Western Health and Social Care Trust

Policy for the Prescription and Administration of Oxygen to Adults in Inpatient Facilities

November 2016

Title:		**Policy for the Prescription and Administration of Oxygen to Adults in Inpatient Facilities**	
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Version No. 2	**Supercedes**	**Policy for the Prescription and Administration of Oxygen to Adults in Inpatient Facilities (August 2013)**	

1.0 Introduction

Oxygen is a drug and is, therefore, subject to regulation as for any other medicine. Its use should be prescribed by appropriately-trained, healthcare professionals. Monitoring of its administration is the responsibility of the healthcare team. As with other medicines, its use may be safe in many circumstances but its administration in some other circumstances may contribute to poorer outcomes or its use may cause harm.

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.

2.0 Aim

The aim of this policy is to ensure that:

- Those patients whose clinical condition merits the prescription of supplemental oxygen will be recognised.
- Oxygen will then be prescribed
  - In line with national (BTS Guideline; Thorax, 2008) guidance and
  - To an indicated saturation (SpO_2) range.
- Prescribers, and those monitoring its effect, will be familiar with the Trust's identified administration systems.
- Those who administer oxygen will be responsible for the supervision of the patient and for the maintenance of the target saturation (SpO_2) range.

3.0 Prescribing, administering and monitoring oxygen

3.1 Prescribing oxygen on the Medicine Prescription and Administration Record (Drug Kardex)

The Trust's Medicine Prescription and Administration Record (Drug Kardex) has been amended (Initially in 2013) to accommodate a section for both the prescribing of oxygen and defining the target saturation (SpO_2) range (Appendix (j)).

This policy provides guidance, in Appendices (a) – (d), on the medical conditions where supplemental oxygen administration is appropriate or contra-indicated.

(As a brief rule-of-thumb, oxygen should be prescribed for most acutely ill patients to achieve oxygen saturation in the range 94 – 98%. For those at risk of hypercapnic respiratory failure, the target oxygen saturation range may be lower (e.g. 88 – 92 %).

3.2 Administering oxygen

A wide variety of oxygen-delivery devices is available. Those available within the Trust are shown in Appendix (g) and Appendix (i). The FiO_2 (fraction of inspired oxygen), which the various devices deliver, is indicated in Appendix (i). The prescribed target oxygen saturation (SpO_2) and patient preference / experience will guide the selection of the delivery device to be utilised.

The staff that are qualified to administer oxygen are identified in Appendix (l).

3.3 Monitoring and recording oxygen

The patient's oxygen saturation and oxygen delivery system should be recorded on the bedside observation National Early Warning Score (NEWS) chart alongside other physiological variables.

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 adjusted appropriately to maintain the saturation (SpO_2) within the prescribed range. With clinical improvement, oxygen administration may be discontinued in some patients. **Continued increases in FiO_2, to maintain the saturation** (SpO_2) **within the target range should prompt close attention to the overall NEWS Score and may be an indication for clinical re-evaluation (see Appendix (k)).** Any sudden fall in oxygen saturation (SpO_2) should lead to clinical re-evaluation +/- the measurement of arterial blood gases (ABG).

3.4 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 in the patient's record.

All peri-arrest and critically ill patients should be given 100% oxygen (15 litres/min via a reservoir [non-re-breathable mask]) whilst awaiting immediate medical review. Patients with COPD, and/or other risk factors for hypercapnia, who develop critical illness should have the same initial target saturations as other critically ill patients - urgent blood gas analysis should be performed on these patients after which a decision about controlled oxygen therapy or supported ventilation (if there is severe hypoxaemia and/or hypercapnia with respiratory acidosis) can be made.

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 registered nurse/health professional can commence oxygen therapy in an emergency situation as indicated in the Trust Policy on Management of the Acutely Unwell Patient.

4.0 Exceptional Circumstances

- 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 Medicine Prescription and Administration Record [aka Drug Kardex]).

- Patients admitted for Long Term Oxygen Therapy assessment.

5.0 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.**

6.0 Indications

The rationale for oxygen therapy is prevention of cellular hypoxia, caused by hypoxaemia (low PaO_2), 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) (Appendix (b); Table 2)

- *Ischaemia* (for example myocardial infarction, but only if associated with hypoxaemia (abnormally high oxygen levels may be harmful to patients with ischaemic heart disease and stroke). (Appendix (b); Table 2)

- *Abnormalities in quality or type of haemoglobin* (for example acute GI blood loss or carbon monoxide poisoning). (Appendix (a); Table 1)

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 within the lungs (especially following thoracic or abdominal

surgery) resulting in hypoxaemia (Ferguson 1999). There is some evidence to suggest a decreased incidence of postoperative wound infections with short-term oxygen therapy following bowel surgery.

7.0 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 FiO_2. Supplemental O_2 should be administered with caution in patients suffering from Paraquat poisoning (see website www.toxbase.org) and with acid inhalation or previous Bleomycin lung injury.

8.0 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 worsening respiratory acidosis. This may occur in patients with COPD, neuromuscular disorders, morbid obesity or musculoskeletal disorders. (Appendix (c); Table 3). There are several factors which lead to the rise in CO_2 with oxygen therapy in patients with hypercapnic respiratory failure and details are in the BTS guideline www.brit-thoracic.org.uk/ emergency oxygen

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

9.0 Transfer and transportation of patients receiving oxygen

Patients who are to be transferred from one area to another must have clear documentation of their ongoing oxygen requirements and documentation of their oxygen saturation. This information should be on the patient's medicines' Kardex which should accompany the patient.

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 area's prescription until the patient is reviewed and transferred over to the target saturation scheme; this change to the new unit's prescribing and monitoring practice should occur as soon as possible.

9.0.1 Transfer of a patient to a department where they will only spend a short time.

All patients who are sedated /unconsciousness /acutely unwell / need to be lifted out of bed must be accompanied by a member of nursing staff whilst being transferred from one area to another.

All other patients in particular those who manage their oxygen therapy independently at home may be considered suitable to be transferred by only the porter.

Preparation for transfer

The porter is responsible for preparing the cylinder for transfer. This includes:

1. Checking and fitting the regulator to a new cylinder if required.
2. Checking the cylinder volume gauge is working correctly if it is a new cylinder

The nurse looking after the patient is responsible for:

1. Making sure the patient is well enough to leave the ward if they are to go unaccompanied.
2. Making sure there are cylinders available on the ward for patient transfer, ordering as needed from Pharmacy
3. Checking the gas flow rate is set correctly on the cylinder.
4. Making sure there is enough gas in the cylinder at the required flow rate to last until the patient returns to the ward and can be reconnected to the piped supply. (Must be at least 1h of gas)
5. Ensuring Oxygen is prescribed on Kardex
6. Ensuring the Kardex accompanies patient

At the destination

If a nurse has accompanied the patient, the nurse is responsible for:

1. Making sure the oxygen is continued during the time there.
2. Connecting the patient to the piped oxygen supply if necessary. This will be at the same flow rate as the cylinder.
3. Helping to move the patient if required.
4. Making sure there is enough oxygen in the cylinder for the return to the ward.

On arrival, if the patient is not being accompanied by a nurse the porter must inform a member of staff there that a patient who uses oxygen is being left.

The healthcare professional dealing with the patient will connect them to the piped oxygen if they believe the patient may be there for an extended period of time. This will be at the same flow rate as the cylinder.

When the patient is ready to return to the ward the health care professional who has been dealing with the patient must:

1. Make sure the patient is well enough to return to the ward.
2. Connect the patient back to the oxygen cylinder if required and check the gas flow rate is set correctly on the cylinder.

3. Make sure there is enough gas in the cylinder at the required flow rate to last until the patient returns to the ward and can be reconnected to the piped supply.

10.0 Peri-operatively 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.

11.0 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 cannulae 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.

12.0 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.

