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PEER REVIEWED FEATURE
POINTS: 2 CPD/2 PDP

Optimising function in COPD

Key points

- Physical activity levels are reduced in people with chronic obstructive pulmonary disease (COPD).
- Lower physical activity levels in patients with COPD are associated with poorer outcomes.
- People with COPD should be encouraged to meet the recommended guidelines for physical activity.
- Pulmonary rehabilitation, which includes exercise training and education, is an essential component in the management of COPD.
- Pulmonary rehabilitation improves exercise capacity and quality of life, reduces hospitalisations for acute exacerbations and may improve physical activity levels.
- All people with COPD should be offered pulmonary rehabilitation.

Physical activity and pulmonary rehabilitation

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National and international guidelines strongly endorse the benefits of physical activity and exercise training via pulmonary rehabilitation in patients with COPD.

In Australia, chronic obstructive pulmonary disease (COPD) is estimated to affect about 14% of people aged 40 years or older.[1] It is the second leading cause of avoidable hospital admissions,[2] and in some rural and remote regions, it is the leading cause.[3] Although the role of pharmacology in the management of COPD is well recognised, physical management is often neglected. This is despite high-level evidence for the positive impact of physical activity and exercise training via pulmonary rehabilitation on the outcomes of the disease, and the recommendations of national and international guidelines that strongly endorse the benefits of physical activity and referral to pulmonary rehabilitation programs.[4-6]

This article outlines the impact of COPD on physical activity levels and highlights the adverse consequences of low levels of physical activity. In addition, the benefits of pulmonary rehabilitation on important patient outcomes are described. GPs have a vital role in the management of COPD. Optimising management by referring patients with COPD to

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pulmonary rehabilitation programs and encouraging patients to be more active will lead to improved patient outcomes.

PHYSICAL ACTIVITY

Physical activity is defined by the World Health Organization (WHO) as 'any bodily movement produced by skeletal muscles that requires energy expenditure'.[7]

In the context of COPD, physical activity can be simply defined as the activity that a person chooses to do within their available exercise capacity. This implies that physical activity levels are not only affected by physiological impairments such as those in the pulmonary, cardiovascular and musculoskeletal systems but also by other factors such as climate, habits or behaviours, self-efficacy and health beliefs.

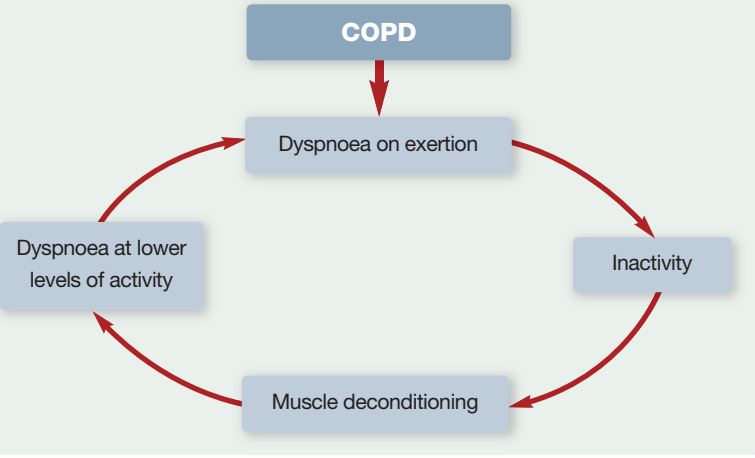

Figure. The disability spiral in COPD.

Are people with COPD inactive?

Dyspnoea on exertion is common in people with COPD and leads to avoidance of the daily activities that elicit this symptom. This results in a downward spiral of progressive inactivity with adverse consequences that includes peripheral muscle deconditioning (Figure), depression, social isolation and poor quality of life.

Measurement of physical activity levels confirm that, compared with an age-matched healthy population, people with COPD have reduced levels of physical activity and that the decline in physical activity progresses as disease severity increases.[8] People with COPD are often sedentary and, compared with age-matched healthy people, have been shown to spend less time walking (46% less) and standing (35% less), and to spend more time sitting (22% more) and lying down (200% more).[9]

Why is physical activity important in COPD?

