PROTEIN ORAL NUTRITIONAL SUPPLEMENTATION FOR THE ELDERLY AND MALNOURISHED HOSPITAL PATIENT

White Z (PhD), Kotze V (RD), Erasmus A (RD)
Department Human Nutrition, University of Pretoria

Medical Chronicle October 2016

MEDICAL CHRONICLE
The Doctor's Newspaper
www.medicalchronicle.co.za
Established 1965
CELEBRATING 50 Years ANNIVERSARY

Disease related malnutrition is very common across all health care settings.
The effect of disease related malnutrition can be detrimental on both physical and clinical health, leading to an increased length of hospital stay, morbidity, mortality and increased cost.

The reason for this is that malnutrition not only lead to disease, but it affects disease outcome negatively in several ways which include a decrease in immune function leading to increased infections and decreased ability of the body to recover, muscle weakness that increases the risk of falls, venous thromboembolism and pressure ulcers.

Causes of malnutrition are multifactorial and differ from metabolic effects of underlying disease to reduced nutritional intake.

It is estimated that malnutrition affects about 20-55% of all medical and surgical patients admitted to hospitals.
Among hospitalised older adults, 40-60% are malnourished or at risk for malnutrition.

These patients can be managed with a variety of oral dietary approaches including dietary modification, counselling by a dietician or the use of oral nutritional supplements (ONS).

This article will focus on protein-energy malnutrition (PEM), protein requirements and the effect of high protein ONS and their effects on various anthropometric, functional and biochemical indexes among the elderly and malnourished patient.

PROTEIN-ENERGY MALNUTRITION (STARVATION), SARCOPENIA AND CACHEXIA

Malnutrition is broadly defined as, "a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients causes measurable adverse effects on tissue/body form (body shape, size, and composition) and function, and clinical outcome”.

The American Society for Parenteral and Enteral Nutrition (ASPEN) defines malnutrition as “the presence of two or more of the following characteristics: insufficient energy intake, weight loss, loss of muscle mass, loss of subcutaneous fat, localised or generalised fluid accumulation, or decreased functional status”.

Unintentional weight loss includes three primary syndromes: starvation, sarcopenia and cachexia.

Protein-Energy Malnutrition can be defined as “a pathologic depletion of the body’s lean tissues caused by starvation, or a combination of starvation and catabolic stress”.
PEM develops when protein or energy intake, or both, continually fail to meet the body’s requirements for these nutrients.
The human body has adapted to slow or prevent the progression of PEM thorough several mechanisms including reduced protein store and reduced metabolic rate.
When the adaptation is successful, it will reduce energy and protein requirements to match the requirements (only if the starvation ration of energy and protein is not too low), resulting in restored homeostasis and maintaining key physiologic functions.
Clinically, these adaptations results in reduced cardiac and respiratory capacity, muscular weakness and functional disability, mild hypothermia and a reduced body protein reserve.

Cachexia is defined as “a multi-organ syndrome associated with diseases such as cancer, chronic infection, chronic obstructive pulmonary disease, chronic heart failure and others, characterised by body weight loss (at least 5%), muscle and adipose tissue wasting and inflammation, and often anorexia”.
Cachexia is associated with alterations in the metabolism of carbohydrate, lipid and protein.
According to an international consensus: “Cachexia, is a complex metabolic syndrome associated with underlying illness and characterised by loss of muscle with or without loss of fat mass”.
Various conditions are frequently associated with cachexia including anorexia, inflammation, insulin resistance and increased muscle protein breakdown.

Sarcopenia, on the other hand, is a component of the frailty syndrome and refers to the 'degenerative loss of skeletal muscle mass, quality, and strength associated with ageing'.
Sarcopenia in a broader sense is also defined 'as any loss of skeletal muscle mass and strength that occurs with advanced age and secondary to chronic diseases including cancer.

Various factors causes and contributes to sarcopenia, which include: age-related reduction in nerve cells (responsible for sending signals from the brain to the muscles to induce movement), decreasing hormone concentrations (growth hormone, testosterone, and insulin-like growth factor), decreased protein synthesises and an inadequate intake of calories and/or protein to sustain muscle mass.

Sarcopenia and cachexia are both classified as muscle wasting disorders. The elderly is particularly vulnerable to cachexia due to the interchange between chronic illness and elements such as sarcopenia, malnutrition and immobility.
Between 10 and 40% of patients with chronic conditions including heart failure, chronic bstructive pulmonary disease (COPD), cancer, HIV, and renal and liver failure suffer from cachexia.

Frailty, loss of independence, poor prognosis and increased mortality are associated with weight and muscle loss.

During disuse, skeletal muscle loss occurs at a rate of approximately 0.5% of total muscle mass per day, translating into approximately 150g of muscle tissue lost per day in a healthy adult. This result in more than 1kg of muscle mass lost after a single week.

