Policy for the Prescription and Administration of Emergency Oxygen in Adults

Prepared by: Dr Annika Graham (Consultant Physician with an interest in Respiratory Medicine)
Dr Nicholas Scriven (Consultant Physician with an interest in
Sue Wood (Respiratory Nurse Specialist)
Sally Feltham (Respiratory Nurse Specialist)
with support from the CHFT oxygen working group

Date: July 2009
Review Date: July 2011
Approved by: Medicines Management Committee – 9 July 2009
Contents

1. Introduction
2. Aim
3. Prescribing, administering and monitoring oxygen and emergency situations
4. Exclusions
5. Specialist areas
6. Indications
7. Contra indications
8. Cautions
9. Transfer and transportation of patients receiving oxygen therapy
10. Peri-operatively and immediately post operatively
11. Nebulised therapy and oxygen
12. Normal oxygen saturation ranges
13. Administration protocol
14. Humidification
15. Implementation
16. Health and Safety
17. References
18. Appendices
   a) Table 1 Critical illnesses requiring high levels of supplemental oxygen
   b) Table 2 Serious illnesses requiring moderate levels of supplemental oxygen if the patient is hypoxaemic
   c) Table 3 COPD and other conditions requiring controlled or low-dose oxygen therapy
   d) Table 4 Conditions for which patients should be monitored closely oxygen therapy is not required unless the patient is hypoxaemic
   e) Figure 1 Oxygen prescription for acutely hypoxaemic patients in hospital
   f) Oxygen prescription
   g) Administering acute oxygen therapy
   h) Equipment used in the delivery of oxygen
   i) Flow Chart for oxygen administration
   j) Personnel who may administer oxygen
   k) Adult Patient Observation Chart, including codes for oxygen delivery and incorporating the trust adult modified early warning score system (Mews)
   l) Monitoring of patients
   m) Humidification
   n) Health and safety
1 INTRODUCTION

The administration of supplemental oxygen is an essential element of appropriate management for a wide range of clinical conditions; however oxygen is a drug and therefore requires prescribing in all but emergency situations. Failure to administer oxygen appropriately can result in serious harm to the patient. The safe implementation of oxygen therapy with appropriate monitoring is an integral component of the Healthcare Professional's role.

2 AIM

The aim of this protocol is to ensure that:

- All patients who require supplementary oxygen therapy receive therapy that is appropriate to their clinical condition and in line with national guidance (BTS Guideline; Thorax, 2008).
- Oxygen will be prescribed according to a target saturation range. The system of prescribing target saturation aims to achieve a specified outcome, rather than specifying the oxygen delivery method alone.
- Those who administer oxygen therapy will monitor the patient and keep within the target saturation range.

3 PRESCRIBING, ADMINISTERING AND MONITORING OXYGEN

3.1 Identifying appropriate target saturations

Guidance on identifying appropriate saturations for patients is provided for the medical staff and other prescribers in Appendices a-e (table 1-4 and figure 1 in the guideline). In summary oxygen should be prescribed to achieve a target saturation of 94-98% for most acutely unwell patients or 88-92% for those at risk of hypercapnic respiratory failure.

3.2 Prescribing oxygen on the drug chart

An oxygen section on the drug chart has been designed to assist prescription and administration. Oxygen should be prescribed in the designated section of the hospital prescription card (Appendix f) and the appropriate target saturation should be circled on the chart (or if target saturations are not indicated the relevant box should be ticked).

3.3 Administering oxygen

Once the target saturation has been identified and prescribed, guidance regarding the most appropriate delivery system to reach and maintain the prescribed saturation is provided for those administering oxygen in Appendix (g), (h) and (i). Personnel who may administer oxygen is shown in Appendix (j).

3.4 Monitoring and recording oxygen

The patient's oxygen saturation and oxygen delivery system should be recorded on the bedside observation chart alongside other physiological variables as shown in Appendix (k). This appendix also specifies the codes for oxygen delivery devices to be recorded on the observation chart. Patients should thus be monitored as specified in Appendix (l).

All patients on oxygen therapy should have regular pulse oximetry measurements. The frequency of oximetry measurements will depend on the condition being treated and the stability of the patient. Critically ill patients should have their oxygen saturations monitored continuously and recorded every few minutes whereas patients with mild breathlessness due to a stable condition will need less frequent monitoring.
Oxygen therapy should be increased if the saturation is below the desired range and decreased if the saturation is above the desired range (and eventually discontinued as the patient recovers). See section 13 and Appendix (i) for more details.

Any sudden fall in oxygen saturation should lead to clinical evaluation of the patient and in most cases, measurement of blood gases.

Patients on oxygen should have their saturations recorded at in line with the Trust’s minimum observation policy. (See Appendix k and Appendix l)

Patients should be monitored accurately for signs of improvement or deterioration. Nurses should also monitor skin colour for peripheral cyanosis and respiratory rate. Oxygen saturations of less than 90%, with or without oxygen, noisy or laboured breathing or respiratory rate of less than 8 or more than 25 should be reported immediately to the medical team, according to the early warning or Track & Trigger Early warning system in Appendix (k).

### 3.5 Emergency situations

In the emergency situation an oxygen prescription is not required. Oxygen should be given to the patient immediately without a formal prescription or drug order but documented later in the patient’s record.

