Managing Home Oxygen in the Community

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Challenges of Delivering a Home Oxygen Service

- Delivering a cost effective Integrated Home Oxygen services
- Patient groups to be included
- Treatment concordance
- Safety and oxygen
- Knowledge of Home Oxygen Equipment
Components of a Home Oxygen Service

- Screening
- Assessment LTOT & Ambulatory
- Follow-up
- Service Integration
Screening Opportunities for Long Term Oxygen Therapy (LTOT)

Screening will prevent inappropriate prescribing & referrals ensuring cost effective service

Opportunities for Screening

- During COPD annual review in Primary Care
  - Severe & Very Severe COPD to have $\text{SpO}_2$ recorded
  - Availability of pulse oximeters required in Primary Care
- Pulmonary Rehabilitation
- During acute exacerbations patients to be identified as potentially requiring LTOT
  - Assessment should be undertaken during stable phase (at least 5 weeks post exacerbation)
Setting up of Home Oxygen Service

- Patients Groups (e.g. all adults, disease specific)
- Healthcare Setting
  - Acute Hospital or Community
  - Acute Hospital & Community
- Resources
  - Pulse Oximeters
  - Blood gas machine (e.g. i-Stat)
  - Space to undertake ambulatory oxygen assessments
  - Oxygen equipment for assessments
- Competent workforce
  - Knowledge & skills
  - Working environment (i.e. community visits)
Home Oxygen Service Follow-up

- Access to the home oxygen reports from oxygen supplier (authorisation required from HOS lead)
  - New HOOF’s & monthly list identifying changes
  - Monthly concordance report
- Patient & healthcare professional education
  - Oxygen is for hypoxaemia not breathlessness
- Prioritise follow-up of existing patients
  - Use reports to target zero usage
  - Determine when it is no longer cost effective to follow-up
- Identify & develop register of high risk patients
  - CO₂ retainers – provide oxygen alert card
  - Safety issues (Falls & Smokers)
- Audit against Key Performance Indicators (KPI’s)
### Patient Groups

<table>
<thead>
<tr>
<th>Hypoxaemia</th>
<th>Hypoventilation</th>
<th>Normoxic</th>
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<tbody>
<tr>
<td>● COPD</td>
<td>● Neuromuscular</td>
<td>● Cluster Headaches</td>
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<tr>
<td>● Bronchiectasis</td>
<td>● Chest Wall</td>
<td>● Palliative</td>
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<td>● ILD</td>
<td>● Obesity</td>
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<td>● Cystic Fibrosis</td>
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<td>● Heart Failure</td>
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Effect of LTOT on Survival

LTOT SURVIVAL CURVES

Cumulative percent survival

Time (months)

0 10 20 30 40 50 60 70

COT

NOT

MRC O_2

MRC controls

LTOT in COPD

- LTOT increases the survival of patients with chronic hypoxaemia ($\text{PaO}_2 \leq 7.3$ kPa) (NOTT 1980; MRC 1981).

- There is no benefit in the use of LTOT in COPD patients with a $\text{PaO}_2$ above 8kPa (Gorecka et al 1997; Haidl 2004).

- LTOT corrects nocturnal $\text{SaO}_2$, decreases sleep latency & improves sleep quality (Calverley et al 1982; Goldstein et al 1984).

- Severe cardiac arrhythmias have been reported during nocturnal hypoxia, when $\text{SaO}_2 < 80\%$ (Shepard et al 1985). Arrhythmias may be improved with LTOT (Tirlapur et al 1982).