13.0 Summary Oxygen Administration policy (and weaning protocol)

ACTION	RATIONALE
All patients requiring oxygen therapy will have a prescription for oxygen therapy recorded on the patient's Medicine Prescription and Administration Record (Drug Kardex). N.B exceptions- see emergency situations	Oxygen should be regarded as a drug and should be prescribed. BTS National guidelines (2008). British National Formulary (2013).
The prescription will incorporate a target saturation that will be identified by the clinician prescribing the oxygen in accordance with the Trust's oxygen policy.	Certain groups of patients require different target ranges for their oxygen saturation (see Tables 1-Table 4 pages 12-17). Certain groups of patients are at risk of hyperoxaemia, particularly patients with COPD.
The prescription will incorporate an initial starting dose (i.e. delivery device and flow rate)	To provide the nurses with guidance for the appropriate starting point for the oxygen delivery system and flow rate
The drug Kardex should be signed at every drug round	To ensure that the patient is receiving oxygen, if prescribed, and to consider weaning and discontinuation

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 upon starting oxygen therapy. If a patient is receiving intermittent therapy they may be monitored at least 8 hourly.	To identify if oxygen therapy is maintaining the target saturation or if an increase or decrease in oxygen therapy is required
The oxygen delivery device and oxygen flow rate should be recorded alongside the oxygen saturation on the bedside observation chart.	To provide an accurate record and allow trends in oxygen therapy and saturation levels to be identified.
Oxygen saturations must always be interpreted alongside the patient's clinical status, incorporating the early warning score.	To identify early signs of clinical deterioration, e.g. elevated respiratory rate
If the patient's observed saturations fall outside 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.	To maintain the saturation in the desired range.
Saturation higher than target specified or >98% for an extended period of time.	
Step down oxygen therapy as per guidance (Appendix (k)) for delivery	The patient will require weaning down from current oxygen delivery system.
Consider discontinuation of oxygen therapy	The patient's clinical condition may have improved, thereby negating the need for supplementary oxygen
Saturation lower than target specified	
Check all elements of oxygen delivery system for faults or errors.	In most instances a fall in oxygen saturation is due to deterioration of the patient; however, equipment integrity should be checked.
Step up oxygen therapy as per protocols in appendix (k) or prescription. Any sudden fall in oxygen saturation should lead to clinical evaluation and, in most cases, measurement of blood gases	To assess the patient's response to oxygen increase, and ensure that $PaCO_2$ 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)
Monitor NEWS and respiratory rate for further clinical signs of deterioration	Patient safety
Saturation within target specified	
Continue with oxygen therapy, and monitor patient to identify appropriate time for stepping down therapy, once clinical condition allows	
A change in delivery device (without an increase in O_2 therapy) does not require review by the medical team.	(The change may be made in stable patients due to patient preference or comfort).
Oxygen delivery methods	
The Trust's recommended delivery devices will be utilised to ensure a standardised	Previous audits have demonstrated wide variations in delivery devices across clinical

approach to oxygen delivery, see Appendix (i)	areas, potentially increasing the risk of adverse incidents

14. Humidification

Humidification may be required for some patient groups, especially “neck-breathing [previous laryngectomy] patients” and those who have difficulty in clearing airway secretions or mucus.

Some patients experience drying of their nasal mucosa when using nasal cannulae at higher (≥ 3 litres per min) flow rates. Humidification may give some symptomatic relief, but there is limited scientific evidence to substantiate the clinical benefits supporting its use.

15. Implementation

All registered doctors, nurses and midwives, nursing assistants and other healthcare professionals involved in prescribing and/or monitoring oxygen will receive education on the oxygen policy. Teaching aides are available at www.brit-thoracic.org/emergency-oxygen. and the Trust Intranet site http://whsct/intranetnew/. A register of all those who have completed tuition will be maintained.

All doctors should be educated about the oxygen policy. Teaching aids are available, as indicated above. Audits will be performed in all clinical areas. Audit proformas are available on the BTS website www.brit-thoracic.org.uk. The Trust will participate in the national audits organised by the BTS.

The BTS has encouraged the appointment of oxygen champions in all Trusts.
The Western Trust has identified the following across the three sites.

- Altnagelvin Hospital: Dr Rose Sharkey and Ms Helena Phelan
- Tyrone County Hospital: Dr Terry Mc Manus and Bernie O’ Hanlon
- Southwest Acute Hospital Hospital: Dr Terry Mc Manus and Mrs Teresa Howe.

16.0 Health and Safety issues

Please see Appendix (n).

17.0 References

1. O'Driscoll B R, Howard L S, Davison A G. BTS guideline for emergency oxygen use in adult patients. Thorax 2008; 63: Supplement VI. www.brit-thoracic.org.uk/emergencyoxygen/

2. Ferguson, MK: CHEST May 1999 vol. 115 no. suppl 2 58S-63S

3. Summary guideline for prescribing oxygen emergency oxygen in hospital.
4. Available on BTS website: www.brit-thoracic.org.uk/emergencyoxygen/

5. Summary of prescription, administration and discontinuation of oxygen therapy.
6. Available on BTS website: www.brit-thoracic.org.uk/emergencyoxygen/

7. WHSCT Policy on the Management of the Acutely Unwell Patient

8. WHSCT Post-operative care Policy

9. British National Formulary, February 2013.

Equality and Human Rights Statement

This policy is fair and equitable to all patients requiring oxygen therapy at any point in the acute in-patient phase of their hospitalisation. It is not discriminatory to any section of the community. It promotes safe administration of medicines.

Appendix (a)

Table 1 Critical illness requiring high levels of supplemental oxygen

	Additional Comments
Cardiac Arrest or Resuscitation	Use bag-valve mask during active resuscitation Aim for maximum possible saturation until clinical stability
Shock, sepsis, major trauma, near-drowning, anaphylaxis, major pulmonary haemorrhage	Also give treatment for the underlying condition
Major Head Injury	Early intubation and ventilation if comatose
Carbon Monoxide Poisoning	Give highest oxygen flow possible via a bag-valve mask or non re-breathing [reservoir] mask. Check carboxy-haemoglobin levels. Oximetry readings are unreliable as oxy-haemoglobin and carboxy-haemoglobin have similar absorption characteristics. Similarly, arterial pO_2 may be unreliable and oxygen should be administered at the highest flow rates possible, using pCO_2 as the parameter indicating need for ventilation.

Appendix (b)

Table 2 Illnesses requiring moderate levels of supplemental oxygen if the patient is hypoxaemic

- The initial management is by nasal cannulae with an oxygen flow-rate of 2 – 6 litres/min or simple face mask with flow-rate of 6 – 10 litres/min, unless indicated otherwise.
- For patients not at-risk of hypercapnia whose SpO_2 are < 85%, a non re-breathing [reservoir] mask should be used with a flow-rate of 15 litres/min
- The recommended initial SpO_2 range is 94 – 96/98%.
- (If oximetry not available, give oxygen as at first bullet-point until SpO_2 or ABG available.)
- Use a non re-breathing [reservoir] mask if SpO2 target cannot be reached or maintained and seek (more senior) medical guidance.
- If the patient has COPD, or other condition with a risk of carbon dioxide retention, initial oxygen saturation target range is 88 – 92%. When the ABG is available, target range may be changed to > 92% if the pCO_2 is not elevated (and there is no prior history of Type 2 Respiratory Failure requiring NIV or IPPV). A repeat ABG is required within 30 – 60 minutes.

	Additional Comments
Acute Hypoxaemia (cause not yet determined)	Nasal cannulae or simple face mask unless initial SpO_2 < 85% when a non re-breathing [reservoir] mask, flow-rate15 L/min, should be used. Those requiring non re-breathing [reservoir] mask need early medical assessment.
Acute Asthma **Pneumonia** **Lung Cancer** **Post-operative breathlessness**	Management depends on underlying condition
Acute Heart Failure	Consider CPAP
Pulmonary Embolism	Most patients with minor pulmonary embolism are not hypoxaemic and do not require oxygen therapy.
Pleural effusion	Consider early (ultrasound-guided) drainage
Pneumothorax	Hypoxaemia in this setting is an indication for early aspiration / tube placement. For those not requiring aspiration / tube drainage, supplementary oxygen hastens air re-absorption.
Deterioration / exacerbation of IPF	Non re-breathing [reservoir] mask at 15 L/min if SpO_2 < 85%; otherwise nasal cannulae or simple face mask
Anaemia	If breathless with the anaemia, correction of the anaemia is the logical management
Sickle Cell Disease / Crisis	Oxygen supplements to achieve normal Target Range SpO_2 or patient's normal range. Hypoxaemia aggravates sickling.

Appendix (c)

Table 3 COPD and other conditions requiring controlled or low-dose oxygen therapy

- Prior to availability of blood gases, use a 28% Venturi mask at 4 l/min and aim for an oxygen saturation of 88-92% for patients with risk factors for hypercapnia but no prior history of respiratory acidosis. (Grade D)

- Adjust oxygen saturation target range to 94-98% if the $PaCO_2$ is normal (unless there is a history of previous NIV or IPPV) and recheck blood gases after 30-60 minutes. (Grade D)

- Aim at a pre-specified saturation range (from alert card) in patients with a history of previous respiratory acidosis. These patients may have their own Venturi mask. In the absence of an oxygen alert card, but with a history of previous respiratory failure (use of NIV or IPPV), treatment should be commenced using a 28% oxygen mask at 4 l/min in pre-hospital care or a 24% Venturi mask at 2-4 l/min in hospital settings with an initial oxygen target saturation of 88-92% pending urgent blood gas results. (Grade D)

- If the oxygen saturation remains below 88% in pre-hospital care despite 28% Venturi Mask, change to nasal cannulae at 2-6 l/min or simple mask at 6 l/min with target saturation of 88-92%. All at-risk patients with alert cards, previous NIV or IPPV or with saturation below 88% in the ambulance should be treated as a high priority. Alert the Emergency Department that the patient requires immediate senior assessment on arrival at the hospital. (Grade D)

