



CLINICAL EXERCISE SPECIALIST MANUAL

A Fitness Professional's Guide
to Training People with
CHRONIC DISEASE

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**A FITNESS PROFESSIONAL'S GUIDE TO
EXERCISE AND CHRONIC DISEASE**

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CHAPTER 9

COPD AND ASTHMA

By the end of this chapter you will understand:

- Characteristics and diagnostic criteria
 - Chronic Obstructive Pulmonary Disorder
 - Bronchitis and emphysema
 - Asthma
- Statistics
- Treatment strategies
 - Pharmacological
 - Nutrition
 - Exercise
 - Exercise induced asthma
 - FITT
- Risks and considerations

Chronic Obstructive Pulmonary Disorder

Chronic Obstructive Pulmonary Disorder (COPD) is a common preventable and treatable disease characterized by persistent, limited airflow that is usually progressive and irreversible. COPD is associated with an enhanced chronic inflammatory response in the airways and the lungs to noxious particles or gases, and exacerbations and comorbidities contribute to the overall severity in individual patients

(Global Initiative for Chronic Obstructive Lung Disease [GOLD], 2016). Bronchitis and emphysema are forms of COPD; and asthma can be present with or without COPD (American College of Sports Medicine [ACSM], 2018; GOLD, 2016).

Bronchitis is characterized by a sputum producing cough that is persistent for 3+ months, for 2 or more consecutive years (ACSM, 2018; GOLD, 2016). Chronic bronchitis can result in pulmonary inflammation that may damage the bronchial lining and obstruct airflow. Emphysema is characterized by the destruction of alveoli that causes poor gas exchange and an accumulation of air in lung tissue, often resulting in increased pulmonary circulation, and pulmonary hypertension. Asthma is a lifelong disease characterized by airflow obstruction, coughing, wheezing, and chest tightness (Muth, 2015; Silkoff et al., 2015).

Chronic asthma is a diverse inflammatory disease that obstructs the airway with coughing, labored breathing, and wheezing (Silkoff et al., 2015). The initial cause of asthma is unknown, and the severity of asthma is variable and may worsen or become better over time (Muth, 2015). There is a link between asthma and allergies, and accordingly, an asthma attack can be triggered by cold air, infections, animal dander or hair, dust mites, smoke, pollen, mold, stress, or exercise. Unfortunately, because the inflammatory pathways may vary between patients, the effectiveness of treatment plans also varies from patient to patient.

Statistics

In 2015, it was estimated over 65 million people worldwide suffered from COPD and 3.2 million people died. In the United States, COPD is the third leading cause of death due to disease, and it is estimated 16-24 million people have COPD (Krucik, 2018; Rundell, Smoliga, & Weiss, 2018). Although smoking is the leading cause of COPD, harmful pollutants such as chemicals, exhaust, dust, and secondhand smoke can also lead to COPD. The chronic airflow obstruction caused by COPD can lead to reduced cardiac function and hinder gas exchange. Additionally, the systemic inflammatory response can escalate muscle wasting and weakness (Barnes & Celli, 2009). Comorbidities such as cardiovascular disease, osteoporosis, metabolic syndrome, depression and anxiety, and diabetes can be exacerbated or worsened due to systemic inflammation (Barnes & Celli, 2009; Muth, 2015).

Asthma affects almost 300 million people worldwide, and about 8% of the U.S. adult population and 10% of the U.S. youth population (Centers for Disease Control and Prevention [CDC], 2011; Lambrecht & Hammad, 2015). Asthma is responsible for 2 million emergency department visits and half a million hospitalizations annually, as well as 9 deaths per day, or almost 3500 deaths annually (CDC, 2011; Muth, 2015). Asthma costs a patient \$3300 per year in medical costs, and the total cost (medical and lost productivity) is estimated to be over \$18 billion annually (Lambrecht & Hammad, 2015).

Pharmacology and Nutrition

Although quitting smoking is the most effective intervention to alleviate lung function decline associated with COPD, and there is no known cure for asthma, exercise, nutrition, and pharmacology can reduce the burden (Donaire-Gonzalez et al., 2014; Rundell, 2018). Nutrition and drug therapies center around reducing airway inflammation and exercise can reduce bronchial hypertension in asthma patients and help restore activities of daily living for COPD patients. Pharmacological treatments include short and long acting bronchodilators, leukotriene modifiers, and corticosteroids. Table 9.1 lists the various drugs used in the treatment of COPD, side effects, and effects on exercise.

Table 9.1

Pharmacological treatments for asthma and COPD

Type of drug	Type of use	Side effects	Effects of exercise
Short acting B ₂ AR agonist (SABA)	Acute and chronic Fast acting Lasts 4-6 hours	Headache, tachycardia, tremors, anxiety, nausea, dry mouth, cough	Improves exercise via reduction of symptoms
Long acting B ₂ AR agonist (LABA)	Maintenance therapy Combination therapy with inhaled corticosteroids	Headache, tachycardia, tremors, anxiety, nausea, dry mouth, cough	Effect unknown due to inconsistent research
Inhaled steroids	Combination therapy with LABAs	Sore throat	n/a
Oral steroids	Short or long term	Fluid retention, hyperglycemia, muscle atrophy, osteoporosis, bruising, myopathy	n/a
Leukotriene modifiers	Alternative for persistent asthma Not recommended for COPD	Headache, cough, irritability Anaphylaxis may occur	Useful in preventing exercise-induced bronchospasm.

