Clinical Skills

Administering Oxygen

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Aims and Objectives

The aim of this module is to facilitate learning regarding ‘allowing the patient to breathe a higher concentration of oxygen than normal, via a face mask or other equipment.’ (GMC 2015)

The intended learning outcomes are

At the end of the session the student should be able to:

• List the principles which need to be considered when using oxygen therapy.
• Describe risk factors that may arise as a result of administration of oxygen therapy.
• Explain the key recommendations for National Guidance for the use of oxygen.
• Explain how oxygen can be administered using a variety of devices.
• List information required for the completion of patient care plan documentation.
• Reflect on own learning and recognise how improvements can be made.
Introduction

Oxygen is a drug (Vates 2011). It is given by inhalation only.

As a drug the following principles must be considered:-

1. Prescription
2. Administration
3. Documentation
4. Titrate
This e-module covers aspects of these principles with respect to administering oxygen. Please ensure you are also familiar with the below related e-modules:-

- Safe Prescription Writing
- Basic Ward Monitoring
- Arterial Puncture
- Airway Management
- Adult Basic Life Support

Before continuing with this module you need to be sure you have a good understanding of:

1. Anatomy and physiology of respiration including pulmonary ventilation, external respiration, transport of respiratory gases, cellular respiration and the neuro-chemical control of breathing

2. When blood gas analysis should be performed, what the normal values are and the significance of abnormal values.

If you are unsure of any of these please pause now, refresh your memory and then return to this module.

NB: A very useful resource is the BMJ 10 min learning module; inpatient oxygen therapy
Incident data from the National Patient Safety Agency (NPSA) Reporting and Learning System found 281 serious incidents between December 2004 and June 2009 related to the inappropriate administration or management of oxygen’ (NPSA 2009). Of these, 44 incidents may have contributed to patient deaths either because they were given too little or too much oxygen. These incidents ‘could possibly have been prevented if the patients’ oxygen saturation levels had been monitored appropriately’ (NPSA 2009).

Key points to consider from the BTS executive summary BTS Guideline (2017) are as follows:

1. Assess patient
2. Target oxygen prescription
3. Oxygen administration
4. Monitoring and maintenance
5. Weaning and discontinuation
For critically ill patients, high concentration oxygen should be administered immediately and recorded afterwards.

NB Oxygen does not treat the underlying cause.

Oxygen saturations should be checked by pulse oximetry in breathless and acutely ill patients and the inspired oxygen concentration should be recorded on chart with oximetry result.

Pulse oximetry must be available in areas where emergency oxygen is used.

Critically ill patients outside high dependent area should be assessed and monitored using a track & trigger system e.g. NEWS.
• Oxygen should be prescribed to achieve target of 94-98% for most acutely ill or 88-92% in those at risk of hypercapnic respiratory failure
• Best practice is to prescribe a target range at time of admission in case of clinical deterioration
• Target saturation should be written on drug chart
Administering Oxygen

Introduction (3 of 5)

• Oxygen should be administered by staff who are trained to do so
• Monitoring & maintenance of target saturations

- Oxygen saturation and delivery system including flow rate should be recorded on monitoring chart (NEWS)
- Delivery devices and flow rates should be adjusted to keep within target range
- Oxygen should be prescribed and signed for on each drug round
• Oxygen should be reduced in stable patients with satisfactory oxygen saturations
• Oxygen should be discontinued once saturations can be maintained within or above target range breathing air but the prescription should be left in place in case of deterioration
Flow chart adapted from the BTS guideline (BTS 2017), illustrates how principles work in practice.
**Administering Oxygen**

**Oxygen Therapy: Equipment**

<table>
<thead>
<tr>
<th></th>
<th>• Prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Oxygen supply (piped or cylinder)</td>
</tr>
<tr>
<td>2</td>
<td>• Reduction gauge</td>
</tr>
<tr>
<td>3</td>
<td>• Flow meter</td>
</tr>
<tr>
<td>4</td>
<td>• Tubing</td>
</tr>
<tr>
<td>5</td>
<td>• Mechanism for delivery Nasal cannulae, simple face mask, high concentration reservoir mask, venture mask</td>
</tr>
</tbody>
</table>

A humidifier with a water trap may also be used in some situations (see later for indications)
Administering Oxygen
Oxygen Therapy: Procedure (1 of 10)

Unless an emergency situation, a full patient history should be taken and a respiratory examination should be performed before deciding that the patient needs additional oxygen. This will include ascertaining any history of risk of hypercapnic respiratory failure (e.g. COPD) including ownership of an alert card.

Explain to the patient the following:

1. Why oxygen needs to be administered
2. How oxygen will be administered
3. How the effectiveness will be monitored
4. Potential side effects
5. Gain informed consent
Administering Oxygen
Oxygen Therapy: Procedure (2 of 10)

Check the following

Is oxygen prescribed, or is the patient critically ill, or is it an emergency situation?
If so, continue with administration.

