



Diseases and Conditions

COPD

By Mayo Clinic Staff

Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease that causes obstructed airflow from the lungs. Symptoms include breathing difficulty, cough, sputum production and wheezing. It's caused by long-term exposure to irritating gases or particulate matter, most often from cigarette smoke. People with COPD are at increased risk of developing heart disease, lung cancer and a variety of other conditions.

Emphysema and chronic bronchitis are the two most common conditions that contribute to COPD. Chronic bronchitis is inflammation of the lining of the bronchial tubes, which carry air to and from the air sacs (alveoli) of the lungs. It is characterized by daily cough and sputum production. Emphysema is a condition in which the air sacs (alveoli) at the end of the smallest air passages (bronchioles) of the lungs are destroyed as a result of damaging exposure.

COPD is treatable. With proper management, most people with COPD can achieve good symptom control and quality of life, as well as reduced risk of other associated conditions.

Symptoms of COPD often don't appear until significant lung damage has occurred, and they usually worsen over time, particularly if smoking exposure continues. For chronic bronchitis, the main symptom is a daily cough and sputum production at least three months a year for two consecutive years.

Other signs and symptoms of COPD include:

- Shortness of breath, especially during physical activities
- Wheezing
- Chest tightness
- Having to clear your throat first thing in the morning, due to excess mucus in your lungs
- A chronic cough that produces sputum that may be clear, white, yellow or greenish
- Blueness of the lips or fingernail beds (cyanosis)

- Frequent respiratory infections
- Lack of energy
- Unintended weight loss (in later stages)

People with COPD are also likely to experience episodes called exacerbations, during which their symptoms become worse than usual day-to-day variation and persist for at least several days.

The main cause of COPD in developed countries is tobacco smoking. In the developing world, COPD often occurs in people exposed to fumes from burning fuel for cooking and heating in poorly ventilated homes.

Only about 25 percent of chronic smokers develop clinically apparent COPD, although up to half have subtle evidence of COPD. Some smokers develop less common lung conditions. They may be misdiagnosed as having COPD until a more thorough evaluation is performed.

How your lungs are affected

Air travels down your windpipe (trachea) and into your lungs through two large tubes (bronchi). Inside your lungs, these tubes divide many times — like the branches of a tree — into many smaller tubes (bronchioles) that end in clusters of tiny air sacs (alveoli). The air sacs have very thin walls full of tiny blood vessels (capillaries). The oxygen in the air you inhale passes into these blood vessels and enters your bloodstream. At the same time, carbon dioxide — a gas that is a waste product of metabolism — is exhaled.

Your lungs rely on the natural elasticity of the bronchial tubes and air sacs to force air out of your body. COPD causes them to lose their elasticity and overexpand, which leaves some air trapped in your lungs when you exhale.

Causes of airway obstruction

- **Emphysema.** This lung disease causes destruction of the fragile walls and elastic fibers of the alveoli. Small airways collapse when you exhale, impairing airflow out of your lungs.
- **Chronic bronchitis.** In this condition, your bronchial tubes become inflamed and narrowed and your lungs produce more mucus, which can further block the narrowed tubes. You develop a chronic cough trying to clear your airways.

Cigarette smoke and other irritants

In the vast majority of cases, the lung damage that leads to COPD is caused by long-term cigarette smoking. But there are likely other factors at play in the development of COPD, such as a genetic susceptibility to the disease, because only about 25 percent of smokers develop COPD.

Other irritants can cause COPD, including cigar smoke, secondhand smoke, pipe smoke,

air pollution and workplace exposure to dust, smoke or fumes.

Alpha-1-antitrypsin deficiency

In about 1 percent of people with COPD, the disease results from a genetic disorder that causes low levels of a protein called alpha-1 antitrypsin. Alpha-1-antitrypsin (AAt) is made in the liver and secreted into the bloodstream to help protect the lungs. Alpha-1-antitrypsin deficiency can affect the liver as well as the lungs. Damage to the liver can occur in infants and children, not just adults with long smoking histories.

