

# Healthy lifestyle interventions in general practice

## Part 3: Lifestyle and chronic respiratory disease

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### Abstract

Chronic respiratory diseases, in particular chronic obstructive pulmonary disease (COPD), can be classified as a part of the chronic diseases of lifestyle. A lifestyle intervention programme is therefore an essential component of the non-pharmacological management of COPD and other chronic respiratory diseases. The main indication for referral to a lifestyle intervention programme is any symptomatic patient with either COPD or any other chronic respiratory disease, and who also has limited functional capacity. Following a comprehensive initial assessment, patients are recommended to attend either a group-based programme (medically supervised or medically directed, depending on the severity of the disease and the presence of any co-morbidities) or a home-based intervention programme. The main elements of the intervention programme are smoking cessation, exercise training (minimum of three times per week), education, psychosocial support and nutritional support. Regular monitoring should be conducted during training sessions, and a follow-up assessment is indicated after 2-3 months to assess progress and to re-set goals. Longer-term (56 months) intervention programmes are associated with better long-term outcomes.

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### Introduction

Chronic respiratory disease is included in the list of chronic diseases of lifestyle because they represent diseases that are defined by common lifestyle associated risk factors such as smoking, physical inactivity, poor nutritional choices, obesity, and psychosocial factors.<sup>1</sup> The link between these risk factors and the primary and secondary prevention of these chronic diseases has been reviewed in the first of a series of articles in this journal that focus on lifestyle interventions for chronic disease.<sup>1</sup> It is important to note that there are a number of chronic respiratory diseases, but the most common disease group is chronic obstructive pulmonary disease (COPD). COPD is the leading cause of lung-related death and disability.<sup>2</sup> The COPD disease group typically refers to chronic bronchitis and emphysema and is characterised by progressive airflow obstruction that is only partially reversible.<sup>2,4</sup> It has been suggested, from a number of well-conducted studies, that the world-wide prevalence of COPD is 7–19%.<sup>5</sup> This means that the total number of cases of COPD in the world is about 280 million persons. Of particular concern is also the fact that this is a disease that is increasing in women.<sup>5</sup> In South Africa, chronic lung disease is also very common and there is a complex interaction between lifestyle factors (in particular smoking),<sup>6,7</sup> social factors, nutritional factors and infectious diseases (notably tuberculosis, and HIV disease).<sup>8</sup>

A detailed discussion of the epidemiology, pathogenesis, pathophysiology, diagnosis and pharmacological management of chronic lung disease, in particular COPD, has recently been reviewed, and is beyond the scope of this article.<sup>4</sup> In this article, the third in the series, the emphasis is on the role of lifestyle change in the management of chronic respiratory disease (CRD), also known as pulmonary rehabilitation or the non-pharmacological management of CRD.<sup>9</sup> For the purposes of this article, a lifestyle intervention programme for CRD and the term “pulmonary rehabilitation” will be used interchangeably.

Pulmonary rehabilitation has been defined by the American Thoracic Society and the European Respiratory Society as “an evidence-based, multidisciplinary, and comprehensive intervention for patients with chronic respiratory disease who are symptomatic and often have decreased daily life activities. Integrated into the individualised treatment of the patient, pulmonary rehabilitation is designed to reduce symptoms, optimise functional status, increase participation, and reduce health care costs through stabilising and reversing the systemic manifestations of the disease”.<sup>2</sup> This form of lifestyle intervention for chronic respiratory disease therefore includes many elements including a patient assessment, exercise training, education, and psychosocial and nutritional support.<sup>2,10</sup>

It is well established that pulmonary rehabilitation forms an integral part and is considered mandatory in the management of chronic obstructive pulmonary disease (COPD).<sup>2,4</sup> However, it has been suggested that pulmonary rehabilitation is also an appropriate intervention for any stable patient with a chronic lung disease who is disabled by symptoms.<sup>2</sup> Therefore, patients suffering from other chronic respiratory diseases (Table I) may also benefit from referral to a pulmonary rehabilitation programme.<sup>2,11</sup>

**Table I:** Chronic respiratory conditions other than COPD that may also respond favourably to pulmonary rehabilitation

Asthma
Interstitial lung diseases
Bronchiectasis
Cystic fibrosis
Lung cancer
Neuromuscular diseases
Pulmonary vascular disease
Thoracic cage or chest wall abnormalities
Preparation for lung transplantation surgery
Preparation for lung resection surgery

In this article, the scientific rationale for a lifestyle intervention programme for CRD (pulmonary rehabilitation) will first be discussed. This will be followed by an outline of the elements incorporated in a typical pulmonary rehabilitation programme. Finally, the practical implementation of a lifestyle intervention programme for CRD will be reviewed.