Is there a pulse oximeter available?
The oxygen will need to be monitored and titrated to the SpO\textsubscript{2} level.

There must be NO source of combustion (Risk assess).
e.g. check no oil or grease around connections; use alcohol with caution; no heat source; no smoking; care with defibrillation and laser therapy). Oxygen would support combustion.

Is all the appropriate equipment available?
Check the prescription and SpO\textsubscript{2} to ensure you are using the correct mechanism for delivery.
**Oxygen supply**
This can be a piped supply or cylinder.

**Oxygen cylinders** have either a black and white collar or are all white. It is important to read the collar label. The grey bodied cylinder is medical air.

**Piped oxygen port on left** (white collar)
Administering Oxygen
Oxygen Therapy: Procedure (4 of 10)

A reduction gauge, flow meter and tubing

Flow meter

Reduction gauge

Tubing
Nasal cannulae

- Recommended for most patients, however if patient is heavily dependent on breathing through their mouth nasal cannulae may not be suitable
- 2-6L/min gives approx 24-50% FIO₂
- FIO₂ depends on oxygen flow rate and patient’s minute volume and inspiratory flow and pattern of breathing
- Comfortable, easily tolerated, can eat whilst insitu
- No re-breathing
- Preferred by patients (Vs simple mask)
- Low cost product
- May dry nasal passages
Simple face mask
(Medium concentration, variable performance)

- Used for patients with type I respiratory failure
- Flow 5-10 L/min
- Flow must be at least 5 L/min to avoid CO$_2$ build up and resistance to breathing (although packaging may say 2-10L)
- Delivers variable O$_2$ concentration between 35% - 60% FIO$_2$
- Low cost product
High concentration non re-breathing reservoir mask

- Used for hypoxic patients such as critical illness, trauma patients, post-cardiac or respiratory arrest

- May be initial treatment for acutely ill COPD patient, must monitor SpO₂ level and check CO₂ levels with blood gases, with plan to switch to more appropriate delivery system

- Flow 15 L/min (< 10 L/min to prevent rebreathing CO₂)

- Delivers O₂ concentrations between 60 - 80% FIO₂ or above

- Effective for short term treatment

- NB Inflate bag with oxygen to ensure high concentration is delivered
Venturi or Fixed Performance mask

- Used for patients who you wish to control levels of oxygen, those with raised CO₂ (patients with a target of 88-92%)

- Aims to deliver constant oxygen concentrations within and between breaths

- Increasing flow does not increase oxygen concentration

- With TACHYPNOEA (RR >30/min) the oxygen supply should be increased by 50%

- Note different colour component for different concentrations of oxygen

<table>
<thead>
<tr>
<th>Oxygen conc</th>
<th>Flow rate/min</th>
</tr>
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<tbody>
<tr>
<td>24%</td>
<td>2L</td>
</tr>
<tr>
<td>28%</td>
<td>4L</td>
</tr>
<tr>
<td>35%</td>
<td>8L</td>
</tr>
<tr>
<td>60%</td>
<td>15L</td>
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Humidifier and water trap

Humidified oxygen may be needed in the following circumstances:

- Tracheostomy
- Cystic Fibrosis patients
- Physiotherapists may advise humidification
- Patients on High flow whisper CPAP (Continuous Positive Airways Pressure)
- High percentage oxygen
- When patient is ventilated

N.B. There is little evidence of benefit of humidification in routine oxygen therapy
During administration

Prescribe
- Signed prescription to include target saturation and delivery device
- When oxygen delivery commenced
- Prescription signed by nurse at each drug round

Document
- Observations made during oxygen delivery
- Any patient reaction / side effects
- Any changes made and when therapy stopped

Monitor
- Oxygen saturation levels at least every four hours (more often if unstable) and other vital signs
- The patient’s reaction to oxygen etc., e.g. ability to tolerate device, oral fluid intake

Titrate
- Alter amount of oxygen administered, up or down, to maintain target saturation
- Aim to wean patient off oxygen (unless palliative care)
Administering Oxygen
Oxygen Therapy: Checklist

Summary

Before giving oxygen to a patient
• Is oxygen prescribed or is the patient critically ill or is it an emergency situation?
• Is there a pulse oximeter available?
• Is there any source of combustion?
• Is all the appropriate equipment available?
• History and examination
• Have you gained informed consent from the patient?

During administration of oxygen

1. • Prescribe

2. • Document

3. • Monitor

4. • Titrate
References


• General Medical Council (GMC) (2009) Tomorrow’s Doctors London : GMC


• Vates (2011) Delivering oxygen therapy in acute care: part 1 Nursing Times 107 (21) 12-14
Bibliography

  [www.brit-thoracic.org.uk/emergencyoxygen](http://www.brit-thoracic.org.uk/emergencyoxygen)

  [www.nrls.npsa.nhs.uk/alerts](http://www.nrls.npsa.nhs.uk/alerts)

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