- If the diagnosis is unknown, patients over 50 years of age who are long-term smokers with a history of chronic breathlessness on minor exertion [such as walking on level ground] and no other known cause of breathlessness should be treated as if having COPD for the purposes of this guideline. Patients with COPD may also use terms such as chronic bronchitis and emphysema to describe their condition but may sometimes, mistakenly, use “asthma”. FEV_1 should be measured on arrival in hospital if possible and should be measured at least once before discharge from hospital in all cases of suspected COPD. (Grade D)

- Patients with a significant likelihood of severe COPD or other illness that may cause hypercapnic respiratory failure should be triaged as very urgent and blood gases should be measured on arrival in hospital. (Grade D)

- Blood gases should be rechecked after 30-60 minutes (or if there is clinical deterioration) even if the initial $PaCO_2$ measurement was normal. (Grade D)

- If the $PaCO_2$ is raised but pH is $\geq$ 7.35 the patient has probably got long-standing hypercapnia; maintain target range of 88-92% for these patients. Blood gases should be repeated at 30-60 minutes to check for rising $PaCO_2$ or falling pH. (Grade D)

- If the patient is hypercapnic ($PaCO_2$ > 6.kPa) and acidotic (pH < 7.35), consider non-invasive ventilation, especially if acidosis has persisted for more than 30 minutes despite appropriate therapy. (Grade A)

[Grades of recommendation are as per http://www.brit-thoracic.org.uk/]

	Additional Comments	Grade of Recommendation
COPD	May need lower range than the standard 88-92% if acidotic or if known to be very sensitive to oxygen therapy. Ideally use alert cards to guide treatment based on previous blood gas results. If using a Venturi mask increase flow by 50% if respiratory rate is above 30, see recommendation 32. http://www.brit-thoracic.org.uk/	Grade C
Exacerbation of Cystic Fibrosis	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. If using a Venturi mask, increase flow by 50% if respiratory rate is above 30, see recommendation 32. http://www.brit-thoracic.org	Grade D
Chronic neuro-muscular disorders Chest wall disorders	May require ventilator support. Risk of hypercapnic respiratory failure. For acute neuro-muscular disorders and sub-acute conditions, such as Guillain-Barre syndrome, please see Table 4 pg 14. . http://www.brit-thoracic.org.uk/ .	Grade D Grade D

CF, cystic fibrosis: COPD, chronic obstructive pulmonary disease: CPAP, continuous positive airway pressure: IPPV, intermittent positive pressure ventilation; NIV, non-invasive ventilation; $PaCO_2$, arterial carbon dioxide tension; SpO_2, arterial oxygen saturation measured by pulse oximetry.

Appendix (d)

Table 4 Conditions for which patients should be monitored closely but oxygen therapy is not required unless the patient is hypoxaemic

- If hypoxaemic, the initial oxygen therapy is nasal cannulae at 2-6 l/min or simple face mask at 6-10 l/min unless saturation is below 85% (use non re-breathing [reservoir] mask) or if at risk from hypercapnia (see below).
- The recommended initial target saturation range, unless stated otherwise, is 94-98%.
- If oximetry is not available, give oxygen as above until oximetry or blood gas results are available.
- If patients have COPD, or other risk factors for hypercapnic respiratory failure, aim at an oxygen saturation of 88-92% pending blood gas results but adjust to 94-98% if the PaCO2 is normal (unless there is a history of respiratory failure requiring NIV or IPPV) and re-check blood gases after 30-60 minutes.

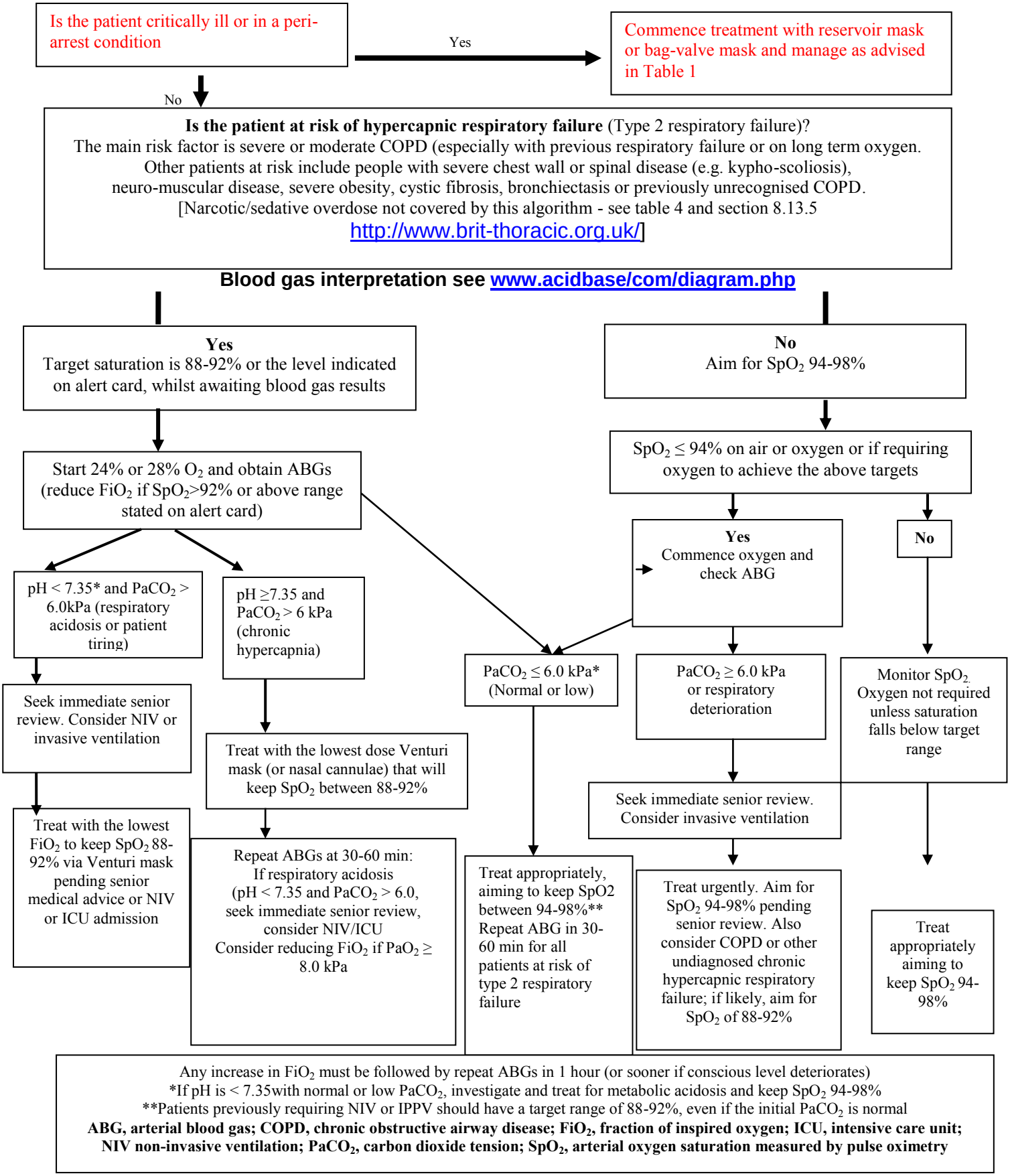
	Additional Comments	Grade of Recommendation
Myocardial infarction & acute coronary syndromes	Most patients with acute coronary artery syndromes are not hypoxaemic and the benefits/harms of oxygen therapy are unknown in such cases.	Grade D
Stroke	Most stroke patients are not hypoxaemic. Oxygen therapy may be harmful for non-hypoxaemic patients with mild-moderate strokes	Grade B
Pregnancy and obstetric emergencies	Oxygen therapy may be harmful to the foetus if the mother is not hypoxaemic. See recommendations 14-17 http://www.brit-thoracic.org.uk/	Grade A-D
Hyperventilation of dysfunctional breathing	Exclude organic illness. Patients with pure hyperventilation due to anxiety or panic attacks are unlikely to require oxygen therapy. **Re-breathing from a paper bag may cause hypoxaemia and is not recommended.**	Grade C
Most poisonings and drug overdose	Hypoxaemia is more likely with respiratory depressant drugs - give antidote if available *e.g. naloxone for opiate poisoning.* Check blood gases to exclude hypercapnia if a respiratory depressant drug has been taken. Avoid high blood oxygen levels in cases of acid aspiration as there is theoretical evidence that oxygen may be harmful in this condition. Monitor all potentially serious cases of poisoning in a level 2 or level 3 environment (High Dependency Unit or Intensive Care Unit)	Grade D

	Additional Comments	Grade of Recommendation
Poisoning with Paraquat or Bleomycin	Patients with Paraquat poisoning or Bleomycin lung injury may be harmed by supplemental oxygen. Avoid oxygen unless the patient is hypoxaemic. Target saturation is 88-92%	Grade C
Metabolic & renal disorders	Most do not need oxygen. (Tachypnoea may be due to acidosis in these patients)	Grade D
Acute and sub-acute neurological and muscular conditions producing muscle weakness	These patients may require ventilatory support and they need careful monitoring, to include spirometry. If the patient's oxygen level falls below the target saturation, they need urgent blood gas measurements and are likely to need ventilator support.	Grade C

COPD, chronic obstructive pulmonary disease; ICU, intensive care unit; IPPV, intermittent positive pressure ventilation; NIV, non-invasive ventilation; $PaCO_2$, arterial carbon dioxide tension; SpO_2, arterial oxygen saturation measured by pulse oximetry.

