

# Non-pharmacological management of COPD

**The non-pharmacological management of COPD is a neglected area in the treatment of respiratory diseases.**

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An almost uniformly neglected area of respiratory disease management is the non-pharmacological component. Most patients with chronic respiratory illnesses will lose their exercise capacity (deconditioning) as the illness progressively limits physical activity. It is usually not appreciated that as medication improves the disease state and static lung function, normalisation of physical activities does not automatically ensue – it has to be re-established. Many patients with obstructive lung disease will inappropriately use rescue bronchodilator therapy when experiencing dyspnoea with exertion, whereas the real problem is that of deconditioning. Practitioners often do not have time to define this problem carefully or advise patients adequately. A careful history and evaluation of patients will delineate the precise reason for dyspnoea and the appropriate management.

For chronic obstructive pulmonary disease (COPD), in particular, non-pharmacological treatments include smoking cessation strategies, pulmonary rehabilitation, ventilatory support, endobronchial treatments and various forms of surgical treatments including bullectomy, lung volume reduction surgery and lung transplantation. Smoking cessation and domiciliary oxygen supplementation in advanced cases remain the only interventions with a proven mortality benefit in COPD.<sup>1</sup>

This review further elaborates on these non-pharmacological interventions, with particular emphasis on pulmonary rehabilitation.

## Vicious cycle of COPD

The commonest symptom associated with COPD is progressive dyspnoea, which leads to limitation of everyday physical activities. Inactivity promotes further physical deconditioning with associated

loss of muscle mass. Advanced COPD is associated with systemic inflammation and increased circulating levels of cytokines, such as tumour necrosis factor-alpha (TNF-alpha), which further promote muscle loss and cachexia. Deconditioning aggravates dyspnoea with further limitation of activities and precipitation of a vicious cycle (Fig. 1). Limitation of activity also promotes social isolation of COPD patients, with an increased risk of depression and anxiety, which commonly remain undiagnosed and untreated.

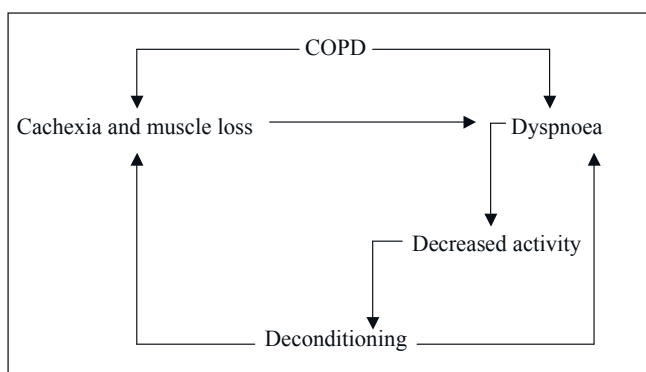


Fig. 1. This diagram illustrates how the various complications of COPD lead to vicious cycles that result in deconditioning.

## Pulmonary rehabilitation

Pulmonary rehabilitation is a broad therapeutic concept. It is defined by international respiratory societies as an evidence-based, multidisciplinary and comprehensive intervention for patients with chronic respiratory diseases who are symptomatic and often limited in their activities of daily life.<sup>2</sup>

Pulmonary rehabilitation is usually provided in the form of a structured programme involving various health care professionals, including physicians, physiotherapists, biokineticists, dieticians and psychologists. A supervised exercise programme is the main component of a rehabilitation programme and is usually combined with patient education, nutritional assessment and psychological support. Pulmonary rehabilitation aims to break the aforementioned vicious cycle of COPD by improving exercise capability and conditioning. The proven benefits of pulmonary rehabilitation are summarised in Table I.

