

Trust Guideline-Non Invasive Ventilation (NIV) for Acute Hypercapnic Respiratory Failure

A Clinical Guideline

For Use in:	NIV Acute Care Bay on Hethel Ward
By:	Medical staff, Nursing staff
For:	Acute Hypercapnic Respiratory Failure
Division responsible for document:	Medical Division
Key words:	Chronic Obstructive Pulmonary Disease, COPD, Obesity Hypoventilation Syndrome, Neuromuscular diseases
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If Yes - does the strategy/policy deviate from the recommendations of NICE? If so why?	No

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This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes.

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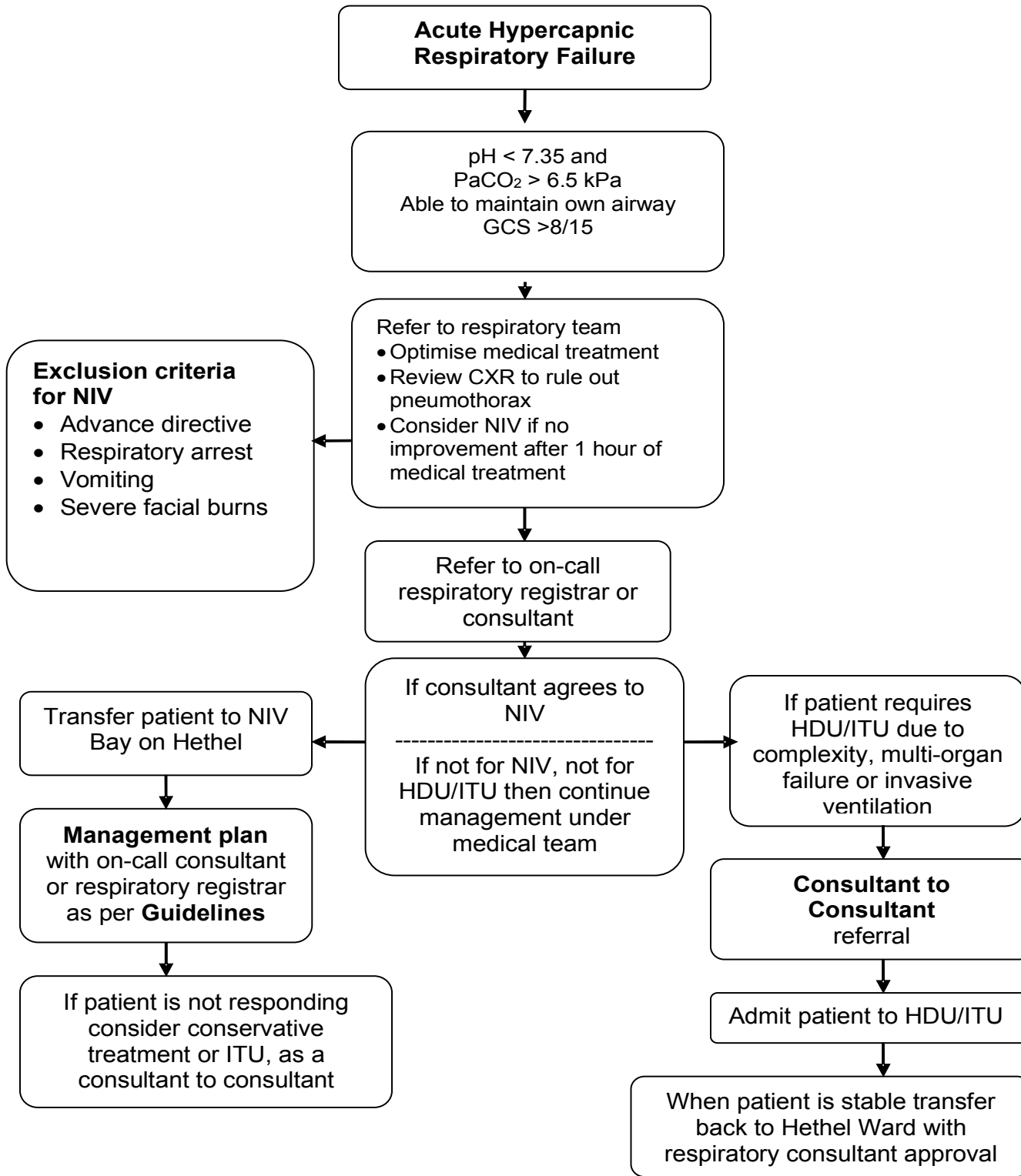
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for Acute Hypercapnic Respiratory Failure**