All peri-arrest and critically ill patients should be given 100% oxygen (15 l/m reservoir mask) whilst awaiting immediate medical review. Patients with COPD and other risk factors for hypercapnia who develop critical illness should have the same initial target saturations as other critically ill patients pending the results of urgent blood gas results after which these patients may need controlled oxygen therapy or supported ventilation if there is severe hypoxaemia and/or hypercapnia with respiratory acidosis.

All patients who have had a cardiac or respiratory arrest should have 100% Oxygen provided along with basic/advanced life support.

A subsequent written record must be made of what oxygen therapy has been given to every patient alongside the recording of all other emergency treatment.

Any qualified nurse/health professional can commence oxygen therapy in an emergency situation.

### 4 EXCLUSIONS

- Patients admitted to specialist areas with a specialised oxygen prescribing policy (see section 5 of this policy document)
- Patients receiving oxygen as part of palliative care or patients on the end of life care pathway (in which case, the prescriber should tick the box ‘target saturations not indicated’ on the drug chart).
- Patients admitted for Long Term Oxygen Therapy assessment.
5 SPECIALIST AREAS
This policy is for general use within general wards and departments. Where specific clinical guidelines are required for oxygen administration within specialist areas, they must be approved via the appropriate clinical governance forum. They should reflect wherever possible the principles within this policy. Patients transferring from specialist areas must be transferred with a prescription for their oxygen therapy utilising target saturation, if the clinical indication is ongoing. If a patient transfers from an area not utilising the target saturation system, their oxygen should be administered as per the transferring area’s prescription until the patient is reviewed and transferred over to the target saturation scheme, which should occur as soon as possible.

6 INDICATIONS
The rationale for oxygen therapy is prevention of cellular hypoxia, caused by hypoxaemia (low PaO2), and thus prevention of potentially irreversible damage to vital organs.

Therefore the most common reasons for oxygen therapy to be initiated are:
• Acute hypoxaemia (for example pneumonia, shock, asthma, heart failure, pulmonary embolus)
• Ischaemia (for example myocardial infarction, but only if associated with hypoxaemia (abnormally high levels may be harmful to patients with ischaemic heart disease and stroke).
• Abnormalities in quality or type of haemoglobin (for example acute GI blood loss or carbon monoxide poisoning).

Other indications include:
• Pneumothorax – Oxygen may increase the rate of resolution of pneumothorax in patients for whom a chest drain is not indicated.
• Post operative state (general anaesthesia can lead to decrease in functional residual capacity with in the lungs (especially following thoracic or abdominal surgery) resulting in hypoxaemia (Ferguson 1999). There is some evidence to suggest a decreased incidence of post operative wound infections with short-term oxygen therapy following bowel surgery.

7 CONTRA-INDICATIONS
There are no absolute contraindications to oxygen therapy if indications are judged to be present. The goal of oxygen therapy is to achieve adequate tissue oxygenation using the lowest possible FiO2. Supplemental O2 should be administered with caution in patients suffering from paraquat poisoning (BNF 2005) and with acid inhalation or previous bleomycin lung injury.

8 CAUTIONS
8.1. Oxygen administration and carbon dioxide retention

In patients with chronic carbon dioxide retention, oxygen administration may cause further increases in carbon dioxide and respiratory acidosis. This may occur in patients with COPD, neuromuscular disorders, morbid obesity or musculoskeletal disorders. There are several factors which lead to the rise in CO2 with oxygen therapy in patients with hypercapnic respiratory failure and details are in the BTS guideline.
8.2. Other precautions/ Hazards/ Complications of oxygen therapy

- Drying of nasal and pharyngeal mucosa
- Oxygen toxicity
- Absorption atelectasis
- Skin irritation
- Fire hazard
- Potentially inadequate flow resulting in lower FiO₂ than intended due to high inspiratory demand or inappropriate oxygen delivery device or equipment faults

9 TRANSFER AND TRANSPORTATION OF PATIENTS RECEIVING OXYGEN

Patients who are transferred from one area to another must have clear documentation of their ongoing oxygen requirements and documentation of their oxygen saturation. If a patient transfers from an area not utilising the target saturation system (see specialist areas above) their oxygen should be administered as per the transferring areas prescription until the patient is reviewed and transferred over to the target saturation scheme, which should occur as soon as possible.

Patients requiring oxygen therapy whilst being transferred from one area to another should be accompanied by a trained member of the nursing staff wherever possible. If this does not occur, clear instructions must be provided for personnel involved in the transfer of the patient, which must include delivery device and flow rate.

10 PERI-OPERATIVE AND IMMEDIATELY POST OPERATIVELY

The usual procedure for prescribing oxygen therapy in these areas should be adhered to, utilising the target saturation. If a patient is transferred back to the ward on oxygen therapy and is not on the target saturation system, the need for ongoing oxygen therapy should be reviewed as soon as possible. If oxygen therapy is to be continued, it should be prescribed using the target saturation scheme unless there is an alternative time-limited instruction which is part of the Trust's Post-Operative care policy for selected patients.

11 NEBULISED THERAPY AND OXYGEN

When nebulised therapy is administered to patients at risk of hypercapnic respiratory failure (see section 8.1), it should be driven by compressed air. If necessary, supplementary oxygen should be given concurrently by nasal prongs at 1-4 litres per minute to maintain an oxygen saturation of 88-92% or other specified target range.

