

TRUST GUIDELINE

**NON-INVASIVE VENTILATION FOR ACUTE HYPERCAPNIC RESPIRATORY FAILURE**

**FAST FIND:**

- This document works in conjunction with the [Action Card for Initiation and Management of Non-Invasive Ventilation](#)
- [Training Needs Analysis](#)

**1. INTRODUCTION / RATIONALE**

Non-invasive ventilation (NIV) has been shown to deliver better outcomes, as compared to invasive ventilation in acute exacerbations of Chronic Obstructive Pulmonary Disease (COPD). There is also evidence to support its use in non-COPD disease; however national audits conducted by the British Thoracic Society have demonstrated that the expected patient benefit is not being delivered, in part due to a number of process deficiencies. There is also a risk that NIV use may be extended inappropriately to all patients with hypercapnia, irrespective of the circumstance or underlying disease process, and the BTS audits have demonstrated that COPD was not the underlying diagnosis / indication in over 30% of cases.

This guideline has been drafted following the publication of national guidelines for the use of NIV and also the NCEPOD report highlighting concerning gaps in the care of many patients treated with NIV in hospital.

This guideline does not cover the use of Continuous Positive Airways Pressure for Acute Cardiogenic Pulmonary Oedema, or the use of High-flow Nasal Oxygen for hypoxic respiratory failure.

**2. DEFINITIONS**

Word/Term	Descriptor
<b>Non-Invasive Ventilation (NIV)</b>	Delivery of support for a patient’s breathing by means of a tight fitting mask delivering pressure on both breathing in and breathing out. This treatment is used to manage respiratory failure in a number of conditions, including COPD, Acute Cardiogenic Pulmonary Oedema and Morbid Obesity

**3. ROLES AND RESPONSIBILITIES**

Post/Group	Details
<b>Respiratory Consultant</b>	<ul style="list-style-type: none"> <li>• Review and maintenance of this document</li> </ul>
<b>Consultants, senior nursing staff</b>	<ul style="list-style-type: none"> <li>• Ensure this guidance is implemented in their area</li> <li>• Ensure staff are trained and competent</li> </ul>
<b>Medical staff</b>	<ul style="list-style-type: none"> <li>• Clinical decision making regarding initiation of non-invasive ventilation</li> <li>• Ensure own training and competencies are up to date</li> </ul>
<b>Registered nurses</b>	<ul style="list-style-type: none"> <li>• Ensure and maintain own competency in management of non-invasive ventilation</li> </ul>

**4. PATIENT SELECTION FOR ACUTE NIV**

It is vital that NIV should not be used if intubation is more appropriate. Ward-based NIV is primarily aimed at patients with COPD.

**4.1 Inappropriate patients**

- NIV should not be used as a substitute for tracheal intubation and invasive ventilation
- Is the Critical Care Unit a more appropriate location for the care of this patient?

- NIV should NOT be started if deemed futile, or not in the patient's long term interests. This should be discussed with the patient and family
- NB. NIV is NOT indicated for COPD patients with a pure metabolic acidosis without hypercapnia
- Patients with acute cardiogenic pulmonary oedema should initially be managed with CPAP and not NIV

## 4.2 Appropriate patients

- Patients with ACIDOTIC, HYPERCAPNIC respiratory failure
- Patients should be receiving maximal medical therapy prior to consideration of NIV

## 5. INITIATION OF NIV

### 5.1 Identifying the need for NIV

An arterial blood gas (ABG) demonstrating **pH <7.35 and PaCO<sub>2</sub> >6.5kPa** indicates acute hypercapnic respiratory failure. Where appropriate, NIV should be initiated within **1 hour** of ABG results indicating this (**BTS Quality Standard 4**). This should be regardless of patient location.

