Tees, Esk and Wear Valleys NHS
NHS Foundation Trust

Oxygen & other medical gases – administration, prescribing, storage and safety

CLIN-0071-v3.0

Status: Approved
Document type: Guidelines

Contents

1 Purpose

Oxygen is one of the most common medicines used in hospital settings and, although potentially life-saving, if administered and managed inappropriately it can cause serious harm. The NPSA (2009) received 281 reports of serious incidents with oxygen and the most common themes from a review of these incidents include:

- **Prescribing**: failure to or wrongly prescribed
- **Monitoring**: Patients not monitored, abnormal oxygen saturations levels not acted upon.
- **Administration**: Confusion of oxygen with medical compressed air, incorrect flow rates, inadvertent disconnection of supply
- **Equipment**: Empty cylinders, faulty and missing equipment

✓ The main aim of this document is to set standards in practice to ensure that oxygen is administered, prescribed and stored safely. The principles apply to all medical gases, but for ease the term “oxygen” will be used throughout most of the document.

✓ This clinical guideline is to guide staff through the process and procedure of oxygen administration, prescribing and storage ensuring quality standards are maintained.

2 Related documents

This procedure also refers to:-

✓ Decontamination of Equipment
✓ Medical Devices Policy
✓ Medicines Overarching Framework
✓ MSS 10: Oxygen - Administration in an emergency
✓ Manual Handling of Objects / Loads
✓ Manual Handling of people
✓ EWS Early Warning Score and the Early Detection and Management of the Deteriorating Patient
✓ Resuscitation Policy
✓ Physiological Assessment Guidelines

3 Process

3.1 Trust Oxygen Cylinders

✓	Oxygen cylinders in the Trust are standardised to one supplier – BOC Medical. The range of cylinder sizes available is limited. The cylinders all have integrated regulators and are easy to use and to maintain. All cylinders within the Trust should operate via an on/off dial.
✓	All Cylinders must be capable of administering high-flow rates of oxygen (0 -15 litres per minute). For guidance on how to use CD and HX oxygen cylinders refer to Appendix 1.
✓	Every cylinder has a batch label, identifying the batch number, filling date and expiry date. It also identifies the cylinder size and type of contents.

3.1.1 CD Cylinders

(See Appendix 2)

All Emergency Response Bags must have a CD oxygen cylinder. These are the small portable cylinders for the use of emergency oxygen. They hold 460 Litres of Oxygen, which if running at a rate of 15 litres per minute (LPM), will provide approximately 30 minutes of oxygen.

A spare oxygen cylinder must be available on site or nearby, to ensure adequate oxygen supplies.

3.1.2 HX Cylinders

(See Appendix 2)

These are the large oxygen cylinders that hold 2300 litres of oxygen. These cylinders are suitable for clinical areas that use oxygen more frequently and are for patients requiring regular oxygen therapy.

All oxygen cylinders must be checked daily to ensure an adequate supply is always available; the content of cylinders can be checked via the 'live gauge' at the top of the cylinder. The expiry date on all cylinders must also be checked.

These checks should be recorded on the Emergency Response Bags Daily Checklist located within the Trust Resuscitation Policy. This checklist has an additional area to highlight checks of any back-up or other oxygen cylinders.

3.1.3 How to Order Oxygen Cylinders

✓	All clinical areas in the Trust have their own cylinder account with BOC medical and this should be cited when arranging any returns and replacements. Orders can be placed by contacting the BOC Customer Service Centre/Helpline – Tel: 0800 111 333 (available 24hrs) If you have an individual account, ensure this information is accessible to the staff who order oxygen. Please note deliveries may take 24-48 hours.
✓	For clinical areas within the Trust who need to open a new account and set-up a new contract for oxygen cylinders, it must be ordered via Cardea. Add your request for type and quantity of

	oxygen cylinder via the non catalogue item (NCI) section.
✓	If you have an individual account with BOC Medical and the service closes, the ward manager must inform BOC Medical, that the cylinder is no longer needed and the contract is terminated. Collection of any oxygen cylinders needs to be arranged.
✓	Some areas within the Trust may have access to a Trust central oxygen store, for example Roseberry Park or Lanchester Road Hospital. Returns and replacements may be arranged by contacting Estates Staff. Follow local protocols.