All patients requiring 35% or greater oxygen therapy should have their nebulised therapy by oxygen at a flow rate of >6 litres/minute.

12 NORMAL OXYGEN SATURATIONS

- In adults less than 70 years of age at rest at sea level 96% - 98% when awake.
- Aged 70 and above at rest at sea level greater than 94% when awake.
- Patients of all ages may have transient dips of saturation to 84% during sleep.
<table>
<thead>
<tr>
<th>ACTION</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients requiring oxygen therapy will have a prescription for oxygen therapy recorded on the patients drug prescription chart. N.B exceptions- see emergency situations</td>
<td>Oxygen should be regarded as a drug and should be prescribed. BTS National guidelines (2008). British National Formulary (2008).</td>
</tr>
<tr>
<td>The prescription will incorporate a target saturation that will be identified by the clinician prescribing the oxygen in accordance with the Trust’s oxygen guideline</td>
<td>Certain groups of patients require different target ranges for their oxygen saturation, see Tables 1-4. Certain groups of patients are at risk of hyperoxaemia, particularly patients with COPD.</td>
</tr>
<tr>
<td>The prescription will incorporate an initial starting dose (i.e. delivery device and flow rate)</td>
<td>To provide the nurses with guidance for the appropriate starting point for the oxygen delivery system and flow rate</td>
</tr>
<tr>
<td>The drug chart should be signed at every drug round</td>
<td>To ensure that the patient is receiving oxygen if prescribed and to consider weaning and discontinuation</td>
</tr>
<tr>
<td>Once oxygen is in situ the nurse will monitor observations in line with trust policy. All patients should have their oxygen saturation observed for at least five minutes after starting oxygen therapy. If a patient is receiving intermittent therapy they may be monitored at least 8 hourly.</td>
<td>To identify if oxygen therapy is maintaining the target saturation or if an increase or decrease in oxygen therapy is required</td>
</tr>
<tr>
<td>The oxygen delivery device and oxygen flow rate should be recorded alongside the oxygen saturation on the bedside observation chart.</td>
<td>To provide an accurate record and allow trends in oxygen therapy and saturation levels to be identified.</td>
</tr>
<tr>
<td>Oxygen saturations must always be interpreted alongside the patients clinical status incorporating the early warning score.</td>
<td>To identify early signs of clinical deterioration, e.g. elevated respiratory rate</td>
</tr>
<tr>
<td>If the patient falls outside of the target saturation range, the oxygen therapy will be adjusted accordingly. The saturation should be monitored continuously for at least 5 minutes after any increase or decrease in oxygen dose to ensure that the patient achieves the desired saturation range.</td>
<td>To maintain the saturation in the desired range.</td>
</tr>
<tr>
<td><strong>Saturation higher than target specified or &gt;98% for an extended period of time.</strong></td>
<td></td>
</tr>
<tr>
<td>Step down oxygen therapy as per guidance for delivery</td>
<td>The patient will require weaning down from current oxygen delivery system. See Appendix (i)</td>
</tr>
<tr>
<td>Consider discontinuation of oxygen therapy</td>
<td>The patients clinical condition may have improved negating the need for supplementary oxygen</td>
</tr>
<tr>
<td>Action</td>
<td>Rationale</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Saturation lower than target specified</strong></td>
<td>In most instances a fall in oxygen saturation is due to deterioration of the patient however equipment faults should be checked for.</td>
</tr>
<tr>
<td>Check all elements of oxygen delivery system for faults or errors.</td>
<td></td>
</tr>
<tr>
<td>Step up oxygen therapy as per protocols in appendix (i). Any sudden fall in oxygen saturation should lead to clinical evaluation and in most cases measurement of blood gases</td>
<td>To assess the patients response to oxygen increase, and ensure that PaCO2 has not risen to an unacceptable level, or Ph dropped to an unacceptable level and to screen for the cause of deteriorating oxygen level (e.g. pneumonia, heart failure etc)</td>
</tr>
<tr>
<td>Monitor Early Warning Score and respiratory rate for further clinical signs of deterioration</td>
<td>Patient safety</td>
</tr>
<tr>
<td><strong>Saturation within target specified</strong></td>
<td></td>
</tr>
<tr>
<td>Continue with oxygen therapy, and monitor patient to identify appropriate time for stepping down therapy, once clinical condition allows</td>
<td></td>
</tr>
<tr>
<td>A change in delivery device (without an increase in O2 therapy) does not require review by the medical team.</td>
<td>(The change may be made in stable patients due to patient preference or comfort).</td>
</tr>
<tr>
<td><strong>Oxygen delivery methods</strong></td>
<td>Previous audits have demonstrated wide variations in delivery devices across clinical areas, potentially increasing the risk of adverse incidents</td>
</tr>
<tr>
<td>The Trusts recommended delivery devices will be utilised to ensure a standardised approach to oxygen delivery, see Appendix (h)</td>
<td></td>
</tr>
</tbody>
</table>

14 **HUMIDIFICATION**
Humidification may be required for some patient groups, especially patients with a tracheostomy and those who have difficulty in clearing airway secretions or mucus. See Appendix (m).

