

English Pharmacy Board 6 February 2008

PUBLIC BUSINESS

Guidelines for Use of Oxygen in Adult Patients

Purpose

To consider the guidelines for use of oxygen in adult patients.

Strategic objective domains

- An organisation that consistently performs as a regulator, professional representative leader and publisher

Action required

To endorse the guidelines.

1. Background

The British Thoracic Society have asked the Society to endorse the attached document. The text has been approved by the BTS Standards of Care Committee in November 2007. Both Anna Murphy (UKCPA) and Meghna Joshi (RPSGB) have provided extensive comments and input into the document. To save on printing costs the Executive Summary has been printed. If Board members would like the full guidelines of 165 pages then it will be emailed.

2. Risk Implications

There has been extensive input from the Society into the guidelines so the risk implications are minimal.

3. Resource Implications

There are no resource implications.

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Deputy Head of Corporate Secretariat

British Thoracic Society

Guideline for emergency oxygen use in adult patients

Full Text of Guideline

Working draft updated 12th December 2007

Endorsed by Guideline Development Committee (see Section 16)

Endorsed by British Thoracic Society Standards of Care Committee

Reviewed by Peer Reviewers July 2007

Reviewed on BTS website August 2007

Awaiting formal endorsement by:

*Association of Respiratory Nurse
Specialists
Association for Respiratory Technology and
Physiology
British Association for Emergency Medicine
British Cardiovascular Society
British Geriatrics Society
British Paramedic Association
Chartered Society of Physiotherapy
General Practice Airways Group (GPIAG)
Intensive Care Society*

*Joint Royal Colleges Ambulance Liaison
Committee
Resuscitation Council (UK)
Royal College of Anaesthetists
Royal College of General Practitioners
Royal College of Midwives
Royal College of Nursing
Royal College of Obstetricians and
Gynaecologists
Royal College of Physicians
Royal College of Surgeons
Royal Pharmaceutical Society of Great
Britain
Society for Acute Medicine*

Executive summary of the Guideline

Philosophy of the Guideline

- Oxygen is a treatment for hypoxaemia, not breathlessness. (Oxygen has not been shown to have any effect on the sensation of breathlessness in non-hypoxaemic patients).
- The essence of this guideline can be summarised simply as a requirement for oxygen to be prescribed according to a target saturation range and for those who administer oxygen therapy to monitor the patient and keep within the target saturation range.
- The Guideline suggests aiming to achieve normal or near-normal oxygen saturation for all acutely ill patients apart from those at risk of hypercapnic respiratory failure or those receiving terminal palliative care.

1. Assessing patients

- In life-threatening emergencies, high concentration oxygen should be administered immediately (Table 1 and Chart 1) and this should be recorded afterwards in the patient's health record.
- The oxygen saturation should be checked by pulse oximetry in all breathless and acutely ill patients, "the fifth vital sign", (supplemented by blood gases when necessary) and the inspired oxygen concentration should be recorded on the observation chart with the oximetry result.

(The other vital signs are Pulse, Blood Pressure, Temperature and Respiratory Rate)

- Pulse oximetry must be available in all locations where emergency oxygen is used.

2. Oxygen prescription

- Oxygen should be prescribed to achieve a target saturation of 94-98% for patients aged below 70 and 92-98% for those aged 70 or above or 88-92% for those at risk of hypercapnic respiratory failure. (Table 1).
- The target saturation should be written (or ringed) on the drug chart (Guidance on Chart 1).

3. Oxygen administration

- Oxygen should be administered by staff who are trained in oxygen administration.
- These staff should use appropriate devices and flow rates in order to achieve the target saturation range (Chart 2).

4. Monitoring and maintenance of target saturation

- Oxygen saturation and delivery system should be recorded on the patient's monitoring chart alongside the oximetry result.

- Oxygen delivery devices and flow rates should be adjusted to keep the oxygen saturation in the target range.
- Oxygen should be signed for on the drug chart on each drug round.

5. Weaning and discontinuation of oxygen therapy

- Oxygen should be reduced in stable patients with satisfactory oxygen saturation.
- Oxygen should be crossed off the drug chart once oxygen is discontinued.

