

## Exercise oximetry step test as part of respiratory assessment and pre-operative assessment in Salford Royal Foundation Trust

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**Classification:** Procedure  
**Lead Author:** Dr Ronan O'Driscoll  
**Additional author(s):** N/A  
**Authors Division:** Respiratory Medicine

**Unique ID:** TWCG3(12)  
**Issue number:** 4  
**Expiry Date:** March 2021

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### Who should read this document?

- Respiratory doctors and specialist nurses
- Respiratory physiology staff (CRI)
  - Pre-operative nursing staff

### Key Messages

This protocol informs clinicians how to undertake a standardised exercise oximetry step test for patients with suspected respiratory disorders. This allows clinicians to assess the severity of lung disease and to evaluate other causes of reduced mobility.

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## Background & Scope

This procedure protocol allows clinicians to assess the severity of patients lung disease in a standardised manner and to evaluate other causes of reduced mobility. It may be used as a more practical alternative to the six minute walk test or the shuttle walk test which are not practical within the confines of the clinic area.

## What is new in this version?

There are no significant changes since the previous issue TWCG3(12), Issue 3

## Policy/ Guideline/ Protocol

### Who should have exercise oximetry (Indications)?

All breathless patients (except those with contraindications) should ideally have exercise oximetry to assess exercise capacity and to understand the patient's reasons for a limited exercise tolerance (References 1-2). This test is especially important if chest surgery is being considered because stair climbing capacity is one of the best predictors of post-operative outcomes (References 3-5) and is easier to arrange than CPEX which is a valuable additional test for patients requiring major surgery.

### Who should not have exercise oximetry (Contra - Indications)?

- Unstable Ischaemic Heart Disease  
(*minor stable angina is not a contra-indication*)
- Severe arthritis or back pain or leg weakness (some patients with limited mobility can undertake a short walk in the consulting room or corridor but not climb stairs—see special protocol for these patients)
- Severe breathlessness at rest or marked hypoxia at rest.
- Skeletal problems or old strokes preventing mobilization,
- Inability or unwillingness to undertake the test.

It is important to standardise this test so that the results obtained by different clinicians can be compared, and to allow comparison of repeated tests on the same patient over a period of time (e.g patients with lung fibrosis). There is good correlation with laboratory lung function tests (References 1-2).

### Test procedure

1. Explain the test to the patient and ensure that they are happy to take part.
2. Place the oximeter on a finger and wait until the SpO<sub>2</sub> reading has stabilized, at least one minute. If it continues to fluctuate (e.g. 93-96%), record the average or most persistent value but document the range in the comments section of the EPR documentation for the test.

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3. Record the baseline oxygen saturation and pulse in the Exercise Oximetry section of EPR. If you are seeing a new patient in the chest clinic you can use the purpose-designed oximetry box on page six of the outpatient proforma and copy your results into EPR when the test is complete.
4. Use a stopwatch (or smartphone timer) to record the patient's exercise time if possible. This is less prone to mistakes than counting from your wrist-watch.
5. Ask the patient to climb on and off the 18 cm step at a rate that is comfortable to them and likely to be sustainable for up to 3 minutes. If the patient starts too quickly, he/she may tire very soon. Tell the patient to stop if he/she feels unduly breathless or if he/she has any other limiting symptoms such as chest pain or joint pain or tiredness in the legs. Remember to record the reason for stopping if the patient needs to stop before 3 minutes (and record if SOB present at 3 minutes).
6. For frail or elderly patients, it is helpful to support the patient by holding the oximeter hand or forearm gently to assist with balance and stability. However, the oximeter finger must be kept free. Pressure of motion artefacts on the device may mislead you.
7. Some patients with mobility problems or severe breathlessness can undertake a short walk in the consulting room or corridor but not climb stairs. Measure the distance walked in meters and make it clear in the "Comments" Section that this patient has undertaken a walk test, not a stair climb.)
8. The patient should exercise for up to 3 minutes. Longer tests do not add value. Patients can stop at any time up to three minutes if they have SOB or other distress.
9. Record the SpO<sub>2</sub> and pulse immediately after the patient stops exercising. Also note the time and how many steps were achieved and why the patient stopped.
10. Keep the oximeter on the patient's finger for at least a further minute. Most people who desaturate will have their lowest saturation about 30-45 seconds after finishing the exercise task. Record the lowest reading as the "post exercise" reading.
11. Note the patients breathing pattern during exercise if relevant for example breath holding or upper airway noisy breathing.
12. Record your results in the designated section in EPR (Enter as document.flow-sheet under "Exercise Oximetry Step Test")

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## Explanation of terms & Definitions

### What are normal values?

96-98% for adults - should NOT fall with exercise  
(May be a bit lower in the elderly, many patients with significant lung disease have low resting SpO<sub>2</sub>)

### What constitutes a significant fall in oxygen saturation?

Swings up to 3% are common. For example, the baseline may be swing between 92% and 95%. A fall of more than 3% is usually significant (see references)

### What is motion artefact?

If the hand swings freely, there can be significant motion artefact which can produce inaccurate readings. Also beware of dark coloured nail varnish, which may block the sensors ability to accurately record the oxygen saturation levels. Try to get the sensor above the nails. If the patient has dark nail varnish then try to remove this or place the probe as high as possible on the little finger.

### What is pressure artefact?

Pressure on the fingertips (e.g. pressing on the couch or on a walking stick) will cause ischaemia in the finger-tips and a falsely low reading.

### How does the valsalva manoeuvre affect the test?

Some patients hold their breath during an unaccustomed exercise task. Together with the exercise, this will produce rapid de-saturation. Watch out for this artefact and ask the patient to breathe naturally.

### How does hyperventilation and dysfunctional breathing affect the test?

Nervous patients who hyper-ventilate before or during exercise may have SpO<sub>2</sub> up to 99% or 100%. Surprisingly, hyperventilation can cause low oximetry readings in some other patients because of peripheral vasoconstriction due to low CO<sub>2</sub> levels and other patients will have compensatory hypo-ventilation following hyper-ventilation (due to low CO<sub>2</sub> level) and they may desaturate 1-3 minutes later. Other patients may develop upper airway dysfunction causing noisy breathing and some may desaturate due to upper airway closure or vocal cord adduction or extreme breath-holding.

### How does illness behaviour affect the test?

A patient with illness behaviour may stop after a few steps with a normal pulse rate and normal oximetry reading. It is usually clear from observation that the reason for stopping is not due to any lung disease. Such patients often have normal lung function or incomplete flow-volume loops due to poor effort.

### Does Exercise Oximetry predict response to Short Burst Oxygen Therapy?

SBOT does not work for COPD patients with saturation >93% at rest but it may help some hypoxaemic patients or those with interstitial lung disease and marked desaturation on exercise. See reference 6

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## References and Supporting Documents

### References

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