Malnutrition is defined as either a deficiency (undernutrition) or an excess (overnutrition) of energy, protein, and other nutrients, with adverse consequences on body composition, physical function, and clinical outcomes. However, the term malnutrition is often used interchangeably with, and specifically to refer to, undernutrition.1

Hospitalized patients and the elderly are at particularly high risk for malnutrition because of disease- and age-associated physiological changes, decreased appetite and food intake, comorbidities, and concomitant medications, as well as cognitive and psychosocial changes.2 In elderly patients, the increased risk for malnutrition is compounded further by sarcopenia, a progressive and generalized age-related decline in skeletal muscle mass and loss of muscle strength and/or physical performance.3 In some populations, particularly in the elderly, malnutrition and sarcopenia can occur in parallel in an inter-related manner of cause and consequence. It is important to note that both malnutrition and sarcopenia can affect even non-hospitalized older adults living in the community.2

People who suffer from malnutrition experience significantly decreased strength and exercise tolerance, weakness and fatigue, and a reduced ability to perform daily activities. Importantly, decreased strength is a risk factor for poor balance and slowed gait, making malnourished elderly people particularly vulnerable to falls and injuries.3 Furthermore, malnutrition and sarcopenia increase the risk of morbidity and mortality, and compromise overall quality of life. In hospitalized patients, malnutrition can increase infection and readmission rates, as well as duration of hospitalization.2

Despite its well-known adverse consequences, malnutrition in adults too often goes unrecognized and untreated. Poor awareness and knowledge among healthcare professionals and the community result in a failure to identify the increased nutritional needs of at-risk individuals. Furthermore, there is a lack of nutrition screening protocols, leading to inadequate nutritional care planning and monitoring in clinical practice.4

The number of people over the age of 65 years in Asia will triple by the year 2050 and will account for an estimated 18% of the total population.5 This effectively amplifies the number of people at risk for malnutrition and highlights an urgent need for effective implementation of interventional strategies. In addition to appropriate dietary intake, exercise and nutritional interventions are crucial in preventing and managing malnutrition and sarcopenia.1,3 This issue of NutriTimes explores the role of oral nutritional supplementation (ONS) in building a strong nutritional foundation for patients with malnutrition and/or sarcopenia to reverse loss of muscle mass and strength so that they can have the best possible quality of life.

References
The prevalence of sarcopenia varies across different populations

Sarcopenia affects up to 30% of community-dwelling adults in Europe and 22% in Asia.\(^1\) Prevalence in individual Asian countries varies greatly owing to differences in the state of aging, physiology, lifestyle, and culture of the disparate populations. The Asian Working Group for Sarcopenia (AWGS) recommends routine screening for community-dwelling adults over the age of 60 or 65 years, depending on the definition of elderly people in each country;\(^2\) whereas the European Working Group on Sarcopenia in Older People (EWGSOP) applies a 65-year-old cut-off for all community-dwelling adults.\(^1\) Additionally, the AWGS recommends screening for all older people with certain clinical conditions (eg repeated falls, cognitive impairment, chronic conditions) in any healthcare setting.\(^2\)

While similar assessment approaches are recommended in Asia and Europe, region-specific cut-off values for sarcopenia should be applied

The EWGSOP definition of sarcopenia requires assessment of muscle mass and either measure of muscle function (ie muscle strength or physical performance).\(^1\) On the other hand, the AWGS diagnosis algorithm stipulates screening of both muscle strength and physical performance before measuring muscle mass for a confirmed diagnosis of sarcopenia.\(^2\)

Although recommended assessment techniques are similar in both regions, various cut-off values (Table 1) are used owing to differences in ethnicities, body size, lifestyle, and culture.

Table 1. Recommended assessment techniques and cut-off values for sarcopenia diagnosis in clinical practice\(^2,3\)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Technique</th>
<th>Cut-off value</th>
<th>Asia</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle mass</td>
<td>DXA (ASM/height(^4))</td>
<td>Men: 7.0 kg/m(^2)</td>
<td>Men: 7.26 kg/m(^2)</td>
<td>Women: 5.4 kg/m(^2)</td>
</tr>
<tr>
<td></td>
<td>BIA (ASM/height(^4))</td>
<td>Men: 7.0 kg/m(^2)</td>
<td>Men: 8.87 kg/m(^2)</td>
<td>Women: 5.7 kg/m(^2)</td>
</tr>
<tr>
<td>Muscle strength</td>
<td>Handgrip strength</td>
<td>Men: &lt;26 kg</td>
<td>Men: &lt;30 kg</td>
<td>Women: &lt;18 kg</td>
</tr>
<tr>
<td>Physical performance</td>
<td>Gait speed</td>
<td>≤0.8 m/s</td>
<td>≤0.8 m/s</td>
<td></td>
</tr>
</tbody>
</table>

