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Patient education: Chronic obstructive pulmonary disease (COPD), including emphysema (Beyond the Basics)

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COPD OVERVIEW — COPD, or chronic obstructive pulmonary disease, is a condition in which the lung airways (bronchial tubes) become inflamed and narrowed and the air sacs become damaged. Smoking cigarettes is the most common cause of lung injury. As the lungs become more damaged over time, it becomes increasingly difficult to breathe. When the damage is severe, it may also become difficult to get enough oxygen into the blood and to get rid of excess carbon dioxide. These changes all lead to shortness of breath and other symptoms. Unfortunately, the symptoms of COPD cannot be completely eliminated with treatment and the condition usually worsens over time.

The term COPD includes both chronic bronchitis (inflammation of the bronchial tubes) and emphysema (destruction of the air sacs). The effects of chronic bronchitis and emphysema on breathing are similar, although there are some differences in symptoms, effects on the body, and treatment.

This article reviews the risk factors, symptoms, and tests used to diagnose COPD and its components, chronic bronchitis and emphysema. An article that discusses treatment of COPD is available separately. (See "[Patient education: Chronic obstructive pulmonary disease \(COPD\) treatments \(Beyond the Basics\)](#)".)

COPD CAUSES — To understand why COPD develops, it is important to understand how the lungs work. Normally, air that we breathe passes from the nose and mouth through the airways to the tiny air sacs of the lung, called alveoli. In the air sacs, oxygen that we breathe passes through the walls of air sacs into the bloodstream ([figure 1](#)). Carbon dioxide passes in the reverse direction, out of the bloodstream, back into the alveoli, and is then eliminated by breathing out ([figure 2](#)). Carbon dioxide is a waste product of the body's metabolism, and must be regularly removed.

In people who develop COPD, irritating gases and particles are inhaled while smoking or breathing smoke filled air (secondhand smoke) or other fumes or particles, such as air pollution. These gases and particles can injure the airways and lungs and cause irritation (inflammation). Genetic susceptibility also likely plays a role, meaning that based on a person's individual genetic makeup, they may be more likely to suffer lung damage when exposed to lung irritants. Over time, the inflammation becomes chronic, damages the lung tissue, and may cause scarring ([figure 3](#)). This lung damage makes it more difficult to breathe in and out and makes it harder for oxygen

and carbon dioxide to pass across the walls of the air sacs. (See "[Chronic obstructive pulmonary disease: Definition, clinical manifestations, diagnosis, and staging](#)".)

Reasons for airflow blockage — Any disease that interferes with airflow out of the lungs can cause COPD. Most people with COPD have chronic bronchitis and emphysema, and some also have asthma.

Chronic bronchitis — Chronic bronchitis is the term used to describe people who have a chronic cough that produces sputum, which is a result of bronchial inflammation. This condition is frequently seen in people who smoke cigarettes. Chronic bronchitis can scar the airways and reduce airflow.

Emphysema — Emphysema is the term used to describe damage to the air sacs in the lung. This damage can also restrict airflow.

Asthma — Asthma is also a chronic inflammatory disorder of the airways. The triggers for this inflammation include exposure to inhaled allergens, respiratory irritants, and viral infections. The inflammation leads to relapsing and remitting episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning.

Treatment is usually successful in reversing inflammation and airway narrowing. In a minority of people with asthma, the chronic inflammation permanently restricts airflow. When this airway narrowing cannot be completely reversed with treatment, the person is said to have COPD. (See "[An overview of asthma management](#)".)

COPD RISK FACTORS — Smoking cigarettes significantly increases the risk of developing COPD. However, approximately 20 percent of people who develop COPD have never smoked.

Other factors that increase the risk of developing COPD include an abnormal sensitivity and exaggerated response to inhaled substances (called airway responsiveness), other exposures, such as secondhand exposure to smoke and workplace exposure to environmental dust or organic materials, or exposure to air pollution. COPD can run in families. (See "[Chronic obstructive pulmonary disease: Risk factors and risk reduction](#)".)

Genetic risk factors for COPD include severe deficiency of alpha-1 antitrypsin, a protein that protects the lungs. (See '[Alpha-1 antitrypsin deficiency](#)' below.)

