Malnutrition in COPD

A cause and effect of morbidity

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The complex relationship between chronic obstructive pulmonary disease (COPD) and nutrition is often underappreciated because the focus is usually on the management of dyspnoea and acute exacerbations. Nutrition is often compromised in patients with COPD and identifying this may assist in reducing the burden of the disease.

Key points

- **Malnutrition is under-recognised in patients with chronic obstructive pulmonary disease (COPD), and it both results from and contributes to the course of the disease.**
- **The pathophysiology of malnutrition in COPD is complex and multifactorial.**
- **Assessment of nutrition and management of malnutrition is an adjunct to standard COPD interventions.**
- **Screening for malnutrition should occur in all patients with COPD and should include more than just a standalone measure of body weight.**
- **Nutritional supplementation can be implemented by GPs.**
- **Referral to dietitians can be helpful in individualising nutritional support.**

Chronic obstructive pulmonary disease (COPD) is a major cause of morbidity and mortality affecting an estimated 1.45 million Australians. It contributes extensively to health expenditure and avoidable hospitalisations. The symptoms of COPD – dyspnoea, cough and sputum production – significantly affect a person's daily functioning and quality of life. Compounding this impact are the interspersed acute exacerbations that typify the disease course.

Somewhat less obvious is the impact that the symptoms of COPD have on a patient's nutrition. The reverse effect is also worth noting, with malnutrition having a negative impact on the symptoms and course of this chronic lung disease (Figure 1). The importance of nutrition in COPD is reflected by the inclusion of body mass index (BMI) in the BODE (BMI, airflow obstruction, dyspnoea and exercise) index, a method of predicting COPD mortality, which is higher for those with lower body mass indices. The European Respiratory Society has published a task force report supporting the role of nutritional status as a determinant of outcome in COPD.[1] The Australian and New Zealand guidelines for the management of COPD (COPD-X) provide nutritional recommendations in their 'Optimise function' section.[2]

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Prevalence and importance

The prevalence of malnutrition in patients with COPD was 21% in a UK study.[3] At a tertiary centre in Australia, 42% of inpatients with COPD were considered malnourished.[4] Unintentional weight loss of greater than 5% was reported in a cohort of 22% of UK patients with COPD and of those patients significant weight loss followed

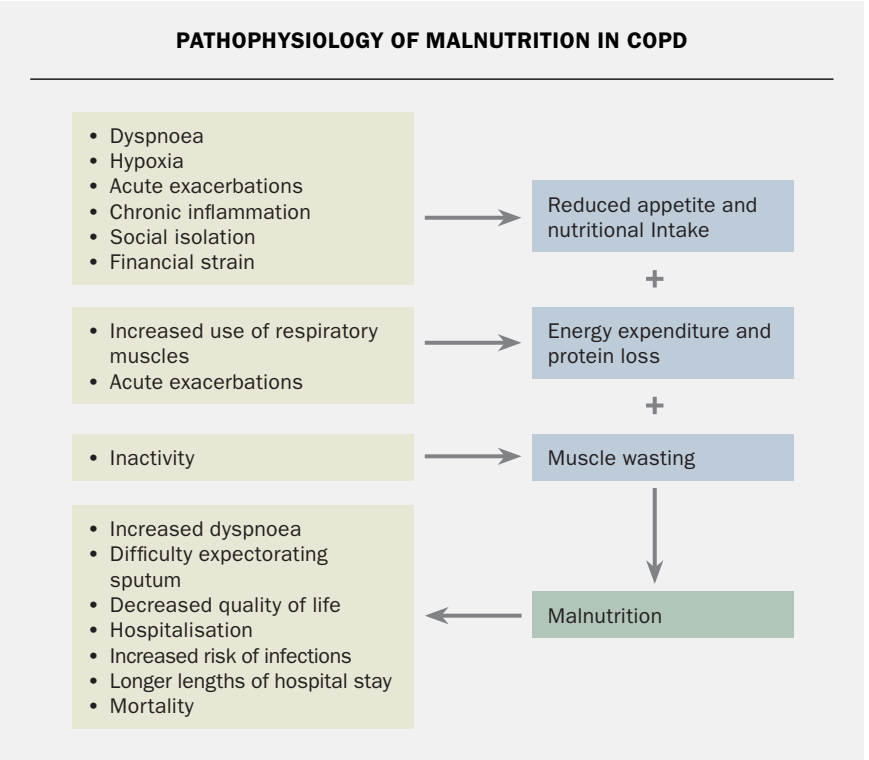


Figure 1. Consequences of COPD lead to malnutrition which in turn aggravates the consequences of COPD.