Oxygen is one of the most widely used drugs and is used across the whole range of specialities. The Guideline group recognise that many doctors and nurses will initially wish to read an abbreviated version of this guideline which is provided in this detachable supplement which is also available to download from the BTS Website.
www.brit-thoracic.org.uk/guidelines.html

Summary of key recommendations for emergency oxygen use

Achieving desirable oxygen saturation ranges in acute illness

Sections 6.7 and 6.8

- 1 This Guideline recommends aiming to achieve a normal or near-normal oxygen saturation for all acutely ill patients apart from those at risk of hypercapnic respiratory failure. Grade D
- 2 The recommended target saturation for patients not at risk of hypercapnic respiratory failure, aged below 70 is 94-98% and the target range for those aged 70 and above is 92-98% to reflect the wider normal range in the latter age group. Grade D
- 3 Most non-hypoxaemic breathless patients do not benefit from oxygen therapy but a sudden reduction of more than 3% in a patient's oxygen saturation within the target saturation range should prompt fuller assessment of the patient (and the oximeter signal) because this may be the first evidence of an acute illness. The narrower target range in younger patients ensures prompt assessment if a patient falls outside the age-specific normal range, but does not imply greater vulnerability to hypoxia. Grade D
- 4 For most patients with known COPD or other known risk factors for hypercapnic respiratory failure (e.g. morbid obesity, chest wall deformities or neuro-muscular disorders), a target saturation range of 88-92% is suggested pending the availability of blood gas results. Grade C
- 5 Some patients with COPD and other conditions are vulnerable to repeated episodes of hypercapnic respiratory failure. In these cases, it is recommended that treatment should be based on the results of previous blood gas estimations during acute exacerbations because hypercapnic respiratory failure can occur even if the saturation is below 88%. For patients with prior hypercapnic failure (requiring NIV or IPPV) who do not have an alert card, it is recommended that treatment should be commenced using a 28% Venturi 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 target saturation of 88-92% pending urgent blood gas results. These patients should be coded as "Status Red" by Emergency Services and the oxygen flow should be turned down if the saturation exceeds 92%. Grade D
- 6 Because oxygenation is reduced in the supine position, fully conscious hypoxaemic patients should ideally be allowed to maintain the most upright posture possible (or the most comfortable posture for the patient) unless there are good reasons to immobilise the patient (e.g. skeletal or spinal trauma). Grade C

Clinical and laboratory assessment of hypoxaemia and hypercapnia

Section 7.1

- 7 Fully trained clinicians should assess all acutely ill patients by measuring pulse, blood pressure, respiratory rate and assessing circulating blood volume and anaemia (ABC assessment). Expert assistance from specialists in intensive care or from other disciplines should be sought at an early stage if patients are thought to have major life-threatening illnesses and clinicians should be prepared to call for assistance when

necessary including a call for a 999 Ambulance in pre-hospital care or a call for the Resuscitation Team in hospital care. Grade C-D

- 8 Clinical assessment of acutely unwell patients should include the use of a recognised physiological "Track and Trigger" systems such as the Modified Early Warning Scoring System (mEWS) and a change in this score should require medical review even if there is no change in oxygen saturation. Grade C
- 9 The oxygen saturation should be checked by trained staff using pulse oximetry in all breathless and acutely ill patients, "the fifth vital sign", (supplemented by blood gases when necessary) and the inspired oxygen concentration should be recorded on the observation chart with the oximetry result. Grade D
- 10 The presence of a normal SpO₂ does not always negate the need for blood gas measurements because pulse oximetry will be normal in a patient with normal oxygen tension but abnormal blood pH or PCO₂ or with a low blood oxygen content due to anaemia. Therefore, blood gases and full blood count tests are required as early as possible in all situations where these measurements may affect patient outcomes. Grade D

Arterial and arteriolised blood gases Section 7.1.3 and 8.4

- 11 For critically ill patients or those with shock or hypotension (systolic blood pressure below 90 mm Hg), the initial blood gas measurement should be obtained from an arterial specimen (ABG). However, for most patients who require blood gas sampling, either ABG or arteriolised Earlobe Blood Gases (ELBG) may be used but the PaO₂ is less accurate in ELBG samples (it under-estimates saturation by 0.5-1 kPa) so oximetry should be monitored carefully if ELBG specimens are used. Grade B
- 12 Local anaesthesia should be used for all arterial blood gas specimens except in emergencies or if the patient is unconscious or anaesthetised. Grade B
- 13 Blood gases should be checked in the following situations.
 - Unexpected or inappropriate hypoxaemia (SpO₂ below 94% in patients aged up to 70 breathing room air or oxygen or SpO₂ below 92% in patients aged 70 and above) or any patient requiring oxygen to achieve the above targets. (*Allowance should be made for transient dips in saturation to 90% or less in normal subjects during sleep*). Grade D
 - Deteriorating oxygen saturation or increasing breathlessness in a patient with previously stable hypoxaemia (e.g. severe COPD). Grade D
 - Any previously stable patient who deteriorates and requires a significantly increased fraction of inspired oxygen (FIO₂) to maintain a constant oxygen saturation. Grade D
 - Any patient with risk factors for hypercapnic respiratory failure who develops acute breathlessness, deteriorating oxygen saturation, or drowsiness or other symptoms of CO₂ retention. Grade D
 - Breathless patients who are thought to be at risk of metabolic conditions such as diabetic ketoacidosis or metabolic acidosis due to renal failure. Grade D