Quick reference guideline

Admission Pathway Non-Invasive Ventilation Bay



Trust Guideline-Non Invasive Ventilation (NIV) for Acute Hypercapnic Respiratory Failure In COPD patients

Objective of Guideline

To guide management of patients with acute hypercapnic respiratory failure.

Rationale for the recommendations

Non invasive positive pressure ventilation (NIPPV or NIV) has become first line treatment of acute hypercapnic exacerbation in Chronic Obstructive Pulmonary Disease (COPD) not responding to first line medical treatment.

Background

Common Indications for starting NIV for Acute Hypercapnic Respiratory Failure are

Chronic Obstructive Pulmonary Disease/Emphysema
Obesity Hypoventilation Syndrome (OHS)
Neuromuscular conditions causing Respiratory Muscle weakness: For example Motor Neurone Disease (MND)

Broad Recommendation

1. Initial assessment of a COPD patient with acute hypercapnic exacerbation

The first assessment can take place in A/E, Acute Medicine Unit (AMU) or in any ward of the NNUH and should be carried out by a respiratory consultant or a NIV trained and accredited specialist registrar in respiratory medicine.

The first assessment should include clinical review, arterial blood gases (a reference one on air is preferable), chest X-ray, ECG, FBC, U&Es, LFTs and CRP.

Optimal medical treatment is as follows:

- Steroids.
- Nebulisers.
- Antibiotics.
- Controlled oxygen therapy, using a 24-28% Venturi oxygen mask or nasal cannulae at a flow rate targeted to keep the SpO₂ between 88%-92%.

If optimal initial medical treatment has not improved clinical status and (ABG) in 60 minutes, NIV should be considered.

At the end of this **60 minute** trial of medical treatment:

- If the pH is below 7.35, the respiratory rate over 25 per minute and PaCO₂ > 6.5 kPa, NIV is highly recommended.

The limit of treatment must be decided at an early stage by the Respiratory Consultant. The resuscitation status must be determined. It must be decided whether the patient is suitable for intubation, in the event of failure of NIV.

The following points may aid in the decision making:

- NIV may be the ceiling of the treatment in some patients who have a poor performance status. **This decision should be made at Consultant level and prompt completion of RESPECT documentation**

The wishes of the informed patient and their close relatives with regard to treatment withdrawal or escalation should be the cornerstone of any decision-making. This should be clearly documented in the RESPECT form.

The initial key decisions will involve predicting quality of life, dignity in dying, number of previous NIV episodes, and the previously agreed ceiling of treatment. **A clear medical plan is essential at this stage and should be documented in the notes.**

2. Criteria for admission to the Hethel Ward NIV Bay

- **Age is not a limitation** for NIV in hypercapnic respiratory failure
- **In the presence of well controlled comorbidities and/or predicted decent quality of life for at least 3 months, the use of NIV should not be excluded.**
- If the patient is agitated or lethargic on admission, this requires special consideration by the respiratory consultant.
- **In case of agitation**, a mild sedative (under exclusively consultant supervision) could be given (1-2 mg Lorazepam subcutaneously).
- **Patients with a pneumothorax** should have a chest drain in place prior to initiating treatment with NIV. Once urgently treated, if NIV is still required, it should be instituted.
- **However, facial trauma, facial burns, fixed obstruction of the upper airway, vomiting, are formal contraindications to NIV trial.**

3. How to start NIV

Infection Prevention and Control

As delivering Non Invasive Ventilation is considered as an Aerosol Generating Procedure (AGP) clinical staff **MUST** wear Full Personal Protection Equipment (PPE) and adhere to IP&C Standards and Guidelines

In all areas providing acute non-invasive ventilation (NIV), a minimum staffing ratio of one nurse to two acute NIV patients must be in place, as recommended in the British Thoracic Society guidelines 2016 (1) and NCEPOD recommendations 2017 (2). The duration for which this should continue will be determined by each individual patient's response to ventilation.

