**PRESENTATION**

Oxygen (O₂) is a gas provided in compressed form in a cylinder. It is also available in liquid form, in a system adapted for ambulance use. It is fed via a regulator and flow meter to the patient by means of plastic tubing and an oxygen mask / nasal cannulae.

**INDICATIONS**

<table>
<thead>
<tr>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant illness and/or injury.</td>
<td>Critical illnesses requiring high levels of supplemental oxygen (refer to <a href="#">Table 1</a>).</td>
</tr>
<tr>
<td>Serious illnesses requiring moderate levels of supplemental oxygen if the patient is hypoxaemic (refer to <a href="#">Table 2</a>).</td>
<td>COPD and other conditions requiring controlled or low-dose oxygen therapy (refer to <a href="#">Table 3</a>).</td>
</tr>
<tr>
<td>Conditions for which patients should be monitored closely but oxygen therapy is not required unless the patient is hypoxaemic (refer to <a href="#">Table 4</a>).</td>
<td></td>
</tr>
</tbody>
</table>

**CONTRA-INDICATIONS**

Explosive environments.

**ACTIONS**

Essential for cell metabolism. Adequate tissue oxygenation is essential for normal physiological function.

Oxygen assists in reversing hypoxia, by raising the concentration of inspired oxygen. Hypoxia will, however, only improve if respiratory effort or ventilation and tissue perfusion are adequate.

If ventilation is inadequate or absent, assisting or completely taking over the patient’s ventilation is essential to reverse hypoxia.

**SIDE EFFECTS**

Non-humidified O₂ is drying and irritating to mucous membranes over a period of time.

In patients with COPD there is a risk that even moderately high doses of inspired oxygen can produce increased carbon dioxide levels which may cause respiratory depression and this may lead to respiratory arrest. Refer to [Table 3](#) for guidance.

**CAUTIONS**

Oxygen increases the fire hazard at the scene of an incident.

Defibrillation – ensure pads firmly applied to reduce spark hazard.

**CONTRA-INDICATIONS**

Explosive environments.

**SIDE EFFECTS**

Non-humidified O₂ is drying and irritating to mucous membranes over a period of time.

In patients with COPD there is a risk that even moderately high doses of inspired oxygen can produce increased carbon dioxide levels which may cause respiratory depression and this may lead to respiratory arrest. Refer to [Table 3](#) for guidance.

**DOSE AND ADMINISTRATION**

- Measure oxygen saturation (SpO₂) in all patients using pulse oximetry.
- For the administration of moderate levels of supplemented oxygen nasal cannulae are recommended in preference to simple face mask as they offer more flexible dose range.
- Patients with tracheostomy or previous laryngectomy may require alternative appliances e.g. tracheostomy masks.
- Entonox may be administered when required.
- Document oxygen administration.

**CHILDREN**

- **ALL** children with significant illness and/or injury should receive **HIGH** levels of supplementary oxygen.

**ADULTS**

- Administer the initial oxygen dose until a reliable oxygen saturation reading is obtained.
- If the desired oxygen saturation cannot be maintained with simple face mask change to reservoir mask (non-rebreath mask).
- For dosage and administration of supplemental oxygen refer to [Tables 1-3](#).
- For conditions where **NO** supplemental oxygen is required unless the patient is hypoxaemic refer to [Table 4](#).

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1 This guidance is based on O'Driscoll BR, Howard LS, Davison AG, on behalf of the British Thoracic Society. BTS guideline for emergency oxygen use in adult patients. Thorax 2008;63(Suppl_6):vi1-68, with kind permission of the British Thoracic Society.
### Table 1 - High levels of supplemental oxygen for adults with critical illnesses

<table>
<thead>
<tr>
<th>Condition</th>
<th>Initial dose</th>
<th>Method of administration</th>
</tr>
</thead>
</table>
| **Cardiac arrest or resuscitation:**  
  - basic life support  
  - advanced life support  
  - foreign body airway obstruction  
  - traumatic cardiac arrest  
  - maternal resuscitation | Maximum dose until the vital signs are normal | bag-valve mask |
| Carbon monoxide poisoning | 15 litres per minute | Reservoir mask (non-rebreathe mask) |
| **Major Trauma:**  
  - abdominal trauma  
  - burns and scalds  
  - electrocution  
  - head trauma  
  - limb trauma  
  - neck and back trauma (spinal)  
  - pelvic trauma  
  - the immersion incident  
  - thoracic trauma  
  - trauma in pregnancy  
  - Anaphylaxis  
  - Major pulmonary haemorrhage  
  - Sepsis e.g. meningococcal septicaemia  
  - Shock | 15 litres per minute | Reservoir mask (non-rebreathe mask) |
| Active convulsion  
 Hypothermia | Administer 15 litres per minute until a reliable SpO2 measurement can be obtained and then adjust oxygen flow to aim for target saturation within the range of 94-98% | Reservoir mask (non-rebreathe mask) |