**Rationale for a lifestyle intervention programme (pulmonary rehabilitation) for chronic respiratory disease (CRD)**

The rationale and scientific basis for pulmonary rehabilitation has recently been reviewed and evidence-based clinical guidelines were published by the American College of Chest Physicians (ACCP) and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACPR).<sup>2</sup> The proven benefits of a lifestyle intervention programme (pulmonary rehabilitation) and the level of scientific evidence for each of these benefits are listed in Table II.<sup>2,11-13</sup>

**Table II:** Benefits of a lifestyle intervention programme (pulmonary rehabilitation) for chronic respiratory disease (CRD)

Level of scientific evidence	Benefit of pulmonary rehabilitation
A – High level of evidence	Improving functional capacity (6-minute walk or Shuttle walk test)
	Improving the symptom of dyspnoea in patients with COPD
	Improving health related quality of life in patients with COPD
B – Moderate level of evidence	Reducing the number of hospital days and other measures of health care utilisation
	Psychosocial benefits for patients with COPD
C – Low or very low level of evidence	Cost efficacy of programmes for patients with COPD
Insufficient evidence to date	Improving the survival of patients with COPD

Thus, there is strong scientific support for recommending a lifestyle intervention programme in chronic respiratory disease, notably for COPD. In particular, there is strong evidence that functional capacity

increases, dyspnoea decreases and quality of life increases in patients undergoing such programmes. There is some evidence that these interventions reduce health care utilisation and improve psychosocial outcomes. Finally, it is important to note that systemic consequences of chronic respiratory disease (Table III)<sup>5</sup> as well as co-morbidities such as cardiac disease, diabetes mellitus, hypertension, osteoporosis and psychological disorders are common in COPD patients (Table IV).<sup>14</sup>

**Table III:** Systemic consequences of chronic respiratory disease<sup>5</sup>

Decreased fat free mass
Impaired systemic muscle function
Pulmonary hypertension
Anaemia
Osteoporosis
Depression

**Table IV:** Prevalence (%) of co-morbidities in patients with COPD<sup>14</sup>

Co-morbidity	Prevalence (%)
Arthritis	22–70
Cardiac disease	13–65
Hypertension	18–52
Diabetes mellitus	2–16
Hyperlipidaemia	9–51
Psychological	9–38
Gastrointestinal	15–62
Cancer	4–18
Osteoporosis	32

The value of lifestyle intervention in the management of cardiac disease has already been addressed in Part II of this series.<sup>15</sup> It is also well known that lifestyle interventions, including exercise training, are important components in the management of many of these co-morbidities. Therefore, apart from the direct benefits of a lifestyle intervention programme for patients with COPD and chronic lung disease (Table II), these intervention programmes also have an additional positive influence on the systemic consequences of chronic respiratory disease as well as existing co-morbidities. The role of lifestyle interventions in some of the other co-morbidities among COPD patients will be covered in future articles in this journal.

**Elements of a lifestyle intervention programme (pulmonary rehabilitation) for chronic respiratory disease (CRD)**

A comprehensive pulmonary rehabilitation programme can be defined as a programme of regular exercise training that also incorporates at least one, but typically a number of additional lifestyle elements such as smoking cessation, education, psychosocial support, nutritional counselling and intervention, and other novel components.<sup>2,16</sup> It therefore stands to reason that a comprehensive lifestyle intervention programme for CRD can only be effectively administered by a multi-disciplinary team of health professionals including general practitioners, sports and exercise medicine specialists (sports physicians), pulmonologists, biokineticists (applied exercise physiologists), nutritionists, psychologists, physiotherapists and others.<sup>11</sup> Patients are usually diagnosed and stabilised on optimum pharmacological treatment, after which they can be referred to a lifestyle intervention programme. The indications and contra-indications for referral of a patient to a lifestyle intervention programme for CRD are listed in Table V.