3.2 Medical Gas Storage & Safety

3.2.1 Clinical Environment

- All Trust locations where medical gas cylinders are stored must have gas cylinder signs displayed.
- Cylinders must be located in a safe and secure environment.
- Cylinders must be identified as part of the COSHH and fire risk assessments.
- All spare and in-use cylinders must be adequately restrained; stored and secured in an upright position. They should not be free standing as they risk falling over injuring staff or patients, and this could also cause damage to the cylinders.
- Where more than one cylinder is available, they must be clearly identified with the appropriate label: FULL, IN-USE or EMPTY.
- Ensure cylinders are used in strict rotation, so that cylinders with the earliest filling date are used first.
- Cylinders must be kept clean, dry and stored away from sources of heat or ignition.
- Cylinders should also be handled with care, never knocked violently or allowed to fall over. Never roll cylinders along the ground.
- CD cylinders may be stored in Emergency Response Bags; if additional CD cylinders are held, these should be restrained to the wall by a safety chain or CD holder.
- HX cylinders must be stored and transported on an appropriate type and size of oxygen trolley.
- Additional HX cylinders should be restrained to the wall by a safety chain or on an oxygen trolley when not in use.
- HX cylinders in use in the ECT department may be stored horizontally in the designated oxygen cradles underneath Patient trolleys. See appendix 4, for some storage options available from Cardea.
- When using medical gas cylinders it is important that no part of the cylinder valve or equipment is either lubricated or contaminated with oil or grease.
- Take care if using oil or petroleum-based hand creams as these could provide sufficient contamination to the medical cylinder valve surface when handling the cylinder to cause an ignition when the valve is turned on.
- The application of paraffin based skin products to patients, e.g. Diprobase ointment, emulsifying ointment, white soft paraffin causes an additional potential fire hazard when administering oxygen to them.
- For patients who need home visits, arrangements need to be made with the ambulance patient transport service to enable transport of the patient and oxygen.

✓ All equipment must be handled in line with the Manual Handling of Objects / Loads

Staff must NEVER transport oxygen cylinders in their own motor vehicles.

3.2.2 Designated Trust Oxygen Storage facilities

Storage Facilities managed by Estates staff should ensure:

- ✓ Oxygen cylinders are stored:
  - in a purpose built cylinder store that allows cylinders to be kept dry and clean, not subject to extremes of heat or cold;
  - away from stocks of combustible material;
  - separately from industrial and other non-medical cylinders;
  - to maintain separation between full and empty cylinders
- ✓ Unauthorised entry is prevented to protect cylinders from theft.
- ✓ Oxygen cylinders are used in strict rotation so that cylinders with the earliest filling date are used first.
- ✓ HX oxygen cylinders are stored vertically on concrete floored pens; CD oxygen cylinders can be stored horizontally on shelves.
- ✓ Warning notices prohibiting smoking and naked lights are posted clearly in the cylinder storage area.
- ✓ The Fire Services are aware of the location of any cylinder storage area within the Trust.
- ✓ Safety shoes and protective gloves are worn when moving and handling oxygen cylinders.
- ✓ All equipment is handled in line with the Trust Manual Handling of Objects / Loads Procedure.
- ✓ That staff receive the necessary training to manage an oxygen storage facility and handle and transport oxygen.

3.3 Medical Gas Administration

3.3.1 Prescribing

Medical gases (including oxygen) are licensed medicines and, as such, are subject to the Medicines Act and must be treated in the same way as any other medicine.