COPD SYMPTOMS — COPD usually causes no or mild symptoms at first. As the disease progresses, symptoms usually worsen. The most common symptoms include:

- Coughing and spitting up phlegm (mucus)
- Wheezing (a whistling or squeaking noise as you breathe)
- Shortness of breath at first with activity and, as disease worsens, at rest
- Fatigue

COPD DIAGNOSIS — If you have shortness of breath, a chronic cough, or cough up phlegm, your healthcare provider may recommend testing for COPD. The test used to diagnose COPD is a type of a pulmonary (lung) function test (PFT). (See "[Chronic obstructive pulmonary disease: Definition, clinical manifestations, diagnosis, and staging](#)".)

Pulmonary function tests (PFTs) — The pulmonary function test (PFT) that measures airway obstruction is called spirometry, and is required to diagnose COPD. Spirometry can detect COPD even in people who do not yet have symptoms.

During spirometry, you take a deep breath in and then blow out as hard and as fast as you can into a tube connected to a machine called a spirometer. The spirometer measures how fast and how much air you can blow out of your lungs. If the measurement is abnormal, the next step is to repeat the test after you use a

bronchodilator that you breathe from an inhaler (which should improve the measurement). In people with asthma, the test measurements usually return to normal, but in people with COPD, the test measurements may only partially improve.

After the diagnosis of COPD is confirmed, spirometry is repeated over time to monitor the status of the disease and the effectiveness of treatment.

In some cases, additional pulmonary function tests are performed. These tests include measurements of lung volume, oxygenation, carbon dioxide, gas exchange, and exercise performance. The results of these tests are used to evaluate for lung diseases other than COPD that may be contributing to shortness of breath and to guide treatment of COPD in specific cases.

- Measurements of lung volume are usually performed in a box that looks like an old fashioned phone booth. People with more severe COPD may have an increase in lung volume.
- Another machine can measure the ability of the lungs to transfer gases like oxygen. This machine usually uses a very small amount of carbon monoxide, which is not enough to cause harm, but which reflects how oxygen is absorbed. With emphysema, the ability to transfer gases is typically reduced.
- Oximetry measures the amount of oxygen in the blood using a device called a finger oximeter, which clips onto the finger like a clip-on earring. Oximetry may also be checked during exercise, such as walking on level ground or climbing stairs. When the oxygen saturation drops to 88 percent or below, supplemental oxygen is usually prescribed. (See ["Patient education: Chronic obstructive pulmonary disease \(COPD\) treatments \(Beyond the Basics\)"](#).)
- An arterial blood gas sample may be obtained to determine if you have problems clearing carbon dioxide from the blood. Arterial blood gas is usually obtained by taking a blood sample from the artery in your wrist.
- There are several types of exercise tests. The simplest is to determine how far you can walk in 6 minutes. In this test, your pulse, difficulty breathing, and blood oximetry are usually measured. A more extensive test can be performed on a bicycle or a treadmill that can measure your maximum ability to perform physical work and can monitor both heart and lung function. This test is often used to assess other causes for shortness of breath and before starting a rehabilitation program.

Alpha-1 antitrypsin deficiency — Alpha-1 antitrypsin deficiency is a genetic disorder which causes 2 to 3 percent of the cases of emphysema in the United States. All adults who have symptoms of COPD should be tested for alpha-1 antitrypsin deficiency. (See ["Clinical manifestations, diagnosis, and natural history of alpha-1 antitrypsin deficiency"](#) and ["Treatment of alpha-1 antitrypsin deficiency"](#).)

Chest x-ray and computed tomography (CT scan) — In general, a chest x-ray is not needed to make the diagnosis of COPD because COPD does not affect the chest x-ray unless the disease is very severe. Your doctor may perform a chest x-ray, however, to exclude other lung diseases. The CT scan is a very sensitive test to detect the presence of emphysema. In patients with severe disease, a CT scan to determine the presence of emphysema can help guide treatment.

COPD TREATMENT — The first and most important part of any treatment plan for COPD is for smokers to stop smoking. This is true regardless of how long ago you were diagnosed with COPD and how severe your disease is. Studies of people with COPD show that worsening of the disease is slowed in people who stop smoking. (See ["Patient education: Quitting smoking \(Beyond the Basics\)"](#).)