Ejiofor & Turner, 2013; Muth, 2015; Rundell et al., 2018

Similar to pharmacotherapy, nutritional considerations should focus on reducing inflammation. Due to the anti-inflammatory properties of some antioxidants, a diet high in fruits and vegetables has been shown to be beneficial for patients who suffer from inflammatory lung diseases (de Boer, van de Worp, Hageman, & Bast, 2017; Muth, 2015). Vitamin E and probiotics may provide the most profound effect on chronic inflammatory lung disease. Other antioxidants that may improve lung function by reducing inflammation are Vitamins A and C. Although there is limited research on Omega-3 and Omega-6 fatty acids, it appears Omega-3 may act as an anti-inflammatory, and Omega-6 may be pro-inflammatory. Additionally, even though there is little effect on inflammation, caffeine is known to improve lung function through bronchodilation.

Activity

The main goal for a client with COPD should be to improve quality of life by reducing barriers to training and activity, and minimize comorbidities (ACSM, 2018; GOLD, 2016; Muth, 2015). However, even though clients with COPD can improve their quality of life, exercise will not cure COPD, and due to the long-lasting nature of the disease, and varying degrees of severity, there is no consensus on FITT principles. Low-moderate intensity exercise can reduce systemic inflammation and increase peripheral vascularity due to the removal of CO₂; increase skeletal muscle function by increasing O₂ levels; and improve self-efficacy. While low-intensity exercise can reduce the risk of future hospital visits, high-intensity exercise may be contraindicated due to an increase in airway inflammatory response (Donaire-Gonzalez et al., 2014; Muth, 2015).

Although exercise reduces systemic inflammation, the effect on airway inflammation in asthma patients is largely unknown. However, because many asthma patients do not exercise at all, any improvement in lung function and strength will be a benefit. Exercise-induced bronchospasms (EIB) occurs when the symptoms of asthma are brought on by exercise or activity. Up to 80% of asthma patients may experience EIB, but it can affect individuals without an underlying diagnosis of asthma and may present symptoms only during exercise (Craig & Dispenza, 2013). In some cases, symptoms may not present until after exercise halts and can last for 12 hours. EIB can be triggered by cold and/or dry air, inhaled or food allergens, pollutants, and a rapid onset of vigorous activity. Consequently, caution should be used during resistance training, and more specifically upper body exercises that increase ventilation such as cross-country skiing, rowing, or hand-cranked ergometers. Conversely, exercise in an indoor and humid environment, such as an indoor pool, may be a good choice. For clients with well controlled asthma, exercise guidelines for the general population can be used.

It is advised a client with COPD who has not participated in a medically-supervised pulmonary rehabilitation program be evaluated for cardiovascular disease risks. Additionally, for clients with COPD or asthma, a medical clearance is recommended, and a 6-minute walk test should be performed as it is easy to complete (Muth, 2015). See the Table 9.2 for FITT guidelines.

The list offers considerations to be used when working with clients with pulmonary dysfunction:

- Only start a bout of exercise if symptoms are under control.
- Perform a 10-15-minute warm-up, and an extended cool down.
- Use RPE scale to communicate severity of symptoms.
- Avoid exercising in areas that contain asthma triggers.
- Incorporate intervals when possible.
- Muscular fatigue may be the most limiting factor for a client with COPD.
- The limitations from dyspnea can be overcome with experience.
- Keep all fast-acting inhalers readily available.
- Optimal time to exercise is late morning.
- Clients should practice pursed-lip and diaphragmatic breathing.

Table 9.2

FITT guidelines for pulmonary dysfunction

FITT for COPD	Frequency	Intensity	Time	Type
Cardiorespiratory	3-5 days/week	Light: 30-40%peak VO ₂ Vigorous: 60-80% VO ₂ max Should be based on 6-minute walk test	No less than 15 min Ideally 30-40 min	Walking/cycling
Resistance	2-3 days/week	40-80% 1RM	1-4 sets 8-12 reps	All modalities Mostly large muscle groups

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FITT for asthma				
Cardiorespiratory	Start with 2-3 days/week Progress to 5 days/week	No more than 60% VO ₂ max, or 80% walking speed determined from 6-minute walk test	Start with 20-30 min Progress to 40 minutes	Swimming Walking Running Cycling
Resistance	2-3 days/week	60-80% 1RM	2-4 sets 6-12 reps	All modalities Mostly large muscle groups

ACSM, 2018; Muth, 2015; Rundell, 2018

Discussion and application

1. What is exercise-induced asthma, what is the prevalence, and what are the causes?
2. What is the main goal of exercise therapy for a client with COPD, and what benefits are specific to a client with COPD?

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