ASM, appendicular skeletal muscle mass; BIA, bioimpedance analysis; DXA, dual X-ray absorptiometry

An integrated management approach of exercise and nutritional supplementation is recommended in Asia and Europe

Although the AWGS does not provide specific recommendations for interventional strategies, it highlights the importance of a multilevel approach that employs both exercise and nutritional supplementation.\(^2\)

Based on findings from a systematic literature review, the EWGSOP concluded that exercise interventions, especially those based on resistance training, have a role in improving muscle strength and performance. It further recommends supervised resistance training or composite programs for at least 3 months, as well as increased daily physical activity. Findings from its review also suggest that nutritional intervention with essential amino acid (including approximately 2.5 g leucine) and β-hydroxy-β-methylbutyric acid (HMB) supplements may improve muscle mass and function.\(^1\)

References
Oral nutritional supplementation improves recovery in malnourished hospitalized adults and elderly patients

Introduction

Malnutrition in hospitalized patients can occur as a result of physiological changes, response to drugs, change in habits, and reactive emotional status. An estimated one in three patients enters the hospital malnourished and, if left untreated, two-thirds will experience further decline in nutritional status during hospitalization. Among patients who are not malnourished at admission, approximately one-third may become malnourished during their stay.1

The elderly are also particularly vulnerable to malnutrition because of aging-associated factors and decline in physiological functions. These include reduced lean body mass, decreased secretion of digestive juices, comorbidities, sensory function deficits, comitant medications, changes in the oral cavity, and fluid and electrolyte regulation. Hospitalization and social determinants can further contribute to nutritional inadequacy. Hospital malnutrition affects up to 78% of elderly patients in Asia.2

Oral nutritional supplementation (ONS), as part of a nutritional intervention strategy, has a role in reversing weight loss and its consequences, and in improving quality of life in malnourished hospitalized patients.

ONS in hospitalized adults

ONS was assessed in a randomized controlled trial of moderately malnourished patients with a mean age of 39 years, who were admitted to 13 hospitals in India for 4.0–4.5 days, mostly for treatment of infectious diseases. Compared with patients who received counseling alone, those who also received ONS twice daily for 12 weeks achieved greater improvements in weight, body mass index (BMI), and daily energy intake (230 vs 560 kcal; P<0.05). The increase in both weight and BMI with ONS was significantly higher than with counseling alone throughout the study (Figure 1). Furthermore, patients with more functional impairment at baseline benefited most from ONS. Patients on ONS who were in the lowest tertile of baseline handgrip strength score achieved significantly greater weight gain at weeks 4 and 8, as well as improvement in strength at week 4, compared with those in the upper tertiles and compared with control patients in the lowest tertile.3

These findings echo those of a study of malnourished surgical patients in the UK, in which ONS achieved significantly less weight loss than no ONS. Although there was progressive reduction in grip strength in both study groups, ONS achieved less reduction in strength 10 weeks after surgery than no ONS (−0.82 vs −1.93 kg/m²; P<0.001). Importantly, patients who received ONS had significantly greater improvements in physical and mental health status 10 weeks post-surgery than those who did not receive ONS.4

![Figure 1. Effect of ONS on change in body weight and BMI from baseline to follow-up visits](image-url)

ONS in elderly patients discharged from hospital

In 100 elderly malnourished patients aged ≥65 years from four hospitals in the UK, those who received 8-week ONS post-discharge consumed significantly more dietary energy and protein 1 month after ONS discontinuation, and gained more weight 6 months post-discharge, than those who did not receive ONS (1.85 vs 1.33 kg). Although ONS was only given during the first 8 weeks, BMI and triceps skinfold thickness improved significantly throughout the 6-month study. Importantly, handgrip strength increased significantly during supplementation, although this was not sustained post-supplementation.5