**NOTE** – Some oxygen saturation monitors cannot differentiate between carboxyhaemoglobin and oxyhaemoglobin owing to their similar absorbances.

### Table 2 - Moderate levels of supplemental oxygen for adults with serious illnesses if the patient is hypoxaemic

<table>
<thead>
<tr>
<th>Condition</th>
<th>Initial dose</th>
<th>Method of administration</th>
</tr>
</thead>
</table>
| **Acute hypoxaemia or clinically centrally cyanosed (cause not yet diagnosed)**  
 **Deterioration of lung fibrosis or other interstitial lung disease** | SpO2 <85%  
 10-15 litres per minute | Reservoir mask (non-rebreathe mask) |
| **Acute hypoxaemia (cause not yet diagnosed)**  
 **Deterioration of lung fibrosis or other interstitial lung disease**  
 **Acute asthma**  
 **Acute heart failure**  
 **Pneumonia**  
 **Lung cancer**  
 **Postoperative breathlessness**  
 **Pulmonary embolism**  
 **Pleural effusions**  
 **Pneumothorax**  
 **Severe anaemia**  
 **Sickle cell crisis** | SpO2 ≥85-93%  
 2-6 litres per minute  
 SpO2 ≥85-93%  
 5-10 litres per minute | Nasal cannulae  
 Simple face mask |
### Table 3 - Controlled or low-dose supplemental oxygen for adults with COPD and other conditions requiring controlled or low-dose oxygen therapy

<table>
<thead>
<tr>
<th>Condition</th>
<th>Initial dose</th>
<th>Method of administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic obstructive pulmonary disease (COPD)</td>
<td>4 litres per minute</td>
<td>28% Venturi mask or patient’s own mask</td>
</tr>
<tr>
<td>Chronic exacerbation of cystic fibrosis</td>
<td>4 litres per minute</td>
<td>28% Venturi mask or patient’s own mask</td>
</tr>
<tr>
<td>Chronic neuromuscular disorders</td>
<td>4 litres per minute</td>
<td>28% Venturi mask or patient’s own mask</td>
</tr>
<tr>
<td>Chest wall disorders</td>
<td>4 litres per minute</td>
<td>28% Venturi mask or patient’s own mask</td>
</tr>
<tr>
<td>Morbid obesity (body mass index &gt;40 kg/m²)</td>
<td>4 litres per minute</td>
<td>28% Venturi mask or patient’s own mask</td>
</tr>
<tr>
<td><strong>NOTE</strong> - If the oxygen saturation remains below 88% change to simple face mask.</td>
<td>5-10 litres per minute</td>
<td>Simple face mask</td>
</tr>
<tr>
<td><strong>NOTE</strong> - Critical illness <strong>AND</strong> COPD/ or other risk factors for hypercapnia.</td>
<td>If a patient with COPD or other risk factors for hypercapnia sustain or develop critical illness/injury ensure the same target saturations as indicated in Table 1 – Critical Illness.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4 – No supplemental oxygen required for adults with these conditions unless the patient is hypoxaemic but patients should be monitored closely