- ✓ Before a medical gas is administered to a patient, written authority from a prescriber must be obtained. This authority must include the name, and concentration of the medical gas (where appropriate), the method of administration, the percentage and/or rate of flow. This can be achieved via a prescription written for an individual patient on the prescription and administration chart or on an approved bespoke chart or electronic prescribing system.
- ✓ The location where oxygen is administered must be risk-assessed to ensure safety at all times by the clinical staff.
- ✓ A designated Practitioner administering a medical gas to a patient must administer in accordance with the prescription and record administration chart.
- ✓ In an emergency situation oxygen can be administered without a prescription - see Medication Safety Series (MSS) 10

The NPSA (2009) report the potential for serious harm if oxygen is not administered or handled

properly. The main safety concerns relate to underuse and overuse of oxygen:

- ✓ Underuse of oxygen is extremely dangerous as it exposes critically ill patients to the risk of hypoxic organ damage.
- ✓ Overuse of oxygen can also be harmful, especially for patients with chronic obstructive pulmonary disease (COPD)
- ✓ The concentration of oxygen required depends on the condition being treated; the administration of an inappropriate concentration of oxygen can have serious or even fatal consequences.
- ✓ Current prescribing guidelines on oxygen therapy can be accessed via the current edition of the British National Formulary.

In an emergency situation oxygen may be administered without a prescription by any staff who have undertaken resuscitation training. See MSS 10 Oxygen - Administration in an Emergency

3.3.2 Monitoring

Following guidance issued from a Rapid Response Report (NPSA/2009/RRR006: Oxygen Safety in Hospitals), all Ward/Unit Managers must ensure they have a pulse oximeter available in all locations where oxygen is used.

- ✓ Oxygen saturation levels should be monitored in all patients receiving oxygen therapy.
- ✓ A pulse oximeter is a medical device used to measure oxygen saturation (SpO2) levels within the body and to monitor the effectiveness of oxygen. For further guidance regarding Pulse oximetry refer to Royal Marsden Manual Online via the following link - Physiological Assessment Guidelines

3.3.3 Oxygen Administration Devices

There is a variety of devices available to administer regular oxygen therapy; these are all available via Cardea on Medical device template 32: General Oxygen Therapy. Oxygen face masks must not be confused with nebuliser masks.

3.3.4 Nasal Cannula

- A nasal cannula consists of two prongs that are inserted inside the nostrils. Giving oxygen by nasal cannula allows the patient to talk, eat, and drink; they can also be less claustrophobic than facemasks.
- A nasal cannula is usually preferred for long-term oxygen therapy. It can, however, produce dermatitis and mucosal drying in sensitive individuals. Generally flow rates must not exceed 4L/min or it will damage the mucosa.

3.3.5 Simple Oxygen Face mask

- Simple oxygen face masks are:

- single patient use;
- low-flow masks which entrain the air from the atmosphere;
- able to deliver a variable oxygen percentage from 21-60%.

- The actual amount of oxygen the patient receives will depend on the rate and depth of respiration.

✓ Place the oxygen mask over the patient's nose and mouth with the elastic strap over the ears to the back of the head. Adjust the length of the strap to ensure the mask fits securely.

3.3.6 Rebreath Oxygen Face Mask

- These are often used when a percentage of oxygen has been prescribed.

- This special mask incorporates a rebreath system which is colour-coded and specifies the flow of oxygen required to deliver 24%, 28%, 35%, 40% and 60% oxygen. These are therefore fixed performance masks where a known concentration can be achieved.

✓ First select the correct colour-coded rebreath oxygen mask according to the prescribed percentage of oxygen. Place the facemask over the patient's nose and mouth with the elastic strap over the ears to the back of the head. Adjust the length of the strap to ensure the mask fits securely. Set the flow rate as indicated on the device.

3.3.7 Non-Rebreath Oxygen Face Mask

The non-rebreath mask provides a high concentration of oxygen and the reservoir bag allows for adequate oxygen to be available to meet the unpredicted breathing pattern and tidal volumes.
Features:

- Flexible plastic mask with elastic head strap
- Incorporated oxygen reservoir bag
- Oxygen tubing supplied and pre-connected
- Latex free
- Delivery of 99%-100% oxygen concentration
- High concentration at a flow rate of 15 litres per minute

3.4 Home Oxygen

✓ Contact the patient's GP to arrange the supply of oxygen to patients who need oxygen treatment at home.