In 81 elderly patients hospitalized for chest infections in Hong Kong, ONS given for 1 month post-discharge resulted in significantly greater improvements in nutritional status, appetite, life satisfaction, and mental health compared with no ONS. Furthermore, patients who received ONS experienced significantly improved functional ability and physical activity at 2 months, and fewer sleeping difficulties at 3 months than those who did not receive ONS.6

Summary

Physicians may be reluctant to prescribe ONS in the community due to the financial burden on patients, arguing that malnutrition results from underlying diseases and that the management of these diseases should take priority. However, a recent 11-year analysis of 44 million adult inpatient episodes in the USA found that ONS can reduce hospitalization duration and cost by approximately 20%, and readmission risk by 7%. Given the high prevalence of hospital malnutrition, ONS proves to be an important intervention for improving outcomes at reduced healthcare costs.7

References

As a result of the exponential growth of the aging population, particularly in Asia, early detection and management of sarcopenia in daily clinical practice has become increasingly relevant and important. Professor Liang-Kung Chen from National Yang Ming University in Taiwan shared his clinical insights into sarcopenia management.

**Professor Liang-Kung Chen**
Professor and Director, Aging and Health Research Center, National Yang Ming University
Director, Center for Geriatrics and Gerontology, Taipei Veterans General Hospital
President, Taiwan Association of Integrated Care

### How does aging affect muscle strength?
Advancing age is the primary factor for the loss of muscle mass and function, particularly in people above 50 years old. Other age-related factors include nutrient deficiency, lack of exercise, and disease-related factors such as advanced organ failure and inflammatory and endocrine diseases.

### How is sarcopenia diagnosed?
Sarcopenia is diagnosed by assessing both muscle strength (handgrip strength) and physical performance (gait speed). If handgrip strength and/or gait speed is below a certain threshold, the patient’s muscle mass should then be measured by dual X-ray absorptiometry, bioimpedance analysis, computed tomography, or magnetic resonance imaging for a confirmed diagnosis.

### Is there a difference in the diagnosis of sarcopenia in Asian versus Western populations?
The lean body mass of the Asian population is generally lower than that of Western populations, largely owing to differences in adiposity and dietary patterns. However, there may be intergenerational lifestyle differences whereby the younger generation tends to lead a more urbanized and sedentary lifestyle compared with the older generation, who live a more traditional lifestyle that is typically more physically rigorous. As a result, the muscle mass of older Asian people may be better preserved than that of the younger generation, which may lead to a lower prevalence of sarcopenia among the older Asian people compared with Western populations.

### Are there any country-specific differences for diagnosing sarcopenia in Asia?
Based on published reports, the elderly population in Malaysia generally has higher rates of obesity and poorer physical performance compared with the elderly in East Asian countries/regions such as Japan, Korea, Hong Kong, and Taiwan.

As the diagnostic cut-off for muscle mass is based on standard deviations from the mean muscle mass of a reference group, cut-off values may vary according to local community samples.

### Is sarcopenia reversible? If so, how?
Yes, sarcopenia is reversible. Effective sarcopenia management should comprise good nutrition and physical activity. Good nutrition should consist of sufficient protein intake at a recommended level of 1.2–1.5 g/kg body weight daily. Elderly patients usually have comorbidities such as hypertension and diabetes that necessitate dietary restrictions, which may inadvertently have a detrimental effect on their nutritional status and should be taken into consideration when planning nutritional interventions.

### How should nutrition and oral nutritional supplementation (ONS) be used in the management of sarcopenia?
The physician should first determine the amount of dietary protein that the patient consumes regularly. The patient should be advised to make dietary changes to increase protein intake, and ONS may be considered if the patient is unable to increase protein intake through dietary means.

There are three levels of nutritional intervention:
- a. Dietary changes to increase protein intake
- b. Supplementation with essential amino acids such as leucine or arginine
- c. Supplementation with β-hydroxy-β-methylbutyric acid (HMB), an active metabolite of leucine, to further improve muscle synthesis.

### Once a patient is on ONS, how should they be monitored?
Patients should be monitored by assessing daily activity, physical performance, and energy levels. As nutritional supplement is not a drug, its continued use should depend on the individual patient’s preference and nutritional status.

### What are some practical ways of optimizing the overall management of sarcopenia?
In clinical practice, routine screening among the elderly will ensure early detection and management of sarcopenia. Physicians should actively promote good nutrition and exercise among the elderly as they are crucial components of the healthy aging process.