<table>
<thead>
<tr>
<th>Condition</th>
<th>Initial dose</th>
<th>Method of administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial infarction and acute coronary syndromes</td>
<td>SpO₂ &lt;85%</td>
<td>Reservoir mask (non-rebreath mask)</td>
</tr>
<tr>
<td>Stroke</td>
<td>15 litres per minute</td>
<td>SpO₂ ≥85-93%</td>
</tr>
<tr>
<td>Cardiac rhythm disturbance</td>
<td>2-6 litres per minute</td>
<td>SpO₂ ≥85-93%</td>
</tr>
<tr>
<td>Non-traumatic chest pain/discomfort</td>
<td>5-10 litres per minute</td>
<td>SpO₂ ≥85-93%</td>
</tr>
<tr>
<td>Implantable cardioverter defibrillator firing</td>
<td><strong>Pregnancy and Obstetric Emergencies:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>o birth imminent</td>
<td>o haemorrhage during pregnancy</td>
</tr>
<tr>
<td></td>
<td>o pregnancy induced hypertension</td>
<td>o vaginal bleeding</td>
</tr>
<tr>
<td></td>
<td>Abdominal pain</td>
<td>Headache</td>
</tr>
<tr>
<td></td>
<td>Hyperventilation syndrome or dysfunctional breathing</td>
<td>Hyperventilation syndrome or dysfunctional breathing</td>
</tr>
<tr>
<td></td>
<td>Most poisonings and drug overdoses (refer to Table 1 for carbon monoxide poisoning and special cases below for paraquat poisoning)</td>
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</tr>
<tr>
<td></td>
<td>Metabolic &amp; renal disorders</td>
<td>Metabolic &amp; renal disorders</td>
</tr>
<tr>
<td></td>
<td>Acute and sub-acute neurological and muscular conditions producing muscle weakness (assess the need for assisted ventilation if SpO₂ &lt;94%)</td>
<td>Acute and sub-acute neurological and muscular conditions producing muscle weakness (assess the need for assisted ventilation if SpO₂ &lt;94%)</td>
</tr>
<tr>
<td></td>
<td>Post convulsion</td>
<td>Post convulsion</td>
</tr>
<tr>
<td></td>
<td>Gastrointestinal bleeds</td>
<td>Gastrointestinal bleeds</td>
</tr>
<tr>
<td></td>
<td>Glycaemic emergencies</td>
<td>Glycaemic emergencies</td>
</tr>
<tr>
<td></td>
<td>Heat exhaustion/heat stroke</td>
<td>Heat exhaustion/heat stroke</td>
</tr>
</tbody>
</table>

**Special cases**

- Poisoning with paraquat

**NOTE** – patients with paraquat poisoning may be harmed by supplemental oxygen so avoid oxygen unless the patient is hypoxaemic. Target saturation 88-92%
Is the patient in CARDIAC and / or RESPIRATORY ARREST or in need of VENTILATORY SUPPORT?

Yes ➔ Administer the maximum dose of oxygen via a bag-valve mask until the vital signs are normal, then aim for target saturation within the range of 94-98%

No ➔ Do you know or suspect CARBON MONOXIDE poisoning?

Yes ➔ Administer maximum dose of oxygen via a reservoir mask

No ➔ Do you know or suspect a critical illness requiring HIGH levels of oxygen? Refer to table 1

Yes ➔ Administer 15l/min of oxygen via a reservoir mask until the vital signs are normal, then aim for target saturation within the range of 94-98%

Yes ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

No ➔ Administer 4l/min of oxygen via a 28% Venturi mask or patient's own mask to aim for target saturation within the range of 88-92%

No ➔ Monitor SpO₂ and if the saturation falls below 88% administer oxygen to maintain a saturation within the range of 88-92%

SpO₂ <85% ➔ Administer 15l/min of oxygen via a reservoir mask

SpO₂ 85-87% ➔ Administer 2-6l/m via nasal cannulae or 5-10l/min of oxygen via a simple face mask

Aim for target saturation within the range of 88-92%

Yes ➔ Monitor SpO₂ and if the saturation falls below 88% administer oxygen to maintain a saturation within the range of 88-92%

No ➔ Do you know or suspect a condition requiring CONTROLLED OR LOW–DOSE levels of oxygen? Refer to table 3

Yes ➔ SpO₂ <85% ➔ Administer 15l/min of oxygen via a reservoir mask

SpO₂ 85-93% ➔ Administer 2-6l/m via nasal cannulae or 5-10l/min of oxygen via a simple face mask

Aim for target saturation within the range of 88-92%

No ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

SpO₂ <85% ➔ Administer 15l/min of oxygen via a reservoir mask

SpO₂ 85-93% ➔ Administer 2-6l/m via nasal cannulae or 5-10l/min of oxygen via a simple face mask

Aim for target saturation within the range of 94-98%

Yes ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

No ➔ Do you know or suspect PARAQUAT poisoning?