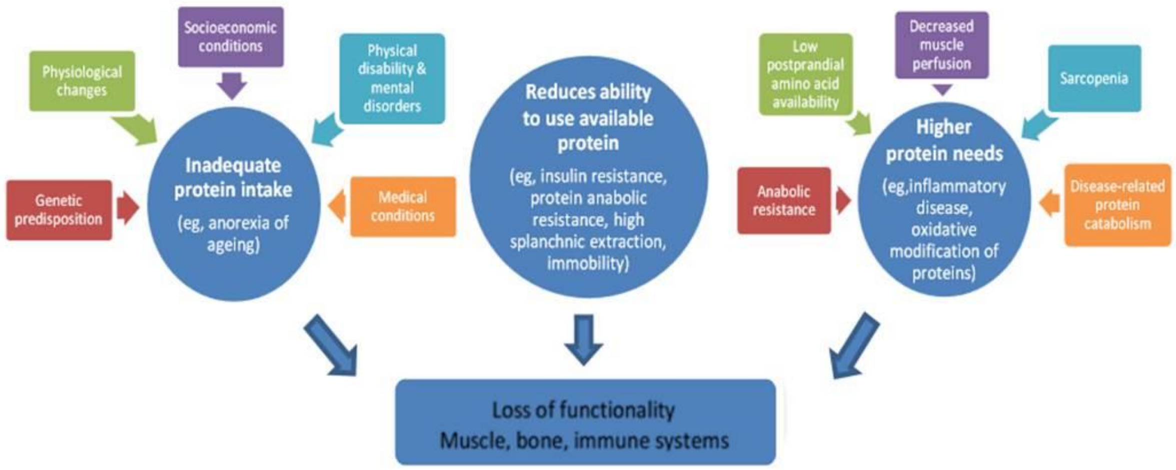
In several populations, particularly among the elderly, prolonged muscle disuse forms a significant health concern.
In order to attenuate muscle loss during a period of disuse, it is essential to maintain dietary protein intake, and nutrition is therefore an important factor to regulate the maintenance of muscle mass.

Specific supplementation with food sources high in dietary protein and/or specific protein and/or the use of essential amino acids supplements can be applied to compensate for anabolic resistance due to disuse, by enhancing postprandial rates of muscle protein synthesis.

DIETARY PROTEIN REQUIREMENTS

Appropriate dietary protein intake for older adults is important for maintaining functionality. The risk for common age-associated problems, such as sarcopenia, osteoporosis, and impaired immune responses is increased when protein intakes are inadequate. Inadequate intake of protein, reduced ability to use available protein, as well as higher protein needs variously influence protein use in older individuals (Figure 1).

Figure 1. Aging-related causes and consequences of protein deficits (Adapted from Bauer *et al.*[16] and Deutz *et al.*[18])



Protein requirements changes with ageing and vary according to different chronic diseases, decreased absorption, and synthesis.
An international study group was appointed by The European Union Geriatric Medicine Society (EUGMS) and other scientific organisations to review dietary protein needs with aging (PROT-AGE Study Group).
Their goal was to develop updated, evidence-based recommendations for optimal protein intake by older people.
The PROT-AGE study group has the following recommendation with regard to average daily intake: 1.0 to 1.2g protein per kilogram of body weight per day for older people (>65 years) to maintain and regain lean body mass and function; higher protein intake (ie, 1.2g/kg body weight/d) for elderly who are exercising and otherwise active.
Older people who have acute or chronic diseases need even more dietary protein (i.e., 1.2-1.5g/kg body weight/d).

Sufficient protein of 1.2-1.5g/kg of dry body weight is necessary to maintain or restore lung and muscle strength, as well as to promote immune function in COPD patients and prevent muscle tissue wastage in tuberculosis patients.

Similar guidelines were published a year later by the European Society for Clinical Nutrition and Metabolism (ESPEN) Expert group.

Older people with severe kidney disease (ie, estimated GFR <30 mL/min/1.73m2), but who are not on dialysis, are an exception to the high protein recommendation of 1.2-1.5g/kg body weight/d, and may need to limit protein intake.

In critical illness, protein delivery of 2-2.5 g/kg/day is safe and may be optimal for most critically ill patients except for those with refractory hypotension, overwhelming sepsis, or severe liver disease.
Deficiency of protein stores and abnormal protein metabolism occur in HIV and AIDS, but no evidence exists for increased protein intake, but with an opportunistic infection, an additional 10% increase in protein intake is recommended.

Disease specific protein and energy recommendations according to the Gauteng therapeutic protocol are listed in Table 1.