**Table V:** Indications and contra-indications for referral to a lifestyle intervention programme (pulmonary rehabilitation) for chronic respiratory disease (CRD)<sup>11,17</sup>

Indications	All patients with COPD and other CRD who have symptoms, and who have limited functional capacity <sup>2,11,17</sup>
	FEV1/FVC < 0.7 and FEV1 < 80% predicted post-bronchodilator (43)(18) <sup>5</sup>
	BODE index $\geq 3$ <sup>* 5</sup>
	Motivated patient
	Adherent patient
Absolute contra-indications	General contra-indications to exercise training and testing <sup>15</sup>
	Sub-optimal pharmacological treatment of lung disease
	Unstable or untreated co-morbidities <sup>17</sup>
	Severe-exercise induced hypoxaemia not correctable with oxygen supplementation
	Inability to exercise due to severe lung or other disease (general contra-indications to exercise)
	Severe cognitive dysfunction or psychiatric illness
Relative contra-indications	Continued smoking or smoking cessation < 3 months <sup>**</sup>
	Lack of motivation
	Non-adherence
	Inadequate financial resources

\* BODE index – functional index that predicts of outcome. This index is based on four functional measures including **B**ody Mass Index (BMI), **O**bstruction (FEV1), **D**yspnoea [modified Medical Research Council scale (MMRC)], **E**xercise tolerance (6 minute walk distance)<sup>18</sup> (Appendix A)

\*\* Smoking cessation is a requirement by some health insurers before pulmonary rehabilitation services will be funded

A medical practitioner trained in sports and exercise medicine usually directs the programme and works with a team of health professionals to successfully administer all the elements of the programme. Close cooperation between the referring doctors and the multi-disciplinary team is strongly encouraged.

### Practical implementation of a lifestyle intervention programme (pulmonary rehabilitation) for chronic respiratory disease (CRD)

The first step in the implementation of a pulmonary rehabilitation programme is a comprehensive initial assessment.<sup>11,17,19</sup> This assessment should consist of a medical history, clinical examination and special investigations (as required). The aims of this assessment are:

- to confirm the indications for referral (Table V)
- to exclude contra-indications to the programme (Table V)
- to identify any systemic consequences of chronic respiratory disease (Table III) and co-morbidities (Table IV)
- to determine functional capacity – this would typically include exercise electrocardiography (if indicated to exclude cardiac disease), 6-minute walk test, and tests to determine body composition, muscle strength, muscle endurance, and musculotendinous flexibility
- to confirm the severity/stage of the disease (Table VI)

- to determine nutritional status
- to determine health status (quality of life), psychological well-being and social well-being (using instruments such as the Short Form-36 and others)<sup>11</sup>

The determination of severity of chronic respiratory disease is an important component of the initial assessment. The severity of the disease process will to some extent determine the setting of a lifestyle intervention programme. There are two recommended methods of assessing severity (Table VI). These methods are mainly for COPD, but can be used for other chronic respiratory disease settings as they reflect functional impairment.

**Table VI:** Assessment of the severity of COPD (and other chronic respiratory disease) to determine the setting of the lifestyle intervention programme

Severity	GOLD/ATS/ERD* guidelines <sup>2</sup>	BODE** score <sup>5</sup>	Lifestyle intervention programme setting
Mild	FEV1 $\geq 80\%$ predicted	0–2	Home based/self help#
Moderate	FEV1 50–80% predicted	3–4	Medically directed#
Severe	FEV1 30–50% predicted	5–6	Medically supervised
Very severe	FEV1 $\leq 30\%$ predicted	7–10	Medically supervised

\* Global Initiative for Chronic Obstructive Lung Disease (GOLD), American Thoracic Society (ATS), European Respiratory Society (ERS)

\*\* BODE index – functional index that predicts outcome. This index is based on four functional measures including **B**ody Mass Index (BMI), **O**bstruction (FEV1), **D**yspnoea [modified Medical Research Council scale (MMRC)] **E**xercise tolerance (6 minute walk distance) (Appendix A)<sup>18</sup>

# These recommendations apply only if no other indications for medically directed or medically supervised programmes are present such as the existence of co-morbidities (e.g. cardiac disease) which may place individuals at higher risk during exercise training<sup>15</sup>

Once a patient has been assessed, an individual lifestyle intervention programme can be planned.