In terms of patient selection, rehabilitation is appropriate for COPD patients of all grades of severity, although some data suggest that severely incapacitated patients may not benefit.<sup>3</sup> Patients selected

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for pulmonary rehabilitation programmes should be highly motivated. Current smokers are usually not considered for rehabilitation unless they also partake in a smoking cessation programme, as there have been reports that smokers are less likely to complete a rehabilitation programme.<sup>1,4</sup>

**Table I. Benefits of pulmonary rehabilitation in COPD**

- Improvement in exercise tolerance
- Reduction in dyspnoea
- Improvement in health-related quality of life
- Reduction in hospitalisation and health care expenditure
- Reduction in anxiety, depression and social isolation
- Possibly improved survival

The minimum duration of an effective exercise programme in pulmonary rehabilitation is currently not known, although guidelines suggest 6 weeks.<sup>1,2</sup> Longer programmes, however, are associated with better results, albeit at increased costs. Exercise should be performed at least three times per week to achieve physiological benefits.<sup>2</sup> Where resources are limited, supervised training sessions can be combined with unsupervised home sessions.

Exercise usually takes the form of lower-extremity endurance training. This can be in the form of simple walking exercises or the use of a treadmill or a stationary cycle. The patients' maximal exercise capability should be assessed by formal cardiopulmonary exercise testing before the start of the rehabilitation programme. During training the intensity should be maintained at a level of more than 60% of this capacity – ideally for more than 30 minutes. Interval training is an alternative in patients unable to achieve the desired intensity or duration of exercise and consists of shorter bursts of high-intensity exercise combined with periods of lower-intensity exercise.<sup>2</sup> Lower-extremity strength training can be combined with endurance training and achieves better results in terms of improvements in muscle mass compared with endurance training alone. Some programmes also include upper-extremity training with arm cycle ergometry, free weights or elastic bands, as many activities of daily living primarily involve the use of upper extremity muscles.

It is important that bronchodilator therapy be optimised before exercise to enhance performance. Patients on long-term oxygen treatment should also continue this during exercise and may even require higher flow rates than at rest.

Transcutaneous, neuromuscular electrical stimulation involves passive stimulation of contraction of peripheral muscles to elicit a training effect. It can be used as an adjunct to conventional forms of exercise and can also be used to improve peripheral muscle strength in severely incapacitated and even bed-bound patients. It has also been used in the setting of acute exacerbations of COPD, thereby allowing continued training.<sup>2,5</sup>

Other less conventional forms of training that have been used in rehabilitation programmes include breathing retraining and ventilatory muscle training. Patients with COPD may have a rapid, shallow breathing pattern that is deleterious to ventilation and gas exchange. Retraining with breathing techniques that employ yoga or pursed lip breathing has, in some studies, led to improvements in dyspnoea.<sup>6</sup> Attempts at improving ventilatory muscle strength or endurance with these manoeuvres have yielded mixed results.<sup>7</sup>

Nutritional assessment should also form part of a pulmonary rehabilitation programme. Cachexia and loss of muscle mass are part of the systemic complications of COPD and independent predictors of mortality. Nutritional supplementation should be considered in individuals with a body mass index (BMI) below 21.<sup>1,2,5</sup>

The use of anabolic steroids, growth hormone, testosterone and creatine supplementation has also been investigated but has so far not proven to be beneficial.<sup>2</sup>

Patient education is integral to any rehabilitation programme and should include aspects of medication, nutrition and smoking cessation as well as guided self-management, i.e. early recognition of exacerbations.

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Depression and anxiety are also highly prevalent in COPD patients and are related to deterioration in functional ability and resultant social isolation.<sup>1,2</sup>

Participating in a rehabilitation programme will commonly lead to an improvement of these symptoms purely by promoting social interaction of patients and improving functional ability. Psychological assessment as part of a rehabilitation programme can identify individuals who may benefit from further psychotherapy or psychotropic medication.

### *Non-invasive positive-pressure ventilation (NPPV)*

NPPV delivered by a nasal or facial mask aims to improve hypoventilation and provide respiratory muscle rest in patients with COPD. Although NPPV is highly useful in severe exacerbations of COPD, it has not been shown to be beneficial in stable COPD patients.<sup>5</sup> An exception is the COPD patient with concomitant obstructive sleep apnoea or obesity-hypoventilation syndrome.