3.5 Oxygen Concentrators

- An oxygen concentrator is a medical device that separates oxygen from other gases that are present in the surrounding air and can provide a supply of oxygen for administration. Oxygen concentrators are more economical for patients who need oxygen for long periods; a concentrator is recommended for a patient who needs oxygen for more than 8 hours a day (or 21 cylinders per month).

✓ Refer to the latest edition of the BNF for supplier information if the above criteria are met for an inpatient requiring oxygen therapy. Contact the patient's GP to arrange the supply of an oxygen concentrator to patients at home.

Patients may be admitted to wards/departments with oxygen concentrators. Many of the same principles regarding oxygen safety and storage apply with the use of oxygen concentrators and generally include:

✓	Position the oxygen concentrator away from curtains or drapes, radiators, heaters, and fireplaces. Be certain to place the unit so all sides are at least 12 inches away from a wall or other obstruction.
✓	In the event of a fire, ensure the emergency operator is aware of an oxygen concentrator is on the premises.
×	Oxygen concentrators manufacture high purity oxygen, which promotes rapid burning. Do not allow smoking or open flames in the same vicinity of this device or any oxygen carrying accessory.
×	Do not use oil, grease, or petroleum-based products on or near the unit – (for e.g. E45 cream, Vaseline).
×	Do not use extension cords with concentrators.
×	Do not place the unit in a confined area, always use the device in a well ventilated room.
×	Do not keep combustible materials stored near your medical oxygen supply.
×	Never leave the oxygen concentrator running when it is not in use.

Always refer to the Operating Instructions/Manual supplied with specific concentrators for specific instructions.

If in doubt contact the supplier of the oxygen concentrator for further advice and to arrange any training that is required.

3.6 Ambulatory Oxygen Therapy

- ✓ If ambulatory oxygen therapy is to be considered, the patient must be assessed by a Consultant respiratory physician or specialist nurse who can:
  - perform a risk assessment;
  - ensure suitability; and
  - advise Trust staff accordingly regarding any specialist ambulatory equipment that is required.
- ✓ Patients who are admitted who already use equipment or ambulatory oxygen should be risk assessed prior to admission while still in the Acute Trust or at home by the clinical staff and ensure that the necessary equipment is available.

4 Related documents and references

- BOC compressed medical oxygen (2016) data sheet
- British National Formulary - online
- http://www.bocmedical.co.uk/safety/basic_safety.asp accessed on 07/11/08
- Medical Oxygen Integral Valve Cylinders: Instructions for use. BOC Medical 2009.
- Royal Marsden Manual Online (RMMO) of Clinical Nursing Procedures - access here
- NPSA (2009) Rapid Response Report: Oxygen safety in hospitals. NPSA/2009/RRR006 29 September 2009
- NHS Improvement Patient Safety Alert: Risk of death and severe harm from failure to obtain and continue flow from oxygen cylinders NHS/PSA/W/2018/001 January 2018

5 How this procedure will be implemented

- This procedure will be published on the Trust's intranet and external website.
- Line managers will disseminate this procedure to all Trust employees through a line management briefing.

5.1 Training needs analysis

Identified as part of the resuscitation policy.

6 Document control

Date of approval:	25 January 2018	
Next review date:	25 January 2021	
This document replaces:	Medicines - Medical Gases PHARM-0002-006 Administration of oxygen in an emergency situation for adults and children PHARM-0020-v4 Oxygen – Administration, Prescribing, Storage and Safety Guidelines CLIN-0071-V2	
Lead:	Name	Title
	Christopher Williams	Chief Pharmacist
Members of working party:	Name	Title
	Members of the Resuscitation Forum	N/A
This document has been agreed and accepted by: (Director)	Name	Title
	David Brown	Acting Chief Operating Officer
This document was approved by:	Name of committee/group	Date
	Drug & Therapeutics Committee	25 January 2018
This document was ratified by:	Name of committee/group	Date
	Drug & Therapeutics Committee	25 January 2018
An equality analysis was completed on this document on:	See overarching EA for pharmacy documents	