Table 1. Malnutrition screening tool*[9]

Question/answer	Points
Has the patient lost weight unintentionally in the past six months?	
No	0
Unsure	2
Yes, 1–5kg	1
Yes, 6–10kg	2
Yes, 11–15kg	3
Yes, >15kg	4
Has the patient been eating poorly because of a decreased appetite?	
No	0
Yes	1
Total score†	

* Adapted from: Metro North Hospital and Health Service Royal Brisbane and Women's Hospital. Malnutrition Is your patient at risk?
† A score of two or more indicates a patient at risk of malnutrition.

an acute exacerbation in 41% of cases.[5] Patients with COPD at risk of malnutrition have higher rates of hospitalisation, longer hospital stays and increased mortality.[4,6] Underweight patients with COPD report poorer quality of life, and this effect is independent of other measures of disease severity (such as forced expiratory volume in one second [FEV_1]). Identifying at-risk patients may go some way to reducing the burden of this chronic disease. Further to this, nutritional improvements are possible in patients with COPD and result in several functional gains.[7]

Pathophysiology

Appetite and nutritional intake

It is now well recognised that COPD is a systemic inflammatory illness not only affecting the lungs. Chronic inflammation is a major contributor to sarcopenia and cachexia, in part through its negative impact on appetite.[8] Dyspnoea and fatigue limit a person's ability to meet their daily nutritional requirements. The social isolation and financial strain that accompanies the functional loss in COPD may also limit access to affordable food. Hyperinflation can increase intra-abdominal pressure resulting in early satiety. The appetite suppressant effect of cigarette smoking is well known and is important in those COPD patients who continue smoking.

Energy expenditure, protein loss and inactivity

Energy expenditure of the respiratory muscles increases from 2% to around 15 to 20% of basal metabolic rate in patients with COPD. The energy imbalance is widened during acute exacerbations, a time when energy intake is often compromised. Inactivity can result from the symptoms of this debilitating disease. Body protein is lost through immobility, worsening muscle wasting. Respiratory muscle wasting, including that of the diaphragm, worsens dyspnoea and makes sputum expectoration more difficult. This may predispose to acute exacerbations and hospitalisation. Muscle wasting elsewhere contributes to difficulty with functional tasks and fatigability.

Assessment

Routine nutritional screening using a validated screening tool such as the malnutrition screening tool (MST, Table 1) should be carried out in all patients with COPD to identify those at risk and to initiate treatment.[9] Assessment of body weight alone is unlikely to be sensitive enough to detect all patients at nutritional risk. The malnutrition screening tool considers both unintentional weight loss and decreased oral intake.

Documenting and monitoring weight at each outpatient visit is suggested, with a percentage weight loss of 5% in three months and 10% in 6 months indicating a significant malnutrition risk.[8] A BMI less than 20kg/m^2 has been found to be an independent predictor of mortality and hospitalisation in COPD, although it is important to note that patients with a BMI in the healthy weight range or above may still be malnourished or at nutritional risk.[10]

The presence of oedema, common in COPD patients, creates difficulties in anthropometrical measurement due to changes in body composition. Measurement and

Figure 2. Measuring mid-upper arm circumference.

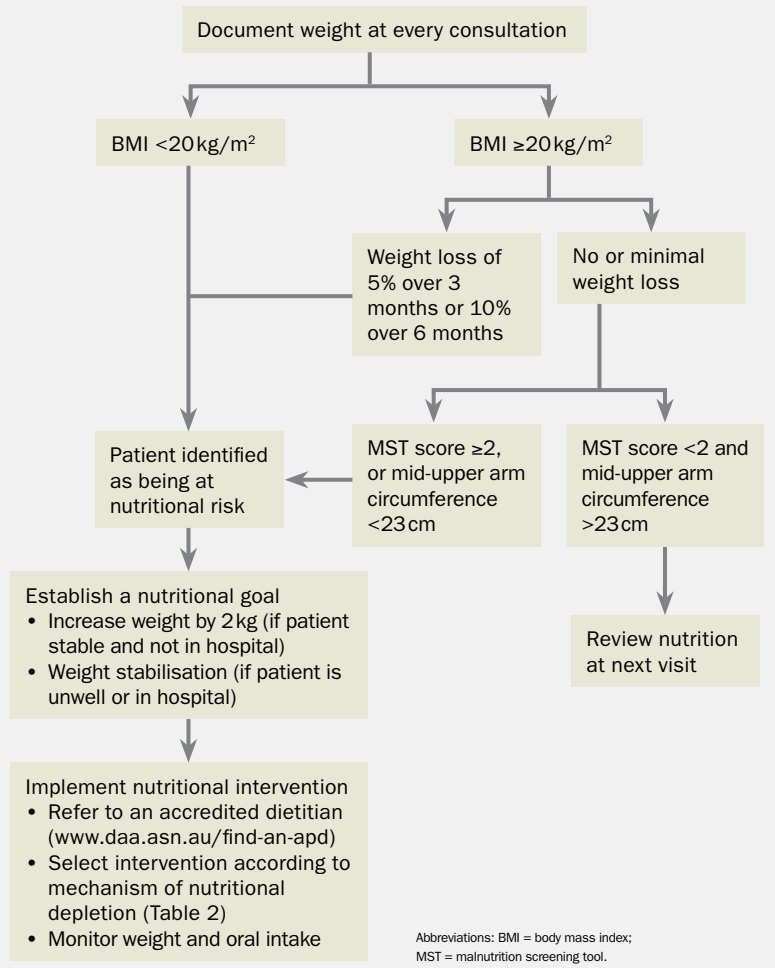
monitoring of the upper-arm may be useful. A mid-upper arm circumference less than 23 cm often indicates a BMI of less than 20 kg/m^2 (Figure 2).[4,11]