### Education

An educational strategy is a key component of any lifestyle intervention programme for patients with chronic disease in general, including chronic respiratory disease.<sup>9,17,19,19</sup> The general practitioner is uniquely positioned to address this first component of a lifestyle intervention programme for these patients.

The educational component can be delivered in a variety of ways including group sessions (typically weekly and just before or after an exercise session), or through information booklets/pamphlets, and individual counselling.<sup>11</sup> This intervention should not only focus on improving knowledge but should primarily be aimed at teaching skills.<sup>17</sup> The content of an educational programme can vary but would normally include the following topics<sup>11,19</sup>:

- Causes and consequences of common lung diseases
- Medications that are commonly used to treat lung disease
- Oxygen therapy
- Principles of exercise training

- Monitoring during exercise training
- Breathing techniques
- Dealing with depression, anxiety and stress
- Nutrition and lung disease
- Recognising acute exacerbations of lung disease
- What to do in emergencies
- Travelling with lung disease
- Coping with end-of-life issues

The precise impact and value of an educational programme for patients with chronic respiratory disease has not been well studied.<sup>11</sup> However, the importance of an educational programme in chronic disease management is widely recognised and it should therefore be included.

### **Smoking cessation**

As smoking is the most important cause of COPD, smoking cessation is one of the most important and cost-effective means of 1) reducing COPD risk, and 2) preventing or delaying the development of airflow limitation.<sup>2,4,5,20</sup> In South Africa, there is a considerable general burden of chronic disease that is attributable to smoking.<sup>6,7</sup> In the context of lifestyle intervention programme for chronic respiratory disease, smoking cessation is therefore one of the most important lifestyle interventions,<sup>20</sup> and in some instances, continued smoking has been considered a relative contra-indication to enrolment in pulmonary rehabilitation.<sup>11</sup>

In any lifestyle intervention program, a smoking cessation educational and support programme must be included.<sup>20</sup> In the first instance, the reasons that cause patients to continue smoking should be identified. These reasons are often multi-factorial and include the addictive potential of nicotine, conditional responses to stimuli surrounding smoking, depression, poor education low income, and forceful advertising campaigns.<sup>5</sup>

The elements of a successful smoking cessation programme should address these factors and include the following:

- A strong message from the medical staff including the general practitioner to stop smoking<sup>4,19</sup>
- Assessing readiness to stop smoking<sup>19</sup>
- Identifying both motivating factors and barriers to stopping<sup>19</sup>
- Acknowledging the difficulty in stopping<sup>19</sup>
- Providing educational information that describes the specific benefits of stopping<sup>9</sup>
- Use of self-help books, support groups, chat rooms.<sup>19</sup> Examples of two self-help programmes in South Africa are:
  - Smokenders (<http://www.smokenders.co.za>)
  - Allen Carr's Easyway to stop smoking (<http://www.allencarr.co.za/>)
- Pharmacological interventions can be considered and include the following: nicotine (dermal patch, gum, inhalers, nasal spray), slow release bupropion, varenicline (relieving nicotine withdrawal symptoms)<sup>4,5,19</sup>
- Reducing and eliminating occupational and other exposures to airborne pollutants should also be addressed<sup>4</sup>

In addition to the benefits of smoking cessation in reducing the risk of other chronic diseases of lifestyle such as cardiovascular disease,<sup>15</sup> successful smoking cessation in patients with chronic respiratory disease is associated with preserved lung function, improved

symptoms, and improved mortality.<sup>19</sup> Smoking cessation should therefore be a key element in a lifestyle intervention programme for patients with chronic respiratory disease.

### **Exercise training**

It has been suggested that exercise training is, after smoking cessation, the cornerstone of a lifestyle intervention programme for chronic respiratory disease<sup>5,11,13</sup> and should therefore be a mandatory component of such a lifestyle intervention programme.<sup>2,4</sup> This recommendation is based on a high level of evidence (1A).<sup>2</sup>

The exercise training component of pulmonary rehabilitation can be administered in an in-patient setting, an out-patient setting or as a self administered home-based programme.<sup>11</sup> However, in most instances these programmes are administered in a group setting where sessions (usually 3/week) are supervised by members of the multidisciplinary lifestyle intervention team.<sup>11</sup>