- Acutely breathless or critically ill patients with poor peripheral circulation in whom a reliable oximetry signal cannot be obtained. Grade D
- Any other evidence from the patient's medical condition that would indicate that blood gas results would be useful in the patient's management (e.g. unexpected change in "track and trigger" systems such as a sudden rise of several units in modified Early Warning Score or an unexpected fall in oxygen saturation of 3% or more, even if within the target range). Grade D

Oxygen use in specific illnesses: See Tables 1-4 and Charts 1-2 (and Section 8 in main text)

Critical illness requiring high levels of supplemental oxygen

– see Table 1 and Section 8

Serious illness requiring moderate levels of supplemental oxygen if a patient is hypoxaemic

– see Table 2 and Section 8

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

– see Table 3 and Section 8

Conditions for which patients should be monitored closely but oxygen therapy is not required unless the patient is hypoxaemic – see Table 4 and Section 8

Oxygen therapy in pregnancy *Section 8.13.3*

- 14 Women who suffer from major trauma, sepsis or acute illness during pregnancy should receive the same oxygen therapy as any other seriously ill patients, with a target oxygen saturation of 94-98%. The same target range should be applied to women with hypoxaemia due to acute complications of pregnancy (e.g. collapse related to amniotic fluid embolus, eclampsia or ante partum or postpartum haemorrhage) Grade D
- 15 Women with underlying hypoxaemic conditions (e.g. heart failure) should be given supplemental oxygen during labour to achieve an oxygen saturation of 94-98% Grade D
- 16 All women with evidence of hypoxaemia who are more than 20 weeks pregnant should be managed with left lateral tilt to improve cardiac output. Grade B
- 17 The use of oxygen during labour is widespread but there is evidence that this may be harmful to the fetus. Therefore, the use of oxygen during labour is not currently recommended in situations where the mother is not hypoxaemic (except as part of a controlled trial). Grade A

Emergency use of oxygen in pre-hospital and hospital care *Sections 8 and 9*

- 18 Pulse oximetry must be available in all locations where emergency oxygen is being used. Grade D
 - (see also the limitations of using pulse oximetry section 7.1.2)

- 19 Emergency oxygen should be available in primary care medical centres; preferably using oxygen cylinders with integral high-flow regulators. Alternatively, oxygen cylinders fitted with high-flow regulators (delivering over 6 l/min) must be used. Grade D
- 20 All documents which record oximetry measurements should state whether the patient is breathing air or a specified dose of supplemental oxygen. Grade C
- 21 The oxygen saturation should be monitored continuously until the patient is stable or arrives at hospital for a full assessment. The oxygen concentration should be adjusted upwards or downwards to maintain the target saturation range. Grade D
- 22 In most emergency situations, oxygen is given to patients immediately without a formal prescription or drug order. The lack of a prescription should never preclude oxygen being given when needed in an emergency situation. However, a subsequent written record must be made of what oxygen therapy has been given to every patient (in a similar manner to the recording of all other emergency treatment). Grade D
- 23 Patients with COPD (and other at-risk conditions) who have had an episode of hypercapnic respiratory failure should be issued with an oxygen alert card and with a 24% or 28% Venturi mask. They should be instructed to show the card to the ambulance crew and Emergency Department staff in the event of an exacerbation. Grade C
- 24 The content of the alert card should be specified by the physician in charge of the patient's care, based on previous blood gas results. Grade D
- 25 The primary care team and ambulance control should also be informed by the responsible clinician that the patient has had an episode of hypercapnic respiratory failure and carries an Oxygen alert card. These patients home addresses and ideal oxygen dose or target saturation ranges can be flagged in the ambulance control systems and disseminated to ambulance crews when required. Grade D
- 26 Out of hours services providing emergency Primary Care services should be informed by a responsible clinician that the patient has had an episode of hypercapnic respiratory failure and carries an Oxygen alert card. Use of oxygen in these patients will be guided by the instructions on the alert card. Grade D
- 27 During ambulance journeys, oxygen driven nebulisers should be used for patients with asthma and may be used for COPD patients in the absence of an air-driven compressor system. If oxygen is used for patients with known COPD, its use should be limited to 6 minutes. This will deliver most of the nebulised drug dose but limit the risk of hypercapnic respiratory failure. (section 10.8.2) Grade D.
- 28 If a patient is found to have respiratory acidosis due to excessive oxygen therapy, the oxygen therapy should not be discontinued abruptly but should be stepped down to 28% or 24% oxygen from a Venturi mask depending on oxygen saturation and blood gas results. Grade C