- Relationships have been found between the degree of chronic hypoxaemia and psychological changes (Krop rt al 1973; Heaton et al 1983; Okubadejo et al 1996).
LTOT for Interstitial Lung Disease (ILD)

- Chronic hypoxaemia occurs in patients with severe ILD caused by diffusion abnormalities, shunting & ventilation perfusion inequalities.
- No RCT’s reporting the effects of LTOT in ILD.
- Uncontrolled studies demonstrated improvement in pulmonary haemodynamics with LTOT (Polonski 1994).
- Survival rates in ILD are worse compared to COPD, with mortality highest among patients with an FEV$_1$ < 2.1 litres. (Strom et al 1991; Gorecka et al 1992; Strom et al 1993).
A Cochrane review examined 9 published studies on oxygen therapy in CF

- Daytime and nocturnal hypoxaemia can be corrected with supplemental oxygen (Versteegh et al 1990)
- No improvement in survival, lung, or cardiac health (Mallory 2005).
- Improvements in school and work attendance (Zinman et al 1989).

LTOT in CF aims to improve tissue oxygenation and prevent complications associated with hypoxaemia, rather than to produce any survival benefits.
Restrictive lung disease may result from neuromuscular diseases (i.e. muscular dystrophy, poliomyelitis, or other factors affecting chest wall expansion (i.e. kyphoscoliosis thorocoplasty, severe obesity)

Patients with chest wall disease & neuromuscular disorders develop nocturnal hypoventilation which causes nocturnal **Hypoxia & Hypercapnia**

Respiratory muscle weakness contributes to REM-associated nocturnal hypoventilation (ATS/ERS Statement on Respiratory Muscle Testing, 2002)

Nocturnal hypoventilation may develop before daytime respiratory failure is apparent.

Respiratory failure can be exacerbated with the use of supplemental oxygen therapy.
Clinician must be vigilant for patient complaints of daytime sleepiness, fatigue and lethargy, morning headaches or impaired concentration that may signal sleep disruption and nocturnal hypoventilation.

Non-invasive ventilatory support is the treatment choice in these patients.

LTOT may be required additionally in the first few months of therapy but should be reviewed & withdrawn if necessary.

Sleep studies measuring SpO2 and TcCO2 should be performed in all patients for whom nocturnal ventilatory support is being considered.
Obstructive Sleep Apnoea

- Patients with obstructive sleep apnoea develop nocturnal hypoxia, related to upper airway obstruction.

- The conventional treatment for significant sleep apnoea is nasal CPAP (continuous positive airway pressure), which will correct the nocturnal hypoxia in most cases.

- LTOT administered on its own to patients with sleep apnoea can prolong the length of apnoeas and thus worsen symptoms.

- However, some patients with severe sleep apnoea, or those who have coexisting sleep apnoea and COPD (overlap syndrome), develop severe chronic hypoxaemia and may require supplemental oxygen at night with CPAP for a few months initially.
Chronic Heart Failure

- Little evidence exists that patients with treated chronic heart failure have hypoxaemia (*NICE, 2003*).
- Some normoxic patients may develop nocturnal hypoxaemia that may predispose to cardiac arrhythmias (*Obenza et al, 2000*).
- One small RCT of domiciliary oxygen for seven nights in patients with heart failure & Cheyne-Stokes respiration suggested some improvement in breathing pattern at night, but no improvement in awakenings or daytime sleepiness and functional status. (*Andreas et al 1996*)
Long-term oxygen therapy recommended if there is daytime hypoxaemia (PaO2 on air of < 7.3 kPa) or nocturnal hypoxaemia with SpO2 below 90% for at least 30% of the night. *(NICE, 2003)*

Randomised controlled trials are required of LTOT in heart failure, with outcome measures including sleep quality and quality of life.
There is no evidence of the effectiveness of LTOT in randomised controlled trials in patients with pulmonary hypertension, with the exception of COPD patients.

- In the NOTT trial, survival after 8 years was related to the decrease in mean PAP during the first 6 months of treatment.
- In the MRC trial, LTOT prevented a rise in PAP of 3 mmHg, seen in the control group, though a fall in PAP was not found.