### **Setting and level of supervision of the exercise intervention**

At present there are no precise guidelines on the risk stratification prior to exercise training for patients with chronic respiratory disease. Therefore, recommendations to determine the degree of medical supervision that is required during exercise rehabilitation sessions are not clear. However, there are criteria that can be used as guidelines to identify high risk individuals where direct medical supervision is required during exercise for patients with chronic respiratory disease that undergo lifestyle intervention.<sup>11</sup>

Guidelines for a setting where exercise training sessions should be conducted under direct medical supervision (medical doctor present at the training sessions) are:

- severe or very severe respiratory disease (Table VI)
- presence of co-morbidities where medical supervision would normally be indicated (e.g. cardiac disease)<sup>15</sup>
- slow convalescence from an acute respiratory illness
- patients that receive additional treatment modalities during training (including supplemental oxygen, inspiratory pressure support, inspiratory muscle training)<sup>16</sup>

In patients with moderate respiratory disease (FEV1 50–70%, BODE 3–4), or those with co-morbidities where medically directed exercise is indicated, pulmonary rehabilitation should take place in a group setting under medical direction (no doctor is necessarily required be present at supervised training sessions).

In patients with mild chronic respiratory disease (Table VI) and with minimal or no co-morbidities, the exercise intervention programme can be self administered in a home-based setting.

### **Practical implementation of the exercise training component**

The practical implementation of any exercise training programme is usually discussed by describing the following practical aspects of a training program: frequency of the training sessions, durations of individual training sessions, length of the intervention program, intensity of training, modality (type) of exercise training, monitoring and progression of training and special considerations in the training programme. The practical recommendations for each aspect of an exercise training programme for chronic respiratory disease are summarised in Table VII.

**Table VII:** Recommendations for each component of the exercise training in patients with chronic respiratory disease

Component	Recommendation/s
Frequency of training sessions <sup>11,13,17</sup>	<ul style="list-style-type: none"> <li>Start the programme with training 2–3 times per week</li> <li>Can increase the training sessions to <math>\geq 3</math> times per week</li> </ul>
Duration of a training session <sup>11,17</sup>	<ul style="list-style-type: none"> <li>The endurance training component of the session should be 20–30 minutes</li> <li>Most exercise sessions are in total about 60 minutes</li> </ul>
Length of the programme <sup>11,13,17</sup>	<ul style="list-style-type: none"> <li>Minimum of 20 sessions (usually three times per week)</li> <li>Most programmes are for 12 weeks (three months) initially – a minimum of six weeks is recommended</li> <li>A long term commitment to maintain an exercise training programme is strongly recommended</li> </ul>
Intensity of training <sup>11,13,16,17,21</sup>	<ul style="list-style-type: none"> <li>The intensity of training is determined by the outcome of a symptom limited exercise test</li> <li>Higher intensity exercise (&gt; 60% maximum capacity) produces greater physiological benefits, and should be encouraged</li> <li>Interval training (alternating higher and lower intensity exercise) can be used effectively</li> <li>Lower intensity exercise is effective for patients with more severe disease</li> </ul>
Type (modality) of training <sup>11,12,16,17,21,22</sup>	<ul style="list-style-type: none"> <li>Endurance type training (walking, jogging, cycling, rowing, stair climbing, Nordic ski trainer) has traditionally been the main type of exercise and should be included</li> <li>Muscle strength training and strength-endurance training have recently been shown to have specific benefits in patients with muscle atrophy and weakness</li> <li>Strength training showed greater improvements in Health Related Quality of Life (HRQL) outcomes than endurance training</li> <li>A combination of upper and lower extremity training is encouraged</li> <li>Flexibility training should also be included in the training programme</li> </ul>
Monitoring and progression of training	<ul style="list-style-type: none"> <li>Regular monitoring of each patients during training session is important and can include: documenting respiratory and other symptoms as well as the dyspnoea index, recording resting and exercise heart rate and blood pressure, documenting Rating of Perceived Exertion (RPE) during exercise</li> <li>Progression of the exercise training programme should take place at regular intervals (bi-weekly) and can include duration of sessions, intensity of exercise training, altered type of training and later the frequency of training sessions per week can be increased to most days of the week</li> </ul>

In addition to the general exercise training recommendations (Table VII), patients with chronic respiratory disease may also benefit from special modalities to assist exercise training programmes. A detailed discussion of each of these special modalities is beyond the scope of this article. However, the following special modalities can be included as part of exercise training for patients with CRD:

- The use of special breathing techniques such as “pursed lip” breathing and diaphragmatic breathing can be added to the standard exercise training programme<sup>11</sup>
- An additional inspiratory muscle training programme can be added to the standard exercise training programme for patients with inspiratory muscle weakness (maximal inspiratory mouth pressure < 60% predicted baseline value)<sup>16</sup>
- Oxygen supplementation during exercise training for patients that are already on long-term oxygen therapy and those with exercise-induced hypoxaemia<sup>9,16,17,23</sup>
- Exercise training accompanied by non-invasive mechanical

ventilation (NIMV) can be used in patients with severe or very severe disease<sup>16,17,23</sup>

- Exercise while breathing low-density gas mixtures may reduce the work of breathing during training – this special modality is currently not recommended for general use in the rehabilitation setting<sup>16,17,23</sup>
- Neuromuscular electrical stimulation has been listed as a novel additional training modality to improve skeletal muscle function in these patients<sup>16,23</sup>
- Biofeedback techniques may also be of value<sup>23</sup>

### Psychosocial intervention

It is well recognised that psychological and social consequences are common in patients suffering from chronic respiratory disease,<sup>24</sup> yet these are often not recognised and therefore not treated.<sup>13</sup> Furthermore, chronic psychosocial stress may lead to maladaptive coping behaviours (such as smoking and physical inactivity) which themselves increase the risk of, or exacerbate, CRD. The prevalence of psychological disorders in these patients ranges from 30–58%<sup>25</sup> with anxiety and depression being the two commonest disorders (a prevalence of depression in about 45% of patients).<sup>13,24</sup> As for other chronic diseases, the subjective experience of patients with COPD may be significantly affected with respect to self-perception and self-efficacy as functionality – both at home and at work – declines.<sup>1</sup> The consequent psychological responses such as fear, anger, social withdrawal<sup>13</sup> and loss of meaning are likely to diminish quality of life and negatively impact compliance with both pharmacological and non-pharmacological treatments, creating a therapeutic ‘vicious circle’. Cognitive dysfunction has also been reported in patients with COPD with moderate to severe hypoxaemia.<sup>25</sup> Cognitive dysfunction includes abnormalities in perceptual-motor integration, abstract reasoning, attention to auditory stimuli, learning and memory, and language skills.<sup>25</sup>

The general practitioner is well-positioned to both assess and intervene at this level, providing an opportunity to mirror and reflect on the patient’s emotional experience, offer hope for improvement (through active rehabilitation programs) and even teach basic self-regulatory skills, which may enhance coping capacity. A psychosocial intervention programme should therefore be included as part of a lifestyle intervention programme for these patients.<sup>2,24</sup> Exercise training, along with education and a psychosocial support program, reduces anxiety and depression in patients with chronic respiratory disease.<sup>3</sup> Elements of such a psychosocial programme are: developing an adequate social support system,<sup>24</sup> learning stress reduction techniques – such as biofeedback-based relaxation, breathing techniques, mindfulness and yoga, creating an environment for patients to express and reflect on their emotions, and addressing specific problems including sexual intimacy, and partner or spouse dependency. If significant psychiatric illness is identified, these patients should be referred for specialist professional care.<sup>13</sup>

It is important to note that the literature on psychosocial interventions in chronic diseases is still emerging and lacks granularity with respect to the content and quality of such interventions. As such a reference to “breathing techniques” for example does not take into account the myriad of techniques available and compare their relative effectiveness; further research addressing these specific sub-dimensions of a rehabilitation programme still remains to be done. It is apparent, however, at least theoretically, that psychosocial interventions which acknowledge the development of self-awareness<sup>26</sup> as their foundation, irrespective of the content, are more likely to produce long-term and sustainable clinical benefits as patient’s recognise the value of self-management and adherence to treatment.

### Nutritional intervention

The most common nutritional consideration in patients with chronic respiratory disease is associated involuntary weight loss, and muscle wasting.<sup>10,13,27</sup> It has been shown that, in these patients, weight loss and muscle wasting are associated with an increased risk of acute exacerbations, hospital admissions, and the need for mechanical ventilation.<sup>10</sup> It has been observed that muscle wasting and weight loss affects about 33% of patients with chronic respiratory disease.