Appendix (e)

Oxygen prescription for acutely hypoxaemic patients in hospital



Any increase in FiO_2 must be followed by repeat ABGs in 1 hour (or sooner if conscious level deteriorates)
*If pH is < 7.35with normal or low $PaCO_2$, investigate and treat for metabolic acidosis and keep SpO_2 94-98%
**Patients previously requiring NIV or IPPV should have a target range of 88-92%, even if the initial $PaCO_2$ is normal
ABG, arterial blood gas; COPD, chronic obstructive airway disease; FiO_2, fraction of inspired oxygen; ICU, intensive care unit; NIV non-invasive ventilation; $PaCO_2$, carbon dioxide tension; SpO_2, arterial oxygen saturation measured by pulse oximetry

Appendix (f)

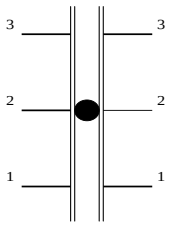
Administering Acute Oxygen Therapy

Action	Rationale
1. Ensure patency of airway	To promote effective oxygenation
2. The type of delivery system used will depend on the needs and comfort of the individual patient. Most stable patients prefer nasal cannulae to masks. It is the nurses' role to assess the patient and use the prescribed system.	To provide accurate oxygen delivery
3. Ensure oxygen is prescribed on Medicine Prescription and Administration Record (Drug Kardex) In some situations a protocol / policy/ patient group direction may be in place to allow designated nurses to administer oxygen (eg Intensive care Unit). In these cases, the doctor must review the patient's condition within the stated time and prescribe oxygen accordingly.	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.
4. Ensure that the oxygen dose is clearly indicated. If nasal cannulae or simple masks are being used check that the flow rate is clearly indicated.	In accordance with the administration of medicines policy.
5. Inform patient and or relative/ carer of the combustibility of oxygen	Oxygen supports combustion therefore there is always a danger of fire when oxygen is being used
6. Show and explain the oxygen delivery system to the patient.	To obtain understanding and cooperation
7. Assemble the oxygen delivery system carefully as shown in Appendix (g).	To ensure oxygen is given as prescribed
8. Attach oxygen delivery system to oxygen source.	To ensure oxygen supply is ready
9. Attach oxygen delivery system to patient according to instructions.	For oxygen to be administered to patient.
10. Turn on oxygen flow in accordance with prescription and manufacturers instruction.	To administer correct FiO_2 [%] of oxygen.
11. Ensure patient has either a drink or a mouthwash within reach.	To prevent drying of the oral mucosa.
12. Clean oxygen mask as required with general-purpose detergent and dry thoroughly. Discard systems after use.	To minimise risk of infection Single patient device

Appendix (g)

Equipment used for Oxygen Administration and Monitoring

1. Oxygen Flow Meter



Correct Setting for 2 l/min

Please note that the Oxygen and Air outlet are often placed side-by-side at the patient's bed head

2. Pulse Oximeter

Each clinical area (inpatient ward, A&E Dept. & Paramedic Ambulances) isequipped with pulse Oximeters. These give a measurement of oxygen saturation(SpO_2) within the blood and the pulse rate.

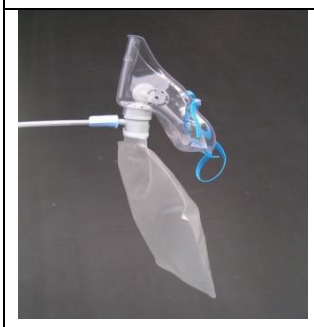
3. Oxygen Administration

A Nasal Cannulae	
	Nasal cannulae consist of a 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. Flow rates can be across the range 1 – 6 l/min, though most usually 2 – 4 l/min.

Performance	**Indication**	**Administration**
This is a **variable performance device.** It is not advisable to assume what per cent oxygen ($Fi0_2$) the patient is receiving. This is not important if the patient is in the correct target range. Set the flow rate to achieve the desired target oxygen saturation	Most patients prefer nasal cannulae to face masks for either short- or long-term oxygen use. They have the advantage of not interfering with feeding and are not as inconvenient as masks during coughing and sneezing.	Position the tips of the cannulae in the patient's nose so that the tips do not extend more than 1.5cm into the nose. Place tubing over the ears and under the chin. Educate patient re prevention of pressure areas on the back of the ear

B Simple Mask		
	Mask has a soft plastic face piece; vent holes are provided to allow air to escape. Minimal flow rate of 6 L/min (to give enough oxygen; lower rates may cause increased resistance to breathing and may also cause CO_2 re-breathing due to the small mask size.) Maximum FiO_2 delivered ~ 50%-60% at 15 L/min flow.	
Performance	**Indication**	**Administration**
This is a **variable performance device**. The oxygen concentration delivered will be influenced by**:** **a.** the oxygen flow rate (litres per minute) used, **b.** leakage between the mask and face; **c.** the patient's tidal volume and breathing rate.	This is a general purpose mask for everyday use – e.g. post-operative use; heart failure; acute asthma. **These masks must NOT to be used for CO_2-retaining patients.**	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. Minimum flow-rate is 6 L/min.

C Venturi Mask		
	A mask incorporating a device to enable a fixed concentration of oxygen to be delivered independent of patient factors, 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. The masks come in five colours, each delivering a defined FiO_2 as indicated on the mask stem: Blue = 24% White = 28% Yellow = 35% Red = 40% Green = 60%	
Performance	**Indication**	**Administration**
This is a **high [predictable] performance oxygen mask** designed to deliver a specified oxygen concentration regardless of breathing rate or tidal volume. However, if the patient is tachypnoeic (RR > 30), then the flow rate should be doubled from the indicated flow-rate on the mask stem. This does not affect the concentration of oxygen but allows the gas flow rate to match the patient's breathing pattern.	This mask will deliver an accurate FiO_2 when used according to its instructions. It is, therefore, the delivery device of choice where controlled flow is required – e.g. COPD patients.	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.

D Reservoir [non-rebreathable] Mask		
	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. 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.	
Performance	**Indication**	**Administration**
This is a **variable oxygen delivery device**. High concentrations of oxygen (FiO_2 of 60 – 70%) can be achieved.	This is the preferred device for use when high FiO_2 rates are required. However, the accuracy of the delivered FiO_2 cannot be guaranteed. **NOT to be used for $C0_2$-retaining patients except in life-threatening emergencies such as cardiac arrest or major trauma.**	Ensure the reservoir bag is inflated before placing mask on patient; this is maintained by using 15 litres of oxygen per min. 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.

E Aquapak System		
	**Choice of two sterile water reservoir bottle sizes, 340ml for oxygen flow rate >2 l/min and 650ml for delivery of 28-98% oxygen via mask**	
Performance	**Indication**	**Administration**
This is a **variable, though predictable, oxygen delivery device**. High concentration of oxygen can be achieved.	Humidified oxygen should be utilised when high percentage of oxygen are required for prolonged periods and in those with chronic respiratory illness to prevent drying of the mucosa and secretions.	Humidifier adaptor attaches Aquapak prefilled humidifiers to mask/ cannulae. Audible alarm incorporated in the adaptor alerts clinical staff to flow restriction or occlusion of humidifier or tubing. This device can be used in conjunction with Aerodyne heater device (appendix h).

F Bag-valve Mask [http://emedicine.medscape.com/article/80184-overview#showall]

The masks come in many sizes, including newborn, infant, child, and adult (small, medium, and large). Choosing the appropriate size helps to create a good seal and, therefore, aids effective ventilation. Newer bags have built-in pressure valves. Place the mask on the patient's face before attaching the bag. Cover the nose and the mouth with the mask without extending it over the chin. Change the size of the mask, as appropriate, to create a good seal.

Performance	Indication	Administration
Bags with one-way expiratory valves allow greater than 90% oxygen delivery during both positive pressure and spontaneous ventilation, while bags lacking this feature only deliver about 30% oxygen during spontaneous breaths. For a patient with a perfusing rhythm, ventilate at a rate of 10-12 breaths per minute. During cardiopulmonary resuscitation (CPR), give 2 breaths after each series of 30 chest compressions until an advanced airway is placed, then ventilate at a rate of 8-10 breaths per minute. Give each breath over 1 second.	Bag-valve-mask (BVM) ventilation is an essential emergency skill. This basic airway management technique allows for oxygenation and ventilation of patients until a more definitive airway can be established and in cases where endotracheal intubation or other definitive control of the airway is not possible.	BVM ventilation requires a good seal and a patent airway. Lift the mandible up to the mask rather than pushing the mask down onto the face. An adequate seal can more easily be made with a mask that is too big than one that is too small. Leave dentures in place, when possible, to improve mask seal. If the patient's facial hair makes a seal difficult to obtain, apply a water-soluble lubricant over the beard to improve the contact between the face and the mask. If the one-handed mask ventilation is not effective, switch to the two-handed technique. The best way to prevent aspiration is with good technique, including low-pressure, low-volume ventilation with slow insufflation.

