



# Spirometry explained

## What is spirometry?

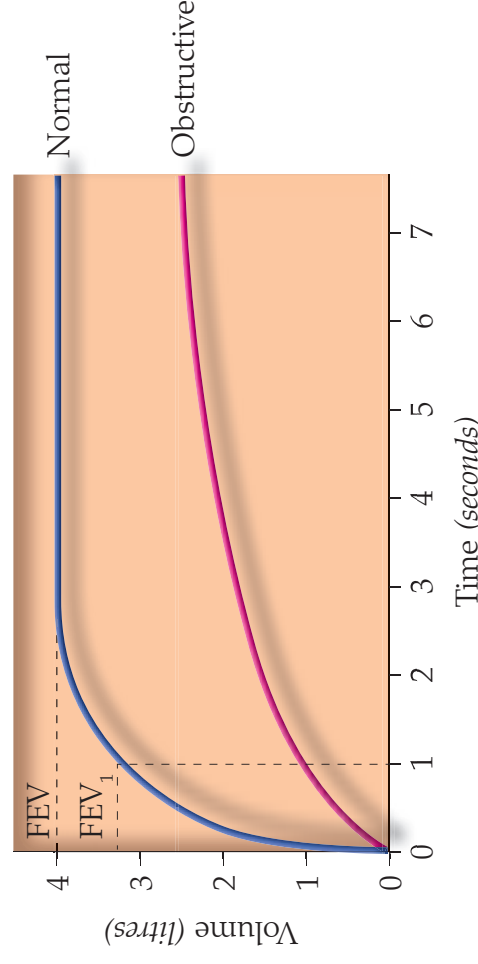
- > A spirometer is a simple device used to measure how much air a patient breathes out and how long it takes them to do so, i.e. patterns of airflow (normal, obstructive, restrictive or combined)<sup>1</sup>
- > Findings are presented in a spirogram (spirometry tracings), showing volume/time or flow/volume curves.<sup>1</sup>

## Why perform spirometry?

- > To confirm diagnosis of chronic obstructive pulmonary disease (COPD), even if in mild or moderate stages<sup>2</sup>
- > To identify severity of disease and monitor disease progression
- > To differentiate between obstructive airway conditions (e.g. COPD, asthma) and restrictive diseases (e.g. cystic fibrosis)
- > To guide the patient's care pathway, together with presenting symptoms.

## How to interpret spirometry?

- > Use the curve patterns and numbers to guide your interpretation
- > Most spirometers automatically calculate the percentage of the predicted normal values. This is performed with reference data already programmed into the machine. Enter details of the patient's sex, race, age and height for this to be calculated.



## Terminology for interpreting spirometry

FEV <sub>1</sub>	FVC	VC	FEV <sub>1</sub> /FVC	FEV <sub>1</sub> /VC
<ul style="list-style-type: none"> <li>&gt; Forced expiratory volume in one second, i.e. the volume of air blown out in the first second taken from a forced vital capacity</li> <li>&gt; Percentage predicted is used to grade the severity of lung disease.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Forced vital capacity, i.e. the total volume of air that the patient can blow out in one breath (e.g. until they cannot blow any more)</li> <li>&gt; Normal FVC is 80% or more of predicted value.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Vital capacity, i.e. the total volume of air blown out in a relaxed manner from breathing in and blowing out as much as you can.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Ratio of FEV<sub>1</sub> to FVC, i.e. a percentage of the FVC</li> <li>&gt; 70% or 0.7 is the 'set' figure indicating obstruction.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Ratio of FEV<sub>1</sub> to VC — used when the volume of air in the VC is larger than that in the FVC.</li> </ul>

Note: Values of FEV<sub>1</sub> and FVC are expressed as a percentage of the predicted normal for a person of the same sex, age and height.<sup>1</sup>

## Patient advice before the test<sup>3</sup>

- Avoid eating a full meal within two hours of the test
- Avoid alcohol within four hours of the test
- Avoid smoking within 24 hours of the test
- Avoid exercise within 30 minutes of the test
- Wear loose-fitting clothing.

## Contraindications to spirometry testing (always adapt to your place of work and local policy)<sup>3</sup>

- Exacerbation in last 4–6 weeks
- Haemoptysis
- Pneumothorax
- Unstable cardiovascular status
- Thoracic, abdominal or cerebral aneurysms
- Recent eye surgery
- Nausea and vomiting
- Recent thoracic/abdominal surgery
- Pain.

## How to perform spirometry?

Prepare the patient by fully explaining the test<sup>1,2</sup> — allowing some practice attempts before taking readings can help. No more than eight attempts (including practice ones) should be taken at any one session.<sup>4</sup>

Two sets of measurements will need to be undertaken — for both, the patient should be seated and comfortable.<sup>1,2</sup>

- **Vital capacity** — this can be done first so that the patient becomes familiar with the equipment:
  - Patient needs a nose clip or to hold their nose
  - Patient breathes in deeply and then exhales slowly and steadily until all the air is blown out (encourage the patient to keep blowing)
  - Repeat test at least two more times and record values manually — the best two blows should be within 100mls of each other.<sup>4</sup>
- **Forced vital capacity** — the FEV<sub>1</sub> is taken from this test:
  - No nose clip is needed
  - Patient breathes in deeply and exhales hard and fast until all the air is blown out
  - Repeat test at least two times and record values manually — the best two blows should be within 100mls of each other.<sup>4</sup>

**Remember:** always interpret spirometry results alongside a patient's full clinical history<sup>3</sup>

1. Global Initiative for Chronic Obstructive Lung Disease (2015) *Pocket guide to COPD diagnosis, management and prevention*. Available online: <http://bit.ly/1V9Xd31>

2. British Thoracic Society COPD Consortium (2005) *A practical guide to using spirometry in primary care*. BTS COPD Consortium, London. Available online: <http://bit.ly/1Ojvxw>

3. Lovridge C (2015) *J GPN* 1(2): 28–33

4. Primary Care Commissioning (2013) *A guide to performing quality assured diagnostic spirometry*. Available online: <http://bit.ly/1Len4V5>