Equipment used to deliver emergency oxygen therapy *See section 10*

- 29a It is recommended that the following delivery devices should be available in pre-hospital settings where oxygen is administered. Grade D

- High concentration reservoir mask (non-rebreathe mask) for high-dose oxygen therapy.
- Nasal cannulae (preferably) or simple face mask for medium dose oxygen therapy.
- 28% Venturi mask for patients with definite or likely COPD. (Patients who have an oxygen alert card may have their own 24% or 28% Venturi mask)
- Tracheostomy masks for patients with tracheostomy or previous laryngectomy.

29b Most hospital patients can be managed with the same delivery device as in 29a but 24% Venturi masks should also be available. Grade D

- 30 The flow rate from simple face masks should be adjusted between 5 and 10 litres per minute to achieve the desired target saturation. Flow rates below 5 l/min may cause carbon dioxide re-breathing and increased resistance to inspiration. Grade C
- 31 In many patients, Venturi masks can be substituted with nasal cannulae at low flow rates (1-2 l/min to achieve the same target range) once patients have stabilized. Grade D
- 32 Patients with a respiratory rate above 30 breaths per minute should have the flow rate set to 50% above the minimum flow rate specified for the Venturi mask and/or packaging. (Increasing the oxygen flow rate into a Venturi mask increases the total gas flow from the mask but does not increase the concentration of oxygen which is delivered) Grade C.
- 33 Trusts should take measures to eliminate the risk of oxygen tubing being connected to the incorrect wall oxygen outlet or to outlets that deliver compressed air instead of oxygen. Air flow-meters should be removed from the wall sockets or covered with a designated air outlet cover when not in use. Special care should be taken if twin oxygen outlets are in use. Grade D
- 34 Humidification is not required for the delivery of low flow oxygen or for the short-term use of high-flow oxygen. It is not therefore required in pre-hospital care. Pending the results of clinical trials, it is reasonable to use humidified oxygen for patients who require high-flow oxygen systems for more than 24 hours or who report upper airway discomfort due to dryness. Grade B
- 35 In the emergency situation, humidified oxygen use can be confined to patients with tracheostomy or an artificial airway although these patients can be managed without humidification for short periods of time (e.g. ambulance journeys). Grade D
- 36 Humidification may also be of benefit to patients with viscous secretions causing difficulty with expectoration. This benefit can be achieved using nebulised normal saline. Grade C
- 37 Bubble bottles should not be used because there is no evidence of clinically significant benefit but there is an infection risk. Grade C
- 38 When oxygen is required by patients with prior tracheostomy or laryngectomy, a tracheostomy mask (varying the flow as necessary) should achieve the desired oxygen saturation (tables 1 to 4). An alternative delivery device, usually a two piece device fitted directly to the tracheostomy tube may be necessary if the patient deteriorates. Grade D

Oxygen therapy during nebulised treatments *See section 10*

39 For patients with asthma, nebulisers should be driven by piped oxygen or from an oxygen cylinder fitted with a high flow regulator capable of delivering a flow rate over 6 l/min. The patient should be changed back to their usual mask when nebuliser therapy is complete. If the cylinder does not produce this flow rate, then an air-driven nebuliser (with electrical compressor) should be used with supplemental oxygen by nasal cannulae at 2-6L/m to maintain an appropriate oxygen saturation level. Grade D

40 When nebulised broncho-dilators are given to hypercapnic acidotic patients, they should be driven by compressed air and, if necessary, supplementary oxygen should be given concurrently by nasal cannulae at 2-4 litres per minute to maintain an oxygen saturation of 88-92%. The same precautions should be applied to patients who are at risk of hypercapnic respiratory failure prior to the availability of blood gas results. Once the nebulised treatment is completed for patients at risk of hypercapnia, controlled oxygen therapy with a fixed concentration (Venturi) device should be re-instituted. Grade D

- During ambulance journeys, oxygen driven nebulisers should be used for patients with asthma and may be used for COPD patients in the absence of an air-driven compressor system. If oxygen is used for patients with known COPD, its use should be limited to 6 minutes. This will deliver most of the nebulised drug dose but limit the risk of hypercapnic respiratory failure. (See recommendation 27)

Prescription, Administration, Monitoring and discontinuation of oxygen therapy*Sections 11 and 12*

41 Oxygen should always be prescribed or ordered on a designated document as discussed in detail in section 11 of this Guideline. In emergencies, oxygen should be given first and documented later.

