

Pulmonary Function

What is it?

The pulmonary system consists of the organs and structures involved in breathing, such as the trachea, lungs, and alveoli. The ability to properly inspire and expire air is essential to a healthy lifestyle. Pulmonary function tests are a broad range of tests that measure lung function - i.e. how well the lungs move air in and out of the body and how efficiently they transfer oxygen to and carbon dioxide from the blood.

Why is it important?

In 2011, the CDC listed respiratory diseases, specifically chronic obstructive pulmonary disease (COPD), as the third leading cause of death in the United States, claiming the lives of over 100,000 people. Pulmonary function testing is the primary method used to diagnosis, stage, and monitor various respiratory diseases. In simplistic terms, respiratory diseases can be classified as either obstructive or restrictive processes. Obstructive disorders, such as emphysema and asthma, are characterized by airflow limitation and increased lung compliance, typically resulting in increased lung volumes with air trapping (known as dead space because this does not increase the functional capacity of the lungs).

Conversely, restrictive disorders, such as pulmonary fibrosis or even obesity, are characterized by reduced lung volumes and an increase in overall stiffness (decreased compliance) of the lungs. Though medical treatments for these conditions continue to advance, they are still mostly limited to symptom management. Thus, it is essential to maintain a healthy respiratory system by choosing to exercise, eat right, and abstain from smoking. Early detection of abnormal values is critical in catching the disease in a state where these simple lifestyle interventions may be enough to return pulmonary function back to normal.

How is it assessed?

While there are a number of variables that can be measured from a standard pulmonary function test, the three most common are Forced Vital Capacity (FVC), Forced Expiratory Volume in One Second (FEV₁), and the ratio between FVC and FEV₁. FVC refers to the amount of air one can expire after taking the largest inspiration possible. Essentially, it describes the maximum amount of air you are capable of moving in one breath. FEV₁ describes the maximum amount of air that can be expired in one second of exhaling and is an important measure of airway compliance. The interplay between FVC, FEV₁, and FEV₁/FVC provides a clear picture of lung function and is instrumental in the diagnosis of restrictive and obstructive diseases. FVC and FEV₁ are both assessed by blowing into a tube which uses a microprocessor-driven pneumotachometer to measure air flow and then mathematically derive volume. For the FVC test, you will take the largest inspiration possible followed by the largest expiration possible. The expiratory volume will be recorded. FEV₁ is measured in a similar manner, only this time you will breathe out as fast as you can and only the first second of your expiration will be recorded. The FVC to FEV₁ ratio is then calculated by simple division.

What to expect during the assessments:

1. You will be asked to wear a nose clip to ensure all air movement occurs in and out of the measuring tube. It is also important to keep a tight seal with your lips around the tube throughout the measurement period.
2. This is an effort dependent test and you will be taking several deep breaths. You will be asked to take a few "practice" breaths to get a sense of how it feels. Please be aware of repeating several of these deep breaths too quickly can lead to lightheadedness and in some rare cases, fainting. Take as much time as you need between breaths.

Participant preparation:



Test validity and data accuracy are greatly improved by adhering to the following guidelines prior to your assessment. Your test(s) will be given on the assumption that you have followed these recommendations:

1. Refrain from ingesting heavy meals, alcohol, caffeine and tobacco products within 5 hours of testing
2. You should be well rested for the test: avoid significant exertion or exercise 24 hours prior to testing and get a good night's sleep