Currently, there is no cure for COPD; however, many treatments are available for the symptoms and complications of this disorder. Most patients require ongoing treatment to keep symptoms under control.

A separate topic discusses the treatment of COPD. (See "[Patient education: Chronic obstructive pulmonary disease \(COPD\) treatments \(Beyond the Basics\)](#)".)

WHERE TO GET MORE INFORMATION — Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

[Patient education: Chronic obstructive pulmonary disease \(COPD\), including emphysema \(The Basics\)](#)

[Patient education: Shortness of breath \(dyspnea\) \(The Basics\)](#)

[Patient education: Pneumothorax \(collapsed lung\) \(The Basics\)](#)

[Patient education: Cough in adults \(The Basics\)](#)

[Patient education: Chronic bronchitis \(The Basics\)](#)

[Patient education: Atelectasis \(The Basics\)](#)

[Patient education: Chronic pulmonary aspergillosis \(The Basics\)](#)

[Patient education: Breathing tests \(The Basics\)](#)

[Patient education: Medicines for chronic obstructive pulmonary disease \(COPD\) \(The Basics\)](#)

[Patient education: Lung transplant \(The Basics\)](#)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

[Patient education: Chronic obstructive pulmonary disease \(COPD\) treatments \(Beyond the Basics\)](#)

[Patient education: Quitting smoking \(Beyond the Basics\)](#)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

[Arrhythmias in COPD](#)

[Bullectomy for giant bullae](#)

[Chronic obstructive pulmonary disease: Definition, clinical manifestations, diagnosis, and staging](#)

[Chronic obstructive pulmonary disease: Risk factors and risk reduction](#)

[Delivery of inhaled medication in adults](#)

[Management of infection in exacerbations of chronic obstructive pulmonary disease](#)

[Dynamic hyperinflation in patients with COPD](#)

[Lung volume reduction surgery in COPD](#)

[Management of exacerbations of chronic obstructive pulmonary disease](#)

[Management of stable chronic obstructive pulmonary disease](#)

[Management of the patient with COPD and cardiovascular disease](#)

[Chronic obstructive pulmonary disease: Prognostic factors and comorbid conditions](#)

[Nocturnal ventilatory support in COPD](#)

[Nutritional support in advanced lung disease](#)

[Portable oxygen delivery and oxygen conserving devices](#)

[Pulmonary rehabilitation](#)

[Role of anticholinergic therapy in COPD](#)

[Role of inhaled glucocorticoid therapy in stable COPD](#)

[Role of methylxanthines in the treatment of COPD](#)

[Role of mucoactive agents and secretion clearance techniques in COPD](#)

[The evaluation, diagnosis, and treatment of the adult patient with acute hypercapnic respiratory failure](#)

[Clinical manifestations, diagnosis, and natural history of alpha-1 antitrypsin deficiency](#)

[Treatment of alpha-1 antitrypsin deficiency](#)

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/copdchronicobstructivepulmonarydisease.html, available in Spanish)

- National Heart, Lung, and Blood Institute

(www.nhlbi.nih.gov/health/dci/Diseases/Copd/Copd_WhatIs.html)

- American Lung Association

(www.lungusa.org)

- Alpha-1 Foundation

(www.alphaone.org)

Patient Support — There are a number of online forums where patients can find information and support from other people with similar conditions.

- [About.com](#) COPD Forum

(<http://copd.about.com>)

[1-4]

