Cheshire and Wirral Partnership NHS
NHS Foundation Trust

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Policy for the administration and use of oxygen

Lead executive	Director of Nursing, Therapies and Patient Partnership
Authors details	Senior Health and Safety Advisor – 01244 397715 Clinical Training Manager 01244 397408

Type of document	Policy
Target audience	All clinical staff
Document purpose	The purpose of the document is to ensure all staff are aware of the safety procedures required for administration of oxygen for service users and that procedures are in place for safe storage of cylinders. There are dangers if medical gas cylinders are not used correctly and this policy is aimed at alleviating any danger or risk to the service user and all those who handle cylinders.

Approving meeting	Patient Safety and Effectiveness Sub Committee	Date 20/04/2017
Implementation date	January 2018	

CWP documents to be read in conjunction with	
HR6	Trust-wide learning and development requirements including the training needs analysis (TNA)
CP24	Cardio Pulmonary Resuscitation (CPR) and Medical Emergency policy
CP16	Electro Convulsive Therapy (ECT) policy
GR1	Incident reporting and management policy
CP59	Management and training needs of medical devices
CP28	Smoke free policy

Document change history	
What is different?	1.Oxygen administration flowchart - Added 2. Section 2.1 There are no contraindications to the use of medical oxygen but the inspired concentration should be limited for longer periods in those service users with chronic Obstructive Pulmonary Disease (COPD) 3. Section 2.2 Flow rates for specific percentages of oxygen to be delivered via a semi-rigid facemask - are shown in table 1 and Flow rate for the percentage of oxygen to be delivered via a 100% Non-Rebreather facemask – to be delivered in an emergency / during respiratory distress, medical help and (9)999 must be contacted if this mask is utilised – shown in table 2 4. Section 2.8 - More information added 5. Appendices 1-6 added.
Appendices / electronic forms	Yes, to show levels of oxygen required for separate situations and images of equipment
What is the impact of change?	Low

Training requirements	Yes - Training requirements for this policy are in accordance with the CWP Training Needs Analysis (TNA) with Education CWP.

Document consultation	
East locality	Consultation via policy discussion forum.
Wirral locality	Consultation via policy discussion forum.
West locality	Consultation via policy discussion forum.
Corporate services	Consultation via policy discussion forum.
External agencies	N/A

