



PULMONARY FUNCTION TESTS

A. SPIROMETRY

What it is

Spirometry is the most commonly ordered pulmonary function test. It measures the maximal volume of air that one can inspire and expire with maximal effort.

It can aid in the diagnosis of lung diseases, monitoring of lung conditions and the evaluation of treatment effectiveness. It can also be ordered as a part of pre-operative assessment.

Pre- and post-bronchodilator spirometry

Pre- and post-bronchodilator spirometry is used to evaluate lung function in an individual with known or suspected respiratory conditions such as asthma and chronic obstructive pulmonary disease (COPD).

It involves measuring lung function before and after the administration of a bronchodilator (inhaler). Individuals may be required to stop their current inhalers as advised by their physician before the test.

Pre-bronchodilator spirometry provides baseline measurements of lung function. Post-bronchodilator spirometry provides useful information on the effectiveness of medication in improving lung function and can aid in diagnosis and treatment decisions.

What to expect

During the test, you will be asked to take a deep breath in and then blow into a spirometer as hard and as fast as you can. The volume of air and the speed at which it is exhaled is then calculated.

Contraindications

Your doctor will evaluate your fitness to perform spirometry. If you are scheduled for spirometry and have any of the following conditions, please consult your doctor.

- Recent surgery
- Unstable heart condition or recent heart attack
- Recent or ongoing respiratory infection
- Coughing of blood
- Pregnancy (third trimester)

Preparation

- Wear loose-fitting clothing
- Avoid large meals for at least two hours
- Skip heavy exercise for at least one hour
- Stop smoking for at least one hour

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- Avoid alcohol for at least four hours
- Stop your inhalers as advised by your doctor.

B. LUNG VOLUME TESTS

Plethysmography

What it is

Plethysmography is a test that measures lung capacity (volume). The test is performed in an enclosed, airtight chamber (Body Box).

It can aid in diagnosis and monitoring the progression of diseases such as COPD, asthma and interstitial lung disease (ILD), as well as monitoring the effectiveness of treatment.

What to expect

During the test, you will be seated in a transparent chamber and the technologist will instruct you to perform a series of breathing manoeuvres while the pressure and volume changes in the chamber are measured. The test is completely safe and non-invasive.

Contraindications

Your doctor will evaluate your fitness to perform plethysmography. If you are scheduled for plethysmography and have any of the following conditions, please consult your doctor.

- Claustrophobia
- Recent surgery
- Recent or ongoing respiratory infection
- Inability to walk or stand without assistance
- Inability to sit upright with no support for an extended period
- Preparation
- Wear comfortable clothing that does not restrict breathing
- Avoid restrictive accessories such as waist girdles, corsets or tight belts

C. NITROGEN WASHOUT

What it is

A nitrogen washout is a test that measures lung capacity (volume) using a technique where nitrogen gas in the lungs is removed by prolonged breathing of pure oxygen.

What to expect

During the test, pure oxygen is inhaled and the nitrogen concentration in the exhaled breath is measured over time.

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Contraindications

Your doctor will evaluate your fitness to perform nitrogen washout. If you are scheduled for nitrogen washout and have any of the following conditions, please consult your doctor.

- Recent surgery
- Recent heart attack
- Recent stroke
- Recent or ongoing respiratory infection
- Inability to seal your lip over the mouthpiece for the entire duration of the test
- Preparation
- Avoid eating large meals before testing
- Wear comfortable clothing that does not restrict breathing

D. DIFFUSION STUDY**What it is**

A diffusion study helps to assess the gas exchange ability of the lungs, or how well gases such as oxygen are transferred between the lungs and blood stream.

What to expect

During the test, you will be inhaling a gas mixture. The concentration of the gases in the gas mixture is then measured over time, allowing the diffusing capacity to be calculated.

A rest time of four minutes will be given after each attempt.

Contraindications

Your doctor will evaluate your fitness to perform a diffusion study. If you are scheduled for a diffusion study and have any of the following conditions, please consult your doctor.

- Mental confusion or poor muscular coordination that prevents the test from being performed adequately.
- Long-Term Home Oxygen Therapy

Preparation

- Wear loose-fitting clothing
- Avoid large meals for at least two hours
- Skip heavy exercise for at least one hour
- Stop smoking for at least one hour
- Avoid alcohol for at least four hours
- Supplemental oxygen should be discontinued for 10 minutes before beginning the test (if clinically acceptable)

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E. FRACTIONAL EXHALED NITRIC OXIDE TEST

What it is

A fractional exhaled nitric oxide (FeNO) test is a quick and non-invasive test that measures the amount of nitric oxide gas exhaled from the lungs.

Nitric oxide levels can be increased in the presence of inflammation. It can be used as a marker of airway inflammation and can aid in the diagnosis and monitoring of asthma, as well as monitoring the effectiveness of treatments.

