
SPIROMETRY FOR DIAGNOSIS OF COPD

Spirometry is as important for the diagnosis of COPD as blood pressure measurements are for the diagnosis of hypertension. Spirometry should be available to all health care professionals.

What is Spirometry?

Spirometry is a simple test to measure the amount of air a person can breathe out, and the amount of time taken to do so.

A **spirometer** is a device used to measure how effectively, and how quickly, the lungs can be emptied.

A **spirogram** is a volume-time curve.

Spirometry measurements used for diagnosis of COPD include (see Figure 2, page 9):

- **FVC** (forced vital capacity): maximum volume of air that can be exhaled during a forced maneuver.
- **FEV₁** (forced expired volume in one second): volume expired in the first second of maximal expiration after a maximal inspiration. This is a measure of how quickly the lungs can be emptied.
- **FEV₁/FVC**: FEV₁ expressed as a percentage of the FVC, gives a clinically useful index of airflow limitation.

The ratio FEV₁/FVC is between 70% and 80% in normal adults; a value less than 70% indicates airflow limitation and the possibility of COPD.

FEV₁ is influenced by the age, sex, height and ethnicity, and is best considered as a percentage of the predicted normal value. There is a vast literature on normal values; those appropriate for local populations should be used^{1,2,3}.

Why do Spirometry for COPD?

- Spirometry is needed to make a firm diagnosis of COPD.
- Together with the presence of symptoms, spirometry helps stage COPD severity and can be a guide to specific treatment steps.
- A normal value for spirometry effectively excludes the diagnosis of clinically relevant COPD.
- The lower the percentage predicted FEV₁, the worse the subsequent prognosis.
- FEV₁ declines over time and faster in COPD than in healthy subjects. Spirometry can be used to monitor disease progression, but to be reliable the intervals between measurements must be at least 12 months.

What You Need to Perform Spirometry

Several types of spirometers are available:

- relatively large bellows or rolling-seal spirometers (usually only available in pulmonary function laboratories). Calibration should be checked against a known volume e.g. from a 3-litre syringe on a regular basis.
- smaller hand held devices, often with electronic calibration systems.

A hard copy of the volume time plot is very useful to check optimal performance and interpretation, and to exclude errors.

Most spirometers require electrical power to permit operation of the motor and/or sensors. Some battery operated versions are available that can dock with a computer to provide hard copy.

It is essential to learn how your machine is calibrated and when and how to clean it.

How to Perform Spirometry

Spirometry is best performed with the patient seated. Patients may be anxious about performing the tests properly, and should be reassured. Careful explanation of the test, accompanied by a demonstration, is very useful. The patient should:

- Breathe in fully.
- Seal their lips around the mouthpiece.
- Force the air out of the chest "as hard and fast as they can until their lungs are completely "empty."
- Breathe in again and relax.

Exhalation must continue until no more air can be exhaled, must be at least 6 seconds, and can take up to 15 seconds or more.

Like any test, spirometry results will only be of value if the expirations are performed satisfactorily and consistently. Both FVC and FEV₁ should be the largest value obtained from any of 3 technically satisfactory curves and the FVC and FEV₁ values in these three curves should vary by no more than 5% or 100 ml, whichever is greater. The FEV₁/FVC is calculated using the maximum FEV₁ and FVC from technically acceptable (not necessarily the same) curves.

Those with chest pain or frequent cough may be unable to perform a satisfactory test and this should be noted.

Where to find more detailed information on spirometry

1. **American Thoracic Society**
<http://www.thoracic.org/adobe/statements/spirometry1-30.pdf>
2. **Australian/New Zealand Thoracic Society**
<http://www.nationalasthma.org.au/publications/spiro/index.htm>
3. **British Thoracic Society**
<http://www.brit-thoracic.org.uk/copd/consortium.html>