

Better Living with Chronic Obstructive Pulmonary Disease

A Patient Guide

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THE
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Government**

Queensland Health

"When you can't breathe...nothing else matters"™

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Lung function tests

This chapter will help you to understand:

- Why lung function tests are important in the diagnosis and treatment of chronic obstructive pulmonary disease (COPD).
- What the lung function tests are.

Why are lung function tests important in the diagnosis and treatment of COPD?

Lung function tests assist in the diagnosis and management of COPD. The tests measure how well, and how much air, you breathe in and out of your lungs. Lung function tests can also show how well oxygen enters your body, and how much air you have in your lungs. The tests used are spirometry, gas transfer measurements and lung volume measurements.

What are the lung function tests?

What is spirometry?

Spirometry is the most commonly used test. It is vital to confirm the diagnosis of COPD by spirometry. This test measures the amount of air you are able to breathe in and out, and how quickly you are able to breathe air out. Typically, if you have COPD, you will take longer to breathe all of your air out.

Spirometry is done by breathing into a machine called a spirometer. You will be asked to take your biggest breath in and to breathe all the air out as fast as you can into the machine. This needs to be done several times and your best result is recorded. It can take up to 20 minutes to complete the tests. Spirometry is often repeated after you have taken some breathing medications (for example, Ventolin® or Bricanyl®). This is done to find out if your lung function improves with these medications.

Spirometry will be used to monitor your COPD and to check how well your treatment is working.



Spirometry is vital to confirm a diagnosis of COPD

What should I know before taking the spirometry test?

- You may be asked to **not** take your breathing medications on the day of the test. However, if you feel really breathless, take your breathing medications and let the person conducting your test know when you used your breathing medications.
- As effort is required to do this test, you may get tired. This is not unusual.
- The person conducting the spirometry test will give you instructions on how to do the test. If you do not understand them, ask for the instructions to be repeated or for a demonstration on how the test should be undertaken.
- You can sometimes become light-headed during the test. If this happens, stop breathing into the machine and let the person conducting your test know.
- To get the best results, you will be asked to do the test several times.
- Breathing test results vary according to a person's age, height, whether they are male or female, and their ethnic background.

The results of these breathing tests allow your lung function to be compared with people who are like you, but who do not have lung conditions.

Your breathing test results can be used to classify the severity of your lung condition. Different measurements are taken to assess your lung function.

The most common measures are:

1. **Forced Expiratory Volume in one second (FEV₁).** This is the maximum amount of air that can be expelled from the lungs during the first second of breathing out following a maximal breath in.
2. **Vital Capacity (VC).** This is the maximum amount of air that can be expelled from the lungs while breathing out following a maximal breath in.
3. **Forced Vital Capacity (FVC).** This is the maximum amount of air that can be expelled from the lungs while breathing out forcefully. VC and FVC are equal in a normal lung but can differ in patients who have a chronic lung condition.

4. **FEV₁/FVC.** This measures how much air is blown out in the first second proportional to the total amount blown out of the lung. So it shows how quickly the lungs can be emptied. People with healthy lungs can usually blow out 70% to 90% of their air in the first second.



Spirometry measures how quickly you empty your lungs

What is a gas transfer measurement?

The gas transfer measurement is a test that measures how well oxygen in the air moves from your lungs across the air sacs (*alveoli*) and into your blood stream, and thus to your vital organs.

This test is done by breathing into a mouthpiece connected to a machine.

You will be asked to breathe out as much as you can, to take a large breath in, and to hold your breath for 10 seconds before breathing back into the machine. To get the best results, you will be asked to repeat the test.

This test will take about 15 minutes to complete.

Typically, if you have severe COPD, your results will be low when compared with people who are like you, but who do not have lung conditions.

What should I know before taking the gas transfer measurement test?

- If you are on oxygen, you will be asked to take the oxygen off for a few minutes before the test.

What is a lung volume measurement?

The lung volume measurement is a test that measures the amount of air in your lungs. There are three measurements, which are taken:

- At the end of a normal breath.
- When you have taken in a deep breath.
- When you have blown out all the air.

No matter how hard you try, when you have blown out all the air, there is still some air left in your lungs. It is this amount of air that is left in the lungs that is measured.

Lung volumes are measured in a machine called a body plethysmograph, which is like a box with glass walls. This test is done in a box because very small pressure changes need to be measured while you are breathing.

During the test, you will sit in the box with the door closed and breathe through a mouthpiece attached to the machine.

You will be instructed to breathe normally through the mouthpiece. However, every now and then, you will be asked to breathe against a blockage and to also breathe all the air out and then take a large breath in. The test will take approximately 10 minutes to complete.

Typically, if you have COPD, your lungs will be a lot bigger than normal because of the amount of air trapped in your lungs (*hyperinflation*).

What should I know before taking the lung volume measurement test?

- If you are on oxygen, usually you will be asked to come off the oxygen during the test.
- If you suffer from claustrophobia in small spaces, let the operator know. They may ask you to attempt the test as most people can do the test even if they have claustrophobia.



Lung volume measurement measures how much air is in your lungs