<table>
<tr><td colspan="3">G Tracheostomy Mask</td></tr>
<tr><td>  </td><td colspan="2">These devices are designed to allow oxygen to be given via a tracheostomy tube or to patients with previous laryngectomy (i.e., ‘neck breathing patients’). The oxygen flow rate should be adjusted to achieve saturation in accordance with the prescribed oxygen saturation target range. Oxygen given in this way for prolonged periods needs constant humidification (see Appendix h) and patients may need suction to remove mucus from the airway.</td></tr>
<tr><td>Performance</td><td>Indication</td><td>Administration</td></tr>
<tr><td>This is a <u>variable oxygen delivery device</u>.</td><td>For use in ‘neck breathing’ patients who have respiratory or other disorders which result in sub-physiological oxygen saturation recordings.</td><td>Gently pace the mask over the head and neck. Adjust to patient’s comfort; however, the elastic must be sufficiently taut to maintain the mask over the tracheostomy site.</td></tr>
</table>

H Nasal High Flow (NHF™) (Fisher and Paykel)		
		This device claims to deliver high-flow oxygen, via the nasal route, at body temperature and humidified to alveolar saturation concentration. This temperature and humidity balance markedly influences patient tolerability and allows very high FiO_2 administration, for prolonged periods, by means other than face mask.
Performance	**Indication**	**Administration**
This is a **high [predictable] performance oxygen delivery system.** Flow rate and FiO_2 can be adjusted to patient need.	While this delivery system is prir indicated in the HDU / ICU settir (e.g. in the peri-invasive ventilati setting), its use in a general war may allow patients, intolerant of claustrophobic sensation of a fa mask, to receive high-flow oxyge prolonged periods. This must on used in Wards that Staff have be fully trained in its use.	The device requires a source of electricity to provide the heating of the administered air/oxygen. Nasal 'cushions' are fitted to the nasal orifices and supported by adjustable elastic straps.

Appendix (h)

Humidification

Performance	Indication	Administration
The performance of Humidification Systems is very variable and evidence for their benefit is poorly documented in research literature. - Nasal High Flow (NHF™) is a high-flow, humidified, nasal, oxygen-delivery system (discussed above at H in Appendix (g))	High-flow oxygen (nasal cannulae at flow rates ≥ 4 litres/min; Venturi masks at flow rates ≥ 4 litres/min; non-re-breathable masks and the Aquapak systems) should be used in conjunction with humidification. Prolonged use of nasal cannulae (at any flow rate) may 'dry up' the nasal mucosa and patient comfort may be assisted by incorporation of humidification.	A humidification bottle can be incorporated into the circuit for any oxygen administration situation. The Aquapak system has 'built-in' humidification.

Appendix (h)

Humidification

		
Performance	Indication	Administration
Heat and Moisture Exchanger (HME)	A HME, sometimes known as 'Swedish nose' can be used in tracheostomy patients. This acts in a similar way to the upper airway, the heat and moisture of the exhaled gas is retained either by condensation or by absorption and delivered in the returning gas as it passes through the HME (Pryor and Prasad, 2008).	This is used if the patient is spontaneously ventilating through room air with no supplementary oxygen. Regularly prescribed nebulised Sodium Chloride 0.9% may also be considered in this situation (Conway 1992) Saline nebulisers should not be used as an alternative to effective humidification. **Humidification is essential for patients with temporary tracheostomies.** .

Appendix (h)

Humidification: Guidelines for adding external heater to the humidification

		
Performance	Indication	Administration
Aerodyne Heater Device	The humidification device will depend on the patient's clinical situation. For self-ventilating patients with an intact upper airway a cold or heated aquapak will be adequate.	To ensure the oxygen is being heated and humidified the water should be observed to flow through the recycling tube. The heater should be adjusted for patient comfort.

Appendix (i) Oxygen administration devices on general wards in hospitals

Oxygen administration devices on general wards in hospitals

Patients in a peri-arrest situation and critically ill patient should be given maximum oxygen therapy via a Reservoir [non re-breathing] mask (± Humidified System) or via a Bag-valve (AMBU) mask, while immediate medical help is arriving. The exception is that group of COPD patients with known oxygen sensitivity recorded in their case notes or in the EPR. For these patients the target oxygen saturation level is in the range of 88-92%.

Nasal Cannulae

Simple Mask

Venturi Mask

Delivered FiO2	Delivery Device Options Always ensure connection to the Oxygen delivery port not the Air outlet					
24%	Nasal Cannulae, 1 l/min	or	Blue Venturi	2 litres/min*		
28%	Nasal Cannulae, 2 l/min	or	White Venturi	4 litres/min*		
35%	Nasal Cannulae, 4 l/min	or	Yellow Venturi	8 litres/min*		
40%	Simple Mask, 6 l/min	or	Red Venturi	10 litres/min*	or	AQUAPAK
60%	Simple Mask, 8 – 10 l/min		Green Venturi	12 litres/min*	or	AQUAPAK
60 – 70%	Reservoir [non re-breathable mask], 15 l/min				or	AQUAPAK
80%	AQUAPAK					
85 – 90%	AQUAPAK					

Reservoir Mask

***Please increase oxygen flow rate by 2 litres/min if RR>30**

AQUAPAK

All patients must have ABG or earlobe blood gases (ELBG) within 1 h of requiring increased oxygen	**Signs of Increasing Respiratory Distress** ↑ing Respiratory Rate (esp. if > 30); ↓ing SpO_2; ↑ing FiO_2 to maintain SpO_2; ↑ing mEWS score; signs of CO_2 retention (drowsiness, headache, flushed face, flapping tremor)	Seek medical advice if patient appears to need increasing oxygen therapy or if there is a rising EWS or Track and Trigger score

See patient's Medicine Prescription and Administration Record (Drug Kardex) and chart 1 and tables 1-4 for starting dose and target saturation. Choose the most suitable delivery system and flow rate and titrate oxygen up or down to maintain target saturation. Allow at least five minutes at each dose before adjusting further (except major and sudden fall in saturation).

Appendix (j)

Oxygen prescription chart for adult patients

A prescriber must prescribe the initial flow rate and device. The method and rate of oxygen delivery should be altered by nurses or other healthcare professionals in order to achieve the prescribed saturation range.

NB. The initial prescription does NOT need to be written if the device or flow rate is changed by the nurse or physiotherapist who must document the change in clinical notes. Remember, rapid changes in clinical condition require medical review.

Use addressograph - otherwise write in capitals

Surname: _____
First names: _____
Consultant: _____ Ward: _____
Hospital No: _____ DOB: _____
Health and Care No: _____ Check identity

Prescriber: For most chronic conditions, oxygen should be prescribed to achieve a target saturation of 94-98% (or 88-92% for those at risk of hypercapnic respiratory failure ie. CO_2 retainers).
Is the patient a known CO_2 retainer? ☐Yes ☐No

Prescription:				Administration: Check and record flow rate (FR)/device (D) at each medicine round or other times specified.
Year:	**Day and Month:** →			
	Other times: ↓			
Continuous oxygen therapy ☐			06⁰⁰	
Or 'When required' oxygen therapy ☐			FR/D	
Target oxygen saturation ☐88-92% ☐94-98%			08⁰⁰	
Other saturation range _____			FR/D	
Tick here ☐ if saturation not indicated and state reason			12⁰⁰	
e.g. end of life care			FR/D	
Starting device and flow rate:	Start date	Stop date	14⁰⁰	
			FR/D	
		Signature	18⁰⁰	
Signature Print name			FR/D	
		Pharmacy	22⁰⁰	
Bleep			FR/D	
Continuous oxygen therapy ☐			06⁰⁰	
Or 'When required' oxygen therapy ☐			FR/D	
Target oxygen saturation ☐88-92% ☐94-98%			08⁰⁰	
Other saturation range _____			FR/D	
Tick here ☐ if saturation not indicated and state reason			12⁰⁰	
e.g. end of life care			FR/D	
Starting device and flow rate:	Start date	Stop date	14⁰⁰	
			FR/D	
		Signature	18⁰⁰	
Signature Print name			FR/D	
		Pharmacy	22⁰⁰	
Bleep			FR/D	

Guidance on administering oxygen therapy

Nurses: Sign this prescription chart on every drug round. Record flow rate and device (FR/D) at each drug round using the codes. Oxygen saturations should be recorded on the patient's observation chart.