In people with COPD, higher levels of physical activity are associated with a reduction in the number of hospital admissions due to exacerbations,[10,11] as well as reduced all-cause and respiratory mortality.[10,12,13] Moderate to high levels of physical activity may also have a role in slowing lung function decline and reducing the risk of developing COPD among smokers.[14]

There is strong evidence in the general population that older adults who are physically active have lower rates of all-cause mortality, coronary heart disease, hypertension, stroke, type 2 diabetes and colon and breast cancer, and a higher level of cardiorespiratory and muscular fitness. Also of relevance to older adults are the benefits of exercise as a means of preserving bone mass and reducing the risk of falls.[15] Since people with COPD are mostly in the 'older adult' population, and also have high rates of comorbid conditions, the health benefits from physical activity described above should also be applicable to COPD.

How is physical activity measured?

Physical activity can be assessed using questionnaires, although such self-reporting methods are prone to recall bias (i.e. individuals overestimate their physical activity) and are most useful in large population studies.[16] Objective measures of physical activity use devices such as pedometers, accelerometers and global positioning system (GPS) devices. Pedometers provide a simple and inexpensive method for recording the number of steps taken. However, pedometers do not measure walking duration, speed or grade and are less accurate when people walk very slowly, as is the case in people with very severe COPD. In addition, pedometers do not provide information on other activities not related to walking.

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BENEFITS OF PULMONARY REHABILITATION IN COPD[6,20-24]

Reduces

- Symptoms (dyspnoea and fatigue)
- Anxiety and depression
- Hospitalisations for exacerbations
- Mortality*

Improves

- Exercise tolerance
- Quality of life
- Physical activity levels

* When pulmonary rehabilitation commences after an exacerbation.

Accelerometers and GPS devices offer more detailed information; however, they are expensive. In clinical practice, a combination of a pedometer to record step count and a diary card to record walking duration and nonwalking-based activities may be useful.[17]

What are the recommended levels of physical activity?

In the age category of most people with symptomatic COPD (i.e. 65 years and above), the WHO,[18] the American College of Sports Medicine[15] and the Australian Department of Health and Ageing[19] recommend the following:

- At least 150 minutes of moderate-intensity aerobic physical activity should be undertaken each week (equivalent to 30 minutes a day, five days a week). If a pedometer is available patients can be advised that walking at 100 steps/minute is equivalent to moderate-intensity exercise.
- Aerobic activity should be performed in bouts of at least 10 minutes' duration.
- Muscle-strengthening activities, involving major muscle groups, should be done on two or more days a week.
- An overall recommendation for daily exercise is walking at least 7000 steps each day.

If people with severe COPD are unable to perform the recommended amounts of physical activity they should be as physically active as their condition allows.

Can any intervention change the habitual physical activity level?

It is difficult to alter habitual behaviour, especially in relation to exercise and physical activity. There is evidence that exercise training performed within a pulmonary rehabilitation program can result in a small but significant increase in physical activity in people with COPD.[20] Reassuring patients that breathlessness during daily activities is not harmful, and encouraging increased physical activity, may help to enhance participation in regular physical activity.

PULMONARY REHABILITATION

Pulmonary rehabilitation is an evidence-based intervention for patients with chronic lung disease.[5] Its aims are to reduce dyspnoea and fatigue, optimise functional status, increase exercise tolerance and daily physical activity, improve quality of life and decrease the healthcare burden. Pulmonary rehabilitation programs include patient assessment, exercise training and education about disease management.

Why does pulmonary rehabilitation work?

Exercise training is the component of pulmonary rehabilitation that has the strongest level of evidence for benefit.[5,6] Endurance training involving the large muscle groups in the legs induces physiological changes in the exercising muscles. This, in turn, improves the oxidative capacity of the muscles, reduces lactate build-up during exercise and leads to a decrease in ventilation and dyspnoea. Further, significant psychological benefits occur as the patient becomes more confident to undertake physical activities. This helps to reduce anxiety and depression and social isolation and improves quality of life.

