Home oxygen therapy: an update for community nurses

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Community nurses often have people with chronic respiratory disease on their caseloads and among the vital skills needed to manage this group is the measurement of resting oxygen saturation by pulse oximetry, which can help the nurse decide whether or not to refer the patient onto a specialist oxygen service for assessment. Many elderly patients also have a diagnosis of chronic lung disease and will be receiving long-term oxygen therapy. Pulse oximetry is helpful in assessing whether the prescribed oxygen flow rate is correct for the individual — this may change over time if the patient’s condition deteriorates. This article examines the latest techniques and equipment in home oxygen therapy and the author pays particular attention to pulse oximeters, which are an affordable clinical assessment tool and can easily be added to the equipment already used by community nurses.

KEYWORDS:
Respiration ■ Oxygen therapy ■ Home care ■ Pulse oximetry

Respiratory diseases are one of the leading causes of death worldwide. At the time of writing chronic obstructive pulmonary disease (COPD) was reported to be the overall fourth most common cause of mortality globally, and predicted to be the third most common by 2020 (Gruffydd-Jones and Loveridge, 2011; Murphie, 2014, Simon and Jadwiga, 2014). The National Institute for Health and Care Excellence (NICE, 2010) estimated that over three million people in the UK have been diagnosed with COPD.

COPD is a chronic lung disease characterised by progressive airflow obstruction that is not fully reversible or does not change markedly over several months or years — cigarette smoke is the major risk factor (Rabe et al, 2007). There are a number of other respiratory conditions that may also require referral for oxygen therapy assessment, for example interstitial lung disease, emphysema and chronic asthma (NICE, 2010).

The King’s Fund reported that in the past 30 years, the number of people over the age of 85 in the UK has doubled and that by 2030 one-in-five people will be over 65 (Oliver et al, 2014). The combination of an ageing population, with the increase in prevalence of chronic respiratory disease that is predicted over the next 20 to 30 years, will add to the burden of an already overstretched NHS with a direct impact on the numbers of patients referred for specialist oxygen assessment.

OXYGEN THERAPY IN THE COMMUNITY

Community nurses are at the forefront of healthcare delivery and are faced with an ever-increasing workload, caring for patients who have multiple morbidities and complex nursing care needs, and who are living longer (RCN, 2011). Recognising who should be referred to specialist services for oxygen assessment increasingly forms part of the community nursing team’s role.

Long-term oxygen therapy is defined as the use of prescribed oxygen therapy for 15 hours per day via an oxygen concentrator in chronically hypoxaemic patients (British Thoracic Society, 2015). There are a number of chronic lung diseases that may require assessment for long-term oxygen therapy, and

Chronic obstructive pulmonary disease (COPD) is the name given to a collection of lung diseases including chronic bronchitis, emphysema and chronic obstructive airways disease. People with COPD will experience difficulties in breathing because of a narrowing of their airways (referred to as airflow obstruction).

The common symptoms of COPD include increasing breathlessness, persistent cough with phlegm and frequent chest infections. The main cause is smoking, which irritates and inflames the lungs.

Source: NHS Choices, www.nhs.uk

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Source: NHS Choices, www.nhs.uk
while COPD is the most common, other conditions may require referral, including (NICE, 2010):

- Chronic severe asthma
- Interstitial lung disease
- Cystic fibrosis
- Bronchiectasis (risk of infection due to abnormal widening of the bronchi)
- Pulmonary vascular disease
- Primary pulmonary hypertension
- Pulmonary malignancy.

Guidelines are available on who should be considered for long-term oxygen therapy and up-to-date British Thoracic Society guidelines on home oxygen therapy have recently been published (British Thoracic Society, 2015). However, deciding which patients should be formally referred to oxygen assessment services for consideration for long-term oxygen therapy is still a complex area for many community nurses, particularly in the absence of routine pulse oximetry measurement. Community nurses are not always supplied with pulse oximeters and the majority of nursing courses do not specifically focus on oxygen provision.

Pulse oximetry

A pulse oximeter is a portable battery operated device that is attached to the patient’s finger and measures the differential absorption of infrared light by oxygenated and deoxygenated haemoglobin in the capillaries. It then translates this into the percentage of haemoglobin that is saturated with oxygen (SpO2) (Plüddemann et al, 2011).

Pulse oximetry offers a non-invasive way of measuring oxygenation levels compared to arterial blood gas sampling, which is invasive, can be a painful, is more time-consuming, and is usually performed by specialist respiratory nurses. Pulse oximetry is now a very affordable and easy first-line clinical investigation that can be used to assess baseline resting oxygen saturation and to detect the presence of hypoxaemia (abnormally low level of oxygen in the blood).

Pulse oximetry is affordable and can easily be used by community nurses concerned that a patient’s oxygen levels may be too low. It offers a practical way for community nurses to decide whether to refer to specialist services for consideration for home oxygen therapy.