Yes ➔ Patients with PARAQUAT poisoning may be harmed by supplemental oxygen so avoid oxygen unless the patient is hypoxic

Yes ➔ SpO₂ <85% ➔ Administer 15l/min of oxygen via a reservoir mask

SpO₂ 85-93% ➔ Administer 2-6l/m via nasal cannulae or 5-10l/min of oxygen via a simple face mask

Aim for target saturation within the range of 94-98%

No ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

Yes ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

No ➔ Do you know or suspect a serious illness requiring MODERATE levels of oxygen? Refer to table 2

Yes ➔ SpO₂ <85% ➔ Administer 15l/min of oxygen via a reservoir mask

SpO₂ 85-93% ➔ Administer 2-6l/m via nasal cannulae or 5-10l/min of oxygen via a simple face mask

Aim for target saturation within the range of 94-98%

No ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

SpO₂ <85% ➔ Administer 15l/min of oxygen via a reservoir mask

SpO₂ 85-93% ➔ Administer 2-6l/m via nasal cannulae or 5-10l/min of oxygen via a simple face mask

Aim for target saturation within the range of 94-98%

Yes ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

No ➔ Other conditions NOT requiring oxygen unless hypoxaemic? Refer to table 4

Yes ➔ SpO₂ <85% ➔ Administer 15l/min of oxygen via a reservoir mask

SpO₂ 85-93% ➔ Administer 2-6l/m via nasal cannulae or 5-10l/min of oxygen via a simple face mask

Aim for target saturation within the range of 94-98%

No ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

Yes ➔ Monitor SpO₂ and if the saturation falls below 94% administer oxygen to maintain a saturation within the range of 94-98%

Figure 1 – Administration of supplemental oxygen in prehospital care
**Table 1 - Critical Illnesses in adults requiring HIGH levels of supplemental oxygen**

- **Cardiac arrest or resuscitation:**
  - basic life support
  - advanced life support
  - foreign body airway obstruction
  - traumatic cardiac arrest
  - maternal resuscitation

- **Major Trauma:**
  - abdominal trauma
  - burns and scalds
  - electrocution
  - head trauma
  - limb trauma
  - neck and back trauma (spinal)
  - pelvic trauma
  - the immersion incident
  - thoracic trauma
  - trauma in pregnancy

- Active convulsion
- Anaphylaxis
- Carbon monoxide poisoning
- Hypothermia
- Major pulmonary haemorrhage
- Sepsis e.g. meningococcal septicaemia
- Shock

**Table 2 - Serious illnesses in adults requiring MODERATE levels of supplemental oxygen if hypoxaemic**

- Acute hypoxaemia or clinically centrally cyanosed (cause not yet diagnosed)
- Deterioration of lung fibrosis or other interstitial lung disease
- Acute asthma
- Acute heart failure
- Pneumonia
- Lung cancer
- Postoperative breathlessness
- Pulmonary embolism
- Pleural effusions
- Pneumothorax
- Severe anaemia
- Sickle cell crisis

**Table 3 - COPD and other conditions in adults requiring CONTROLLED OR LOW-DOSE supplemental oxygen**

- Chronic Obstructive Pulmonary Disease (COPD)
- Exacerbation of cystic fibrosis
- Chronic neuromuscular disorders
- Chest wall disorders
- Morbid obesity (body mass index >40 kg/m²)

**Table 4 - Conditions in adults NOT requiring supplemental oxygen unless the patient is hypoxaemic**

- Myocardial infarction and acute coronary syndromes
- Stroke
- Cardiac rhythm disturbance
- Non-traumatic chest pain/discomfort
- Implantable cardioverter defibrillator firing

- **Pregnancy and Obstetric Emergencies:**
  - birth imminent
  - haemorrhage during pregnancy
  - pregnancy induced hypertension
  - vaginal bleeding

- Abdominal pain
- Headache
- Hyperventilation syndrome or dysfunctional breathing
- Most poisonings and drug overdoses (except carbon monoxide poisoning)
- Metabolic & renal disorders
- Acute and sub-acute neurological and muscular conditions producing muscle weakness
- Post convulsion
- Gastrointestinal bleeds
- Glycaemic emergencies
- Heat exhaustion/heat stroke

**Special cases:**
- paraquat poisoning