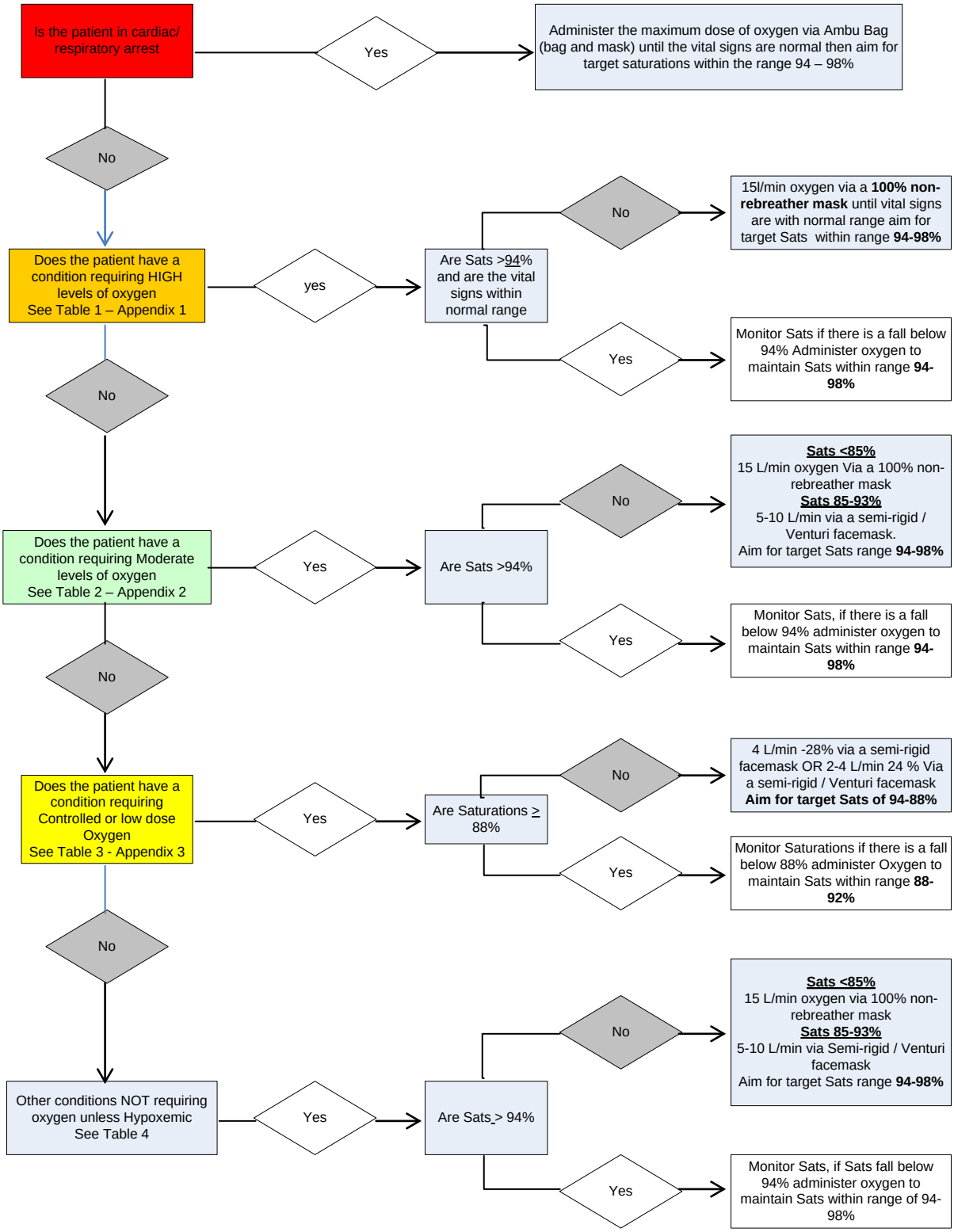
Financial resource implications	None

External references
1. National Patient Safety Agency NPSA/2009/RRR006 2. Department of Health Estates and Facilities EFA/2010/008 3. British Thoracic Society (BTS) Guidelines for emergency Oxygen use in adult patients - https://www.brit-thoracic.org.uk/document-library/clinical-information/oxygen/emergency-oxygen-use-in-adult-patients-guideline/emergency-oxygen-use-in-adult-patients-guideline/ 4. British Thoracic Society (BTS) Summary Guidelines for prescribing oxygen in hospitalhttps://www.brit-thoracic.org.uk/document-library/clinical-information/oxygen/emergency-oxygen-use-in-adult-patients-guideline/appendix-1-summary-of-recommendations-emergency-oxygen-use-in-adult-patients-guideline/

Equality Impact Assessment (EIA) – Initial assessment	Yes/No	Comments
Does this document affect one group less or more favourably than another on the basis of:		
- Race	No	
- Ethnic origins (including gypsies and travellers)	No	
- Nationality	No	
- Gender	No	
- Culture	No	
- Religion or belief	No	
- Sexual orientation including lesbian, gay and bisexual people	No	
- Age	No	
- Disability - learning disabilities, physical disability, sensory impairment and mental health problems	No	
Is there any evidence that some groups are affected differently?	No	
If you have identified potential discrimination, are there any exceptions valid, legal and/or justifiable?		
N/A		
Is the impact of the document likely to be negative?	No	
- If so can the impact be avoided?	N/A	
- What alternatives are there to achieving the document without the impact?	N/A	
- Can we reduce the impact by taking different action?	N/A	
Where an adverse or negative impact on equality group(s) has been identified during the initial screening process a full EIA assessment should be conducted. If you have identified a potential discriminatory impact of this procedural document, please refer it to the human resource department together with any suggestions as to the action required to avoid / reduce this impact. For advice in respect of answering the above questions, please contact the human resource department.		
Was a full impact assessment required?	No	
What is the level of impact?	Low	

Contents

Oxygen Administration quick reference flowchart



1. Introduction

Oxygen (O2) is present in the atmosphere at 21% and is essential to life. The average healthy individual with normal oxygen consumption has no more than four minutes supply of oxygen in the blood.