Training in the use of these devices includes recognising that there are a number of limiting factors that may influence accurate recording of oxygen saturation. These include (Holmes and Pelfers, 2013):

- Poor peripheral perfusion
- Tremor
- Irregular heart rhythm
- Nail varnish
- The presence of anaemia.

However, data on the use of pulse oximetry in primary care is limited, with a recent survey reporting that only 20% of GPs used it to assess respiratory status (Chavannes, 2003, Plüddemann et al, 2011). Despite this, NICE (2010) recommends that pulse oximetry should be available in all healthcare settings.

There is often a misconception among clinicians that patients who are breathless are by definition hypoxaemic. Many patients with a chronic lung disease will experience breathlessness, particularly on exertion; however, this does not mean they will be hypoxaemic when their oxygen saturation levels are measured. This is a significant issue as giving oxygen to someone who is breathless but not hypoxaemic does not offer any clinical benefit and can be costly.

In one large study (predominantly of patients with a cancer diagnosis), oxygen prescribed on the basis of breathlessness alone did not improve the symptom in the majority of users (Currow et al, 2009). Where patients present with breathlessness but without a diagnosis, pulse oximetry should be performed whenever possible to establish the oxygen saturation level in the blood.

If the SpO2 level is below 92% — or if is fluctuating around this level — the patient should be referred for a full assessment. Community patients should have a confirmed diagnosis before being sent for formal oxygen assessment, however, there may be cases where the GP cannot make a diagnosis without referring to a specialist for tests, such as a full pulmonary function/diffusion test or high resolution CT scan (in the case of interstitial lung disease, which is more difficult to spot and diagnose). If the initial reading is borderline, then the pulse oximetry test should be repeated after five weeks (NHS Primary Care Commissioning, 2011).

WHO SHOULD BE REFERRED FOR OXYGEN ASSESSMENT?

The following criteria should be considered when deciding if a patient might need an oxygen assessment:

- Is there an underlying respiratory diagnosis?
- Is there a history of smoking? Current smokers should be referred for smoking cessation advice
- Resting oxygen saturation should be measured using a pulse oximetry device — patients with a resting stable oxygen saturation of less than or equal to 92% should be referred for a blood gas assessment in order to assess their eligibility for long-term oxygen therapy (British Thoracic Society, 2015)
- What is the resting respiratory rate and heart rate?
- What is the normal walking distance?
- Can they manage a flight of stairs without stopping?
- On clinical examination, is there any evidence of peripheral ankle oedema, peripheral or central cyanosis, or finger ‘clubbing’?
- Do they desaturate on exercise (despite having normal oxygen levels at rest) and meet the home oxygen guidelines for ambulatory oxygen?

INFORMATION FOR PATIENTS REFERRED FOR ASSESSMENT

An explanation of the investigations that may be carried out when a patient is referred to the oxygen assessment clinic is helpful, and can help to reassure patients. Investigations may include (NHS Primary Care Commissioning, 2011):

- Clinical examination with chest auscultation (listening to any
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Symptoms

Some of the red flag symptoms for breathlessness include the following:

- Sudden occurrence
- Agitation
- Fever
- Chest pain
- Haemoptysis
- Tachycardia/bradycardia
- Audible wheeze
- Cyanosis
- Noisy breathing (i.e. audible wheeze); stridor (loud, harsh, high pitched respiratory sound).

Red Flag

OXYGEN DELIVERY TECHNIQUES

Static oxygen concentrators

These are the most common mode of long-term oxygen therapy and are usually provided by a static oxygen concentrator, often prescribed for at least 15 hours a day to achieve clinical benefit (NICE, 2010). They can also provide oxygen at a variable flow rate.

Oxygen concentrators are the most economical way of delivering long-term oxygen therapy as they extract oxygen from the air in the room and do not rely on cylinder oxygen, which is much more costly.

The length of time the patient needs to spend on a static oxygen concentrator can affect his or her ability to remain active and can impede travel outside the home. However, despite this, static oxygen concentrators are the most economical way of delivering long-term oxygen therapy as they extract oxygen from the air in the room and do not rely on cylinder oxygen, which is much more costly.

The systems are maintained and serviced by the home oxygen service provider, usually on a 3–6 monthly basis with electricity costs being reimbursed to the patient.

Self-fill oxygen delivery systems

Self-fill oxygen delivery technology is relatively new in the UK and combines an oxygen concentrator with an added reservoir system. This means that the lightweight ambulatory cylinders can be easily refilled, significantly reducing costs by eliminating the need for cylinder deliveries and allowing users greater independence with an unlimited supply of ambulatory oxygen.

A cylinder weighing 4.3lb provides more than five hours of ambulatory oxygen (on a pulsed dose setting) and is refilled as required. This system provides oxygen on inspiration only, thus increasing the supply time by threefold and reducing oxygen wastage.