42 All Primary Care Trusts, Ambulance Trusts and Hospital Trusts should take specific measures to institute safe and effective prescribing of oxygen as documented in section 11 of this Guideline.

Table 1 Critical illnesses requiring high levels of supplemental oxygen*Section 8.10*

The initial oxygen therapy is a reservoir mask at 15 l/min.

Once stable, reduce the oxygen dose and aim for target saturation range of 94-98% if aged <70 and 92-98% saturation if aged ≥70

Patients with COPD and other risk factors for hypercapnia who develop critical illness should have the same initial target saturations as other critically ill patients pending the results of blood gas results after which these patients may need controlled oxygen therapy or supported ventilation if there is severe hypoxia and/or hypercapnia.

	Additional Comments	Grade of Recommendation
Cardiac Arrest or Resuscitation	Use bag-valve-mask during active resuscitation. Aim for maximum possible oxygen saturation until the patient is stable.	Grade D
Shock	Also give specific treatment for the underlying condition	Grade D
Sepsis		Grade D
Major Trauma		Grade D
Near-Drowning		Grade D
Anaphylaxis		Grade D
Major Pulmonary Haemorrhage		Grade D
Major Head Injury	Early intubation and ventilation if comatose.	Grade D
Carbon Monoxide Poisoning	Aim for 100% saturation and check carboxyhaemoglobin levels. A normal or high oximetry reading should be disregarded because saturation monitors cannot differentiate between carboxyhaemoglobin and oxyhaemoglobin, due to their similar absorbances. The blood gas PaO ₂ will also be normal in these cases.	Grade C

Table 2 Serious illnesses requiring moderate levels of supplemental oxygen if the patient is hypoxaemic *Section 8.11*

<p>The initial oxygen therapy is nasal cannulae at 2-6 l/min (preferably) or simple face mask at 5-10 l/min unless stated otherwise. For patients not at risk of hypercapnic respiratory failure who have saturation below 85%, treatment should be commenced with a reservoir mask at 10-15 l/min.</p> <p>Recommended initial oxygen saturation target range is 94-98% if aged <70 and 92-98% saturation if aged ≥70</p> <p>Change to reservoir mask if the desired saturation range cannot be maintained with nasal cannulae or simple face mask (and ensure that the patient is assessed by senior medical staff)</p> <p>If these patients have co-existing COPD or other risk factors for hypercapnic respiratory failure, aim at a saturation of 88-92% pending blood gas results but adjust to 92-98% if the PaCO₂ is normal (unless there is a history of previous hypercapnic respiratory failure requiring NIV or IPPV) and recheck blood gases after 30-60 minutes.</p>		
	Additional Comments	Grade of Recommendation
Acute hypoxaemia - cause not yet diagnosed	Reservoir mask at 10-15 l/min if initial SpO ₂ below 85%, otherwise nasal cannulae or simple face mask <i>Patients requiring reservoir mask therapy need urgent clinical assessment by senior staff.</i>	Grade D
Acute Asthma		Grade C
Pneumonia		Grade C
Lung Cancer		Grade C
Post-operative Breathlessness	Management depends on underlying cause.	Grade D
Acute Heart Failure	Consider CPAP or NIV in cases of pulmonary oedema.	Grade D
Pulmonary Embolism	Most patients with minor pulmonary embolism are not hypoxaemic and do not require oxygen therapy.	Grade D
Pleural Effusions	Most patients with pleural effusions are not hypoxaemic. If hypoxaemic, treat by draining the effusion as well as giving oxygen therapy.	Grade D
Pneumothorax	Needs aspiration or drainage if the patient is hypoxaemic. Most patients with pneumothorax are not hypoxaemic and do not require oxygen therapy. Use a reservoir mask at 10-15 l/min if admitted for	Grade C and Grade D

	observation. Aim at 100% saturation. (Oxygen accelerates clearance of pneumothorax if drainage is not required).	
Deterioration of lung fibrosis or other interstitial lung disease	Reservoir mask at 10-15 l/min if initial SpO ₂ below 85%, otherwise nasal cannulae or simple face mask	Grade D
Severe Anaemia	The main issue is to correct the anaemia. Most anaemic patients do not require oxygen therapy.	Grade B and Grade D
Sickle cell crisis	Requires oxygen only if hypoxaemic (below the above target ranges or below what is known to be normal for the individual patient) Low oxygen tension will aggravate sickling.	Grade B

Table 3 COPD and other conditions requiring controlled or low-dose oxygen therapy *Section 8.12*

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 target range to 94-98% (age below 70) or 92-98% (age 70 or above) if the PaCO₂ 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 target saturation of 88-92% pending urgent blood gas results.** Grade D