The on-call respiratory consultant or Registrar must review and request initiation of NIV in hours. A telephone discussion with the oncall Respiratory Consultant is required prior to starting patients on NIV out-of-hours.

Once the decision has been made to admit the patient to the NIV bay, the admission process should start within 10 minutes including completion of EPMA.

Treatment with acute NIV must be started within a maximum of one hour of the blood gas measurement that identified the need for it, regardless of the patient's location. A service model whereby the NIV machine is taken to the patient to start treatment prior to transfer for ongoing ventilation will improve access to acute NIV.

NIV Prescription chart should be completed by the Registrar or Consultant starting patient on NIV. Non Invasive Ventilation (NIV) Prescription Chart TO be USED IN RESPIRATORY MEDICINE ONLY [Trustdocs/ Id: 16146](#)

The nursing staff will set pressure settings, select appropriate masks and set the alarms under consultant supervision. There is a pre-printed sheet attached to all V60 ventilators as a guide to staff starting NIV.

The nursing staff will monitor the patient for respiratory rate, heart rate, blood pressure, SpO₂ urine output and temperature. Other data may be helpful such as respiratory secretions and change in mood. Any change in settings will be recorded.

Monitoring will take place every 15 minutes during the first hour. The timing of observations will then be adjusted according to the patient's clinical status and will be documented in a dedicated NIV observation chart. Acute Non-invasive Ventilation Observation Chart (Hethel Ward) [Trustdocs Id: 13401](#)

For patients suspected or proven to have COVID-19 please follow Red Pathway Flow chart 1 at the end of this document

4. Initial NIV Settings

- ST mode (spontaneous triggered).
- **Inspiratory**
- **Positive airway pressure (IPAP):** Start at 16 cm H₂O
- **Expiratory Positive airway pressure (EPAP):** Start at 6 cm H₂O
- Backup respiratory rate **12 breaths/minutes.**
- Inspiratory time/expiratory time = 1.0 Sec

Indirect measurement of tidal volume on the BIPAP Vision ventilator should give a VT around 7mL/kg to provide adequate ventilatory support.

- Titrate FiO₂ to ensure prescribed target SpO₂
- The mask should not be strapped too tightly and up to 60 L/min leakage is acceptable.

5. NIV delivery during the first hours and beyond (continuing care)

The presence of medical and nursing staff is mandatory on initiation.

The first two hours of NIV are critical.

Repeat ABGs, 1 hour after initiation of NIV, should show:

- An improvement in PaO₂
- A improvement in PaCO₂ by at least 1 kPa.
- Improvement in pH above 7.35.
- **Repeat arterial blood gases at 4-6 hours after initiation or at the request of the consultant.**

NIV, when successful, should be administered for as long as possible on day 1 i.e. a minimum of 16 hours in 24 hours.

Thereafter we recommend based on clinical assessment and improving clinical status and Arterial blood gases,

- 4 hours on and off NIV aiming for at least 12 hours on day 2 plus overnight
- Day time top ups aiming for 8 hours on day 3 and NIV overnight
- Weaning by day 4 to 5, aiming for nocturnal NIV for 2 nights prior to stopping.

6. When NIV fails

NIV is deemed to have failed when

- The patient remains tachypneic, less alert despite the ventilatory support.
- pH below 7.35.
- PaCO₂ over 8 kPa.

The cause of failure must be sought:

Specifically:

- The mask fit should be checked for massive leaks.
- The medical treatment should be reviewed and optimised.
- The patient should be re-examined looking for other complications such as pneumothorax, pneumonia, cardiovascular collapse, CVA, Cardiac rhythm or conduction disorder.

Sometimes the problem can be solved by practical measures e.g. change of mask, adjusting pressure settings, insertion of chest drain, review and changing of medication.

Sometimes PaCO₂ remains over 8 kPa because of:

- Too much oxygen delivery.

- Mask leakage.
- Circuit set up incorrectly.
- Lack of synchronisation between patient and ventilator.