What to expect

During a FeNO test, you are required to breathe into a device that measures the amount of nitric oxide in your breath, with the aid of visual guides. The measurement usually takes only a few minutes.

Contraindications

Your doctor will evaluate your fitness to perform FeNO. If you are scheduled for a FeNO study and have any of the following conditions, please consult your doctor.

- Inability
- Inability to seal your lip over the mouthpiece for the entire duration of the test
- Inability to exhale continuously for 10 seconds

Preparation

Avoid caffeine, alcohol, smoking and nitrate-rich foods (including beets and green leafy vegetables) an hour before the test.

F. SKIN PRICK TEST

What it is

An aeroallergen skin prick test is a mode of testing for allergies to environmental allergens.

What to expect

The test is usually done on a flat skin surface such as the forearm. The test site is disinfected and marked to keep track of the different allergens.

The lancet is dipped into the allergen extract, withdrawn and applied to the skin with firm pressure, allowing the allergen to penetrate the skin.

A raised, red itchy bump (wheal) may be observed and measurements will be taken after 20 minutes. Controls such as histamine and saline are used to ensure accuracy.

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Contraindications

Your doctor will evaluate your fitness to perform a skin prick test. If you are scheduled for a skin prick test and have any of the following conditions, please consult your doctor.

- Uncontrolled asthma
- Inability to cease antihistamine or other drugs that may interfere with the test

Skin conditions such as psoriasis, eczema or dermatographism may also affect the accuracy of the test.

Preparation

- Your doctor may ask detailed questions about your medical history
- You may be asked to stop medications containing antihistamines between three to seven days prior to the test
- Avoid topical creams, lotions and moisturizers prior to the procedure

G. CARDIOPULMONARY EXERCISE TEST**What it is**

Cardiopulmonary Exercise Test is type of exercise testing that is used to assess the performance of the heart and lungs at rest and during exercise.

The test is typically conducted on a stationary bicycle with progressively increasing levels of exercise (resistance) while wearing a mask which measures the amount of oxygen uptake and carbon dioxide production during the test. Several parameters such as oxygen saturation, blood pressure and electrocardiogram will also be monitored continuously during the test.

Contraindications

The test may be contraindicated for people with recent surgery, heart attack, recent or ongoing respiratory infection, or who are unable to cycle on a bicycle or walk on a treadmill.

Preparation

Comfortable exercise attire and shoes should be worn and large meals should be avoided prior to the test.

H. EXERCISE-INDUCED ASTHMA TEST**What it is**

An exercise-induced asthma test is a diagnostic test that helps to determine if a person has exercise-induced asthma..

What to expect

The test involves measuring your lung function (spirometry) before and after exercising. Exercise is typically done on a treadmill. If required, a bronchodilator may be administered to you during the test.

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Contraindications

While exercise-induced asthma is generally safe, the test may be contraindicated for people with:

- Significant airway obstruction observed on baseline lung function tests
- Pregnancy
- Recent or ongoing respiratory infection
- Unstable heart condition(s)

Preparation

- Withhold medications as advised by your doctor
- Wear appropriate exercise attire and shoes
- Avoid vigorous exercise on the day of testing

I. METHACHOLINE CHALLENGE TEST

What it is

A methacholine challenge test is a diagnostic test used to evaluate if a person has hyperresponsive airways.

What to expect

During the test, you will inhale increasing concentrations of methacholine (a substance that causes the airways to constrict).

Your lung function will be monitored before and after each inhalation to determine the sensitivity of their airways to methacholine. If required, a bronchodilator may be administered to you during the test.

Contraindications

The test may be contraindicated for people with:

- Reduced lung function
- Pregnancy
- Recent or ongoing respiratory infection
- Unstable heart condition
- Contraindications to spirometry
- Inability to withhold bronchodilators
- Medications that affect or are contraindicated for the test
- Preparation
- Wear loose comfortable clothing that that does not restrict breathing
- Withhold medications as advised by your doctor

J. HYPERTONIC SALINE TEST

What it is

A hypertonic saline test is a diagnostic test used to evaluate if a person has hyperresponsive airways.

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What to expect

During the test, you will inhale a saline solution in increasing time durations through a nebulizer.

Your lung function will also be monitored before and after each inhalation to determine the sensitivity of their airways to the saline solution. If required, a bronchodilator may be administered to you during the test.

This test is generally well tolerated, although some people may experience temporary shortness of breath or chest tightness during the test.

Contraindications

The test may be contraindicated for people with:

- Reduced lung function
- Pregnancy
- Recent or ongoing respiratory infection
- Unstable heart condition(s)
- Contraindications to spirometry
- Inability to withhold bronchodilators
- Medications that affect or are contraindicated for the test

Preparation

- Wear loose comfortable clothing that that does not restrict breathing
- Withhold bronchodilators as advised