15 **IMPLEMENTATION**
All nurses, nursing assistants and other healthcare professionals involved in prescribing or administrating oxygen should be taught on the oxygen policy. Teaching aides are available on [www.brit-thoracic.org/emergencyoxygen](http://www.brit-thoracic.org/emergencyoxygen). A record of all those who have been taught will be kept.

All doctors should be taught about the oxygen policy. Teaching aids are available on the BTS website. Audits will be performed in all clinical areas. Audit proformas are available on the BTS website. The hospital will participate in the national audits organised by the BTS.

The BTS has appointed oxygen champions in all Trusts to help introduce the Guideline. Dr Annika Graham and Sally Feltham (HRI) and Dr Nicholas Scriven and Sue Wood (CRH) are the Oxygen Champions within CHFT.

16 **HEALTH AND SAFETY ISSUES** are covered in Appendix (n).
REFERENCES

- Summary of prescription, administration and discontinuation of oxygen therapy. Available on BTS website: www.brit-thoracic.org.uk/emergencyoxygen/
## Table 1 Critical illnesses requiring high levels of supplemental oxygen (see section 8.10)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Additional comments</th>
<th>Grade of recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac arrest or resuscitation</td>
<td>Use bag-valve mask during active resuscitation</td>
<td>Grade D</td>
</tr>
<tr>
<td>Stock, sepsis, major trauma, near-drowning, asphyxia, major pulmonary haemorrhage</td>
<td>Also give specific treatment for the underlying condition</td>
<td>Grade D</td>
</tr>
<tr>
<td>Major head injury</td>
<td>Early intubation and ventilation if comatose</td>
<td>Grade D</td>
</tr>
<tr>
<td>Carbon monoxide poisoning</td>
<td>Give as much oxygen as possible using a bag-valve mask or reservoir mask. Check carboxyhaemoglobin levels.</td>
<td>Grade C</td>
</tr>
<tr>
<td></td>
<td>A normal or high oximetry reading should be disregarded because saturation monitors cannot differentiate between carboxyhaemoglobin and oxyhaemoglobin owing to their similar absorbance. The blood gas PaO2 will also be normal in these cases (despite the presence of tissue hypoxia).</td>
<td></td>
</tr>
</tbody>
</table>

(COPD, chronic obstructive pulmonary disease. PaO2, arterial oxygen tension.)
# Table 2  Serious illnesses requiring moderate levels of supplemental oxygen if the patient is hypoxaemic

<table>
<thead>
<tr>
<th>Additional comments</th>
<th>Grade of recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute hypoxaemia (cause not yet diagnosed)</td>
<td>Grade D</td>
</tr>
<tr>
<td>Reservoir mask at 10–15 l/min if initial SpO₂ &lt; 85%, otherwise nasal cannula or simple face mask.</td>
<td>Grade D</td>
</tr>
<tr>
<td>Patients requiring reservoir mask therapy need urgent clinical assessment by senior staff.</td>
<td></td>
</tr>
<tr>
<td>Acute asthma</td>
<td>Grade C</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Grade C</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>Grade C</td>
</tr>
<tr>
<td>Postoperative breathlessness</td>
<td>Grade D</td>
</tr>
<tr>
<td>Management depends on underlying cause.</td>
<td></td>
</tr>
<tr>
<td>Acute heart failure</td>
<td>Grade D</td>
</tr>
<tr>
<td>Consider CPAP or NIV in cases of pulmonary oedema</td>
<td></td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>Grade D</td>
</tr>
<tr>
<td>Most patients with minor pulmonary embolism are not hypoxaemic and do not require oxygen therapy.</td>
<td></td>
</tr>
<tr>
<td>Pleural effusions</td>
<td>Grade D</td>
</tr>
<tr>
<td>Most patients with pleural effusions are not hypoxaemic. If hypoxaemic, treat by draining the effusion as well as giving oxygen therapy.</td>
<td></td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>Grade D</td>
</tr>
<tr>
<td>Frees aspiration or drainage if the patient is hypoxaemic. Most patients with pneumothorax are not hypoxaemic and do not require oxygen therapy.</td>
<td></td>
</tr>
<tr>
<td>Use a reservoir mask at 10–15 l/min if admitted for observation. Aim at 100% saturation (oxygen accelerates clearance of pneumothorax if drainage is not required).</td>
<td></td>
</tr>
<tr>
<td>Deterioration of lung fibrosis or other interstitial lung disease</td>
<td>Grade D</td>
</tr>
<tr>
<td>Reservoir mask at 10–15 l/min if initial SpO₂ &lt; 85%, otherwise nasal cannula or simple face mask.</td>
<td></td>
</tr>
<tr>
<td>Severe anaemia</td>
<td>Grade B and D</td>
</tr>
<tr>
<td>The main issue is to correct the anaemia. Most anaemic patients do not require oxygen therapy.</td>
<td></td>
</tr>
<tr>
<td>Sickle cell crisis</td>
<td>Grade B</td>
</tr>
<tr>
<td>Requires oxygen only if hypoxaemic (below the above target ranges or below what is known to be normal for the individual patient). Low oxygen tension will cause vasoconstriction.</td>
<td></td>
</tr>
</tbody>
</table>