For adults with COPD related to AAt deficiency, treatment options include those used for people with more common types of COPD. In addition, some people can be treated by replacing the missing AAt protein, which may prevent further damage to the lungs.

Risk factors for COPD include:

- **Exposure to tobacco smoke.** The most significant risk factor for COPD is long-term cigarette smoking. The more years you smoke and the more packs you smoke, the greater your risk. Pipe smokers, cigar smokers and marijuana smokers are at risk, as are people exposed to large amounts of secondhand smoke.
- **People with asthma who smoke.** The combination of asthma, a chronic airway disease, and smoking increases the risk of COPD even more.
- **Occupational exposure to dusts and chemicals.** Long-term exposure to chemical fumes, vapors and dusts in the workplace can irritate and inflame your lungs.
- **Age.** COPD develops slowly over years, so most people are at least 35 to 40 years old when symptoms begin.
- **Genetics.** As noted above, the uncommon genetic disorder alpha-1-antitrypsin deficiency is the cause of some cases of COPD. Other genetic factors likely make certain smokers more susceptible to the disease.

Complications of COPD include:

- **Respiratory infections.** People with COPD are more susceptible to colds, the flu and pneumonia. Any respiratory infection can make it much more difficult to breathe and could cause further damage to lung tissue. An annual flu vaccination and regular vaccination against pneumococcal pneumonia will help prevent some infections.
- **Heart problems.** For reasons that aren't fully understood, COPD increases your risk of heart disease, including heart attack. Quitting smoking markedly reduces this risk.
- **Lung cancer.** Smokers with chronic bronchitis have a greater risk of developing lung cancer than do smokers who don't have chronic bronchitis. Quitting smoking also markedly reduces this risk.
- **High blood pressure.** COPD may cause high blood pressure in the arteries that bring blood to your lungs (pulmonary hypertension).
- **Depression.** Difficulty breathing can keep you from doing activities that you enjoy. And dealing with serious illness can contribute to development of depression. Talk to

your doctor if you feel sad or helpless or think that you may be experiencing depression.

If your primary care doctor suspects that you have COPD, you'll likely be referred to a pulmonologist, a doctor who specializes in lung disorders.

What you can do

Before your appointment, you might want to write a list of answers to the following questions:

- What symptoms are you experiencing? When did they start?
- What makes your symptoms worse? Better?
- Does anyone in your family have COPD?
- Have you had any treatment for COPD? If so, what was it and did it help?
- Have you ever taken beta blockers for your high blood pressure or heart?
- Are you being treated for any other medical conditions?
- What medications and supplements do you take regularly?

You might want to have a friend or family member accompany you to your appointment. Often, two sets of ears are better than one when you're learning about a complicated medical problem, such as COPD. Take notes if this helps.

What to expect from your doctor

Your doctor may ask some of the following questions:

- How long have you had a cough?
- Do you get short of breath easily?
- Have you noticed any wheezing when you breathe?
- Do you or have you ever smoked cigarettes?
- Would you like help in quitting?

COPD is commonly misdiagnosed — former smokers are often told they have COPD when in reality they have simple deconditioning or another less common lung condition. Likewise, many people who truly do have COPD aren't diagnosed until the disease is far advanced and interventions are less effective.

If you have symptoms of COPD and a history of exposure to lung irritants — especially cigarette smoke — your doctor may recommend these tests:

- **Pulmonary function tests.** Spirometry is the most common lung function test. During this test, you'll be asked to blow into a large tube connected to a spirometer. This machine measures how much air your lungs can hold and how fast you can blow the air out of your lungs. Spirometry can detect COPD even before you have symptoms of the disease. It can also be used to track the progression of disease and to monitor

how well treatment is working. Spirometry often includes measurement of the effect of bronchodilator administration. Other lung function tests include measurement of lung volumes, diffusing capacity and pulse oximetry.