A	Air (not requiring O_2, weaning or on PRN O_2)	**CP**	Patient on CPAP system
SM	Simple mask	**NIV**	Patient on NIV system
N	Nasal cannulae (e.g . 2 litres via nasal specs, prescribe as '2L/N')	**OTH**	Other device (specify) _____
RM	Reservoir mask	**V24**	Venturi 24% (change figure as appropriate for % in use)
TM	Tracheostomy mask	**H28**	Humidified oxygen at 28% (change figure as appropriate for percentage in use)

If a ward patient is requiring high flow oxygen via non rebreathe mask, consider medical review.
If target saturations are 88-92%, nebulised drugs should not be driven by oxygen (unless specified by the doctor)

Appendix (k)

Improvement: as patient's condition improves, then the nurse may reduce the quantity of oxygen administered by one step on a 4-hourly basis

Stepwise Management Options for Nurse Adjustment of Prescribed Oxygen (as detailed in the PDG Oxygen Directive)

Step	Oxygen concentration (% FiO2)	Device options
0	Room air, 21 %	
1	24 %	Nasal cannulae, 1 L/min or Blue Venturi, 2 L/min
2	28 %	Nasal cannulae, 2 L/min or White Venturi, 4L/min
3	35%	Nasal cannulae, 4 L/min or Yellow Venturi, 8L/min
4	40%	Simple mask, 6 L/min or Red Venturi, 10L/min or AQUAPAK
5	60%	Simple mask, 8-10L/min or Green Venturi 12L/min or AQUAPAK
6	60-70%	Reservoir (Non-re-breathable) mask, 15L/min or AQUAPAK
7	80%	AQUAPAK
8	85-90%	AQUAPAK
(9)	(>90%)	(CPAP or Mechanical Ventilation)

Ongoing increase in oxygen requirements or 3 or more step changes at any one assessment is an indication for medical reevaluation

Escalation: each step change is an indication for clinical re-evaluation and recording in clinical notes

Appendix (I)

PERSONNEL WHO MAY ADMINISTER OXYGEN

Any qualified:
- Registered Nurse or Midwife.
- Doctor, or
- Physiotherapist.

Other authorised healthcare professionals may be involved in the administration of oxygen in accordance with the directions of a prescriber or prescription e.g. Critical Care Technologists, Radiographers.

All healthcare professionals who administer oxygen must have received appropriate training and have been deemed competent to do so by their appropriate manager and, where appropriate a risk assessment carried out in accordance with Trust's Medicines Code.

Appendix (m) Monitoring of Patients: See Trust NEWS or other patient monitoring system

➢ Observe the following: ☆ Monitor arterial oxygen (SpO_2) saturation levels according to Trust Oxygen Policy ☆ Visual observations of skin colour for central cyanosis (blue lips). ☆ Respiratory rate. ☆ Any sign of respiratory distress should be reported immediately.	In order to accurately monitor the patient for signs of improvement or deterioration.
➢ 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])	
➢ Check the patient's mouth and nose and behind the ears.	To identify signs of infection and pressure sores as soon as possible.
➢ Record all observations on appropriate chart: 4 hourly if on continuous oxygen 8 hourly if on intermittent oxygen.	To ensure adequate record keeping.

Appendix (n)

HEALTH AND SAFETY

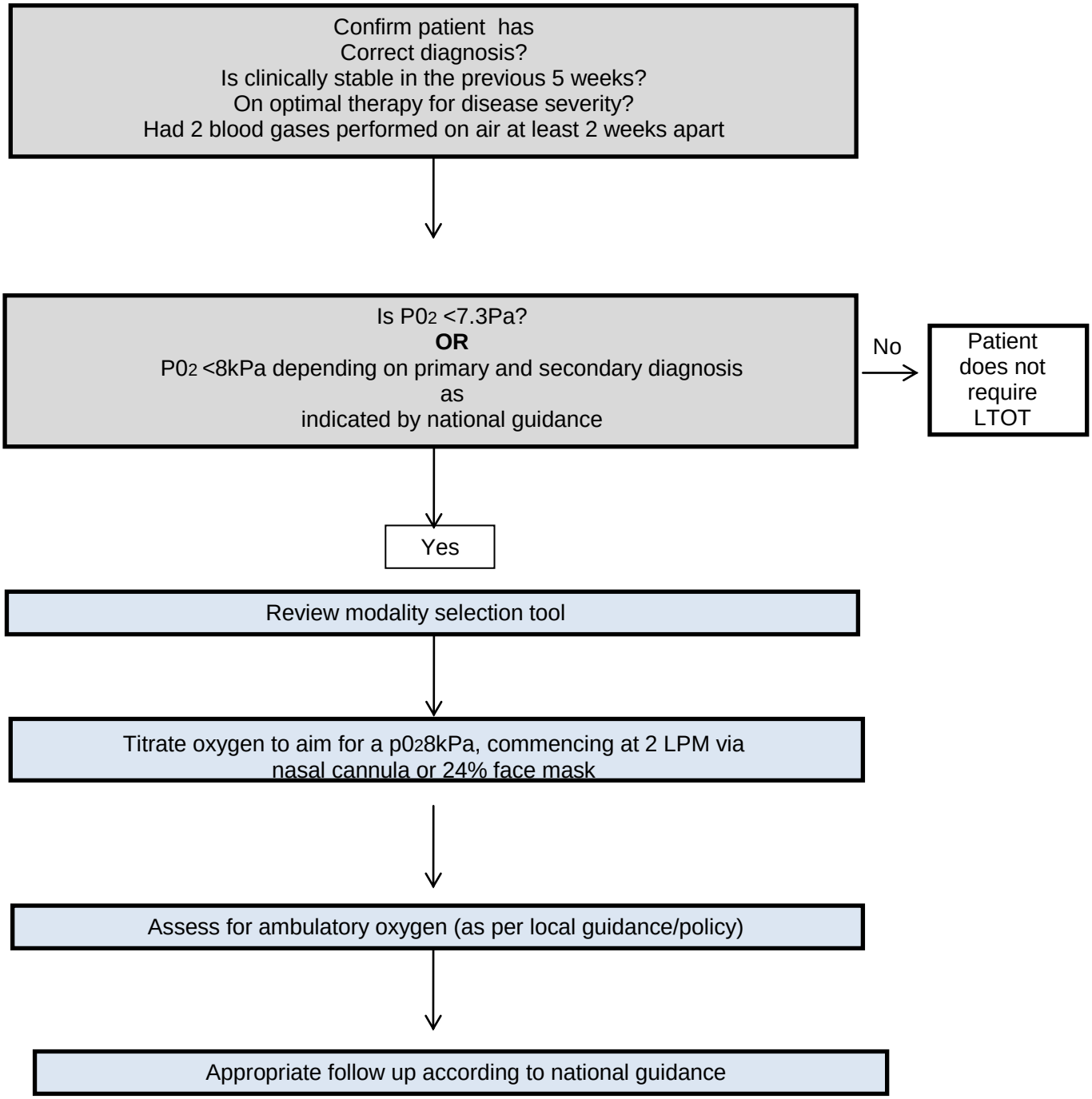
➢ Inform patients and carers about the combustibility of oxygen	Oxygen supports combustion; there is always a danger of fire when oxygen is being used.
➢ Oxygen should be stored in an area designated as 'no smoking'.	
➢ Electrical appliances should be kept at least five feet away from the source of oxygen.	Oxygen can be potentially dangerous when in contact with sources of ignition and flammable material.
➢ Avoid grease or oil coming into contact with apparatus.	
➢ Store unused cylinders in a dry, well ventilated place.	

- Handle oxygen cylinders carefully - Use a purpose-built trolley to move them
- Cylinders must be in racks, chained or clamped to prevent them from falling over
- Only store as many cylinders as you need to – remove excess to reduce risk
- Return empty cylinders to the supplier/Pharmacy
- Treat empty cylinders with the same caution as you would a full one

Appendix (o)