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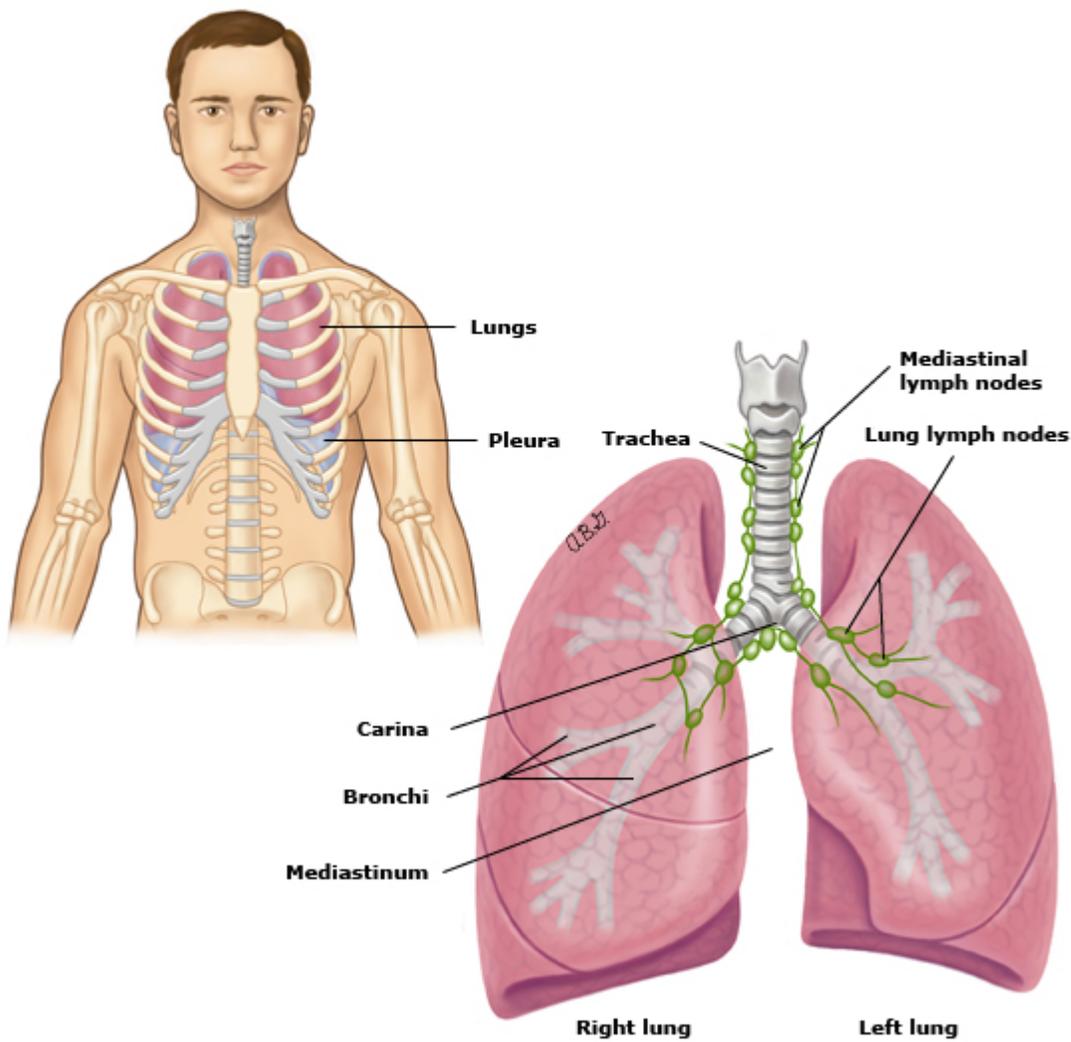
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GRAPHICS