If any of the following are present invasive ventilation through intubation should be considered if the patient is suitable.

- pH below 7.25.
- Hypercapnic coma (GCS below 8 and PaCO₂ over 8 kPa).
- PaO₂ below 6 kPa despite adjusted FiO₂ plus appropriate settings.
- Cardiorespiratory arrest.

Admission to HDU/ITU should be discussed at Consultant level

If NIV withdrawal is considered Please follow flow chart 2.

7. Infection Control

As delivering Non Invasive Ventilation is considered as an Aerosol Generating Procedure (AGP) clinical staff MUST wear Full PPE and adhere to IP&C Standards and Guidelines Personal Protective Equipment (PPE) Procedure [Trustdocs Id: 588](#) and IP&C COVID Staff PPE Poster [Trustdocs Id: 18604](#)

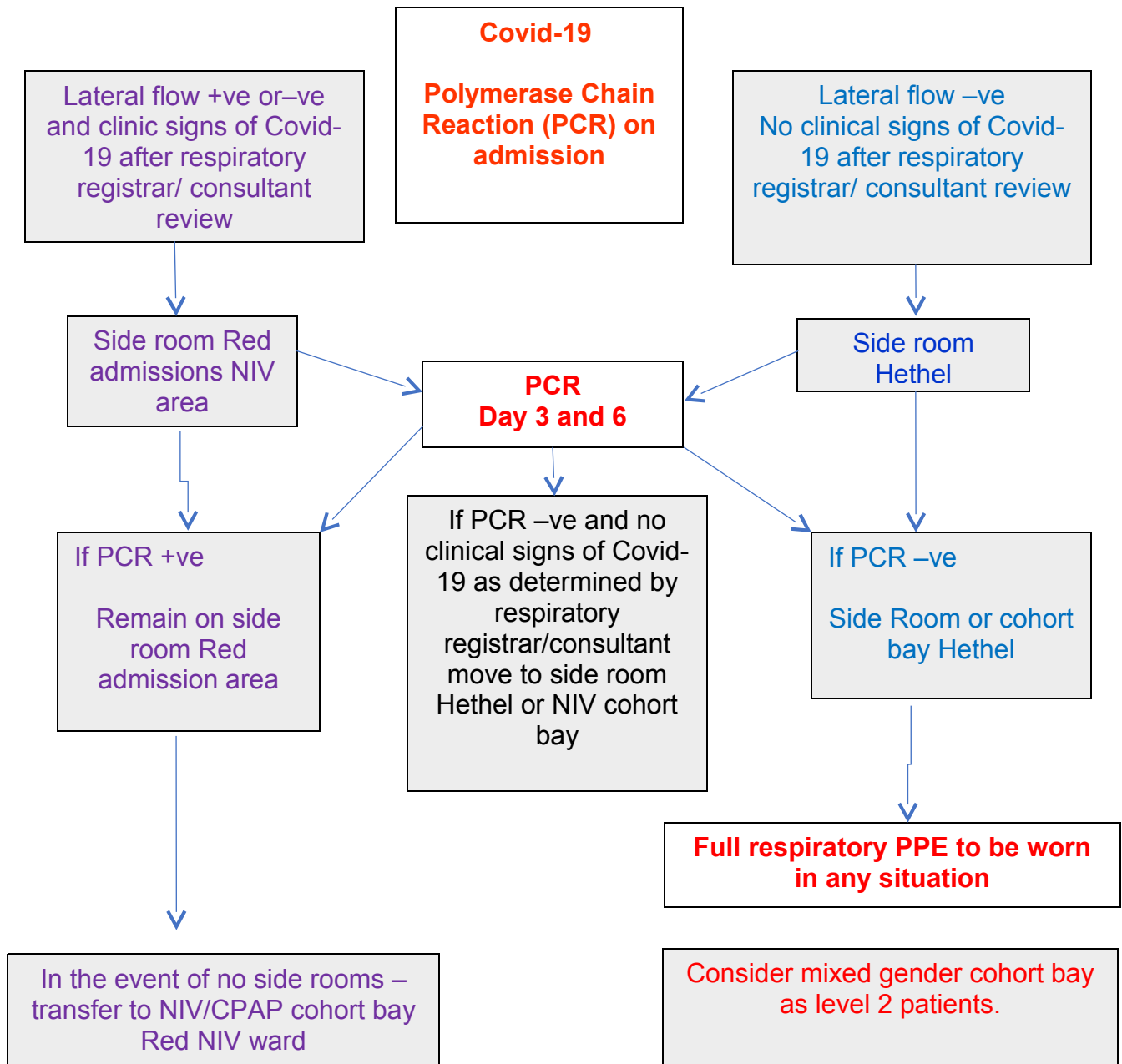
The masks, exhalation ports and headgear are disposable (single patient use).