Oxygen is one of the most common medicines used in hospital settings and should always be prescribed – except in emergencies, where oxygen should be given first and documented later. Oxygen is indicated in many critical conditions and can save lives by preventing severe hypoxaemia. However, there is a potential for serious harm and even death if it is not administered and managed appropriately.

Cheshire and Wirral Partnership NHS Foundation Trust (CWP) has a duty to ensure the safe use of oxygen administration delivered in service user care. This policy applies to all staff who are involved in the administration, use and handling of any medical gases.

The National Patient Safety Agency (NPSA) required healthcare organisations to ensure that:

- Actions to minimise risks of oxygen therapy are made available to all relevant staff;
- Oxygen is always given immediately in an emergency and documented later;
- Pulse oximetry is available in all locations where oxygen is used;
- Oxygen related incidents are monitored.
- Training in the use of oxygen is available;
- Systems are in place to ensure reliable and adequate supplies.

Medical gas cylinders when used correctly are a convenient and safe method of administering the gas to the service user. There are however inherent dangers if medical gas cylinders are not used correctly and this policy is aimed at alleviating any danger or risk to the service user and all those who handle cylinders.

- Oxygen, a medical gas, when used within CWP is administered in cylinders and is also piped in one Electro Convulsive Therapy (ECT) suite.

Medical gases are contained under pressure in purpose designed cylinders to enable gases to be conveniently stored, transported and used in small quantities in any desired location. Cylinders are available in a range of sizes.

2. Description of cylinders

Medical gas cylinders are coloured to identify the contents and have a plastic collar indicating properties of the particular gas and other data including type of gas, batch of manufacture and use by date where appropriate and safety instructions.

Oxygen cylinders are black with a white collar or in the smaller more modern cylinders (sizes CD, DD and ZX) are all white with an integral pressure regulator.

The only medical gas currently used by CWP staff is oxygen.

2.1 Administration of oxygen

- In an emergency, oxygen should be given first and prescribed afterwards;
- Pulse oximetry must be in use during oxygen administration and the oxygen saturations monitored;
- There are no contraindications to the use of medical oxygen but the inspired concentration should be limited for longer periods in those service users with Chronic Obstructive Pulmonary Disease (COPD).
- Oxygen therapy is given following ECT using a disposable mask at the rate of 4 litres/35% per Minute.

- Pulse oximetry is in use constantly during ECT recovery and readings are recorded as per ECT policy - appendix 8;
- All oxygen tubing and masks used in CWP are disposable.

2.2 Cylinders and contents

Table A- Oxygen cylinder details

Cylinder size	Cylinder colour	Cylinder height	Cylinder contents	Duration of cylinder at 15 litres/min
Size CD	All white	520mm	460 litres	30 minutes
Size DD	All white	520mm	460 litres	30 minutes
Size ZX	All white	1000mm	3,040 litres	202 minutes
Size F	Black with a white collar	9300mm	1,360 litres	90 minutes

Wards should have a backup cylinder if they have a size CD or DD for the emergency trolley in case of delayed attendance by paramedic emergency services.

Table B - Flow rates for specific percentages of oxygen to be delivered via a Venturi face mask (images in appendix 5)

Litres / Min	2	4	6	8	10	15
O2 %	24%	28%	31%	35%	40%	60%
	Blue	White	Orange	Yellow	Red	Green

Table C - Flow rate for the percentage of oxygen to be delivered via a 100% Non-Rebreather facemask – image in appendix 5.

Litres / Min	15
O2 %	100%

100% Oxygen to be delivered in an emergency / during respiratory distress, medical help and (9)999 must be contacted if this mask is utilised

2.3 Supply and storage of oxygen cylinders

Medical gas cylinders shall only be procured via the nominated suppliers under the NHS Supplies contract for provision of medical gases.