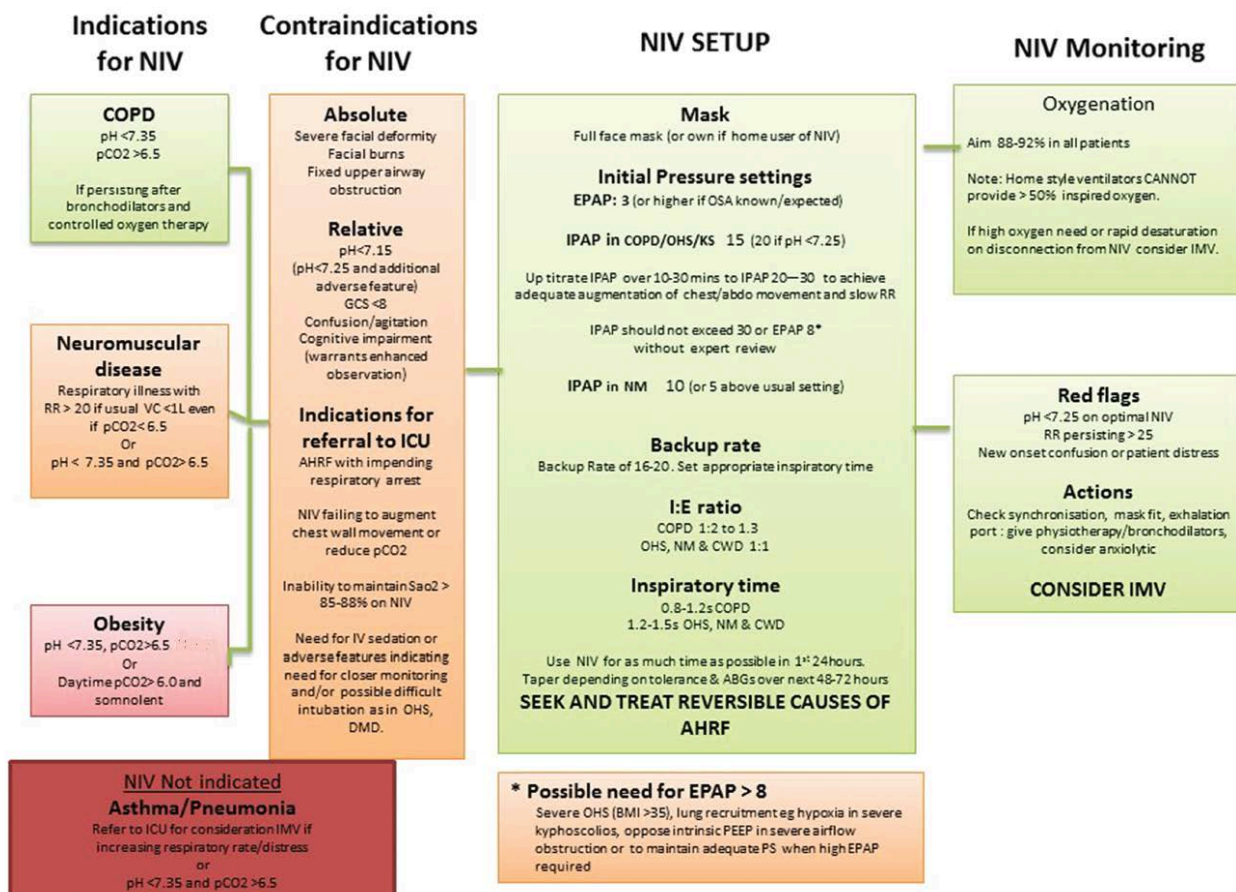
**Is the patient appropriate to receive NIV?** All patients should be discussed with Registrar/Consultant.

Medical management should be optimised;

- Oxygen titrated to achieve SpO<sub>2</sub> 88-92% by controlled oxygen delivery (this should be prescribed)
- Treat reversible causes for respiratory failure (eg. Opiate toxicity, oxygen toxicity)
- Corticosteroids in COPD
- Nebulised bronchodilators regularly in COPD
- Physiotherapy if significant sputum production
- Drainage of large effusions or pneumothorax

Chest radiography is recommended, but should not delay initiation of NIV in severe acidosis.

### 5.2 Initiating NIV



An escalation plan should be decided where the decision is made to initiate NIV, including treatment failure parameters and resuscitation status; this should be clearly documented in the medical notes (**BTS Quality Standard 6**). The most appropriate place to deliver NIV should be decided (DCC, Respiratory ward) (**BTS Quality Standard 1**).

An NIV care plan and prescription should be commenced, including Mode, EPAP and IPAP settings and back up rate. All changes to ventilator settings must be documented in the care plan.

**All patients on NIV outside DCC should be seen by a Respiratory Consultant within 14 hours and have a Respiratory Consultant review daily thereafter (BTS Quality Standard 6).**

Patients initiated on NIV should be moved to the Respiratory ward or DCC as soon as clinically stable to do so.