Pathway for long term oxygen assessment

Based on BTS guidelines: http://www.brit-thoracic.org.uk/guidelines



Appendix (p) Cylinder duration versus selected flowrate

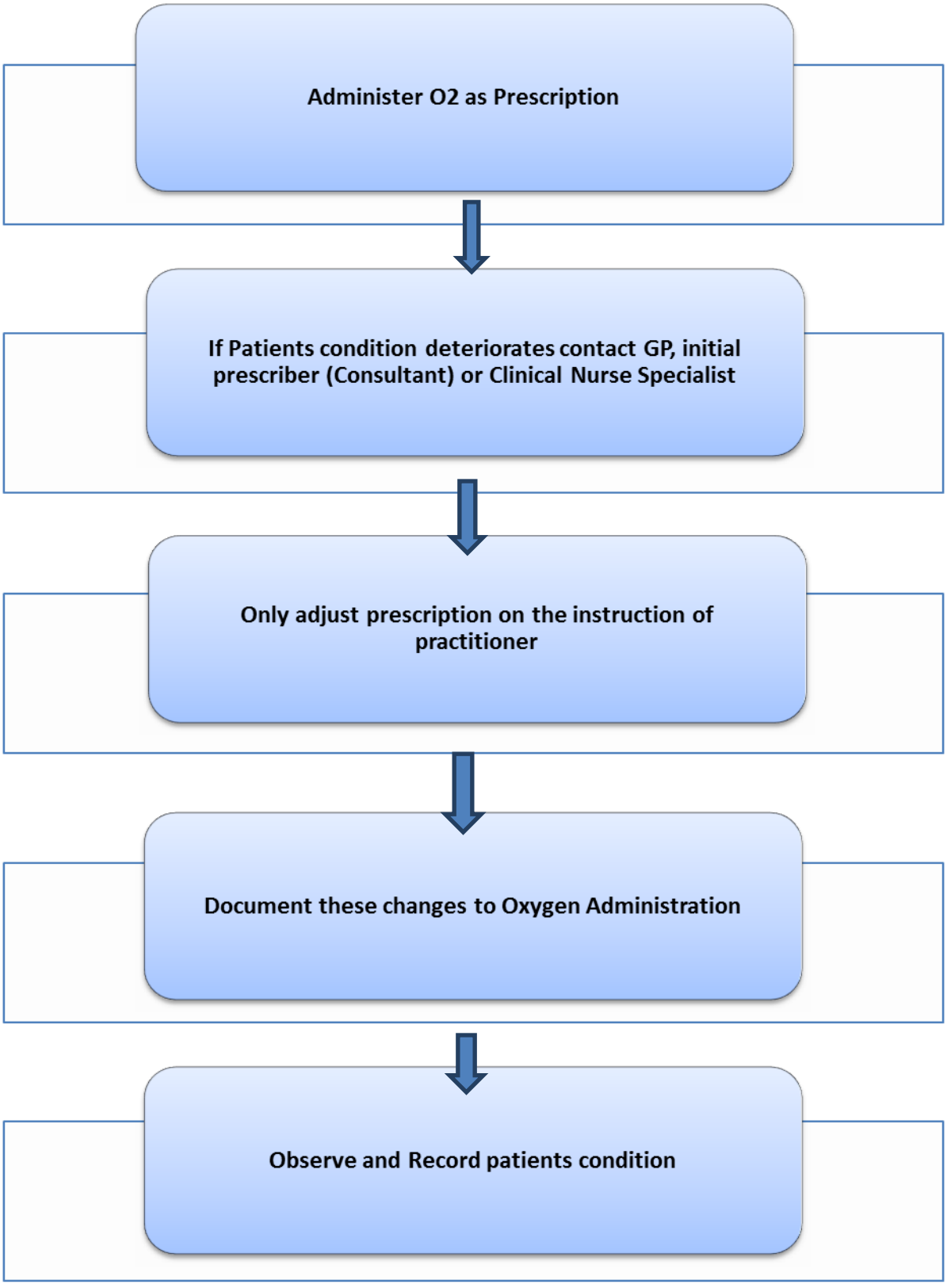
The cylinder duration times are approximate and are to be used as guidance. The cylinder contents gauge should be checked prior to use to ensure that there is sufficient gas available. A test can also be done on the regulator to make sure the guage is working correctly (See Trust Operational use of Medical Gases)

Gauge Contents*		Full (100%)		Half (50%)		Low (25%)	
Cylinder Size	**Flowrate * (lit/min)**	**Duration (hours)**	**Duration (Mins)**	**Duration (hours)**	**Duration (Mins)**	**Duration (hours)**	**Duration (Mins)**
ZA Dimensions L390mm X D85mm Weight (full) 1.75 kg	15	0 hr 20 min	20 min	0 hr 10 min	10 min	0 hr 5 min	5 min
	12	0 hr 25 min	25 min	0 hr 9 min	9 min	0 hr 6 min	6 min
	10	0 hr 30 min	30 min	0 hr 15 min	15 min	0 hr 7 min	7 min
	8	0 hr 37 min	37 min	0 hr 14 min	14 min	0 hr 9 min	9 min
	6	0 hr 50 min	50 min	0 hr 25 min	25 min	0 hr 12 min	12 min
	4	1 hr 15 min	75 min	0 hr 37 min	37 min	0 hr 18 min	18 min
	2	2 hr 30 min	150 min	1 hr 15 min	75 min	0 hr 37 min	37 min
	1	5 hr	300 min	2 hr 30 min	150 min	1hr 15 min	75 min
	0.5	10 hr	600 min	5 hr	300 min	2 hr 30 min	150 min
	0.1	50 hr	3000 min	25 hr	1500 min	12 hr 30 min	750 min
CD Dimensions L520mm X D100mm Weight (full) 3.5 kg *(please note that the low flow rates are for when a secondary flowmeter is being used)*	15	0 hr 30 min	30 min	0 hr 15 min	15 min	0 hr 7 min	7 min
	12	0 hr 38 min	38 min	0 hr 19 min	19 min	0 hr 9 min	9 min
	10	0 hr 46 min	46 min	0 hr 23 min	23 min	0 hr 11 min	11 min
	9	0 hr 51 min	51 min	0 hr 25 min	25 min	0 hr 12 min	12 min
	8	0 hr 57 min	57 min	0 hr 28 min	28 min	0 hr 14 min	14 min
	7	1 hr 5 min	65 min	0 hr 32 min	32 min	0 hr 16 min	16 min
	6	1 hr 16 min	76 min	0 hr 38 min	38 min	0 hr 19 min	19 min
	5	1 hr 32 min	92 min	0 hr 46 min	46 min	0 hr 23 min	23 min
	4	1 hr 55 min	115 min	0 hr 57 min	57 min	0 hr 28 min	28 min
	3	2 hr 33 min	153 min	1 hr 16 min	76 min	0 hr 38 min	38 min
	2	3 hr 50 min	230 min	1 hr 55 min	115 min	0 hr 57 min	57 min
	1	7 hr 40 min	460 min	3 hr 50 min	230 min	1 hr 15 min	75 min
	0.5	15 hr 20 min	920 min	7 hr 40 min	460 min	3 hr 50 min	230 min
	0.1	76 hr 40 min	4600 min	38 hr 20 min	2300 min	19 hr 10 min	1150 min
DD Dimensions L520mm X D100mm Weight (full) 3.5 kg	4	1 hr 55 min	115 min	0 hr 57 min	57 min	0 hr 28 min	28 min
	2	3 hr 50 min	230 min	1hr 55 min	115 min	0 hr 57 min	57 min
DF Dimensions L690mm X D175mm Weight (full) 12 kg	4	5 hr 21 min	322 min	2 hr40 min	161 min	1 hr 20 min	80 min
	2	10 hr 43 min	644 min	5 hr 21 min	322 min	2 hr 40 min	161 min
ZH Dimensions L595mm X D175mm Weight (full) 14 kg	15	2 hr 40 min	160 min	1 hr 20 min	80 min	0 hr 40 min	40 min
	12	3 hr 20 min	200 min	1 hr 40 min	100 min	0 hr 50 min	50 min
	10	4 hr	240 min	2 hr	120 min	1 hr	60 min
	8	5 hr	300 min	2 hr 30 min	150 min	1 hr 15 min	75 min
	7	5 hr 42 min	343 min	2 hr 51 min	171 min	1 hr 20 min	85 min
	6	6 hr 40 min	400 min	3 hr 20 min	200 min	1 hr 40 min	100 min
	5	8 hr	480 min	4 hr	240 min	2 hr	120 min
	4	10 hr	600 min	5 hr	300 min	2 hr 30 min	150 min
	3	13 hr 20 min	800 min	6 hr 40 min	400 min	3 hr 20 min	200 min
	2	20 hr	1200 min	10 hr	600 min	5 hr	300 min
	1	40 hr	2400 min	20 hr	1200 min	10 hr	600 min
	0.5	80 hr	4800 min	40 hr	2400 min	20 hr	1200 min
	0.1	400 hr	24000 min	200 hr	12000 min	100 hr	6000 min