CPD: chronic obstructive pulmonary disease; CPAP: continuous positive airway pressure; IPPV: intermittent positive pressure ventilation; NIV, non-invasive ventilation; Pco₂, arterial carbon dioxide tension; SpO₂, arterial oxygen saturation measured by pulse oximetry.
## Table 3  COPD and other conditions requiring controlled or low-dose oxygen therapy (section 8.12)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Grade of recommendation</th>
<th>Additional comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD</td>
<td>Grade C</td>
<td>May need lower range if acidic or if known to be very sensitive to oxygen therapy. Ideally use alert cards to guide treatment based on previous blood gas results. Increase flow by 50% if respiratory rate is &gt;30 (see recommendation 32).</td>
</tr>
<tr>
<td>Exacerbation of CF</td>
<td>Grade D</td>
<td>Admit to regional CF centre if possible; if not, discuss with regional centre or manage according to protocol agreed with regional CF centre. Ideally use alert cards to guide therapy. Increase flow by 50% if respiratory rate is &gt;30 (see recommendation 32).</td>
</tr>
<tr>
<td>Chronic neuromuscular disorders</td>
<td>Grade D</td>
<td>May require ventilatory support. Risk of hyperoxic respiratory failure.</td>
</tr>
<tr>
<td>Chest wall disorders</td>
<td>Grade D</td>
<td>For acute neuromuscular disorders and subacute conditions such as Guillain-Barré syndrome (see table 4).</td>
</tr>
<tr>
<td>Morbid obesity</td>
<td>Grade D</td>
<td></td>
</tr>
</tbody>
</table>

CF, cystic fibrosis; COPD, chronic obstructive pulmonary disease; CPAP, continuous positive airway pressure; IPPV, intermittent positive pressure ventilation; NIV, non-invasive ventilation; Pao₂, arterial carbon dioxide tension; Pao₂, arterial oxygen saturation measured by pulse oximetry.
# Conditions for which patients should be monitored closely but oxygen therapy is not required unless the patient is hypoxaemic

<table>
<thead>
<tr>
<th>Condition</th>
<th>Additional comments</th>
<th>Grade of recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial infarction and acute coronary syndromes</td>
<td>Most patients with acute coronary artery syndrome are not hypoxaemic and the benefits/harms of oxygen therapy are unknown in such cases.</td>
<td>Grade D</td>
</tr>
<tr>
<td>Stroke</td>
<td>Most stroke patients are not hypoxaemic. Oxygen therapy may be harmful for non-hypoxaemic patients with mild to moderate strokes.</td>
<td>Grade D</td>
</tr>
<tr>
<td>Pregnancy and obstetric emergencies</td>
<td>Oxygen therapy may be harmful to the fetus if the mother is not hypoxaemic (see recommendations 16-17).</td>
<td>Grades A–D</td>
</tr>
<tr>
<td>Hyperventilation or dysfunctional breathing</td>
<td>Exclude organic illness. Patients with pure hyperventilation due to anxiety or panic attacks are unlikely to require oxygen therapy. Rebreathing from a paper bag may cause hypoxaemia and is not recommended.</td>
<td>Grade C</td>
</tr>
<tr>
<td>Meth poisoning and drug overdose (see table 1 for carbon monoxide poisoning)</td>
<td>Hypoxaemia is more likely with respiratory depressant drugs. Give antidote if available (e.g. naloxone for opiate poisoning).</td>
<td>Grade D</td>
</tr>
<tr>
<td>Poisoning with paracetamol or bismuthin</td>
<td>Patients with paracetamol or bismuthin lung injury may be harmed by supplemental oxygen.</td>
<td>Grade C</td>
</tr>
<tr>
<td>Metabolic and renal disorders</td>
<td>Most do not need oxygen (tachypnoea may be due to acidosis in these patients).</td>
<td>Grade D</td>
</tr>
<tr>
<td>Acute and subacute neurological and muscular conditions producing muscle weakness</td>
<td>These patients may require ventilatory support and they need careful monitoring which includes spirometry. If the patient's oxygen level falls below the target saturation, they need urgent blood gas measurements and are likely to need ventilatory support.</td>
<td>Grade C</td>
</tr>
</tbody>
</table>

COPD, chronic obstructive pulmonary disease; ICU, intensive care unit; IPPV, intermittent positive pressure ventilation; NIV, non-invasive ventilation; $P_{aCO_2}$, arterial carbon dioxide tension; $S_{O_2}$, arterial oxygen saturation measured by pulse oximetry.
Emergency Oxygen Use in Adult Patients:
Chart 1: Oxygen prescription for acutely hypoxaemic patients in hospital

Any increase in PO₂ must be followed by repeat APO₂ in 1 h or sooner if conscious level deteriorates

1. If pH is 7.5 (HCO₃⁻ > 40 mEq/l with normal or low PaCO₂, investigate and treat metabolic acidosis and keep SpO₂ 84-98%

2. Potentialiy requiring IMV or CPAP should have a target range of 90-94% unless FO₂ is reduced due to PO₂ transition failure

