

Lung Function Tests in Asthma

LUNG FUNCTION TESTS IN ASTHMA

Asthma is a very common condition. It cannot be cured, but can be controlled with effective medication administered correctly in combination with good monitoring by the patient and health care provider. Asthma is controlled when patients are having no or few symptoms, no attacks needing hospital visits and no or few emergency reliever medication usage. Another way of assessing asthma control is to do tests that measure the function of your lungs. These tests are sometimes also done to help with the diagnosis of asthma.

What are lung function tests?

Lung function tests are any tests done that measures the functioning of the lungs. Some of these tests need sophisticated machines and highly trained staff, but some can be done by the patient at home.

Common lung function tests include:

- Peak flow rates;
- Spirometry; and
- Response and challenge tests.

What is a peak flow test?

A peak flow test is a lung function test using a peak flow meter.

A peak flow meter is a small, simple device that is held in the hand, and testing can be done at a doctor's office, clinic or even at home! The peak flow meter allows you to measure how fast the air can be blown out of your lungs. This is called the peak expiratory flow rate and is measured in litres per minute. A



high peak flow rate means the airways are open, a low peak flow rate means the airways are narrowed and that the air cannot get out quickly. This is a hallmark of uncontrolled asthma. Peak flow tests are difficult or impossible to do in children below the age of four.

Why is it done?

Testing your peak expiratory flow may help:

- Diagnose asthma;
- Guide the treatment and monitor the effectiveness of asthma treatment; and
- Measure how well your asthma is controlled and to decide on the need for emergency treatment.
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How to use the peak flow meter:

1. You must be standing when using a peak flow meter;
2. Remove any food or chewing gum you may have in your mouth;
3. Set the pointer on the gauge of the peak flow meter to 0 (zero), and make sure your fingers are not in the way of the marker;
4. Attach the mouthpiece to the peak flow meter;
5. Hold the meter parallel with the floor;
6. Take a deep breath in, filling the lungs as much as possible;
7. Place the peak flow meter mouthpiece in your mouth and close your lips tightly around the outside of the

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- mouthpiece. Do not put your tongue inside the mouthpiece;
8. Blow out as hard and as fast as you can. You do not need to breathe out for more than a second;
 9. Read the value shown by the marker;
 10. Reset the meter and blow into the peak flow meter 2 more times. Record your values each time you blow. If you cough or make a mistake during the testing, do the test again; and
 11. After you have blown into your peak flow meter 3 times, record the highest value on your daily record sheet.

Peak flow monitoring relies on your trying as hard as you can. For accurate results, it is important that you give the test your best effort every time.

What does it mean?

Your peak flow recordings will fall into different zones; the safe “green” zone, where the peak flow rate is >80% of normal; the orange “caution” zone, where the peak flow rate is between 50-80% of normal; and the red “danger” zone, where the peak flow rate is <50% of normal. If there is a peak flow rate of <80% of normal, it means that the airways are narrowed. This can be measured by the peak flow meter before wheezing occurs, so it gives you the advantage of starting treatment earlier and preventing severe attacks.

Speak to your doctor about making a personal asthma action plan that shows the peak flow rate values of each of these ranges for you, as well as a written action plan of what to do if your values fall in one of the “caution” or “danger” zones.

Signs of poor control include frequent low peak flow rate values and a large difference between morning and evening

peak flow rate values. If this happens, your doctor may want to reassess your inhaler technique and adapt the frequency or dose of your asthma medication.

What else affects peak flow apart from asthma?

- Patient technique
- Incorrect posture
- Inability to form tight seal around mouthpiece
- Type of meter
- Time of day
- Recent use of a bronchodilator
- Other respiratory diseases e.g. COPD

What is spirometry?

Spirometry is a lung test that is done in a doctor's office or emergency room. If possible, it should be done on initial diagnosis of asthma, after treatment is started and symptoms have stabilised, and every year afterward. This test measures the flow of air out of your lungs using a forced breathing manoeuvre. This means the person takes as deep a breath as possible and then blows out as long and as hard as possible, until the lungs are completely empty. The test is better than a peak flow



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rate, but cannot be done at home, and needs to be interpreted by a doctor or nurse who has experience doing the test. Your doctor or nurse may use it to assess the response of the lungs to treatment over time, or to diagnose the type of lung disease that is present. This lung function test can show abnormalities that children and their parents may be unaware of. Spirometry is difficult to do in children below the age of six.

What are response and challenge tests?

Response tests measure lung function (using peak flow or spirometry) before any medication is given, and then again after a nebuliser or reliever asthma pump is given. One of the features of asthma, as opposed to other causes of wheezing, is that asthma will respond to reliever medicine with an improvement in the lung function tests of more than 12%. This is sometimes called a reversibility test or a post-bronchodilator test.

Challenge tests are done less frequently than response tests. A common challenge test is the exercise challenge. Children who are suspected of having asthma are asked to perform lung function tests as a baseline. They exercise for 6 minutes until their heart rates go up to over 170. The lung function tests are repeated after a recovery period of 5 minutes. Many asthmatics will show a drop in their lung function tests because the airways have closed after the exercise. If this happens, a response test should immediately be done to prove a good response to the asthma medication.



In specialised centres, chemicals or allergens may be used as a challenge instead of exercise to cause tightening of the airways. These are done very rarely and only under expert supervision.

What is exhaled Nitric Oxide?

This is a breathing test to see how much inflammation (and swelling) is in your lungs. It can only be done at a doctor's office and is only available at a few places in South Africa. To do the test, you breathe slowly and constantly into a mouthpiece which measures the nitric oxide gas given off by inflamed lungs. The test is especially useful if your doctor is sure whether your lung problem is asthma or not, and can also be used to measure the response to therapy and therefore control of your asthma. If the measurement is high, then lots of inflammation is present, and medication, technique, and the regularity of using controller medication needs to be reassessed.