Nutritional goals

Once a patient has been assessed as at risk of malnutrition, it is important for a nutritional goal to be established. Goals will vary depending on whether the patient's condition is stable or the patient is experiencing an acute exacerbation and whether comorbidities are present. Weight gain is very difficult to achieve in the short period of time during a hospitalisation. In the acute setting, weight stabilisation may be a more appropriate goal. An approach to assessing and managing nutrition in patients with COPD is outlined in the Flowchart.

Recent reviews have challenged the historical view that weight loss is an inevitable and irreversible part of COPD. It has been demonstrated that weight loss is, in fact, reversible and weight gain of 2 kg has been associated with functional improvements as well as reduced mortality in one study.[7,12,13] In malnourished patients with COPD, an increase in weight of at least 2 kg could be a therapeutic target. A referral to an accredited practising dietitian is recommended to assist with goal setting and tailoring nutritional interventions (Table 2).

ASSESSING AND MANAGING NUTRITION IN PATIENTS WITH COPD



Flowchart. A suggested approach for GPs to assess nutrition in patients with COPD.

Therapies

Malnutrition in COPD is the result of a complex interplay between a number different pathophysiological processes as outlined above. The management of malnutrition in this group of patients, as in any chronic illness, requires a multidimensional approach. Specific treatments for the disease itself, including bronchodilators, pulmonary rehabilitation and smoking cessation, may reduce symptom burden and exacerbation frequency and therefore improve appetite and mobility. The intent of this article is to provide some insights into the lesser known nutritional aspects that should be considered as an integral adjunct to established therapies. It is worth noting that in many of the studies of nutritional supplementation the intervention has included a structured exercise program (i.e. pulmonary rehabilitation).

To some degree, treatments should be tailored to the likely mechanisms for the malnutrition (Table 2). A multimodal approach to therapies (e.g. exercise program combined with dietary supplements and newer treatments) is recommended to encompass the complexity of malnutrition in COPD patients.

Table 2. Nutritional interventions

Mechanism of nutritional depletion	Suggested nutritional intervention
Anorexia and taste changes	• Improve texture, flavour, smell and presentation of food • Eat every two hours • Review medications • Assess mood and need for treatment or referral
Early satiety	• Eat small, frequent, energy dense meals • Select fortified foods – e.g. cream, butter, milk powder, cheese, oils • Use energy and protein dense oral nutritional supplements • Use preprandial prokinetics
Dyspnoea and fatigue	• Eat softer foods that require less chewing • Drink nourishing liquids • Sit out of bed for meals • Implement energy conservation techniques – refer to occupational therapist • Use easy to ingest medications (e.g. liquid preparations)
Impaired food access	• Organise feeding assistance (if required) • Review the need for home assistance • Organise meal delivery • Promote communal eating – e.g. communal dining room, family or other meal groups
Dysphagia	• Modify texture of diet • Consider speech therapy review

Online resources

- Find a dietitian – www.daa.asn.au/find-an-apd
- Ordering oral nutritional supplementation – www.nutritionaustralia.org; www.independenceaustralia.com
- Patient education – www.health.qld.gov.au/nutrition/nemo_nutrsup

GPs are ideally situated to commence and monitor the benefits of these therapies. Some resources are listed in the Box.

Oral nutritional supplementation

A Cochrane review evaluating nutritional supplementation in patients with COPD found evidence for benefit in terms of achieving weight gains especially in the malnourished.[14] The same review found that nutritional support improved six-minute walk distance. Despite these findings, there is a lack of use of supplements in practice. Mortality benefits of nutritional supplementation have not been studied and would be difficult to demonstrate in randomised controlled trials. Researchers showed, in a randomised controlled trial in 2009, that weight gain can be sustained even after formal nutritional support is ceased if dietary counselling is initially provided.[15]

Both GPs and nurses can recommend strategies to overcome the causes of nutritional depletion before or in the absence of a dietetic referral (Flowchart). GPs can recommend oral nutritional supplementation, which is easily purchased from supermarkets and online; a variety of supplements can also be accessed via a dietitian. These supplements should contain significant amounts of protein, and high calorie density/low volume preparations to minimise abdominal discomfort. Contrary to previous understanding, formal studies have shown that high carbohydrate preparations are better tolerated due to enhanced gastric emptying.[8]