Figure 1: Chart 1: Oxygen prescription for acutely hypoxaemic patients in hospital. ABE arteriolar blood gas, COPD chronic obstructive pulmonary disease, FIO₂ fraction of inspired oxygen, ICU intensive care unit, IV intravenous infusion, PaCO₂ carbon dioxide tension, SpO₂ arterial oxygen saturation measured by pulse oximetry.
November 2009
Oxygen Prescription is still in the development stage
<table>
<thead>
<tr>
<th>ACTION</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ensure patency of airway</td>
<td>To promote effective oxygenation</td>
</tr>
<tr>
<td>2. The type of delivery system used will depend on the needs and comfort of the patient. It is the nurses role to assess the patient and use the prescribed system.</td>
<td>To provide accurate oxygen delivery to the patient. Most stable patients prefer nasal cannulae to masks</td>
</tr>
<tr>
<td>3. Ensure oxygen is prescribed on prescription chart. In some situations a protocol may be in place to allow designated nurses to administer oxygen. In these cases the doctor must review the patients condition within the stated time and prescribe oxygen accordingly.</td>
<td>To ensure a complete record is maintained and expedite patient treatment. The exception to this action would be during an emergency situation where the resuscitation guideline should be followed.</td>
</tr>
<tr>
<td>4. Ensure that the oxygen dose is clearly indicated. If nasal cannula or reservoir masks are being used check that the flow rate is clearly indicated.</td>
<td>In accordance with the administration of medicines policy.</td>
</tr>
<tr>
<td>5. Inform patient and or relative/ carer of the combustibility of oxygen</td>
<td>Oxygen supports combustion therefore there is always a danger of fire when oxygen is being used.</td>
</tr>
<tr>
<td>6. Show and explain the oxygen delivery system to the patient. Give the patient the information sheet about oxygen.</td>
<td>To obtain consent and cooperation</td>
</tr>
<tr>
<td>7. Assemble the oxygen delivery system carefully as shown in Appendix (h).</td>
<td>To ensure oxygen is given as prescribed</td>
</tr>
<tr>
<td>8. Attach oxygen delivery system to oxygen source.</td>
<td>To ensure oxygen supply is ready</td>
</tr>
<tr>
<td>9. Attach oxygen delivery system to patient according to manufacturers instructions.</td>
<td>For oxygen to be administered to patient</td>
</tr>
<tr>
<td>10. Turn on oxygen flow in accordance with prescription and manufacturers instruction.</td>
<td>To administer correct % of oxygen.</td>
</tr>
<tr>
<td>11. Ensure patient has either a drink or a mouthwash within reach.</td>
<td>To prevent drying or the oral mucosa.</td>
</tr>
<tr>
<td>12. Clean oxygen mask as required with general purpose detergent and dry thoroughly needed. Discard system after use.</td>
<td>To minimise risk of infection (Single patient device)</td>
</tr>
</tbody>
</table>
EQUIPMENT USED IN THE DELIVERY OF OXYGEN  (Choose the appropriate delivery device)

1. Oxygen source  (piped or cylinder)
2. Flow meter
3. Saturation monitor
4. Oxygen Delivery system - (see appendix j for advice on use of each device);

A) Nasal cannula

**DEVICE**

**DESCRIPTION**

Nasal cannulae consist of pair of tubes about 2cm long, each projecting into the nostril and stemming from a tube which passes over the ears and which is thus self-retaining.

**PURPOSE**

Cannulae are preferred to masks by most patients. They have the advantage of not interfering with feeding and are not as inconvenient as masks during coughing and sneezing. It is not advisable to assume what percent oxygen (FI02) the patient is receiving according to the Litres delivered but this is not important if the patient is in the correct target range.

**ACTION**

1. (When using nasal cannula). Position the tips of the cannula in the patient’s nose so that the tips do not extend more than 1.5cm into the nose.

2. Place tubing over the ears and under the chin as shown above. Educate patient re prevention of pressure areas on the back of the ear.

3. Adjust flow rate, usually 2-4 l/min but may vary from 1-6 l/min in some circumstances.

**RATIONALE**

Overlong tubing is uncomfortable, which may make the patient reject the procedure. Sore nasal mucosa can result from pressure or friction of tubing that is too long. To allow optimum comfort for the patient. To prevent pressure sores.

Set the flow rate to achieve the desired target oxygen saturation.
### DEVICE DESCRIPTION PURPOSE

**Venturi mask**

A mask incorporating a device to enable a fixed concentration of oxygen to be delivered independent of patient factors or fit to the face or flow rate. Oxygen is forced out through a small hole causing a Venturi effect which enables air to mix with oxygen.

**Controlled oxygen therapy**

This is a high performance oxygen mask designed to deliver a specified oxygen concentration regardless of breathing rate or tidal volume.

Venturi devices come in different colours for%

Blue = 24%
White = 28%
Yellow = 35%
Red = 40%
Green = 60%

### ACTION RATIONALE

**ACTION**

1. (When using Venturi mask) Connect the mask to the appropriate Venturi barrel attached firmly into the mask inlet.

Rationale: To ensure that patient receives the correct concentration of oxygen

2. Fasten oxygen tubing securely.

Rationale: Correctly secured tubing is comfortable and prevents displacement of mask/cannulae.

3. Assess the patient’s condition and functioning of equipment at regular intervals according to care plan.

Rationale: To ensure patient's safety and that oxygen is being administered as prescribed.

4. Adjust flow rate. The minimum flow rate is indicated on the mask or packet. The flow should be doubled if the patient has a respiratory rate above 30 per minute.

