisting disease on overall nutritive status, a comprehensive, multidisciplinary approach is often helpful in addressing all contributing factors in the diagnosis and treatment of compromised nutritional health in the elderly.

By providing clinicians with an educational overview and providing tools to aid in the nutritional assessment in the elderly, we hope to emphasize that attention to the complexity of multiple comorbidities is essential to the successful nutritional assessment of elderly patients. The following checklist may serve as a preliminary guide to ensuring adequate nutrition among elderly patients:

- Multivitamin supplements are highly recommended for older patients, especially in seniors whose daily caloric intake is less than 1500 kcal/day.
- Advise patients about nutrient-dense food choices when appropriate.
- Investigate body weight losses of 4% or more.
- Nutritional supplements are recommended for at-risk elderly hip fracture patients. Also consider supplements for frail seniors with other fractures.

- Calcium and vitamin D supplementation have been shown to reduce hip fracture rates and are recommended for patients over 65 years of age.
- Advise patients on the merits of whole grains, fruits, and vegetables.
- In hospitalized patients, maintain a high index of suspicion for pre-existing nutritional deficiencies. Utilize the services of a registered dietician.
- Consider referrals to other health professionals for nutritional advice such as dieticians, speech and language pathologists, homecare or visiting nurse services, or other specialized geriatric services available in the community.

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## Notes

[1] Body Mass Index (BMI) is estimated according to the formula BMI = weight (kg)/height (m)$^2$. BMI results of less than 18.5 are classified as underweight, 18.5–24.9 as "normal," 25.0–29.9 as overweight, and over 30.0 as obese (Health Canada 2003).

[2] Activities of daily living refer to tasks that require basic skills such as mobility, self-care, communication, management of environmental hardware and devices, and sexual expression. Instrumental activities of daily living are comprised of tasks that require more advanced problem-solving skills, social skills, and more complex environmental interactions. These include home management and community living skills, health management, and safety preparedness (Pedretti and Zoltan 2001).

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## **Appendix 1** Mini Nutrition Assessment – Short Form (MNA-SF)

A. Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties?

0 _ severe loss of appetite
1 _ moderate loss of appetite
2 _ no loss of appetite

B. Weight loss during last three months

0 _ weight loss greater than 3 kg (6.6 lbs)
1 _ does not know
2 _ weight loss between 1 and 3 kg (2.2 and 6.6 lbs)
3 _ no weight loss

C. Mobility

0 _ bed or chair bound
1 _ able to get out of bed/chair but does not go out
2 _ goes out

D. Has suffered psychological stress or acute disease in the past three months

0 _ yes
2 _ no

E. Neuropsychological problems

0 _ severe dementia or depression
1 _ mild dementia
2 _ no psychological problems

F. Body Mass Index (BMI) (weight in kg) / (height in m)$^2$

0 _ BMI less than 19
1 _ BMI 19 to less than 21
2 _ BMI 21 to less than 23
3 _ BMI 23 or greater

Screening score (subtotal max. 14 points)

*12 points or greater*: Normal – no need for further assessment
*11 points or below:* Possible malnutrition – continue assessment
**Note**: If greater specificity is desired consider 10 points or below as possible malnutrition.
Alternative height calculations using knee to heel measurements:with knee at 90° angle (foot flexed or flat on floor or bed board), measure from bottom of heel to top of knee.
Men _ (2.02 _ knee height, cm) (0.04 _ age) 64.19
Women _ (1.83 _ knee height, cm) (0.24 _ age) 84.88
Body weight calculations in amputees:
For amputations, increase weight by the percentage below for contribution of individual body parts to obtain the weight to use to determine BMI. Single below knee 6.0% Single at knee 9.0% Single above knee 15.0% Single arm 6.5% Single arm below elbow 3.6%

Source: Rubenstein et al (2001); Ranhoff et al (2005).