Change record

Version	Date	Amendment details	Status
3.0	25/1/18	Medicines - Medical Gases (PHARM-0002-006) archived and incorporated into this document. Administration of oxygen in an emergency situation for adults and children (PHARM-0020) also archived. Minor changes to wording in section throughout. Updated hyperlinks throughout and updated cross-referenced documents.	Published

7 Appendix 1 - Cylinder Operating Instructions

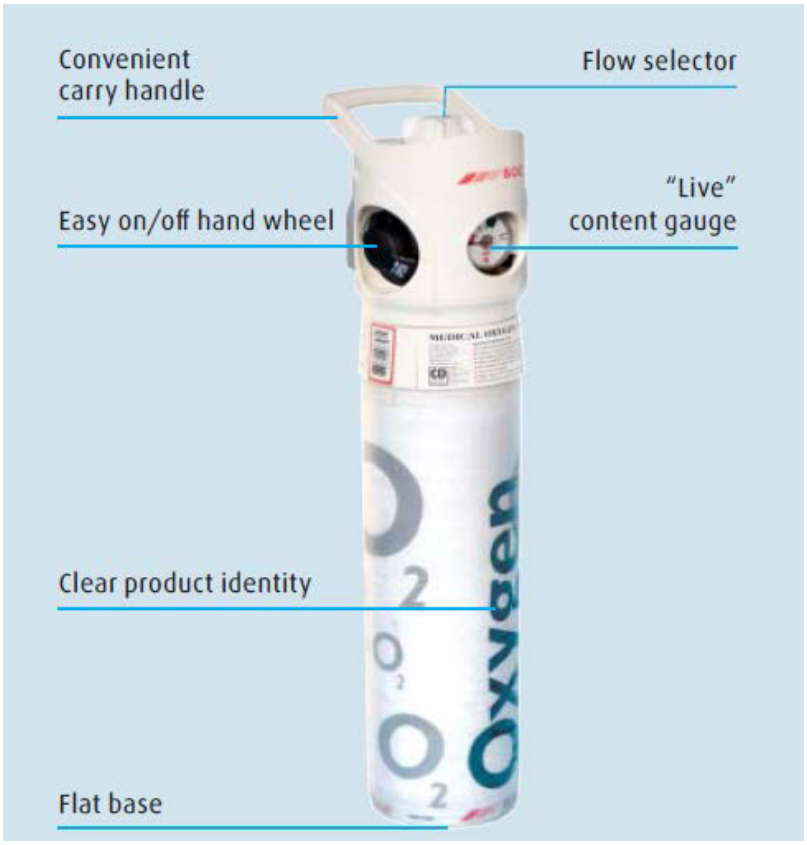
For more detailed instructions please see this leaflet

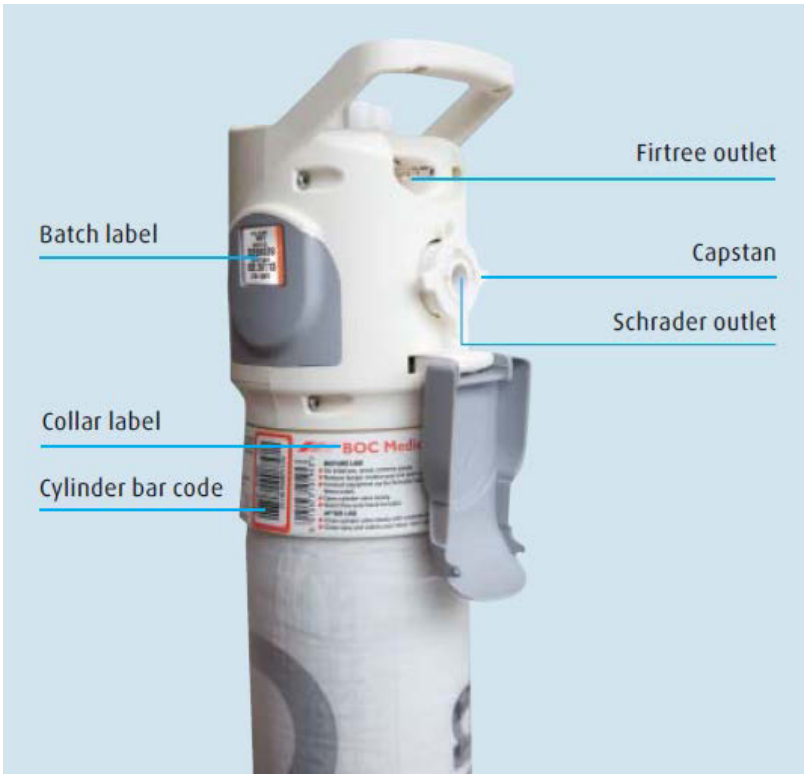
When your new CD cylinder is delivered, ensure any dust covers are removed which are protecting the:

On/Off Hand-wheel	and/or	Oxygen Outlet
		

1. To commence cylinder use, first switch the HX or CD cylinder on by: Turning the on/off hand-wheel slowly anti-clockwise two revolutions 	**2.** Attach the oxygen tubing and required oxygen administration device to the oxygen flow outlet. 
3. Turn the oxygen flow controller clockwise to set the required flow rate; the correct flow rate setting must be fully visible in the window. Check for flow of oxygen gas prior to use. 	**4**. After cylinder use return the oxygen flow controller to '0' and remove and dispose of any used oxygen tubing and oxygen administration device. 
5. Switch the device off by turning the on/off hand-wheel clockwise. Check the 'live' gauge to ensure adequate supply for next administration. 	

8 Appendix 2 - Oxygen Cylinder Features





9 Appendix 4 - Oxygen Related Equipment

The Table below highlights oxygen related equipment available on the Trust Medical devices templates via Cardea:

Oxygen Related Equipment		**Medical Device Template:**
	CD Cylinder Holder 706-0001 (This is suitable for areas that have a spare CD cylinder that may need securing, please note wall fixings are not included, staff would need to arrange this and assembly with the Estates dept.)	32. General Oxygen Therapy
	ZX Cylinder Trolley 10310980 (This is suitable for transporting or storing a HX cylinder)	32. General Oxygen Therapy
	Oxygen Gas Cylinder Sign W18 yellow, black & white	1. Emergency Resuscitation Equipment
	ACC445 Oximeter Finger BCI Digit	16. Pulse Oximetry

10 Appendix 5: Administration of Oxygen in an Emergency Situation

See the Medication Safety Series document: MSS10 - Oxygen - Administration in an emergency

10.1 Resuscitation training

- The Trust will ensure that appropriate training and education is available to implement this protocol.
- Training for emergency administration of oxygen is delivered as part of the basic / immediate life support training
- All training will reflect current Resuscitation Council (UK) and European Resuscitation Council guidelines.
- The Adult, Child and Infant First Response training is provided by specialist Clinical Skills Trainers in Resuscitation

10.2 Response to a patient who requires oxygen

- In all instances except in-patient services at The Friarage and Harrogate Hospitals the ambulance service must be called where a patient requires emergency oxygen. A member of staff should be dispatched to meet the emergency services and guide them to the clinical area
- For a cardiac arrest situation in inpatient services at The Friarage and Harrogate Hospitals the acute resuscitation team (crash team) must be called
- Staff will administer emergency oxygen until the emergency services/acute resuscitation team arrive. The emergency services/acute resuscitation team will then take responsibility for the patient's continuing health care needs and transporting the patient to Accident and Emergency Department if required.

10.3 Initiation of the provision of emergency oxygen

- All employees that work directly with patients and have access to an emergency response bag, are expected to be able to recognise a deteriorating patient, call for help and initiate the administration of oxygen immediately. Basic Life Support and/or Immediate Life Support may also be required.

10.4 Following the provision of emergency oxygen

- Following administration of emergency oxygen a full account must be documented on PARIS.

10.5 Equipment required for the delivery of emergency oxygen

- All inpatient/residential services will have an emergency response bag. Within the bag there will be an Oxygen cylinder that will provide thirty minutes of oxygen when delivered at 15 litres per minute via a Non Re-Breath Oxygen mask, Pocket Mask or a Bag Valve Mask with Reservoir Bag.