- 6MWT Walking distances <332 m \textit{(Miyamoto et al 2001)} & O2 desaturation >10\% \textit{(Paciocco et al, 2001)} indicate impaired prognosis in PH

- There are data showing that nocturnal oxygen therapy does not modify the natural history of PH caused by Congenital Heart Disease \textit{(Sandoval et al, 2001)}
Pulmonary Hypertension
Recommendations

- All patients should have nocturnal oxygen saturation monitoring at initial assessment.
- Oxygen should be administered to maintain daytime & nocturnal PaO2 <8 kPa.
- Ambulatory oxygen can be considered in those with correctable exercise desaturation & symptomatic benefit.
- In-flight supplemental oxygen should be considered for all patients in WHO functional class III and IV or those with resting oxygen saturations <95%.

(Consensus statement on the management of pulmonary hypertension in clinical practice, 2008)
High flow oxygen therapy as a treatment for cluster headache comes from three studies:
- a case series with an unblinded cross-over study in 52 patients with cluster headache (Kudrow 1981)
- a small randomized double-blind cross-over study where 11 patients completed the study (Fogan 1985)
- a randomized double-blind, placebo-controlled trial with intention-to-treat data in 76 patients. High flow short-burst oxygen therapy (12 L/min) produced relief at 15 minutes in 78% compared to 20% for air (Cohen et al 2007).

NICE Headache guidelines (2012) recommend that high flow oxygen and/or triptan should be offered.

Use of 100% oxygen at a flow rate of at least 12 litres per minute with a non-rebreathing mask and a reservoir bag should be used for 15 minutes at the time of cluster headaches.
Home Oxygen Assessment
Hypoxaemia

- Blood gases to determine presence of hypoxaemia
  \(\text{PaO}_2 \leq 7.3 \text{ kPa}\)

- Blood gases to determine flow rate to raise the waking oxygen tension above 8 kPa.

- LTOT indicated in patients with chronic hypoxaemia when:
  - \(\text{PaO}_2\) is \(\leq 7.3 \text{ kPa}\)
  - \(\text{PaO}_2\) is between 7.3 and 8 kPa, in the presence of nocturnal hypoxaemia, pulmonary hypertension or peripheral oedema.

- LTOT at least 15 hours daily, to include night time.
Ambulatory Oxygen Assessment

Who should be considered

- Prescribed in patients with LTOT (PaO$_2$<7.3)
- Patients with exercise desaturation
  - SpO$_2$ at least <90% & drop of 4% from baseline

Assessment

- 6 minute walking test (on air and oxygen)
  - Lowest SpO$_2$, Distance walked, BORG score pre & post
- Check for significant exercise desaturation
- Check that flow of oxygen corrects hypoxaemia
- Conserving device allows cylinder to last 3 times longer, however need to check patient triggers it
Sleep Study (SaO2 & TcCO2) on air
- SaO2 <90%
- TcCO2 raised

Sleep Study (SaO2 & TcCO2) on NIV
- To titrate NIV settings
- To determine if oxygen is required
Home Oxygen Assessment
Normoxic
(Cluster Headaches)

- Assessment of auras
  - To determine if Static and ambulatory cylinders required.
- Confirmed diagnosis
- Initial visit education and risk assessment
- Telephone review to check if still wanting to keep oxygen
Purpose of Home Oxygen Follow-up

- **Review of clinical status:**
  - Optimise medical therapy, education and rehabilitation.
  - Assess for clinical deterioration or improvement to ensure that oxygen is still required and that the prescription is correct.
  - Assess psychological & social barriers

- **Review of equipment use:**
  - Use of oxygen - hours per day, flow rates and delivery system.
  - Ensuring that the equipment is appropriate
  - Safety issues including fire hazards and smoking are assessed.

- **Review of oxygen prescription:**
  - Ensuring that hypoxaemia is corrected using pulse oximetry.
  - Evaluating hypercapnoea using arterial blood gas analysis.

- **Communication:**
  - Communication of the findings of the assessment during follow-up to appropriate healthcare professionals

(Restrick et al 1993; Pepin et al 1996; Atis et al 2001; Peckham 1998; Cullen 2006)
THANK YOU