If the 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 5 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 coded as "Status Red". Alert the A&E Department that the patient requires immediate senior assessment on arrival at the hospital. Grade D

If the FEV₁ is unknown, patients over 50 years of age who are long-term smokers with a history of exertional breathlessness 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. FEV₁ should be measured on arrival in hospital if possible and should be measured at least once prior to 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 (Orange Status) on arrival in hospital Emergency Departments and blood gases should be measured on arrival in hospital. Grade D

Recheck blood gases after 30-60 minutes (or if there is clinical deterioration) even if the initial PaCO₂ measurement was normal. Grade D

If the PaCO₂ is raised but pH is ≥ 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 PaCO₂ or falling pH. Grade D

If the patient is hypercapnic (PaCO₂ > 6.kPa or 45 mm Hg) and acidotic (pH < 7.35) consider non-invasive ventilation, especially if acidosis has persisted for more than 30 minutes despite appropriate therapy. Grade A

	Additional Comments	Grade of Recommendation
COPD	May need lower range if acidotic or if known to be very sensitive to oxygen therapy. Ideally use "Alert cards" to guide therapy based on previous blood gas results. Increase flow by 50% if respiratory rate is above 30, see recommendation 32.	Grade C
Exacerbation of Cystic	Admit to Regional CF centre if possible, if not discuss with regional centre or manage according to protocol agreed with regional CF	

Fibrosis	centre. Ideally use "Alert cards" to guide therapy. Increase flow by 50% if respiratory rate is above 30, see recommendation 32	Grade D
*Neuro-Muscular Disorders *Chest Wall disorders *Morbid Obesity	May require ventilatory support. Risk of hypercapnic respiratory failure.	Grade D Grade D Grade D

