

Recommendations for the Performance of Spirometry in Primary Care

NHS Calderdale CCG, NHS Greater Huddersfield CCG, NHS North Kirklees CCG and NHS Wakefield CCG

Spirometry

Spirometry is an essential tool in the diagnosis, management and severity assessment of people with COPD and other respiratory conditions, e.g. asthma

Training

Diagnostic spirometry should only be conducted by an operator trained and assessed to ARTP or equivalent standards in the performance of spirometry by recognised training bodies. Those performing spirometry should undertake regular updates and annual quality audits to demonstrate competence in the procedure.

Equipment requirements and standards

- A spirometer which meets the ISO standard 26782
- One-way mouthpieces and nose clips
- Bacterial and viral filters (as indicated in selected patients)
- Height measure and weighing scales – calibrated according to manufacturer's instructions.
- Single patient use volumetric or nebuliser (for post bronchodilator spirometry and reversibility testing)
- Single-patient use mask/mouthpiece for nebuliser
- Short acting bronchodilators as per guidelines

Calibration

- The spirometer must be designed for multiple patient use and serviced as per manufacturer's instructions
- The spirometer must be calibrated using a precision annually certificated calibration/verification 3L syringe - this must have an accuracy of +15ml
- For the device to be within calibration limits it must read +/- 3% of true.
- Calibration should be verified prior to every clinic/session or after every 10th patient (whichever comes first).
- Document calibration/verification results consistently, including a simple log of problems as they arise
- Document all repairs and computer software updates related to each specific spirometer.
- The spirometer should have a graphical display to allow technical errors to be identified
- The spirometer should be able to produce hard copies of graphical representation of results
- The spirometer should be cleaned as per manufacturer's instructions after each session with reference to local guidelines and protocols

Absolute Contraindications

- Active Lung infection e.g. AFB positive TB until treated for 2 weeks
- Conditions that may cause serious consequences if aggravated by forced expiration e.g. dissecting / unstable aortic aneurysm, current pneumothorax, recent surgery including ophthalmic, thoracic abdominal or neurosurgery

Relative Contraindications

- Suspected respiratory infection in the last 4-6 weeks
- Undiagnosed chest symptoms e.g. haemoptysis
- Any condition which may be aggravated by forced expiration e.g. history of prior pneumothorax; unstable vascular status such as recent (within 1 month) myocardial infarction, uncontrolled hypertension or pulmonary embolism or history of haemorrhagic event (stroke); previous thoracic, abdominal or eye surgery
- If the patient is too unwell to perform forced expiration
- Communication problems such as learning disability or confusion

Record

- Patients age and gender
- Height barefoot in centimeters (some machines will also request weight in kilograms) If unable to use height use arm span.
- Ethnicity

Note whether the patient has recently had an exacerbation or taken their bronchodilator

Patient considerations

- All patients should receive information at time of booking to enable them to prepare for the test
- Prior to performing spirometry assess for contraindications (see Absolute Contraindications & Relative Contraindications)
- Explain the purpose of the test, why it is important to perform as best they can. Explain that there are 2 types of test (VC and FVC) and each may require several blows

Type of Spirometry

Base-line spirometry

Investigative: to investigate lung function where diagnosis has not been established

Post bronchodilator spirometry

Investigative: to diagnose obstructive conditions where baseline spirometry shows obstructive pattern

Monitoring: to monitor clinical progress in diagnosed COPD and asthma

Reversibility testing

Reversibility testing may help to differentiate asthma from COPD but is **rarely** required. It can be unreliable and differentiation is usually based on clinical features

Information taken from Guide to performing quality assured diagnostic spirometry. http://www.pcc-cic.org.uk/sites/default/files/articles/attachments/spirometry_guide_16-4-13.pdf

*Monitoring Spirometry amended Jan 2017 Page 94
<http://goldcopd.org/gold-2017-global-strategy-diagnosis-management-prevention-copd/>