		Full (100%)		Half (50%)		Low (25%)	
Cylinder Size	**Flowrate* (lit/min)**	**Duration (hours)**	**Duration (Mins)**	**Duration (hours)**	**Duration (Mins)**	**Duration (hours)**	**Duration (Mins)**
D Dimensions L535mm X D102mm Weight (full) 3.4 kg *(please note that the low flow rates are for when a secondary flowmeter is being used)* Volume:	**15**	0 hr 22 min	22 min	0 hr 11 min	11 min	0 hr 05 min	05 min
	12	0 hr 28 min	28 min	0 hr 14 min	14 min	0 hr 07 min	07 min
	10	0 hr 34 min	34 min	0 hr 17 min	17 min	0 hr 08 min	08 min
	8	0 hr 42 min	42 min	0 hr 21 min	21 min	0 hr 10 min	10 min
	6	0 hr 56 min	56 min	0 hr 28 min	28 min	0 hr 14 min	14 min
	4	1 hr 25 min	85 min	0 hr 42 min	42 min	0 hr 21 min	21 min
	2	2 hr 50 min	170 min	1 hr 25 min	85 min	0 hr 42 min	42 min
	1	5 hr 40 min	340 min	2 hr 50 min	170 min	1 hr 25 min	85 min
	0.5	11 hr 20 min	680 min	5 hr 40 min	340 min	2 hr 50 min	170 min
	0.1	56 hr 40 min	3400 min	28 hr 20 min	1700 min	14 hr 10 min	850 min
E Dimensions L865mm X D102mm Weight (full) 5.4 kg *(please note that the low flow rates are for when a secondary flowmeter is being used)* Volume:	**15**	0 hr 45 min	45 min	0 hr 22 min	22 min	0 hr 11 min	11 min
	12	0 hr 56 min	56 min	0 hr 28 min	28 min	0 hr 14 min	14 min
	10	1 hr 08 min	68 min	0 hr 34 min	34 min	0 hr 17 min	17 min
	8	1 hr 25 min	85 min	0 hr 42 min	42 min	0 hr 21 min	21 min
	6	1 hr 53 min	113 min	0 hr 56 min	56 min	0 hr 28 min	28 min
	4	2 hr 50 min	170 min	1 hr 25 min	85 min	0 hr 42 min	42 min
	2	5 hr 40 min	340 min	2 hr 50 min	170 min	1 hr 25 min	85 min
	1	11 hr 20 min	680 min	5 hr 40 min	340 min	2 hr 50 min	170 min
	0.5	22 hr 40 min	1360 min	11 hr 20 min	680 min	5 hr 40 min	340 min
	0.1	113hr 20min	6800 min	56 hr 40 min	3400 min	28 hr 20 min	1700 min
F Dimensions L930mm X D140mm Weight (full) 14.5 kg *(please note that the low flow rates are for when a secondary flowmeter is being used)* Volume:	**15**	1 hr 30 min	90 min	0 hr 45 min	45 min	0 hr 22 min	22 min
	12	1 hr 52 min	112 min	0 hr 56 min	56 min	0 hr 28 min	28 min
	10	2 hr 16 min	136 min	1 hr 08 min	68 min	0 hr 34 min	34 min
	8	2 hr 50 min	170 min	1 hr 25 min	85 min	0 hr 42 min	42 min
	6	3hr 46 min	226 min	1 hr 53 min	113 min	0 hr 56 min	56 min
	4	5 hr 40 min	340 min	2 hr 50 min	170 min	1 hr 25 min	85 min
	2	11 hr 20 min	680 min	5 hr 40 min	340 min	2 hr 50 min	170 min
	1	22 hr 40 min	1360 min	11 hr 20 min	680 min	5 hr 40 min	340 min
	0.5	45 hr 20min	2720min	22 hr 40 min	1360 min	11 hr 20 min	680 min
	0.1	226hr 40min	13600 min	113hr 20min	6800 min	56 hr 40 min	3400 min

Appendix (q)

Titration of Oxygen



Western Health and Social Care Trust

Appendix (r) Pathway for Ambulatory Oxygen Assessment

Confirm patient has correct diagnosis?
Is clinically stable? On optimal therapy for disease severity?

Grade 1 oxygen requirements:
LTOT with Low Activity
Ambulatory oxygen therapy may also be indicated in patients with severe hypoxaemia who are on LTOT for up to 24 hours, and are mainly housebound. These patients will need ambulatory oxygen in order to leave the house, visit relatives etc. The hours of use will be estimated during the assessment.

Grade 2 oxygen requirements:
LTOT with Active Group
Ambulatory oxygen therapy is indicated in patients on LTOT, who are mobile and need to leave the home on regular basis. The type of device that is provided will depend on the patient's mobility and use of ambulatory oxygen. The hours of use will be estimated during assessment, together with the oxygen flow rate.

Grade 3 oxygen requirements:
Non-LTOT Patients
Patients without chronic hypoxaemia and LTOT should be considered for ambulatory oxygen therapy only if they show evidence of exercise-induced oxygen desaturation, improvement in exercise capacity and/or less breathlessness with ambulatory oxygen therapy and the motivation to use the ambulatory oxygen outside the house. The hours of use will be estimated during assessment, together with the oxygen flow rate.

Formal assessment of ambulatory oxygen is not normally appropriate in this group of patients.

Prescribe ambulatory oxygen at the same flow rate as LTOT on minimal hours per day.

Review modality selection tool

Has the patient completed a pulmonary rehabilitation course? National guidance indicates that all appropriate patients should have completed a pulmonary rehabilitation course prior to receiving ambulatory oxygen

Perform walk test (6 minute walk/ISWT on air as per local policy.

Does the patient have oxygen desaturation with a fall in SaO_2 of 4% to a value of <90%

No → Ambulatory oxygen not required

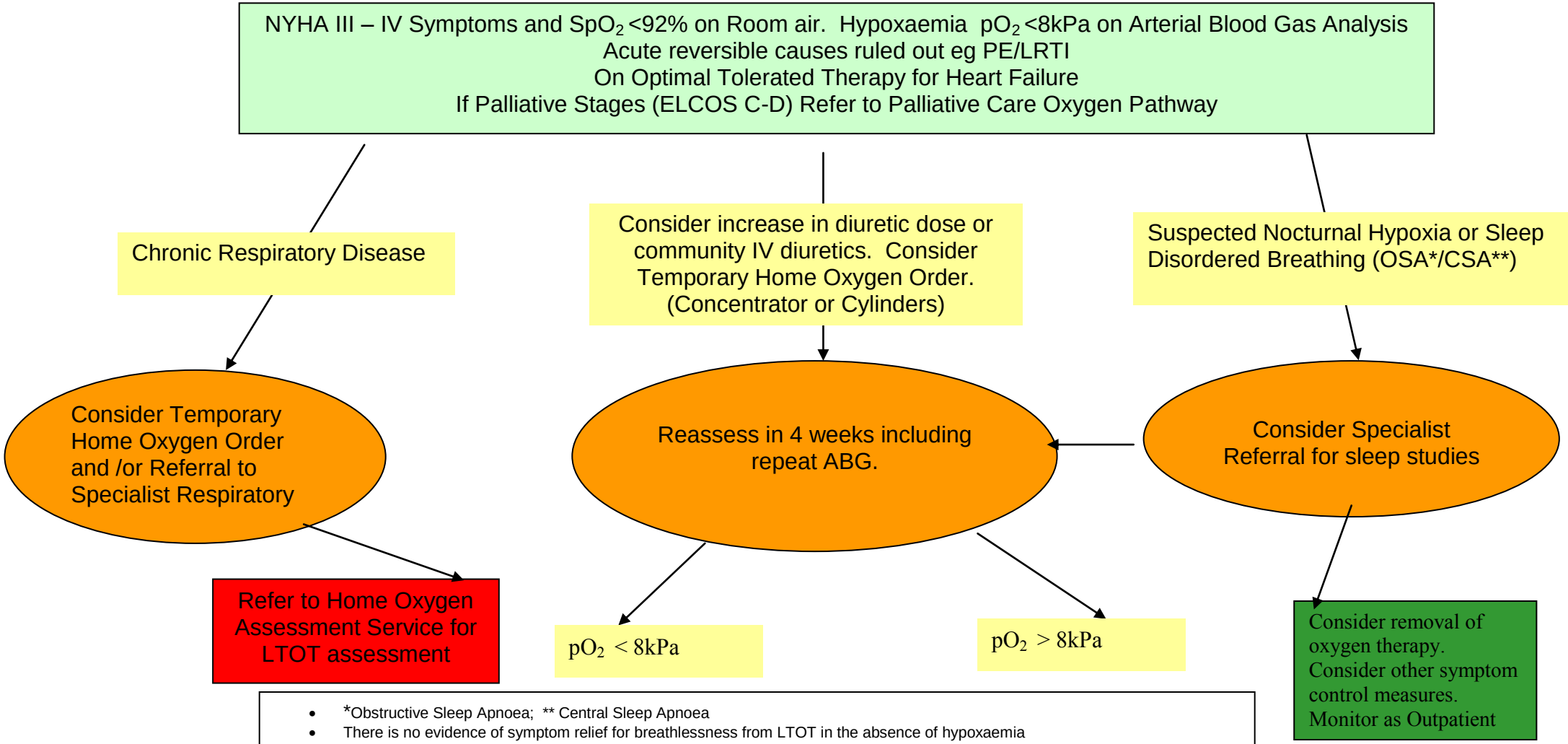
Yes

Perform walk test (6 minute walk/ISWT as peer local policy, on ambulatory oxygen to correct hypoxaemia on exercise >90%
Please see modality selection tool to identify appropriate modalities.

Follow up as per national guidance
Based on BTS guidelines: http://www.brit-thoracic.org.uk/guidelines

Appendix (s)

Referral Pathway for Home O_2 Prescription for Patients with Chronic Heart Failure due to LV Dysfunction (Prognosis <1 yr)



- *Obstructive Sleep Apnoea; ** Central Sleep Apnoea
- There is no evidence of symptom relief for breathlessness from LTOT in the absence of hypoxaemia
- **There is no proven benefit of oxygen therapy in patients with Chronic Heart Failure except in Sleep Disordered Breathing where nocturnal oxygen or CPAP may be of benefit.**