- **Chest X-ray.** A chest X-ray can show emphysema, one of the main causes of COPD. An X-ray can also rule out other lung problems or heart failure.
- **CT scan.** A CT scan of your lungs can help detect emphysema and help determine if you might benefit from surgery for COPD. CT scans can also be used to screen for lung cancer, which is more common among people with COPD than it is among those who smoked but didn't develop COPD.
- **Arterial blood gas analysis.** This blood test measures how well your lungs are bringing oxygen into your blood and removing carbon dioxide.

A diagnosis of COPD is not the end of the world. Most people have mild forms of the disease for which little therapy is needed other than smoking cessation. Even for more advanced stages of disease, effective therapy is available that can control symptoms, reduce your risk of complications and exacerbations, and improve your ability to lead an active life.

Smoking cessation

The most essential step in any treatment plan for COPD is to stop all smoking. It's the only way to keep COPD from getting worse — which can eventually reduce your ability to breathe. But quitting smoking isn't easy. And this task may seem particularly daunting if you've tried to quit and have been unsuccessful.

Talk to your doctor about nicotine replacement products and medications that might help, as well as how to handle relapses. It's also a good idea to avoid secondhand smoke exposure whenever possible.

Medications

Doctors use several kinds of medications to treat the symptoms and complications of COPD. You may take some medications on a regular basis and others as needed.

Bronchodilators

These medications — which usually come in an inhaler — relax the muscles around your airways. This can help relieve coughing and shortness of breath and make breathing easier. Depending on the severity of your disease, you may need a short-acting bronchodilator before activities, a long-acting bronchodilator that you use every day, or both.

Short-acting bronchodilators include albuterol (ProAir HFA, Ventolin HFA, others), levalbuterol (Xopenex), and ipratropium (Atrovent). The long-acting bronchodilators include tiotropium (Spiriva), salmeterol (Serevent), formoterol (Foradil, Perforomist), arformoterol (Brovana), indacaterol (Arcapta) and acclidinium (Tudorza).

Inhaled steroids

Inhaled corticosteroid medications can reduce airway inflammation and help prevent exacerbations. Side effects may include bruising, oral infections and hoarseness. These medications are useful for people with frequent exacerbations of COPD. Fluticasone (Flovent) and budesonide (Pulmicort) are examples of inhaled steroids.

Combination inhalers

Some medications combine bronchodilators and inhaled steroids. Salmeterol and fluticasone (Advair) and formoterol and budesonide (Symbicort) are examples of combination inhalers.

Oral steroids

For people who have a moderate or severe acute exacerbation, short courses (for example, 5 days) of oral corticosteroids prevent further worsening of COPD. However, long-term use of these medications can have serious side effects, such as weight gain, diabetes, osteoporosis, cataracts and an increased risk of infection as well as increased mortality associated with COPD.

Phosphodiesterase-4 inhibitors

A new type of medication approved for people with severe COPD and symptoms of chronic bronchitis is roflumilast (Daliresp), a phosphodiesterase-4 inhibitor. This drug decreases airway inflammation and relaxes the airways. Common side effects include diarrhea and weight loss.

Theophylline

This very inexpensive medication helps improve breathing and prevents exacerbations. Side effects may include nausea, headache, fast heartbeat and tremor. Side effects are dose related, and low doses are recommended.

Antibiotics

Respiratory infections, such as acute bronchitis, pneumonia and influenza, can aggravate COPD symptoms. Antibiotics help treat acute exacerbations, but are not generally recommended for prevention. However, a recent study shows that the antibiotic azithromycin prevents exacerbations, but it isn't clear whether this is due to its antibiotic effect or its anti-inflammatory properties.

Lung therapies

Doctors often use these additional therapies for people with moderate or severe COPD:

- **Oxygen therapy.** If there isn't enough oxygen in your blood, you may need supplemental oxygen. There are several devices to deliver oxygen to your lungs, including lightweight, portable units that you can take with you to run errands and get around town. Some people with COPD use oxygen only during activities or while sleeping. Others use oxygen all the time. Oxygen therapy can improve quality of life

and is the only COPD therapy proven to extend life. Talk to your doctor about your needs and options.