Table 1: Disease specific protein and energy recommendations according to the Gauteng therapeutic protocols

Disease Condition:	Recommended Protein:	Recommended Energy
HIV/AIDS	Asymptomatic HIV: 1.1 – 1.5g/kg/day Symptomatic HIV: 1.5 – 2g/kg/day CD4 count < 200: 2 -2.5g/kg/day	Asymptomatic HIV: 30 -35kCal/kg/day Symptomatic HIV: 35 – 40kCal/kg/day CD4 count < 200: 40 – 50kCal/kg/day
Pulmonary	1.2 – 1.5g/kg/day ABW/day	20 – 30kCal/kg/day
Spinal Cord Injuries	Acute phase: 2g/kg/day Rehabilitation phase: 0.8 – 1g/kg/day	Acute phase: Predictive equation and stress factor of 1.2 + activity factor of 1.1 (admission weight) Rehabilitation phase: 22.7kCal/kg body weight/day (quadriplegic) 27.9kCal/kg/d(paraplegic)
TBI	First 2 weeks: 1 – 1.5g/kg/day There after: 1.5 – 2g/kg/day	20-30kCal/kg desirable weight /day
Stroke	1 – 1.5g/kg/day	110-115% TEE
Cancer	Non-stressed: 1 – 1.2g/kg/day Hypercatabolic: 1.2 -1.6g/kg/day Severe Stress: 1.5 – 2.5g/kg.day	Ambulate patients: 30 -35kCal/kg/day Bed ridden patients: 20 -25kCal/kg/day Weight gain: 30 – 40kCal/kg/day Stressed: 35kCal/kg/day
Pressure Ulcer	1.2 – 1/5g/kg/day (Stage 2 pressure ulcers) 1.5 – 2g/kg/day (Stage 3 and 4 pressure ulcers)	30-40kCal/kg/day
Congestive Cardiac Failure (CCF)	1.3 -1.5g/kg/day	25 – 35kCal/kg/day

ORAL NUTRITIONAL SUPPLEMENTS (ONS)

There are different types of ONS available to suit a wide range of needs.
ONS vary in styles (milk, juice, yoghurt, savoury), formats (liquid, powder, pudding, pre-thickened), types (high protein, fibre containing, low volume) energy densities (1-2.4kcal/ml) and flavours. Most ONS provide ~300kcal, 12g of protein and a full range of micronutrients per serving.
The majority of people requiring ONS include the frail, elderly or people diagnosed with dementia, COPD or cancer. These patients can be managed using standard ONS (1.5-2.4kcal/ml).

High protein ONS are especially suitable for individuals with wounds, post-operative patients, some typesof cancer, and the elderly.

A high protein ONS can be defined as a supplement containing more than 20% of its energy form protein.

Sources of protein used in supplements differ from manufacturer to manufacturer, but the most popular protein sources used for ONS are soybean and milk proteins (whey and casein).

SCIENTIFIC EVIDENCE ON ONS AND PROTEIN SUPPLEMENTATION

In 2007, Stratton and Elia onsolidated the evidence from thirteen previously published reviews on the efficacy of ONS, including high protein ONS, for treating disease-related malnutrition.
The key findings are summarised below, supplemented by the findings of more recent published systematic reviews and meta-analysis according to various outcomes:

ONS use versus routine care in acutely ill, hospitalised and elderly patients with a range of conditions resulted in reductions in mortality – the benefits are primarily in, but not limited to, the undernourished.

Baldwin and Weeks, however, found no difference in mortality or morbidity between groups receiving dietary advice with or without ONS.

Complications, including infections and pressure ulcers, were less with ONS use versus routine care among the acutely ill, elderly and surgical patients.

Cawood et al and Milne et al also reported reduced complications on high protein ONS.
Functional improvements,such as muscle strength and mobility, are reported in individual randomised controlled trials.

Collins et al, as well as Cawood et al reportedsignificant improvements in handgrip strength with ONS and high protein ONS.
ONS have beneficial effects on body weight compared with routine care, significantly attenuating weight loss in acutely ill, hospitalised patients and significantly increasing weight gain in chronically ill, community based patients.

The positive effect on body weight was confirmed by six recent systematic reviews and meta-anlysis.

Liquid ONS are an effective way of increasing total energy and nutrient intakes and tend not to suppress food intake or appetite.
Nutritional status was improved with ONS in most but not all reviews.

Improvements in clinical outcome (reduction in complications) with ONS in some specific groups, including those undergoing gastrointestinal surgery and in patients with hip fracture.

Crickmer et al. evaluated published trials examining oral post-operative protein supplementation in patients having undergone gastrointestinal surgery.
Although protein supplementation did not appear to affect mortality, supplementation with protein results in reduced weight loss and improves nutritional status.

CONCLUSION

Malnutrition is associated with decreased muscle function and impaired functional status. Oral nutritional supplementation is a low-risk, cost-effective strategy to meet the protein requirements in the elderly and malnourished patient to limit muscle mass loss during disuse and to improve protein gain during recovery.
There is consistent, good quality evidence demonstrating the beneficial nutritional, functional and clinical effects of ONS in malnourished patients.
The evidence also exists to support routinely prescribed protein containing oral nutritional supplements for gastrointestinal surgery patients in the immediate post-operative stage. Small volume, energy and nutrient dense ONS can therefore be effective to improve nutritional intake, and maintaining or improving muscle mass (gain) during recovery.