Therefore, a nutritional assessment (including determination of BMI and lean body mass) and a carefully planned nutrition programme are essential components of the lifestyle intervention programme for patients with chronic respiratory disease.<sup>13,27</sup> Improvements in exercise capacity as well as improved respiratory function have been associated with successful nutritional repletion in these patients.<sup>27</sup> A low BMI (< 21) is considered as an indicator of more severe disease, and has been included in the BODE index of disease severity (Appendix A).

Caloric supplementation should be considered in patients with a BMI < 21, involuntary weight loss > 10% in the last six months, or > 5% weight loss in the last month.<sup>13</sup> Strength training should be encouraged to improve muscle mass in these patients. The use of creatine supplementation<sup>16</sup> and anabolic steroids have recently been suggested as a possible additional treatment modalities for the decreased muscle mass seen in these patients.<sup>13,16,27</sup> Other nutritional interventions that may be of value in these patients are polyunsaturated fatty acids,<sup>16</sup> anti-oxidants,<sup>10,16</sup> appetite enhancers,<sup>27</sup> and ghrelin supplementation (a novel growth hormone releasing peptide).<sup>16</sup>

### Repeat assessment, follow-up and retention

All patients undergoing chronic disease rehabilitation should be assessed regularly during training sessions.<sup>17,19</sup> Prior to each exercise training session, it is suggested that the following parameters be assessed and recorded: symptoms of respiratory disease (MMRC dyspnoea index, cough, sputum production, wheezing), other symptoms (cardiac, infectious disease), oxygen saturation, resting heart rate and resting blood pressure. During the exercise training, the following should be recorded: rating of perceived exertion, peak heart rate, peak blood pressure and oxygen saturation.

All the parameters that were recorded during the initial assessment before entering the programme should be repeated after a defined period of intervention (usually 2–3 months).<sup>17,19</sup> A feedback session should be arranged with the patient where these results are reviewed. At this session goal setting can be conducted and the intervention programme can be continued. Based on the repeat assessment this may require continued medically supervised or medically directed exercise training, or the patients can be discharged to continue with a self administered (home based) intervention programme.

There are some data to suggest that longer rehabilitation programmes (5–6 months) are associated with better longer-term adherence and better outcomes than shorter programmes (2–3 months).<sup>12,28</sup>

All the patients with chronic respiratory disease should be re-assessed regularly (at least once per year) as compliance with home maintenance programmes is relatively low.<sup>17</sup>

### Summary and conclusions

In this review, the scientific rationale, indications, and practical steps to implement a lifestyle intervention programme for CRD, in particular

COPD, were discussed. There is strong scientific evidence (level 1A) that a lifestyle intervention programme is an essential component of the non-pharmacological management of COPD and other chronic respiratory diseases. The main indication for referral to a lifestyle intervention programme is any symptomatic patient with either COPD or any other chronic respiratory disease, and who also has limited functional capacity. Following a comprehensive initial assessment, patients are recommended to attend either a group-based programme (medically supervised or medically directed, depending on the severity of the disease and the presence of any co-morbidities) or a home-based intervention programme. The main elements of the intervention programme are smoking cessation, exercise training (minimum of three times per week), education, psychosocial support, behavioural intervention and nutritional support. Regular monitoring should be conducted during training sessions, and a follow-up assessment is indicated after 2–3 months to assess progress and to re-set goals. Longer-term (5–6 months) intervention programmes are associated with better long-term outcomes.

### Appendix A: Calculation of the BODE index (0–12)

The BODE index is calculated by adding all the scores of the four variables (in the table below)<sup>18</sup>

Variable	0	1	2	3
Body mass index (BMI)	≥ 21	≤ 21		
Obstruction: FEV1 (% of predicted)	≥ 65	50–64	36–49	≤ 35
Dyspnoea (MMRC scale) grade*	0–1	2	3	4
Endurance: 6 minute walk test distance (m)	≥ 350	250–349	150–249	≤ 149

\* Modified Medical Research Council (MMRC) dyspnoea scale (grade)<sup>29</sup>:

Grade 0: Not troubled with breathlessness except with strenuous exercise

Grade 1: Troubled by shortness of breath when hurrying on the level or walking up a slight hill

Grade 2: Walks slower than people of the same age on the level because of breathlessness or has to stop for breath when walking at own pace on the level

Grade 3: Stops for breath after walking about 100 meters or after a few minutes on the level

Grade 4: Too breathless to leave the house or breathless when dressing or undressing 🚶

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