- **Pulmonary rehabilitation program.** These programs typically combine education, exercise training, nutrition advice and counseling. You'll work with a variety of specialists, who can tailor your rehabilitation program to meet your needs. Pulmonary rehabilitation may shorten hospitalizations, increase your ability to participate in everyday activities and improve your quality of life. Talk to your doctor about referral to a program.

Managing exacerbations

Even with ongoing treatment, you may experience times when symptoms become worse for days or weeks. This is called an acute exacerbation, and it may lead to lung failure if you don't receive prompt treatment.

Exacerbations may be caused by a respiratory infection, air pollution or other triggers of inflammation. Whatever the cause, it's important to seek prompt medical help if you notice a sustained increase in coughing, a change in your mucus or if you have a harder time breathing.

When exacerbations occur, you may need additional medications (such as antibiotics or steroids or both), supplemental oxygen or treatment in the hospital. Once symptoms improve, your doctor will talk with you about measures to prevent future exacerbations, such as quitting smoking, taking inhaled steroids, long-acting bronchodilators or other medications, getting your annual flu vaccine, and avoiding air pollution whenever possible.

Surgery

Surgery is an option for some people with some forms of severe emphysema who aren't helped sufficiently by medications alone:

- **Lung volume reduction surgery.** In this surgery, your surgeon removes small wedges of damaged lung tissue from the upper lungs. This creates extra space in your chest cavity so that the remaining healthier lung tissue can expand and the diaphragm can work more efficiently. In some people, this surgery can improve quality of life and prolong survival.
- **Lung transplant.** Lung transplantation may be an option for certain people who meet specific criteria. Transplantation can improve your ability to breathe and to be active, but it's a major operation that has significant risks, such as organ rejection, and it obligates you to take lifelong immune-suppressing medications.

If you have COPD, you can take steps to feel better and slow the damage to your lungs:

- **Control your breathing.** Talk to your doctor or respiratory therapist about techniques for breathing more efficiently throughout the day. Also be sure to discuss breathing positions and relaxation techniques that you can use when you're short of breath.

- **Clear your airways.** With COPD, mucus tends to collect in your air passages and can be difficult to clear. Controlled coughing, drinking plenty of water and using a humidifier may help.
- **Exercise regularly.** It may seem difficult to exercise when you have trouble breathing, but regular exercise can improve your overall strength and endurance and strengthen your respiratory muscles.
- **Eat healthy foods.** A healthy diet can help you maintain your strength. If you're underweight, your doctor may recommend nutritional supplements. If you're overweight, losing weight can significantly help your breathing, especially during times of exertion.
- **Avoid smoke and air pollution.** In addition to quitting smoking, it's important to avoid places where others smoke. Secondhand smoke may contribute to further lung damage. Other types of air pollution also can irritate your lungs.
- **See your doctor regularly.** Stick to your appointment schedule, even if you're feeling fine. It's important to steadily monitor your lung function. And be sure to get your annual flu vaccine in the fall to help prevent infections that can worsen your COPD. Ask your doctor when you need the pneumococcal vaccine.

Living with COPD can be a challenge — especially as it becomes harder to catch your breath. You may have to give up some activities you previously enjoyed. Your family and friends may have difficulty adjusting to some of the changes.

It can help to share your fears and feelings with your family, friends and doctor. You may also want to consider joining a support group for people with COPD. And you may benefit from counseling or medication if you feel depressed or overwhelmed.

Unlike some diseases, COPD has a clear cause and a clear path of prevention. The vast majority of cases are directly related to cigarette smoking, and the best way to prevent COPD is to never smoke — or to stop smoking now.

If you're a longtime smoker, these simple statements may not seem so simple, especially if you've tried quitting — once, twice or many times before. But keep trying. It's critical to find a tobacco cessation program that can help you quit for good. It's your best chance for preventing damage to your lungs.

Occupational exposure to chemical fumes and dust is another risk factor for COPD. If you work with this type of lung irritant, talk to your supervisor about the best ways to protect yourself, such as using respiratory protective equipment.

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