BOC supply cylinders to Bowmere and Springview Hospitals. Stocks and supplies are coordinated by CWP Facilities staff and will be delivered to Bowmere and Springview hospitals, Out of Hours, respite units and Crook Lane as required.

In the Millbrook Unit BOC supplies the mental health units with oxygen cylinders. Staff must contact Facilities staff for replenishments. (appendix 6)

To avoid confusion in management of cylinders only one supplier should be used at any one site.

Where exceptional volumes of medical gas are predicted, the ward/department manager shall advise the designated Porter to ensure adequate supplies can be maintained.

Medical gas cylinders shall be stored in a dedicated central store and distributed to wards and departments as required.

Central storage of medical gas cylinders shall be in a dedicated central store that may be a secure cage with roof and level concrete floor sited externally at ground level or an internal store with concrete level floor and ventilation equivalent to 1.5% of wall area.
Ward/ Department Managers must ensure sufficient, spare equipment is available for use.

Ward Department managers at Millbrook Unit must ensure any Oxygen regulators in use are made available for the medical device engineer to service as required.

Central stores shall be identified externally indicating "Medical Gases", a store contents notice, emergency action procedures and location of keys for emergency access. Cylinder sizes ZX, F and J shall be stored vertically in racks or similar apparatus to restrain them in position. Smaller cylinders CD and DD may be stored horizontally for ease of handling. Appropriate handling equipment shall be provided in or near the store. Empty cylinders shall be stored separate from full cylinders.

- The cellophane wrapping seal on full cylinders shall remain intact until the cylinder is ready for use.
- Cylinder stocks shall be rotated to ensure the oldest cylinder refill is used first and no cylinder shall be kept for more than three years. Oxygen has a "use by" life of three years and cylinders require periodic pressure tests by the manufacturer to confirm cylinder integrity.

A system of stock rotation shall be adopted to ensure the earliest date appropriate gas is always used first.

- Cylinders stored in wards/departments shall be either in use secured to equipment or in cylinder trolleys. Spare cylinders shall be stored in a ventilated room with appropriate restraint. The rooms should be appropriately signed to indicate the presence of compressed gas.

A Manifold cylinder room exists at Bowmere Hospital for a piped oxygen supply for the ECT Suite. This is managed in accordance with HTM 02-01 by the Estates department

2.4 Transportation of cylinders

If cylinders are required to be replaced at Lime Walk House, Greenways ward, Thorn Heyes or other inpatient areas off main sites etc., the Facilities staff will deliver the cylinder via a vehicle with secure strapping and appropriate signage will be displayed in the event of an accident i.e. Oxygen – combustible gas.
Internally oxygen cylinders of sizes above CD and DD must be transported in a suitable, secure trolley.

Oxygen can be transported in staff vehicles but appropriate signage should be displayed.

Cylinders must be stored in a separate compartment to the driver and should be adequately restrained.

The Trust has a nicotine management policy throughout its premises, however it must be stressed no smoking or naked flames should be present when medical gases are in use.

2.5 Maintenance of cylinders and regulators

Medical gas cylinders generally require no maintenance other than the periodic pressure tests by the manufacturer. Regulators and flow meters shall be inspected and calibrated in accordance with the manufacturer's instructions by a competent engineer at annual intervals and records kept within the Estates Department (Medical Devices Management).

2.6 Faulty cylinders

Faulty cylinders, e.g. faulty valve operation, damaged valve, minor leaks from valve shall be removed from service, labelled as "faulty cylinder" and returned to the central store to be stored separately. The supplier shall be informed and arrangements made for replacement. The faulty cylinder should be

kept on site if required by the MHRA (Medicines and Health care Products Regulatory Agency) for inspection.

A Datix report will be completed and MHRA informed if required by the Senior Health and Safety Advisor.

If a cylinder is dropped or falls it must be taken out of use immediately and replaced. The oxygen regulator must be checked by the Trust approved engineers for medical device management for any faults.