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

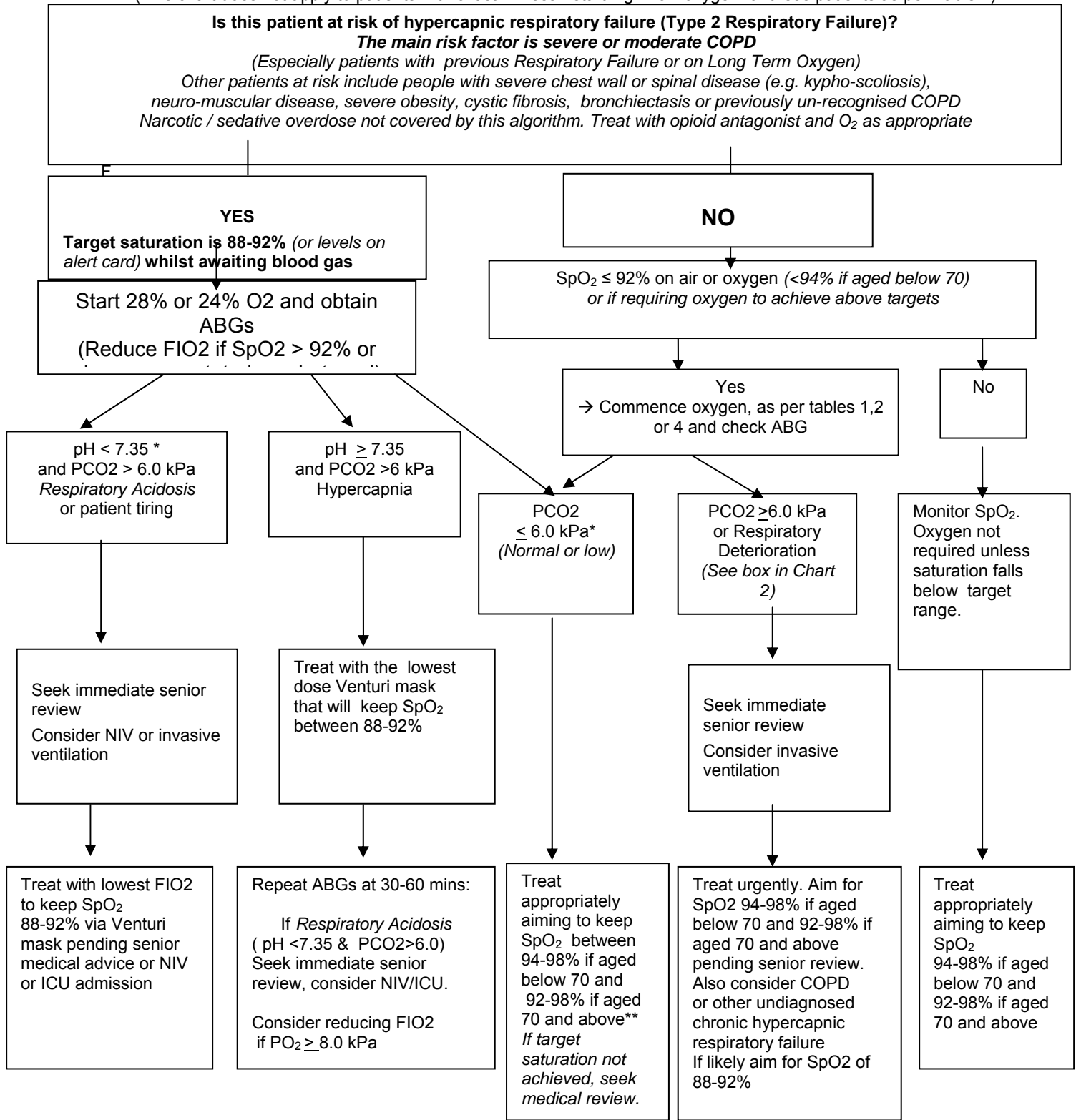
Section 8.13

<p>If hypoxaemic, the initial oxygen therapy is nasal cannulae at 2-6 l/min or simple face mask at 5-10 l/min unless saturation is below 85% (use reservoir mask) or if at risk from hypercapnia. (see below)</p> <p>Recommended initial oxygen saturation target range, unless stated otherwise, is 94-98% if aged <70 and 92-98% saturation if aged ≥70</p> <p>If patients have COPD or other risk factors for hypercapnic respiratory failure, aim at a saturation of 88-92% pending blood gas results but adjust to 94-98% (age below 70) or 92-98% (age 70 or above) 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.</p>		
	Additional Comments	Grade of Recommendation
Myocardial infarction and 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 fetus if the mother is not hypoxaemic. See recommendations 14-17	Grades A- D
Hyperventilation or dysfunctional breathing	Unlikely to require oxygen therapy. Exclude organic illness. Re-breathing from a paper bag may cause hypoxaemia and is not recommended.	Grade C
Most poisonings and drug overdoses	Hypoxaemia is more likely with respiratory depressant drugs, give antidote if available. <i>e.g. Naloxone for opiate poisoning</i> Check blood gases to exclude hypercapnia if a respiratory	Grade D

<i>(See Table 1 for Carbon Monoxide poisoning)</i>	depressant drug has been taken.	
Poisoning with Paraquat Bleomycin or Acid Inhalation	Patients with Paraquat poisoning, Bleomycin lung injury or acid inhalation 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

Chart 1
Oxygen prescription for acutely hypoxaemic patients in hospital

(This chart does not apply to patients with critical illness - start high-flow oxygen for these patients as per Table 1)



Any increase in FIO2 must be followed by repeat ABGs in 1 hour (or sooner if conscious level deteriorates)

Chart 2

Flow chart for oxygen administration on general wards in hospitals

See patient's drug chart and Chart 1 and tables 1-4 for starting dose and target saturation

