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Long term domiciliary oxygen therapy

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National Guideline on

Long term domiciliary oxygen therapy (LTDOT)

1 Introduction

Oxygen is essential to aerobic animal life which is sustained by the pulmonary transfer of oxygen from the atmosphere to circulating blood for distribution to body tissue. Any disturbance of lung structure and function may cause hypoxaemia (arbitrarily defined as an arterial partial oxygen pressure less than 55mm Hg.) The administration of supplemental oxygen to patients with hypoxaemia (insufficient oxygen content in the blood) is one of the most common and universally accepted therapeutic modalities in medicine. Chronic obstructive pulmonary disease (COPD) is a state of chronic hypoxic cor *pulmunale* as a complication of chronic bronchitis and emphysema caused by tobacco smoking.

In simple language:
Chronic obstructive pulmonary disease (COPD) includes the conditions known as chronic bronchitis and emphysema. It is a disease state resulting predominantly from smoking tobacco and is characterised by airflow obstruction which is progressive and irreversible. Airway obstruction may be partially reversible at a specific stage of the disease. LTDOT has been shown to reduce mortality in patients with hypoxaemia and cor *pulmonale* caused by COPD.

It is evident that oxygen may be hazardous for patients when used inappropriately. Many health professionals and patients confuse dyspnoea with lack of oxygen. Dyspnoea is defined as difficult or laboured breathing. It is perceived that domiciliary oxygen therapy is prescribed for humane reasons and not according to need. Intermittent oxygen therapy in the treatment of chronic hypoxia is inappropriate.

Since the introduction of simple techniques to measure oxygen levels in blood, data has accumulated on the long-term use of oxygen therapy in the management of chronic hypoxaemia. Haldane first described a method for administering oxygen from a cylinder by way of a loose-fitting face-piece in 1917 (Intern Med 1980). Long-term oxygen treatment was first suggested in the 1930s by Richards and Barach but did not become technically possible for continuous domiciliary administration until the 1950s (Medical Research Council Working Party-Lancet 1981).

2 Objective of the Policy Guideline

To establish a comprehensive uniform programme for the administration and management of domiciliary oxygen therapy for patients with Chronic Obstructive Pulmonary Disease.

3 Scope of the Policy Guideline

Target population for:

Health education and health promotion
Cares/caregivers of older persons, general public, persons with chronic hypoxic diseases.

Training

All categories of professional health workers
Carers/caregivers/patients on LTDOT

4 Recommended Criteria for Prescribing LTDOT

The primary beneficiaries will be people with chronic obstructive pulmonary disease (COPD). Each patient should be assessed individually using clinical parameters to classify the disease severity and to assess the degree of tissue hypoxia.

LTDOT would not be initiated without an assessment by a pulmonologist or designated physician specialist and in rural areas by trained physicians. A prescription form for oxygen needs to be signed by the pulmonologist/physician specialist and if the latter is not accessible then by a trained physician, before oxygen is supplied. Patients transferred from other provinces need to be treated as new patients and be assessed as soon as possible if not assessed within the last 6 months, patients to continue with previous treatment. Long term supplemental home oxygen therapy should be considered only for patients who have documented hypoxaemia (arterial oxygen tension level $P_a O_2$ of 713 KPa (55mm Hg). The cut off point is at $P_a O_2$ of 55mm Hg for chronic oxygen therapy because the steep proportion of the oxyhaemoglobin dissociation curve begins at 50-60mm Hg. At this point, the percentage saturation of haemoglobin or blood oxygen content falls sharply, lowering oxygen delivery to the tissue. Since the carotid body is sensitive to $P_a O_2$ and oxygen delivery to tissue is dependent on saturation or oxygen content, the shape of the curve allows the $P_a O_2$ to be low enough to stimulate respiration (e.g. 60mm Hg) while blood oxygen saturation is still adequate to supply tissue needs. This supplemental oxygen would only be useful when saturation begins to fall below 90%.

When arterial hypoxaemia due to COPD is diagnosed, the following additional criteria should be adhered to:

- Cessation of smoking. Persons who smoke are excluded in all international guidelines for long-term oxygen therapy because cessation of smoking is the only way to slow progression of the disease. If progression of the disease is not slowed down, there is no benefit from long-term oxygen therapy. People that are on oxygen for 75% of the day and smoke with their oxygen next to their bed or chair are endangering their own safety and the safety

of other people. Cessation of smoking is a definite criterion for long-term domiciliary oxygen therapy.