For any faults associated with oxygen cylinders please contact the relevant supplier for that area, (see appendix 6 for contact details)

Out of hours – remove from use and ensure that facilities staff contacts the supplier as soon as possible.

2.7 Safety checks

- **Staff must ensure that there is sufficient oxygen in all cylinders, at least ¾ full, if a cylinder on the resuscitation trolley is below ¾ full a second cylinder must be ordered from the portering department**. Once the initial cylinder is empty the second cylinder will become the main cylinder, staff must notify the Facilities department to arrange collection of the empty cylinder. Cylinder suppliers do not take cylinders which contain gas so the above instructions must be followed.
- Appropriate masks must be available for use
- A prescription is required for planned administration of oxygen. See section 2.9
- Pulse oximetry is required if oxygen is administered to a service user and all readings should be documented, unsatisfactory readings must be reported to the medical officer.
- If a regulator is in use, staff must check there is no sign of damage before use
- All cylinders of size F and larger must be transported on a secure cylinder trolley
- Ensure the cylinders are free from dust, oil etc.
- Facilities staff must ensure that cylinders stored centrally are properly stored and transported to departments as required;
- Facilities staff must ensure that cylinder connections, regulators and flow meters shall be tested for leaks upon connection to the cylinder. They should not be tested for leaks with any fluid other than proprietary leak detection fluid compatible with that particular gas. Cylinder valves shall be opened prior to use and closed after use to reduce the risk of leakage.

2.8 Emergency situations

In an emergency situation an oxygen prescription is not required. Oxygen should be given to the service user immediately without a formal prescription but documented later in the service user's record.

- All service users who have had a cardiac or respiratory arrest should have 100% Oxygen provided along with basic / advanced life support. They must be given 100% oxygen via by a bag and mask (Ambu-bag) alongside Basic Life Support (BLS) whilst awaiting immediate medical review.
- Service Users whose oxygen saturations deteriorate and they develop respiratory distress must be given 100% high concentration oxygen via a 100% non-rebreather facemask at 15 litres / min flow rate and closely monitored, immediate medical referral / attendance and (9)999 must be called for when this facemask is utilised as patients will ultimately deteriorate, typically COPD patients.
- Service users with Chronic Obstructive Pulmonary Disease (COPD) and other risk factors for hypercapnia (increased amount of carbon dioxide in the blood) that develop critical illness should have the same initial target saturations as other critically ill patients, but will require urgent medical / emergency assessment. They may need controlled oxygen therapy and / or

supported ventilation. Pending the results of urgent blood gas results after which these service users may need controlled oxygen therapy or supported ventilation if there is severe hypoxaemia (insufficient oxygen content) and/or hypercapnia with respiratory acidosis.

A subsequent written record must be made of oxygen therapy given to every service user.

Any health professional can commence oxygen therapy in an emergency situation as indicated by the training they have received

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.

2.9 Prescribing of Oxygen Therapy

Prescribed Oxygen therapy must be recorded on the prescription chart and must include the following information

- Target saturation range must be stated on the prescription chart
- The mode of inhalation must be stated I.E. Mask/ nasal cannula
- The starting flow rate/ concentration must be recorded
- The duration of therapy must be recorded

3. Education

The Education Department will ensure that medical gas training is available online and through mandatory module courses for staff to complete.
Ensure that tuition is delivered on physical health training courses in the safe delivery of oxygen therapy.

ECT Recovery Nurses will receive training in emergency resuscitation procedures

4. ECT Therapy Department

The ECT Nurse must ensure before any ECT session is commenced that there are sufficient oxygen supplies available.

Piped oxygen availability must be checked before each session.
Recovery nurses must complete the ECT Policy recovery checklist for all service users who have undergone ECT.

All disposable equipment must be disposed of in the appropriate receptacle following the session.
The consultant who prescribes ECT Treatment must also prescribe oxygen therapy for the recovery period in the ECT Department. Medical staff and non-medical prescribers must prescribe oxygen for routine or emergency administration

Appendix 1 - High levels of supplemental oxygen

For all patients in emergency situations administer high doses of oxygen until their vital signs are normal, then reduce the oxygen dose and aim for targets saturations within the range of 94-98% (SpO2), medical referral / attendance and (9)999 must be called for.