Rationale: Higher flows are required for patients with rapid respiration and high inspiratory flow rates. This does not affect the concentration of oxygen but allows the gas flow rate to match the patient’s breathing pattern.
C) Simple face mask (variable flow)

**DEVICE**

Simple face mask
Variable Percentage
(Delivers unpredictable concentrations that vary with flow rate)

**DESCRIPTION**

Mask has a soft plastic face piece, vent holes are provided to allow air to escape. Maximum 50%-60% at 15ltrs/minute flow.

**PURPOSE**

This is a variable performance device. The oxygen concentration delivered will be influenced by:

a. the oxygen flow rate (litres per minute) used, leakage between the mask and face;

b. the patient's tidal volume and breathing rate.

NOT to be used for CO₂ retaining patients.

**ACTION**

(If using simple face mask) Gently place mask over the patient’s face, position the strap behind the head or the loops over the ears then carefully pull both ends through the front of the mask until secure. Check that strap is not across ears and if necessary insert padding between the strap and head.

Adjust the oxygen flow rate. Must never be below 5L/min

**RATIONALE**

Ensure a comfortable fit and delivery of prescribed oxygen is maintained.

To prevent irritation.

Flows below 5L/m do not give enough oxygen and may cause increased resistance to breathing and may also cause CO₂ re-breathing due to the small mask size.

*Nasal cannulae should be used for most patients who require medium dose oxygen but a simple face mask may be used due to patient preference or if the nose is blocked*
### Reservoir mask (non re-breathe mask)

**DEVICE**  
Reservoir Mask  
(Non-rebreath Mask)

**DESCRIPTION**  
Mask has a soft plastic face piece with flap-valve exhalation ports which may be removed for emergency air-intake. There is also a one-way valve between the face mask and reservoir bag.

**PURPOSE**  
In non re-breathing systems the oxygen may be stored in the reservoir bag during exhalation by means of a one-way valve. High concentrations of oxygen 80-90% can be achieved at relatively low flow rates.

**Uncontrolled oxygen therapy**

**NOT to be used for CO2 retaining patients except in life-threatening emergencies such as cardiac arrest or major trauma.**

**ACTION**

1. (Non Rebreathe Reservoir Mask)  
   Ensure the reservoir bag is inflated before placing mask on patient, this can be maintained by using 10-15 litres of oxygen per min.

2. Adjust the oxygen flow to the prescribed rate.

**RATIONALE**

To ensure the optimal flow of oxygen to the patient

Inadequate flow rates may result in administration of inadequate oxygen concentration to the patient

In disposable reservoir, oxygen flows directly into the mask during inspiration and into the reservoir bag during exhalation. All exhaled air is vented through a port in the mask and a one-way valve between the bag and mask, which prevents re-breathing.
### E) Tracheostomy mask for patients with tracheostomy or laryngectomy

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>DESCRIPTION</th>
<th>PURPOSE</th>
</tr>
</thead>
</table>
| Mask designed for "neck breathing patients". Fits comfortably over tracheostomy or tracheotomy. Exhalation port on front of mask. | This is a variable performance device for patients with tracheostomy or tracheotomy. The oxygen concentration delivered will be influenced by:  
a. the oxygen flow rate (litres per minute) used.  
b. the patient's tidal volume and breathing rate. |

#### DEVICE

<table>
<thead>
<tr>
<th>Tracheostomy mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Percentage</td>
</tr>
<tr>
<td>(Delivers unpredictable concentrations that vary with flow rate)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACTION</th>
<th>RATIONALE</th>
</tr>
</thead>
</table>
| Gently place mask over the patient's airway, position the strap behind the head then carefully pull both ends through the front of the mask until secure.  
Adjust the oxygen flow rate to achieve the desired target saturation range. Start at 4 l/min and adjust the flow up or down as necessary to achieve the desired oxygen saturation range. | Ensure a comfortable fit and delivery of prescribed oxygen is maintained.  
To ensure that the correct amount of oxygen is given to keep the patient in the target range. |

#### Purposely controlled oxygen therapy

Use cautiously at low flow rates in CO2 retaining patients as there may be no alternative.
**F) Oxygen Flow Meter**

**DEVICE**

![Image of oxygen flow meter]

**DESCRIPTION**

Device to allow the patient to receive an accurate flow of oxygen, usually between 2 and 15 litres per minute.

May be wall-mounted or on a cylinder.

Take special care if your Trust uses a twin oxygen outlets or if there are air outlets which may be mistaken for oxygen outlets.

**PURPOSE**

To ensure that the patient receives the correct amount of oxygen.

---

**Correct Setting for 2 l/min**

---

**Oxygen flow meter**

Delivers oxygen to the patient.

---

**ACTION**

Attach the oxygen tubing to the nozzle on the flow meter.

Turn the finger-valve to obtain the desired flow rate. The CENTRE of the ball shows the correct flow rate. The diagrams shows the correct setting to deliver 2 l/min.

---

**RATIONALE**

To ensure that the patient receives the correct amount of oxygen.
Flow chart for oxygen administration on general wards in hospitals

Emergency Oxygen Use in Adult Patients:

Chart 2: Flow chart for oxygen administration on general wards in hospitals

See patient’s drug chart and chart 1 and tables 1–4 for scoring, dose and target saturation.