For those who are oxygen-dependent and regularly go out for more than 30 minutes every day, this system is more economical and weighs less than continuous flow oxygen using ambulatory oxygen cylinders or liquid oxygen.

Ambulatory oxygen cylinders

Ambulatory oxygen involves the use of oxygen during exercise and the activities of daily living while away from home. It is indicated for a number of conditions, with COPD being the most common, followed by other chronic lung diseases such as:

- Chronic severe asthma
- Interstitial lung disease
- Cystic fibrosis
- Bronchiectasis (abnormal widening of the bronchi, causing danger of infection)
- Pulmonary vascular disease
- Primary pulmonary hypertension
- Pulmonary malignancy.

Ambulatory oxygen can be prescribed following specialist assessment to see if exercise tolerance improves after its use (NICE, 2010; NHS Primary Care Commissioning, 2011).

Oxygen-conserving devices

These aim to improve the efficiency of ambulatory oxygen delivery by only delivering oxygen on inspiration, thereby enabling patients to use either a smaller and lighter system, or a standard system for extended time periods.

The ability of oxygen-conserving devices to extend the life of oxygen cylinders has been highlighted in the literature over the last 20 years (British Thoracic Society, 2015). They ‘sense’ the patient beginning to inspire and instantly deliver a bolus of oxygen — they do not administer oxygen at all during the expiratory phase of exhalation, thus conserving the oxygen supply.

In certain patients (i.e. those who can achieve a target oxygen saturation of over 90–92% when ambulatory), oxygen-conserving devices can extend the life of oxygen cylinders, thus reducing the overall consumption and prescribing costs. These devices can also increase the time spent away from home (Murphie, 2014).

Portable oxygen concentrators

Portable oxygen concentrator technology is constantly evolving and many patients purchase their own devices as they offer more freedom and the ability to leave home for extended periods. However, the availability of these systems is limited in the NHS.

Portable oxygen concentrators can deliver a continuous flow of
oxygen as well as pulsed dose delivery. They are lighter than transportable concentrators but their size and delivery characteristics vary depending on the model and/or manufacturer (Murphie, 2014).

**Liquid oxygen (LOX)**
LOX may be prescribed when the user requires large amounts of portable and/or ambulatory oxygen, or if a higher flow of oxygen is prescribed. LOX is decanted from a main oxygen tank into a vacuum flask in the patient’s home. When empty, the tank is replaced by the home oxygen supplier.

This system is dependent on the home delivery of refill containers, usually on a fortnightly basis, which, added to the fact that it is more specialised, makes LOX more costly than other oxygen delivery systems. However, it may often be the best option for those who require higher flow rates when away from home. LOX must be stored in a well-ventilated room, garage or shed and it is important to ensure that the tanks are not placed near items that are likely to catch fire.

Ambulatory liquid oxygen flasks come in various sizes and can be operated on a continuous flow and pulsed dose setting with internal- or external-conserving devices (Murphie, 2014).

**IN PRACTICE**
Community nurses will often encounter patients with chronic respiratory disease. Any who complain of being breathless, are hypoxaemic and show signs of peripheral cyanosis, or have a very limited exercise capacity, should have their resting oxygen saturation measured by pulse oximetry. This will help the community nurse decide whether to refer the patient to a specialist oxygen service for assessment. Similarly, many elderly patients in the community will have a diagnosis of chronic lung disease and be using long-term oxygen therapy.

Patients who complain of breathlessness on exertion can be assessed with a pulse oximeter to see whether they are de-saturating on exercise, which is often the first symptom described by patients with interstitial lung disease.

Pulse oximetry measurement is helpful in assessing that patients’ prescribed oxygen flow rates are correct, which may change over time as their condition deteriorates (here the nurse should always be prepared to request a specialist opinion, even if it is earlier than planned).

Pulse oximeters are an affordable clinical assessment tool and could easily be added to the equipment that community nurses already use on an everyday basis.

**CONCLUSION**
Community nurses are uniquely placed to assess the ongoing needs of patients with chronic lung disease and other complex comorbidities. Faced with an ever-increasing elderly population and the expected rise in the prevalence of COPD over the next five years, the role of community nurses in identifying those who need to be referred to specialist oxygen assessment services and who need ongoing support for long-term management of oxygen therapy is vital. It is essential that community nurses and specialist respiratory nurses are incorporated into integrated multidisciplinary healthcare teams to achieve this goal.

**REFERENCES**


**KEY POINTS**

- Pulse oximeters are an affordable clinical assessment tool and can easily be added to the equipment already used by community nurses.
- Many elderly patients in the community will have a diagnosis of chronic lung disease and be using long-term oxygen therapy.
- Community nurses often have people with chronic respiratory disease on their caseloads and are able to assess whether the individual patient’s prescribed oxygen flow rate is correct.