Condition	Initial dose	Method of Delivery
• Cardiac arrest and resuscitation	Maximum dose until the Vital signs are normal – 15 litres / min	Bag valve mask (Bag and Mask / Ambu bag.
• Carbon monoxide Poisoning **N.B**. oxygen Saturations may appear to be normal	Maximum dose until the vital signs are normal – 15 litres / min	Reservoir mask (100% non-rebreather mask) or Bag valve mask
• Anaphylaxis • Major pulmonary haemorrhage • Sepsis • Shock • Major trauma • Major head injury • Near drowning • Electrocution	15 litres / min	Reservoir mask (100% non-rebreather mask)
• Active convulsion • Hypothermia	15 litres per minute until Reliable. Oxygen saturation measurement obtained then adjust oxygen to aim for target saturations between 94-98% (SpO2)	Reservoir mask (100% non-rebreather mask)

BTS Guidelines – Table 1

https://www.brit-thoracic.org.uk/standards-of-care/guidelines/bts-guideline-for-emergency-oxygen-use-in-adult-patients/

Appendix 2 - Moderate levels of supplemental oxygen (serious illness)

For hypoxemic (Hypoxia) patients with serious illness, administer moderate levels of oxygen. Administer oxygen until reliable oxygen saturations obtained then adjust oxygen flow to aim for target saturations between 94-98%.

Condition	Saturations / Actions	Method of administration + dose
• Hypoxaemia acute (cause not yet diagnosed) • Deterioration of lung fibrosis (or other interstitial lung disease)	If SpO2<85%	100% non-rebreather Reservoir mask 15 L/min
	If SpO2<85% and risk of hypercapnic respiratory failure	Venturi Mask / Semi Rigid Facemask 5-10 L/min
• Acute asthma • Acute heart failure • Pneumonia • Lung cancer • Pulmonary embolism • Pleural effusions • Pneumothorax • Severe anaemia	Aim for target saturations of 94-98%	Venturi mask / Semi Rigid Facemask 5-10 L/min
	If patient has COPD (or other risks for hypercapnic respiratory failure aim for target saturations of 88-92%	Venturi mask / Semi Rigid Facemask 5-10 L/min

If oxygen saturations within the target range cannot be maintained via a simple face mask (Semi Rigid facemask) at 5-10 L/min, then change to a 100% Non-rebreather reservoir mask, and refer for medical assessment / (9)999 for transfer.

BTS guidelines - Table 2

https://www.brit-thoracic.org.uk/standards-of-care/guidelines/bts-guideline-for-emergency-oxygen-use-in-adult-patients/

Appendix 3 – COPD and other conditions requiring controlled or low dose oxygen therapy

Administer the initial dose until a reliable SpO2 measurement is available then adjust oxygen flow to aim for target saturation within the range of 88-92% or a Pre-specified range on the prescription chart.

Condition	Initial dose	Method of administration
• Chronic Obstructive Pulmonary Disease • Exacerbation of cystic fibrosis • Chronic neuromuscular disorders • Chest wall disorders • Morbid obesity (body mass index >40 kg/m2)	2-4 Litres /min 4 Litres /min	24% Venturi mask / Nasal cannulae Or 28% Venturi mask / Nasal cannulae
If oxygen saturation remains below 88%	2-6 Litres /min 5-10 Litres /min	Venturi mask / Semi Rigid mask Or Nasal cannulae

If respiratory rate is >30 breaths / min, using the Semi-rigid facemasks set the flow rate 50% above the minimum specified for the mask.

If the patient with COPD, or other risk factors for hypercapnia, sustains or develops critical illness / injury, ensure the same target saturations as indicated in Table 1 (Appendix 1).

For service users with COPD, who require oxygen delivered via cannula, a water based moisturiser (such as KY Jelly or similar) on their lips and in their nose to prevent drying or cracking. Petroleum based products (such as Vaseline petroleum jelly) must not be used as these can plug the air holes and are also a fire hazard which could potentially cause chemical burns. Service users must avoid using any flammable products such as aerosols while oxygen is being delivered.