A bacterial/viral filter is used between the mask and tubing to reduce the contamination risk to the machine. This **should be changed every 24 hours**.

The filter on the BIPAP needs to be between patients

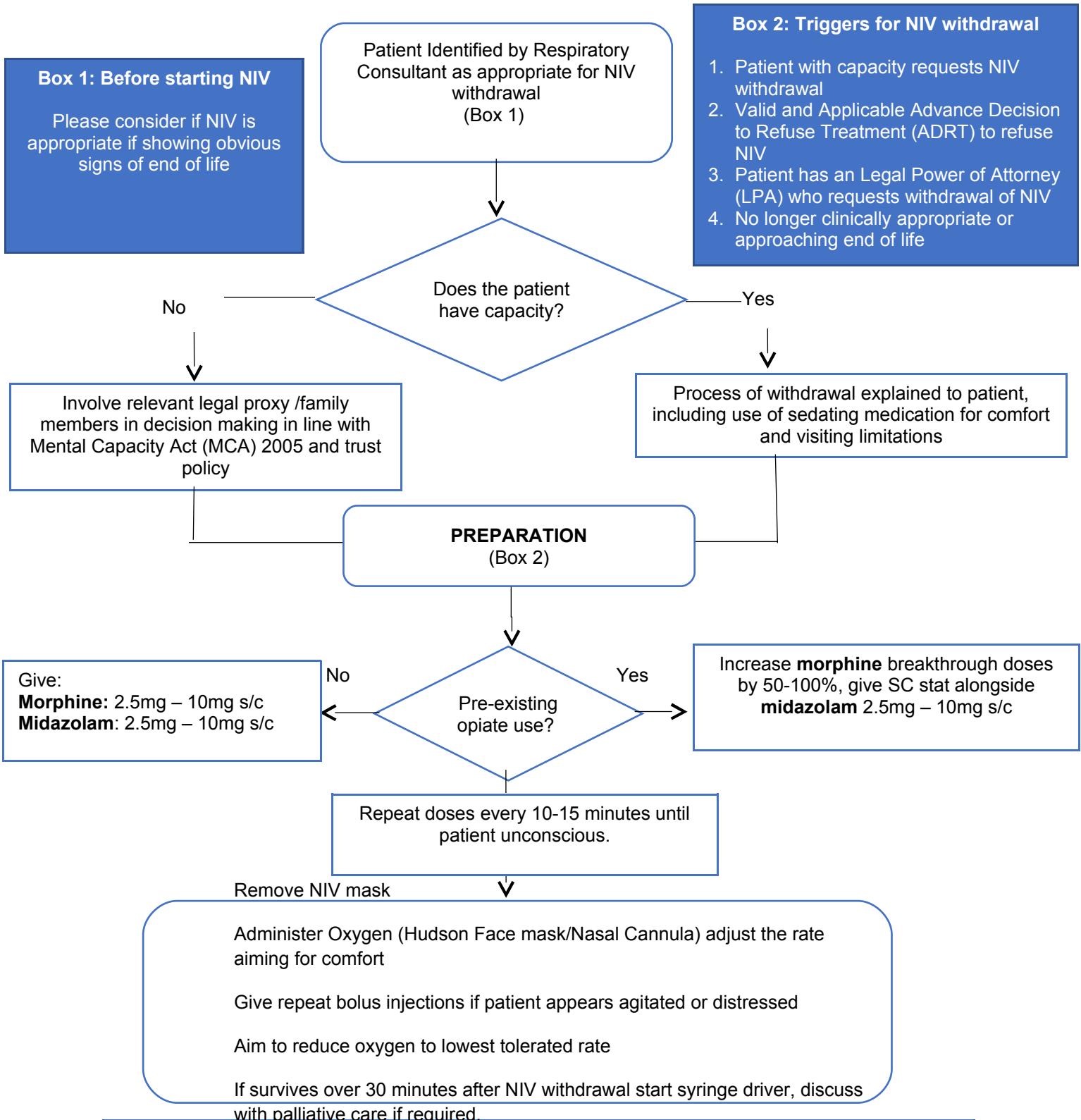
Flowchart 1 : NIV plan during COVID -19 pandemic