Vitamin D supplementation

Vitamin D deficiency is commonly found in patients with COPD; one study found it to be present in 81% of patients, possibly due to a lack of sunlight exposure and/or poor dietary intake.[16] The deficiency is associated with impaired immunity (which may lead to increased infective exacerbations), increased falls risk and osteoporosis (which can cause much morbidity in older patients). A randomised trial of oral vitamin D in COPD patients showed significantly better outcomes in time to moderate or severe exacerbations if the serum vitamin D level was less than 50 nmol/L.[17]

Replacement with oral cholecalciferol may not be adequate in some cases. Vitamin D levels should be checked after three months and if still low, consider a high-dose injection to boost levels more effectively. This may require an authority prescription.

Other supplementation

Omega-3 fatty acids may help patients with COPD by combating the inflammatory response, and patients should be encouraged to include foods in their diet that are high in omega-3 fatty acids (e.g. oily fish and certain plant seeds).[18] Also, some studies have shown positive benefits (increased fat free mass and muscle strength) with essential amino acid supplementation in this patient group.[19,20] In addition, one large study demonstrated a link between higher serum levels of antioxidants and minerals and a higher FEV_1.[21]

Other treatments

Ghrelin analogues (potentially increasing food intake and growth hormone secretion) have been trialled in patients with COPD and have been associated with reported improvements in exercise capacity.[22] In a review in 2016, it was postulated that cognitive behavioural therapy (CBT) could be a way of changing the response to food stimuli in COPD patients to promote weight gain.[23] Certainly, CBT may have other benefits in this patient group (e.g. enhancing the mood-related benefits of an exercise program).

General measures

In addition to nutritional supplementation there are other important aspects of mealtime to address, some of which may seem obvious, though are worth mentioning. Patients with chronic bronchitis should attempt to expectorate before meals. Those on supplemental oxygen should consider the delivery of oxygen during meals. In patients with severe disease, energy expenditure may be reduced during meal preparation by sitting rather than standing and by using electrical devices such as electrical can-openers. Addressing access to food should also form part of nutritional management.

Other causes of weight loss in COPD

It is important to consider other causes of weight loss in patients with COPD.

Lung cancer

Patients with COPD are more likely to develop lung cancer because they usually have a smoking history and diagnosis may be delayed because of overlapping chronic symptoms. Healthcare professionals should be vigilant for concerning symptoms such as any haemoptysis, an unexplained increase in cough, or recurrent chest infections or episodes of pneumonia. Any of these should lead to a chest x-ray being performed and, if indicated, a CT scan.

Chronic lung infections

A range of less common organisms can produce a malnutrition syndrome by colonising regions of bullous emphysema. These include nontuberculous mycobacteria (the most common in this group is *Mycobacterium avium intracellulare* [MAC]), aspergillus, other fungi and nocardia. Investigations to consider could be sputum microscopy and culture for fungi and acid-fast bacilli, CT chest scan and bronchoscopy. Targeted therapy may well assist with weight gain in patients who test positive.

Bronchiectasis

In a primary care study in 2000, 30% of patients with COPD were found to have bronchiectasis on CT scans;[24] and there is a published concept of a COPD-bronchiectasis overlap syndrome.[25] Bronchiectasis should be considered especially if patients are having frequent recurrent chest infections and/or are experiencing difficulty in expectoration of thick mucus. Establishing this diagnosis will lead to a focus on causes, mechanisms, airway clearance (through devices and physiotherapy techniques) and management strategies including mucolytics and chronic antibiotic treatment. Of note, chronic pseudomonas colonisation carries a worse prognosis and is more likely to be associated with unexplained weight loss.[26]

Depression

Depression is common in patients with COPD and should be sought if significant weight loss is present despite adequate supplementation.[27] Enquiries regarding mood and quality of life will help gauge the patient's mental state more accurately. Depressed patients are less likely to seek help, less likely to take their medications and have a lower appetite, which will aggravate their malnutrition further. Empiric short-term courses of antidepressants can be helpful in the management of these patients.

Conclusion

An assessment of nutritional status should be performed in all patients with COPD. Identifying and treating malnutrition may go some way to improving the course of this chronic disease. Diagnosing malnutrition may be easy in the cachectic patient, what is more difficult is to identify the patient at risk of malnutrition and future weight/muscle loss. Optimising nutrition should be multidimensional and be considered an adjunct to medical therapies, pulmonary rehabilitation and smoking cessation. The GP is well-placed to identify and manage malnutrition and should consider involving a dietitian in the management of these often complicated patients. RMT

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A list of references is included in the website version of this article (www.medicinetoday.com.au).

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