### 5.3 Treatment Failure in NIV

#### Contact Critical Care and/or Medical Registrar

- Has treatment of the underlying condition been optimised?
- Would physiotherapy be useful?
- Have any complications developed (pneumothorax, aspiration pneumonitis)? Consider repeating chest radiograph
- PaCO<sub>2</sub> remains elevated
  - Titrate FiO<sub>2</sub> to achieve SpO<sub>2</sub> between 88-92%
  - Check mask fit for excessive leak
  - Check circuit
  - Is patient/ventilator synchrony adequate?
  - Consider increasing IPAP to maximum tolerated by patient
  - Consider increasing EPAP (in obesity), but NEVER exceed EPAP of 5cm H<sub>2</sub>O in COPD
  - Consider a different mode of ventilation or ventilator

### 5.4 Weaning or Stopping NIV

#### Successful treatment

- Weaning is best achieved by increasing time off NIV
- Ability to wean should be assessed daily and is dependent on a normalised pH and ongoing improvement
- Some patients wean only slowly

#### Unsuccessful treatment

- If the patient is failing to improve and is for full active care, discuss with DCC
- If NIV is the ceiling of treatment and the patient has not improved despite adequate treatment, consider withdrawing NIV after discussion with patient and family and commencing appropriate symptom control measures.

## 6. LOCATION AND DELIVERY OF NIV

NIV should only be used in areas with appropriately trained staff (see Section 6) and monitoring as described above. Within the trust these areas are located in:

- Resus bays in the Emergency Department
- Department of Critical Care
- Tower Block Ward 8B at Gloucester Royal Hospital
- Avening Ward at Cheltenham General Hospital.

### 6.1 Monitoring and nursing patients on NIV

- Oxygen saturation should be continuously monitored
- ECG monitoring should be used if the patient has a pulse rate >120bpm or if there is dysrhythmia or cardiomyopathy.
- Observations should be performed hourly until the acidosis has improved.

- PaCO<sub>2</sub> and pH should be monitored by Arterial Blood Gas sampling (**BTS Quality Standard 5**):
  - Prior to initiation of NIV
  - 1 hour after commencing NIV
  - 1 hour after any change in settings
  - If pH significantly improved, but not normalised, ABG should be repeated after 4 hours
  - If the patient deteriorates
  - At 8am if the patient is on NIV overnight
  - **ABG sampling should not be performed if it will not alter management**
- A nursing ratio of one nurse to two acute NIV patients must be in place in areas providing acute NIV.

## 7. TRAINING

See the [training needs analysis document](#) and notes below.

NIV is an effective treatment provided it is delivered correctly. Key to this is training of staff to ensure they have both the knowledge and the practical skills commensurate with their role.

**BTS Quality Standard 2** states that annual training should be provided to staff and that they should have competence in the delivery of NIV.

The NCEPOD study highlights important deficiencies;

- 18% of hospitals did not have a defined staff competency assessment for the delivery of NIV.
- 37% of hospitals that had a formal competency framework permitted untrained staff to supervise patients on NIV.
- Overall, 45% of hospitals permitted staff without competency to directly supervise the care of patients receiving NIV.

Training should include;

- Understanding local pathways of care.
- The basis of ventilatory failure, supported by relevant pathophysiological knowledge including an understanding of blood gas results.
- The evidence base that supports the use of acute NIV for selected patients with AHRF.
- Mask fitting.
- The principles and practice of setting up a ventilator.
- Changing the settings of the ventilator where appropriate to optimise triggering and adequacy of ventilation for those individuals involved in initiating non-invasive ventilation.
- Weaning from acute NIV and understanding the potential role of long-term nocturnal NIV for selected patients.
- Decision-making in non-responders.

## 8. MONITORING OF COMPLIANCE

Do the systems or processes in this document have to be monitored in line with national, regional or Trust requirements?	NO
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## 9. REFERENCES

**The Trust is not responsible for the content of external websites**

- BTS/ICS guideline for the ventilatory management of acute hypercapnic respiratory failure in adults. Davidson AC, et al. Thorax 2016;71:ii1–ii35. doi:10.1136/thoraxjnl-2015-208209
- BTS Quality Standards for NIV - <https://www.brit-thoracic.org.uk/standards-of-care/quality-standards/bts-niv-quality-standards/>
- The National Confidential Enquiry into Patient Outcome and Death. Inspiring Change. 2017. London

## NON-INVASIVE VENTILATION FOR ACUTE HYPERCAPNIC RESPIRATORY FAILURE

<b>DOCUMENT PROFILE</b>	
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RELATED TRUST DOCUMENTS	<a href="#">Non Invasive Ventilation Action Card</a> Non Invasive Ventilation Prescription Chart
OTHER RELEVANT DOCUMENTS	N/A
EXTERNAL COMPLIANCE STANDARDS AND/OR LEGISLATION	<ul style="list-style-type: none"> <li>• BTS NIV Guidelines</li> <li>• BTS Quality Standards for NIV</li> <li>• NCEPOD Recommendations following the “Inspiring Change” report into care of patients undergoing NIV</li> </ul>