Choose the most suitable delivery system and flow rate.

Titrating oxygen up or down to maintain the target oxygen saturation.

The table below shows available options for increasing dosage up or down. This chart does not imply any equivalence of dose between Venturi masks and nasal cannulae.

Allow at least 5 minutes at each dose before adjusting further upwards or downwards (except with major and sudden fall in saturation).

Once your patient has adequate and stable saturation on minimal oxygen dose, consider discontinuation of oxygen therapy.

Venturi 24% 2–4 l/min

Nasal cannulae 1 l/min

Blue

Venturi 28% 4–6 l/min

Nasal cannulae 2 l/min

White

Venturi 29% 6–10 l/min

Nasal cannulae 4 l/min

Yellow

Venturi 40% 10–12 l/min

or simple face mask at 5–8 l/min

Red

Venturi 60% 14–15 l/min

or simple face mask at 7–10 l/min

Green

Reservoir mask at 15 l/min oxygen flow

If reservoir mask required, seek senior medical input immediately.

* For Venturi masks, the higher flow rate is required if the respiratory rate is > 30.

Signs of respiratory deterioration

- Respiratory rate (especially if > 30)
- SPO₂
- Oxygen dose needed to keep oxygen saturation in target range
- EWS/brain score
- CO₂ retention
- Drowsiness
- Headache
- Flushed face
- Tachypnoea

Seek medical advice

All patients must have ABG or enlabe blood gases (ELIG) within 1 h of requiring increased oxygen dose.

Patients in a pre-arrest situation and critically ill patients should be given maximal oxygen therapy via reservoir mask or bag valve mask while immediate medical help is arriving (except for patients with COPD with known oxygen sensitivity recorded in patients’ case notes and drug chart or in the EPR; keep saturation at 84–88% for this subgroup of patients).

Figure 2: Chart 2: Flow chart for oxygen administration on general wards in hospitals. ABG, arterial blood gas; EPR, electronic patient record; EWS, Early Warning Score; SpO₂, arterial oxygen saturation measured by pulse oximetry.
PERSONNEL WHO MAY ADMINISTER OXYGEN
Any qualified nurse, doctor or physiotherapist.
ADULT PATIENT OBSERVATION CHART
INCLUDING CODES FOR OXYGEN DELIVERY AND INCORPORATING THE TRUST ADULT MODIFIED EARLY WARNING SCORE SYSTEM (MEWS)

November 2009
Chart content agreed – Oxygen Therapy Group to lead on implementation

(Produced by Medical Illustrations mipub 192)
MONITORING OF PATIENTS  See Trust mEWS scoring system (appendix k)

1. Observe the following:
   a. Monitor arterial oxygen saturation levels according to Trust Oxygen policy.
   b. Visual observations of skin colour for central cyanosis (blue lips).
   c. Respiratory rate.
   d. Any sign of respiratory distress should be reported immediately.

2. If the arterial oxygen saturation is above or below the target saturation the observer (often a Health Care Assistant) must inform the personnel who are qualified to administer oxygen (usually a Nurse – see appendix g)

3. Check the patients mouth and nose and behind the ears

4. Record all observations 4 hourly on observation chart

<table>
<thead>
<tr>
<th>1. Observe the following:</th>
<th>In order to accurately monitor the patient for signs of improvement or deterioration.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Monitor arterial oxygen saturation levels according to Trust Oxygen policy.</td>
<td></td>
</tr>
<tr>
<td>b. Visual observations of skin colour for central cyanosis (blue lips).</td>
<td></td>
</tr>
<tr>
<td>c. Respiratory rate.</td>
<td></td>
</tr>
<tr>
<td>d. Any sign of respiratory distress should be reported immediately.</td>
<td></td>
</tr>
<tr>
<td>2. If the arterial oxygen saturation is above or below the target saturation the observer (often a Health Care Assistant) must inform the personnel who are qualified to administer oxygen (usually a Nurse – see appendix g)</td>
<td></td>
</tr>
<tr>
<td>3. Check the patients mouth and nose and behind the ears</td>
<td>To identify signs of infection and pressure sores as soon as possible</td>
</tr>
<tr>
<td>4. Record all observations 4 hourly on observation chart</td>
<td>To ensure adequate record keeping.</td>
</tr>
</tbody>
</table>
This should only be used if specifically requested by the doctor or physiotherapist in the following circumstances.

1. If the flow rate exceeds 4 litres per minute for several days
2. Tracheotomy or tracheostomy patients ("neck-breathing patients")
3. Cystic Fibrosis patients
4. Bronchiectasis patients
5. Patients with a chest infection retaining secretions

Can be given by warm or cold humidifier systems
(warm humidifier systems are mainly used in critical care areas)
HEALTH AND SAFETY

1. Inform patients and carers about the combustibility of oxygen. Oxygen supports combustion, there is always a danger of fire when oxygen is being used.

2. Oxygen should be stored in an area designated as no smoking.

3. Electrical appliances should be kept at least five feet away from the source of oxygen. Oxygen can be potentially dangerous when in contact with sources of ignition and flammable material.

4. Avoid grease or oil coming into contact with apparatus.

5. Store unused cylinders in a dry well ventilated place.