BTS Guidelines - Table 3

https://www.brit-thoracic.org.uk/standards-of-care/guidelines/bts-guideline-for-emergency-oxygen-use-in-adult-patients/

Appendix 4 – Conditions for which the patient should be monitored closely but oxygen is not required unless the patient is hypoxaemic.

Aim for target saturations of 94-98% unless stated otherwise on their prescription.

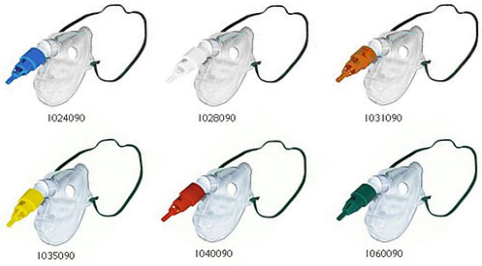
If patients have COPD or other risk factors for hypercapnic respiratory failure aim for saturations between 88-92%.
If necessary administer oxygen with nasal cannulae at 2-6 L/min or semi-rigid facemask at 5-10 L/min.

Condition	Saturations / Actions	Method of administration and initial dose
• myocardial infarction • Acute coronary syndromes • Stroke • Cardiac rhythm disturbance • Pregnancy and obstetric emergencies • Metabolic and renal disorders • Post convulsion • Gastrointestinal bleeds • Glycaemic emergencies	If SpO2<85%	Reservoir mask 15 Litres / min
	If SpO2>=85%	Nasal cannulae 2-6 Litres / min Or Venturi mask / Semi-rigid facemask 5-10 Litres / min
• Acute and sub-acute neurological and muscular conditions producing muscle weakness	Assess the need for assisted ventilations if oxygen saturations <94%	Venturi mask / Semi Rigid Facemask 10-15 L/min
• Most poisonings and drug overdoses	If respiratory depressant drug may need to ventilate the patient until antidote administered	Venturi mask / Semi Rigid Facemask 10-15 L/min
• Hyperventilation		Rebreathing from a paper bag is not recommended

BTS Guidelines - Table 4

https://www.brit-thoracic.org.uk/standards-of-care/guidelines/bts-guideline-for-emergency-oxygen-use-in-adult-patients/

Appendix 5 - Types of Oxygen delivery Face masks

Type of Oxygen mask	Oxygen litres per minute and percentage delivered
Simple / Semi rigid facemask. 	5 – 10 Litres/min = 40 - 60%
Nasal cannula. 	1 – 4 Litres/min = 28 - 35%
Venturi Face masks. 	Blue 2 Litres/min =24% White 4 Litres/min = 28% Orange 6 Litres/min = 31% Yellow 8 Litres/min =35% Red 10 Litres/min = 40% Green 12 Litres/min = 60%
Nebuliser face mask. 	6 Litres per minute via Oxygen supply. Air driven via a nebuliser machine.

100% Non-rebreathing High Concentration Face masks. 	15 Litres/min = 90% - 100%
Bag Valve Mask (BVM – Ambu bag). 	15 litres/min = 100%
Anaesthetic Face Masks (for Bag Valve Mask) 	Red - Size 6 - Extra-large adult Blue - Size 5 - Large adult Green - Size 4 - Medium adult Yellow - Size 3 - Small Adult White - Size 2 - Paediatric Grey – Size 1 – Infant Sky Blue – Size 0 – Neonate

Appendix 6 - Requirement for Replacement Oxygen Cylinder

Requirement for Replacement Oxygen Cylinder

If oxygen cylinder on resuscitation trolley is less than ¾ full, a backup cylinder must also be available on the ward.

Ensure cylinder valve is closed

All CWP Wards

Contact CWP Facilities Department:

- **Central & East** – 01625 409852
- **Wirral** – 0151 343 5542
- **West** – 01244 397278
- **Out of Hours** – 07825 073454

Remove plastic ring pull to activate O^2 delivery