The self-management training included in pulmonary rehabilitation programs may enhance the patient's confidence to manage their condition and to continue with regular exercise on completion of the program.

What are the outcomes of pulmonary rehabilitation?

The outcomes of pulmonary rehabilitation are summarised in the box on this page.[6,20-24] Pulmonary rehabilitation has been shown to produce clinically significant improvements in symptoms (dyspnoea and fatigue), exercise tolerance and quality of life.[6,21] Importantly, it reduces hospitalisations for acute exacerbations of COPD and is cost effective.[22,25]

What is involved for the patient?

Most pulmonary rehabilitation programs provided within Australia last for at least eight weeks.[26] Although most participants in these programs have COPD, individuals with other respiratory conditions, such as interstitial lung disease, bronchiectasis or asthma, and patients undergoing lung surgery may also attend classes.

Patients usually participate in two supervised exercise classes each week and complete an individually prescribed home exercise program on an additional two or three days a week. The exercise classes typically last between 60 and 75 minutes and involve groups of six to 10 patients. An example of a pulmonary rehabilitation program session is given in the box on page 38.[27]

Within Australia, physiotherapists are responsible for exercise prescription and training in over 90% of programs, with nurses or exercise physiologists who have undergone training in pulmonary rehabilitation providing supervision in the remaining programs.[26]

Before starting rehabilitation, patients undergo an assessment that involves a walking test with pulse oximetry to measure exercise capacity and oxygen desaturation

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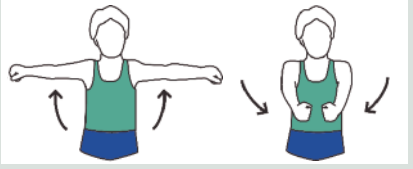
PULMONARY REHABILITATION PROGRAM: EXAMPLE SESSION

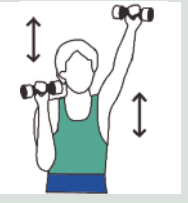
Step 1. 20 to 30 minutes
Lower limb endurance exercise
– e.g. walking and cycling

Step 2. 15 minutes
Upper limb endurance exercises
– e.g. arm reaches



Step 3. 10 minutes
Lower limb strengthening exercises
– e.g. wall squats

Step 4. 10 minutes
Upper limb strengthening exercises
– e.g. arm raises



Refer to the Lung Foundation Australia's Pulmonary Rehabilitation Toolkit for examples of other exercises to include in each step noted above. The toolkit can be viewed online at: http://www.pulmonaryrehab.com.au/welcome.asp[27]

Drawings courtesy of Lung Foundation Australia.

during exercise, and assessment of dyspnoea and quality of life. These measures are repeated at the end of the program to evaluate the patient's response to rehabilitation. In addition, at the initial assessment comorbid conditions that might impact on the ability or safety to exercise, such as cardiovascular, musculoskeletal or neurological impairments and psychological status, are documented. The minimum requirements for patient assessment and the safety considerations, including emergency procedures, are detailed elsewhere.[28]

Although patients exercise with a group, each patient has his or her own individually tailored exercise program. Performing exercise in the group setting is beneficial, as patients see other people who are breathless and gain support and motivation from their peers.

Supplemental oxygen is used during training in patients receiving long-term oxygen therapy (LTOT) and those who have normal oxygen levels at rest but demonstrate profound oxygen desaturation during exercise and are shown to benefit from oxygen. Some patients use short-acting inhaled bronchodilators prior to training if spirometry results confirm that such use provides benefits beyond that provided by the long-acting bronchodilators that the patient may be prescribed.

Many programs also include a component of education, which may involve several members of the multidisciplinary team. The education may include topics such as understanding COPD, disease management, the benefits of exercise and physical activity, nutrition, medications, how to use devices for delivery of medications, oxygen therapy and breathing techniques.

Following the supervised pulmonary rehabilitation program, it is essential that patients continue to maintain a regular home exercise program, as the benefits of a pulmonary rehabilitation program decline over the following 12 to 18 months if regular exercise is not maintained.[5] Where resources permit, participating in a weekly supervised maintenance exercise class or attending pulmonary rehabilitation periodically for assessment of exercise tolerance are strategies that may assist patients to continue with a regular exercise regimen.[29,30]

What types of exercise are important?