Pre-test advice will depend on purpose of spirometry

Investigative: Establish diagnosis	* Monitoring existing conditions	Reversibility testing
Spirometry tests required: <ul style="list-style-type: none"> • Base-line test • If obstructive base-line picture proceed to post bronchodilator test (see below for standard) 	Spirometry tests required: <ul style="list-style-type: none"> • At least Annual VC FEV1/FVC Decline in FEV1 should be tracked to identify patients declining quickly	Spirometry tests required: <ul style="list-style-type: none"> • Base-line test • Post-bronchodilator test (see below for standard)
Before the test STOP: <ul style="list-style-type: none"> • Short acting bronchodilators for 4 hours • Long acting beta 2 agonist for 8 hours • Long acting anticholinergic for 36 hours Before the test CONTINUE <ul style="list-style-type: none"> • Inhaled and oral steroids 	Before the test CONTINUE <ul style="list-style-type: none"> • All usual inhaled therapy 	Before the test STOP <ul style="list-style-type: none"> • Short acting bronchodilators for 4 hours • Long acting beta 2 agonist for 8 hours • Long acting anticholinergic for 36 hours Before the test CONTINUE <ul style="list-style-type: none"> • Inhaled and oral steroids
Ask the patient to avoid: <ul style="list-style-type: none"> • Smoking for at least 24 hours before the test • Eating a large meal before the test • Vigorous exercise before the test 		
<ul style="list-style-type: none"> • Ask the patient to bring existing inhalers to the appointment 		
<ul style="list-style-type: none"> • Check if any contra-indications (see above or allergies and ensure patient has prescription for bronchodilator) 		

Post Bronchodilator Testing

Post-bronchodilator spirometry testing should be performed if baseline spirometry reveals an obstructive picture, if reversibility testing is required (to differentiate asthma and COPD) and for chronic disease monitoring. Bronchodilator administration should be standardised as follows:

- Administer bronchodilator (salbutamol 400mcg via a large volume spacer or 2.5mg via nebuliser)
- Perform spirometry after 20 minutes
- Arrange Interpretation by a competent interpreter
- Ensure follow up arranged for results and on-going management

Prepare patient and equipment to perform the baseline VC.

The VC (vital capacity) is often higher than FVC in patients with COPD; its measurement will identify dynamic hyperinflation. **VC should always be performed** for all patients as part of spirometry

Apply nose clip. The standard

- Patient is sitting comfortably
- A minimum of three acceptable VC manoeuvres must be obtained.
- Repeatability criteria are met when there is no more than 100mls ideally (and certainly no more than 150mls in the occasional highly variable patient) between each blow. Some spirometers will inform the user when this has been achieved.
- Verbally encourage patient to continue to exhale as long as possible
- Observe both patient and the time volume curve as each VC is performed to ensure they:
 - Breathe in to maximal inspiration
 - Do not obstruct the mouthpiece with their teeth or tongue
 - There are no leaks from the mouthpiece
 - Remove false teeth if loose
- Usually this will be achieved within **no more than four VC manoeuvres**

- If the patient is unable to achieve the quality criteria, record why this has not been possible. Another appointment may be required, or refer for specialist assessment

Prepare patient and equipment to perform the baseline FVC.

Nose clip is not essential. The standard

- A minimum of three acceptable FVC manoeuvres must be obtained.
- Repeatability criteria are met when there is no more than 100mls ideally (and certainly no more than 150mls in the occasional highly variable patient) between each blow. Some spirometers will inform the user when this has been achieved.
- Encourage maximum effort at the start of each blow, verbally encouraging patient to continue to exhale to achieve maximal effort
- Observe the patient as each FVC is performed to ensure they:
 - Breathe in to maximal inspiration
 - Do not obstruct the mouthpiece with their teeth or tongue.
 - There are no leaks from the mouthpiece
 - Remove false teeth if loose
- Observe the flow/volume curve as each FVC manoeuvre is being performed to identify:
 - Slow starts
 - Early stops
 - Variability in flow within manoeuvre
- Ensure the patient exhales fully and that this is demonstrated on the graph showing a time/volume plateau.
- Do not perform more than eight FVC manoeuvres in one session. If the patient is unable to achieve these standards - record why this has not been possible, arrange a further appointment to repeat the test if appropriate, or refer for specialist assessment

Enquiries to:

NHS Calderdale CCG: Dr N Taylor

nigel.taylor@calderdaleccg.nhs.uk

NHS Greater Huddersfield CCG: Dr A Handa

Anuj.handa@greaterhuddersfieldccg.nhs.uk

NHS North Kirklees CCG: Dr A Jabbar

adnan.jabbar@northkirkleesccg.nhs.uk

NHS Wakefield CCG: L Chandler

lisachandler@wakefield.gov.uk

Group responsible for development:

NHS Calderdale, NHS Greater Huddersfield, NHS North Kirklees and NHS Wakefield CCG. Cross cluster respiratory group in collaboration with The Mid Yorkshire Hospitals NHS Trust and Calderdale and Huddersfield Foundation Trust.