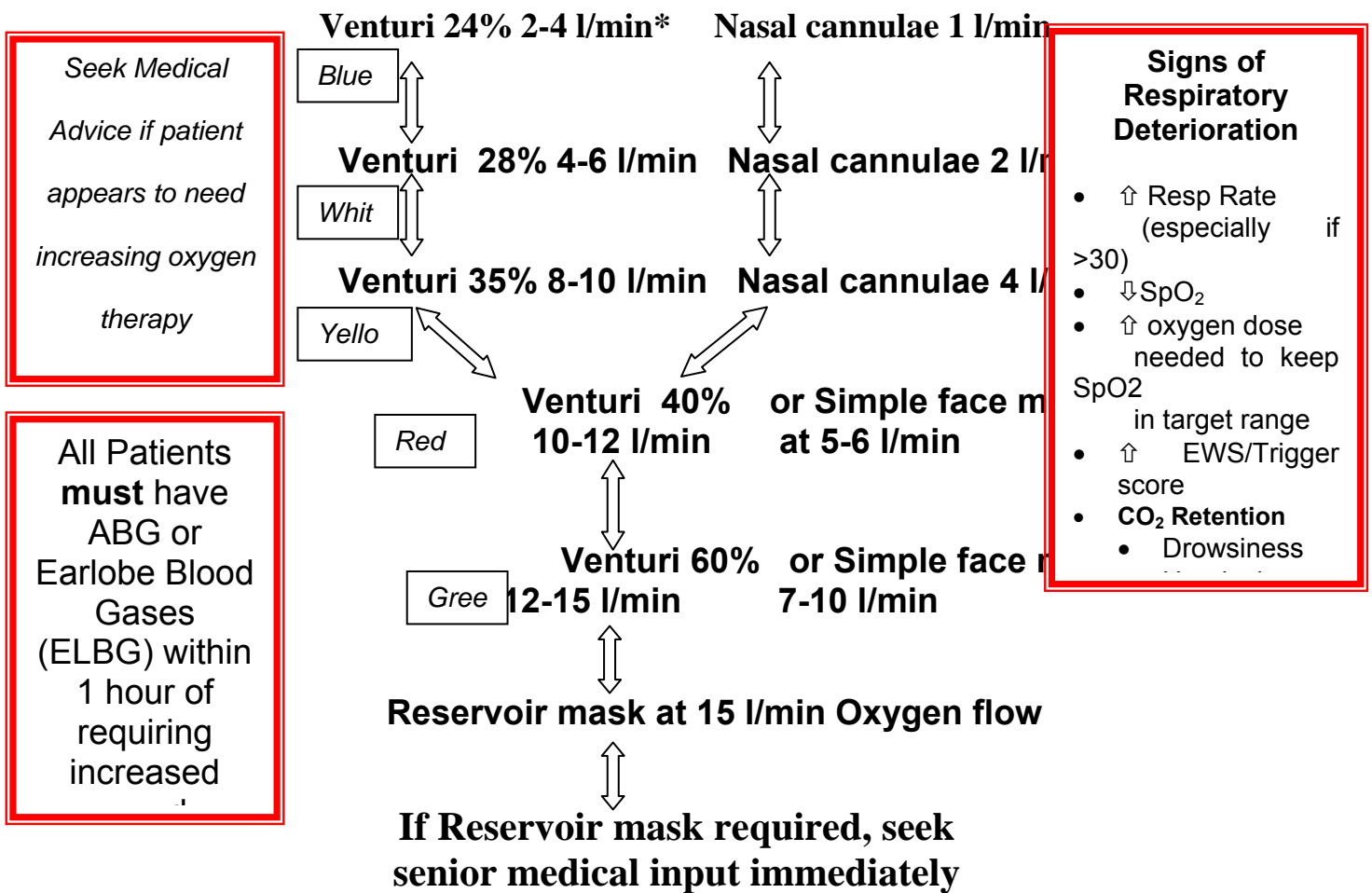
Choose the most suitable delivery system and flow rate

Titrate oxygen *up* or *down* to maintain the target oxygen saturation.

The table below shows available options for stepping dosage up or down. The chart does NOT imply any equivalence of dose between Venturi masks and nasal cannulae.

Allow at least 5 minutes at each dose before adjusting further upwards or downwards (except with major and sudden fall in saturation)

Once your patient has adequate and stable saturation on minimal oxygen dose, consider discontinuation of oxygen therapy.



* For Venturi masks, the higher flow rate is required if the respiratory rate is >30

Patients in a peri-arrest situation and critically ill patients should be given maximal oxygen therapy via reservoir mask or bag-valve mask whilst immediate medical help is arriving.
(Except for patients with COPD with known oxygen sensitivity recorded in patient's case notes and drug chart or in the EPR: keep saturation at 88-92% for this sub-group of patients)

Hierarchy of evidence and grading of recommendations

Levels of evidence and grades of recommendation

Levels of evidence and Grades of Recommendation are based on the levels of evidence used in the NICE COPD Guideline (see below and reference 325). For most of the topics covered by the guideline, there were either no randomised trials or just a handful of observational studies. Members of the group reviewed the evidence for each topic and assigned the most appropriate grading which was usually Grade C evidence (Case control or Cohort studies) or Grade D evidence (Expert opinion or case reports).

Each recommendation has been allocated a grading which directly reflects the hierarchy of evidence upon which it is based.

Please note that the hierarchy of evidence and the recommendation gradings relate to the strength of the literature, not to clinical importance. This is especially important in the field of oxygen therapy where there are very few controlled trials.

Hierarchy of evidence

Level of evidence	Type of evidence
Ia	Evidence from systematic reviews or meta-analysis of Randomised Controlled Trials (RCT)
Ib	Evidence from at least one RCT
IIa	Evidence from at least one controlled study without randomisation
IIb	Evidence from at least one other type of quasi experimental study
III	Evidence from non experimental descriptive studies, such as comparative studies, correlation studies and case control studies
IV	Evidence from expert committee reports or opinions and/or clinical experience of respected authorities

Grading of recommendations

Level of evidence	Type of evidence
A	Based on hierarchy I evidence
B	Based on hierarchy II evidence or extrapolated from hierarchy I evidence
C	Based on hierarchy III evidence or extrapolated from hierarchy I or II evidence
D	Directly based on hierarchy IV evidence or extrapolated from hierarchy I, II or III evidence