Training the muscles of ambulation with a walking or cycling program is an essential component of a pulmonary rehabilitation program. To achieve benefits, patients need to perform walking or cycling exercise for at least 30 minutes per session three to five days each week.[6] A minimum of 20 sessions of exercise training are required to achieve a physiological benefit.[5,6]

Walking is an activity that people who are breathless avoid; however, it is an essential component of everyday life. Therefore, most programs emphasise walking training as an important mode of lower limb endurance exercise. Walking and cycling training are often undertaken in an intermittent manner so that the patient takes frequent short rests during the 30-minute exercise period to avoid intolerable dyspnoea or muscle

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CRITERIA FOR REFERRAL TO PULMONARY REHABILITATION

Inclusions

- Clinical diagnosis of COPD confirmed by spirometry
- Optimised medical management
- Dyspnoea during physical activity
- Current smokers should not be excluded

Exclusions

- Comorbidities that compromise safety or ability to participate in exercise testing or training – e.g. unstable cardiovascular disease, uncontrolled diabetes, recent exertional syncope, severe neurological impairment, severe cognitive impairment
- No motivation to attend

fatigue. A simple circuit of exercises aimed at improving the strength and endurance of the arm and leg muscles so that the patient is able to undertake more easily activities of daily living is also prescribed. The exercise prescription is tailored to the individual based on assessment findings.

Patients need reassurance that breathlessness during activity is not harmful. It is important that exercise is continued long term, so most programs use simple equipment to allow replication of the exercises in the home setting. In addition to regular exercise, patients participating in a pulmonary rehabilitation program are encouraged to increase their level of daily physical activity.

Where resources for carrying out exercise training are limited, a program that comprises only walking training provides a simple, readily available alternative that requires no resources and has been shown to be beneficial.[31] Details of strategies for exercise training when resources are limited have been described elsewhere.[28]

Which patients benefit from pulmonary rehabilitation?

The box on this page details the criteria for referral to pulmonary rehabilitation. The referring doctor can increase the likelihood of a patient participating in a pulmonary rehabilitation program by being enthusiastic and advocating the benefits.[32,33]

Improvements following rehabilitation have been demonstrated in patients with mild, moderate and severe COPD. Any patient with lung disease whose lifestyle is affected by dyspnoea may gain benefits from a pulmonary rehabilitation program. Often, mild symptoms such as dyspnoea only when walking up inclines or climbing stairs are ignored and attributed to ageing, weight gain or lack of exercise and not the underlying lung problem. As a result, many patients who potentially would benefit are not identified as candidates for rehabilitation.

When determining whether a patient is likely to benefit from a pulmonary rehabilitation program, the COPD Assessment Test (CAT, available online: http://www.catestonline.org) may also be useful, as it elicits information about limitation in the ability to perform activities of daily living and symptoms of exertional dyspnoea and fatigue.

Where can pulmonary rehabilitation programs be found?

Lung Foundation Australia has a list of pulmonary rehabilitation programs offered throughout Australia (http://lungfoundation.com.au/professional-resources/pulmonary-rehabilitation/programs). Most take place in hospitals, although some take place in community centres. More pulmonary rehabilitation programs are urgently required to meet the need for this effective intervention.

CONCLUSION

Appropriate management of the physical consequences of COPD through pulmonary rehabilitation can have a significant positive impact on patient outcomes. By referring patients with COPD to pulmonary rehabilitation programs and encouraging them to increase daily physical activity, GPs can help to improve the outcomes of these patients. MT

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References are included in the pdf version of this article available at www.medicinetoday.com.au.

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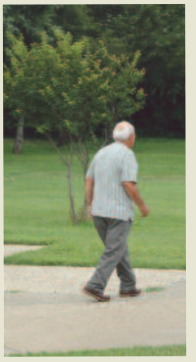

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Optimising function in COPD

Physical activity and pulmonary rehabilitation

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