- A person should have the non-reversible pulmonary illness for ± 3 months, on maximum non-drug and maximum drug treatment.
- The disease must be stable before assessing hypoxaemia since blood gasses may continue to improve for up to 3 months after and acute exacerbation. Do a blood gas assessment only 3 months after exacerbation. Two assessments on at least two occasions, preferably 3 months apart, are essential before LTDOT is prescribed.
- Oxygen requirement for a total minimum period of 15 hours per day at the lowest flow rate (2 - 4 litres/minute) or more than 3 cylinders per month.
- An appropriate source of oxygen, as determined by the special needs and circumstances of the individual patient, should be used.
- All patients, family/caregivers should be adequately counselled and educated, including old age homes and clinics who should have oxygen for emergency cases, particularly about the nature and aim of LTDOT.

5 Indications for LTDOT

5.1 All patients assessed and diagnosed with COPD found to be in need of LTDOT by a pulmonologist, physician specialist or in special cases, a trained physician.

5.2 Forced expiratory volume in 1 second (FEV_1) of less than 1,5 litres and FEV_1 % in conjunction with FEV_1 /FVC ratio of less than 70.

6 Oxygen Therapy

Support and education network should be established in an attempt to encourage the correct use of LTDOT. Patients should be followed-up, monitored and provided with basic care within the primary health care (PHC) system, with referrals for secondary and tertiary care when needed. Oxygen clinics are of value and should be established more widely within each province.

Managing COPD requires the maximization of lung function, the prompt treatment of bronchopulmonary infections, the treatment of heart failure and the correction of tissue hypoxaemia. LTDOT is a therapeutic option for hypoxic COPD. LTDOT is best administered with nasal cannulas or prongs in terms of patient comfort. Prolonged use of plastic nasal cannulas may be associated with irritation of the anterior nares or the face. These complications are easily managed with the use of ointment.

6.1 The following is of importance:

- Patient/family is responsible for the up keep of cylinders, to take good care of the equipment, to turn oxygen off when not in use and to ensure that the oxygen is not leaking.
- The suppliers have a safety responsibility in ensuring that the cylinders, valve and flow meters are in proper working condition.
- Cannulas and prongs must be cleaned daily with soap and water. Cannulas will be provided not less than 3 monthly.
- Information on the nearest 24-hour emergency service is readily available.
- The district service manager will monitor the number of cylinders used. If there is proof of misuse/wastage, the oxygen can be discontinued or patients will pay for the wastage/misuse.
- Patients must be on optimal treatment and rehabilitation before oxygen therapy is prescribed.

- Patients should be re-assessed a year after LTDOT has commenced and every year there after. Not necessarily by a specialist.

- Safety precautions regarding open fires (flames) to be conveyed to users and caregivers.

6.2 Control and correct use of equipment

The nurse or health worker supervising/managing LTDOT is to make a visit prior to LTDOT commencement as well as follow up visit within a few days of commencement of the regimen and ideally once a month but not less than once every six months in order to:

- ensure correct use of equipment by patient and the family with particular reference to the keeping of instructions regarding the hygiene and safety of equipment.

- monitor the patient's general progress by use of pulse oximeter. A pulse oximeter is fixed to a patient's ear or finger to measure the saturation of oxygen in the blood (normal reading 92 - 97%).

- ensure prompt return of equipment when no longer needed by the patient or to be returned by next of kin on death of the patient.

- note change of patient's address in order to prevent losses.

Compliance

Check for compliance as various reasons exist for non-compliance that includes:

- Fear of addiction to oxygen
- Frequent power failures
- Increasing electricity bills
- A dislike of the noise of the concentrator
- Conviction that the requirement for LTDOT is confirmation of imminent death.

6.3 Compressed oxygen

The cylinders vary in size from a small cylinder (1,84kg), which will supply 2 - 4 hours of oxygen to a larger cylinder (4,6kg), which may supply oxygen for up to 28 hours.

The duration of supply depends on the oxygen flow rate, which should not be more than 2 - 4 litres per minute.