### *Surgery for COPD*

Three types of surgical procedures are used in the management of COPD:

- Bullectomy can be considered for selected patients with large emphysematous bullae not contributing to gas exchange. The procedure aims to decompress the underlying lung parenchyma, leading to improvements in dyspnoea and lung function, and can be performed as a thoracoscopic procedure. Bullectomy should only be considered when a bulla occupies more than 50% of the volume of a hemithorax with evidence of compression of underlying functioning lung tissue.<sup>5</sup>
- Lung volume reduction surgery (LVRS) involves the removal of lung tissue in an attempt to improve hyperinflation. It also improves respiratory muscle function by resetting the position of the flattened diaphragms and improves radial traction on the airways with resultant decrease in expiratory airway collapse. This procedure was commonly performed in the 1990s, but was subsequently shown not to be of benefit in an unselected

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COPD population.<sup>8</sup> However, in selected patients with severe effort intolerance and predominantly upper-lobe emphysema, LVRS can lead to improvements in functional status and mortality.

- Although not widely performed in South Africa, lung transplantation is an option in advanced cases of COPD and is the commonest indication for single lung transplantation in most centres where this procedure is performed. In experienced centres, the 5-year survival after lung transplantation currently exceeds 60%.

### Bronchoscopic lung volume reduction (BLVR)

BLVR aims to provide the same benefits as LVRS by placing endobronchial devices via a bronchoscope into airways supplying emphysematous, hyperinflated parts of the lung. These devices function as one-way valves, allowing air to exit the targeted lobe and also allowing drainage of secretions.<sup>9</sup> Unfortunately, defects in the interlobar fissures of the lung can inhibit collapse of targeted areas by providing collateral ventilation. Early trials using endobronchial valve treatment have shown modest results in terms of improving lung function and exercise tolerance. It is likely that future trials will identify certain subgroups of COPD patients who might benefit from BLVR, as is the case with LVRS and improved devices.

### Smoking cessation strategies

Smoking cessation is the only intervention that unequivocally slows the relentless

decline in lung function in COPD patients. Although pharmacotherapy with nicotine replacement, bupropion (Zyban) and the recently introduced varenicline are very useful adjuncts, behavioural therapy forms the cornerstone of any smoking cessation programme.

All health care professionals should give brief smoking cessation advice to every smoker with every patient contact. Brief advice can be summarised as 5 As:

- ASK: Enquire about smoking habits with every contact.
- ADVISE: Strongly advise all smokers to quit.
- ASSESS: Determine willingness to make an attempt to quit.
- ASSIST: Aid the patient in quitting by referring for further counselling and providing pharmacotherapy.
- ARRANGE: Schedule follow-up contact.

The importance of the health professional in this regard cannot be adequately emphasised. Apart from removal of the primary respiratory aetiological agent there are a number of health benefits that accrue to other organ systems as well.

In conclusion, COPD management needs to be holistic. Patients should be constantly encouraged to stop smoking and maintain cessation to limit progression of the disease and augment the benefits of pharmacotherapy. Improvement in functional status can only be achieved with a rehabilitation programme and overall health restitution with attention to all the components addressed in this review.

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### In a nutshell

- COPD is associated with a vicious cycle of dyspnoea, deconditioning and social isolation.
- Pulmonary rehabilitation aims to improve functional ability and social interaction.
- Exercise training forms the most important part of pulmonary rehabilitation, but the latter also involves education and nutritional and psychological assessments.
- Surgical procedures such as bullectomy, lung volume reduction surgery and lung transplantation are appropriate in selected COPD patients.
- Bronchoscopic lung volume reduction is an experimental form of treatment aimed at decreasing hyperinflation by placement of endobronchial devices.
- Health care professionals must offer smoking cessation advice and therapeutic options to every smoker at every opportunity.