Patient confirmed clinical need for NIV/ Continuous Positive Airway Pressure (CPAP) by Respiratory Team





Flow Chart 2: NIV Withdrawal Guidance



Box 1: Before starting NIV

Please consider if NIV is appropriate if showing obvious signs of end of life

Box 2: Triggers for NIV withdrawal

1. Patient with capacity requests NIV withdrawal
2. Valid and Applicable Advance Decision to Refuse Treatment (ADRT) to refuse NIV
3. Patient has an Legal Power of Attorney (LPA) who requests withdrawal of NIV
4. No longer clinically appropriate or approaching end of life

Involve relevant legal proxy /family members in decision making in line with Mental Capacity Act (MCA) 2005 and trust policy

Process of withdrawal explained to patient, including use of sedating medication for comfort and visiting limitations

PREPARATION
(Box 2)

Give:
Morphine: 2.5mg – 10mg s/c
Midazolam: 2.5mg – 10mg s/c

Increase **morphine** breakthrough doses by 50-100%, give SC stat alongside **midazolam** 2.5mg – 10mg s/c

Repeat doses every 10-15 minutes until patient unconscious.

Remove NIV mask

Administer Oxygen (Hudson Face mask/Nasal Cannula) adjust the rate aiming for comfort

Give repeat bolus injections if patient appears agitated or distressed

Aim to reduce oxygen to lowest tolerated rate

If survives over 30 minutes after NIV withdrawal start syringe driver, discuss with palliative care if required.

Box 2: Preparation

1. Complete IPOC & ReSPECT and start palliative care rounding
2. Ensure relevant medications are prescribed and easily accessible (ideally at bedside)
3. Minimum staffing – 1:1 nursing and doctor presence for initial withdrawal
4. Contact palliative care consultant on 7194 – 7 days/week
5. If urgent out of hours withdrawal indicated – call 07623 916125
6. Insert subcutaneous cannula, complete syringe driver chart if patient requires this



Our Vision
To provide every patient
with the care we want
for those we love the most

1. British Thoracic Society NIV Guidelines : <https://www.brit-thoracic.org.uk/quality-improvement/clinical-resources/non-invasive-ventilation/>
2. NCEPOD Report and Recommendations on Acute NIV:
<https://www.ncepod.org.uk/2017niv.html>
3. Ram FSF, Picot J, Lightowler J, Wedzicha JA. Non-invasive positive pressure ventilation for treatment of respiratory failure due to exacerbations of chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews* 2004, Issue 3. Art. No.: CD004104. DOI: 10.1002/14651858.CD004104.pub3.
4. C.M.Chu and al Readmission rates and life threatening events in COPD survivors treated with NIV for acute hypercapnic respiratory failure..*Thorax* 2004;59;1020-1025
5. M.W.Elliott Non-Invasive Ventilation in acute exacerbations of COPD: What happens after hospital discharge?.*Thorax* 2004;59;1006-1008.

Source documents

Non Invasive Ventilation (NIV) Prescription Chart TO be USED IN RESPIRATORY MEDICINE ONLY [Trustdocs/ Id: 16146](#)

Acute Non-invasive Ventilation Observation Chart (Hethel Ward) [Trustdocs Id: 13401](#)

Personal Protective Equipment (PPE) Procedure [Trustdocs Id: 588](#)

IP&C COVID Staff PPE Poster [Trustdocs Id: 18604](#)