Small cylinders are only appropriate for emergency oxygen supply. They are reasonably portable and can be usefull for short trips (2 - 4 hours) outside the home. Unfortunately the small cylinders are very expensive and it is not supplied or paid for by the government. The cost of hiring a small cylinder is the same as a large cylinder. The cost may vary per supplier. Some suppliers combine the cost of hiring and refilling of cylinders.

An oxymatic device (a gadget fixed to the oxygen cylinder which releases oxygen according to the breathing pattern of the patient) is proposed because it is more cost effective compared with compressed oxygen without a device.

Example

Oxygen without device	Oxygen with device
2 litres/min = 29 hours 3 litres/min = 19 hours 4 litres/min = 14 hours	201,3 hours 134,2 hours 100,6 hours

Large cylinders (4,6kg) are heavy and must be appropriately secured, otherwise they may fall and cause injury to patients, caregivers or be damaged. Damaged cylinders are dangerous and is a major fire hazard.

Oxygen suppliers deliver cylinders within the urban areas but not in rural areas. Suppliers should be encouraged to decentralise their services to adhere to rural needs.

6.4 Oxygen concentrators

These devices are approximately the size of a humidifier. They are electrically powered and remove nitrogen from the air to supply a relatively pure oxygen flow of 3 - 5 litres per minute (40%). They are convenient, safe, reliable and inexpensive to run.

They are ideal for patients who require continuous oxygen, more than four cylinders per month. When placed centrally in the home with a 50-foot oxygen supply line, the patient has access to supplemental oxygen throughout the house.

Monthly monitoring and maintenance is essential. The oxygen concentrators are small enough to be transported to other localities for holidays or travel. Where electricity supply is certain, concentrators should be the only method for continuous oxygen supply.

6.5 Advantages of long-term domiciliary oxygen therapy.

Early studies indicated that LTDOT was associated with reduction of the haematocrit and pulmonary arterial pressure. The reversal of pulmonary hypertension was thought to be of great clinical significance. LTDOT is also associated with a reduction in the frequency of admission to the hospital as well as episodes of cor *pulmonale*.

Oxygen therapy showed improvements in general well-being, memory, ability to concentrate, physical coordination and intelligence quotient. Patients are found to be less anxious and depressed. They are less concerned with somatic problems and have a better quality of life.

6.6 Advantages and disadvantages of:

Oxygen cylinders

Advantages	Disadvantages
1. Needs no electricity. 2. Small cylinder is easy to handle when travelling.	1. Costly. 2. Dangerous fire hazard. 3. Not easy to open the flow meter. 4. Can be damaged while transporting. 5. Older persons and very sick patients cannot handle the cylinders. 6. Large cylinders cannot be moved easily, are awkward and heavy, can fall, causing injury or damage. 7. Unsightly and take up a lot of space. Many cylinders have to be accommodated. 8. Because of inconvenience, patients try to save on oxygen and the benefit is lost because of incorrect use.

b) Oxygen concentrators

Advantages	Disadvantages
1. Safe, no fire hazard. Cannot fall. 2. Easy to operate. 3. No inconvenience to replenish as with cylinders. 4. Easy to move around in the home with an extended oxygen supply line. 5. Easy to transport, can be plugged at a rest room. 6. Cost effective, when oxygen usage is more than 10 hours per day. 7. Not unsightly, fit in with rest of furniture.	1. Dangerous if there is a power failure. 2. When a patient needs oxygen while travelling, a small oxygen cylinder must be used. 3. Patient has to pay for electricity. 4. Electricity is essential.

7 Conclusion

It is of importance that all new patients be assessed carefully before LTDOT is commenced. The disease must be stable before assessing hypoxaemia since blood gasses may continue to improve for up to 3 months after an acute exacerbation. Two assessments, preferably 3 months apart, are essential before LTDOT is prescribed. Oxygen therapy must be prescribed according to need and not for humane reasons since it is evident that oxygen may be hazardous for patients when used inappropriately. All persons that are currently on LTDOT must be counselled and explained to prior withdrawal of oxygen therapy. The correct prescription of oxygen will prevent the emotional trauma of oxygen removal at a later stage, this can cause a tremendous amount of distress and anxiety to both the patients and the professional staff. Patient and family education, counselling and support are vital for the adequate and appropriate use of LTDOT.

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