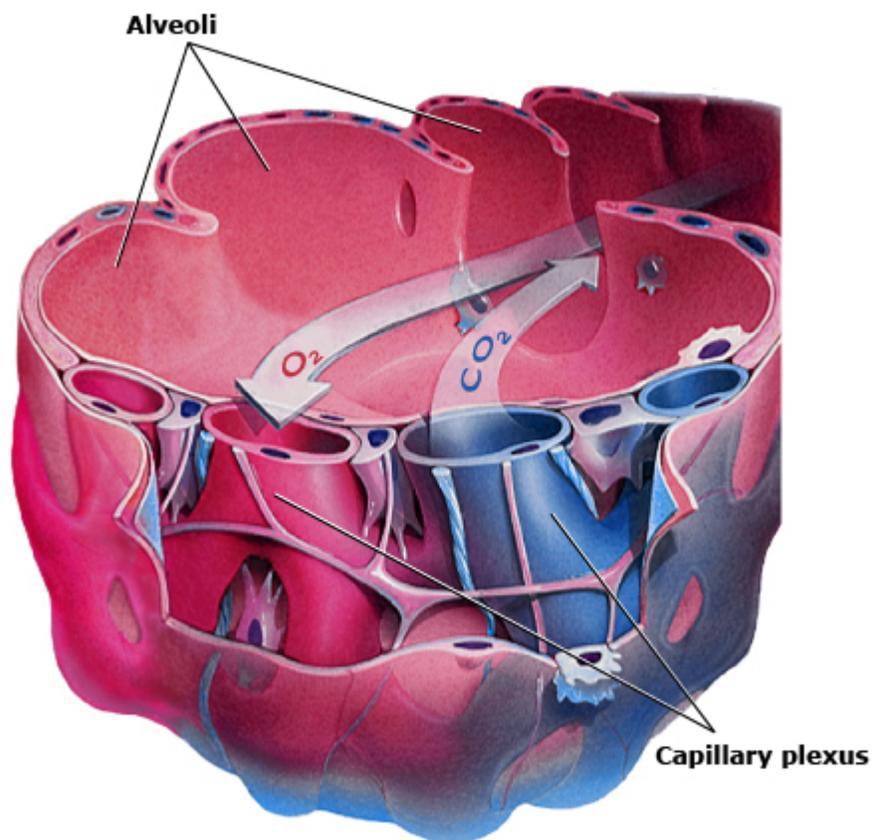
Normal lungs



The lungs sit in the chest, inside the ribcage. They are covered with a thin membrane called the "pleura." The windpipe, or trachea, branches into two smaller airways called the left and right "bronchi." The space between the lungs is called the "mediastinum." Lymph nodes are located within and around the lungs and mediastinum.

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How air is exchanged in the lungs

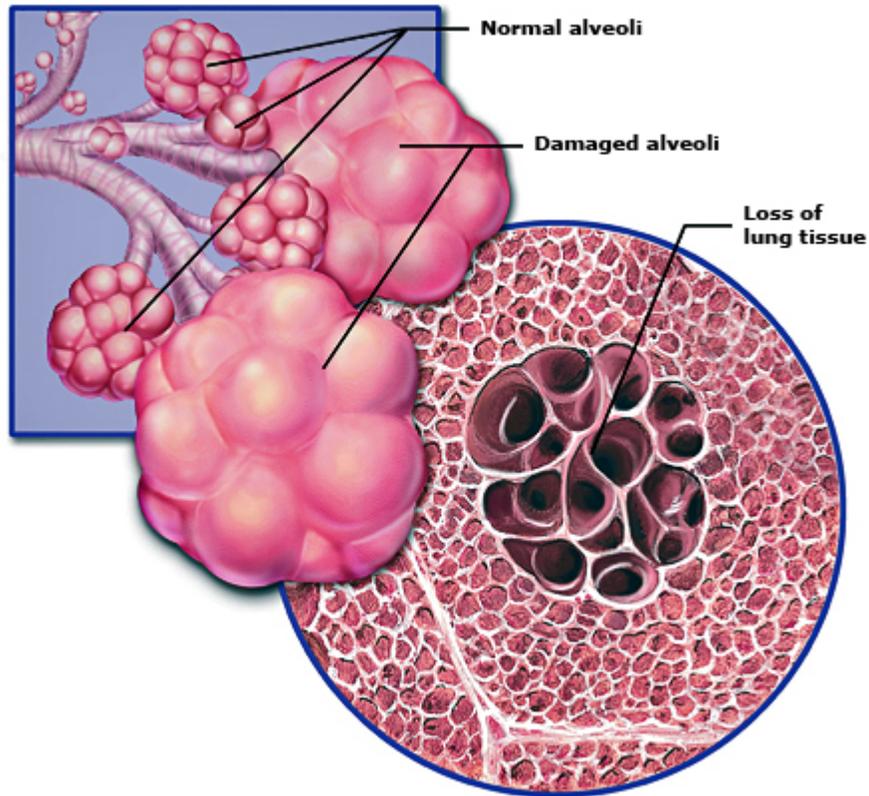


This figure depicts how oxygen (O_2) and carbon dioxide (CO_2) pass between the alveoli (inside the lung) and the capillaries (the blood stream).

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Graphic 73121 Version 2.0

Alveoli anatomy in COPD



This figure shows normal and damaged alveoli. Alveoli that are damaged make it harder for oxygen and carbon dioxide to pass between the lungs and the blood stream.

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