Trust Guideline - Non-Invasive Ventilation (NIV) for Acute Type 2 Respiratory Failure

Document Control:

For Use In:	NNUH		
	Any area in NNUH where a patient requires acute NIV		
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Version	Date	Author	Reason/Change
V6	May 23	GS, VE	Change in infection control guidance, change in NIV guidance
V7	May 2023	GS, VE	Change in NIV direct admit bed and ongoing capacity of direct admit NIV bed to aid flow.

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Non-Invasive Ventilation (NIV) for Acute Hypercapnic Respiratory Failure	Dec 21

Distribution Control

Printed copies of this document should be considered out of date. The most up to date version is available from the Trust Intranet.

Consultation

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Monitoring and Review of Procedural Document

The document owner is responsible for monitoring and reviewing the effectiveness of this Procedural Document. This review is continuous however as a minimum will be achieved at the point this procedural document requires a review e.g., changes in legislation, findings from incidents or document expiry.

Relationship of this document to other procedural documents

This document is a clinical guideline applicable to the NNUH; please refer to local Trust's procedural documents for further guidance, as noted in Section 5.

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

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1. Introduction

1.1. Rationale

Non-invasive ventilation (NIV) has become first line treatment of acute respiratory failure in conditions such as (but not limited to) Chronic Obstructive Pulmonary Disease (COPD), Obesity Hypoventilation (OHS), Neuromuscular/degenerative diseases not responding to first line medical treatment.

1.2. Objective

The objective of the clinical guideline is to:

- To ensure appropriate and timely assessment for and initiation of Non-Invasive Ventilation
- To give guidance to medical and nursing staff caring for patients with Type 2 Respiratory Failure
- Safe and appropriate care of patients requiring NIV.
- Support and guidance for staff caring for patients requiring NIV.

1.3. Scope

This document provides advice and guidance for medical and nursing staff caring for patients with Type 2 Respiratory Failure. It should not be used for patients who require ITU or HDU care or Type 1 Respiratory Failure or metabolic acidosis. It can cover any area in the hospital but mostly aimed at Hethel ward, ED and AMU wards.

1.4. Glossary

The following terms and abbreviations have been used within this document:

Term	Definition
NIV	Non-Invasive Ventilation
IPAP	Inspiratory Positive Airway Pressure
EPAP	Expiratory Positive Airway Pressure
ST	Spontaneous timed mode of ventilation
ABG	Arterial Blood Gas

2. Responsibilities

Dr Prasanna Sankaran, Consultant Respiratory Physician
Georgina Siggins, Vicky Ershadi, VSSN
Joint committee to maintain up to date document in line with local and national guidelines.

3. Processes to be followed.

3.1. Initial Assessment

The first assessment can take place in any area in the NNUH and should be carried out by a respiratory consultant or a NIV trained and accredited specialist registrar (SpR) in respiratory medicine.

The first assessment should include clinical review, arterial blood gases (ABG), chest X-ray, ECG, FBC, U&Es, LFTs and CRP.

Initial 60 minutes of optimal medical treatment should include:

- Steroids.
- Nebulisers.
- Antibiotics.
- Controlled oxygen therapy using a venturi oxygen mask, or nasal cannulae at a flow rate targeted to keep the oxygen saturation (Sp02) levels between 88%-92%.

If optimal initial medical treatment has not improved clinical status and repeat ABG shows the pH below 7.35 and $PaCO_2$ > 6.5 kPa, NIV is highly recommended.

The limit of treatment must be decided at an early stage by the Respiratory Consultant.

- 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.
- 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 on the NIV prescription form: Trustdocs/Id: 16146

3.2. Standards for best practice when requiring NIV.

National guidelines from BTS/ICS (2016) and NCEPOD (2017) published quality standards for the best practice these include, but are not limited to:

1. Acute non-invasive ventilation (NIV) should be offered to all patients who meet evidence-based criteria.
2. Acute NIV should only be carried out in specified clinical areas designated for the delivery of acute NIV – Acute Respiratory Care Unit (ARCU) bed on Hethel Ward at NNUH
3. Patients who meet evidence-based criteria for acute NIV should start NIV within 60 minutes of the arterial blood gas result associated with the clinical decision to provide NIV.

3.3. Admission to the direct admit ARCU bed.

The primary purpose of the ARCU is to provide immediate access to level 2 care to respiratory patients with enhanced clinical requirements, such as patients requiring NIV, CPAP, High Flow Nasal oxygen or high flow-controlled oxygen.

The ARCU aims will be:

- To enable closer monitoring and management of critically unwell respiratory patients and to improve patient outcomes and reduced hospital associated complications.
- Reduce mortality.
- Maximising ED and acute admission areas bed capacity by improving patient flow.
- To optimise intensive care capacity by enabling step down of patients still requiring higher level of respiratory support.

ARCU admission criteria:

All patients should have an acute, reversible reason for admission. Patients are suitable for the ARCU if they require level 1 or certain level 2 care (single organ support but not requiring inotropes according to ICS 2009) and do not fulfil the criteria for level 3 care (multiple organ dysfunction or need for mechanical ventilation or haemofiltration)

- Age is not a limitation for NIV in hypercapnic respiratory failure.
- In the presence of well controlled comorbidities and/or predicted quality of life acceptable to patient for at least 3 months, the use of NIV should not be excluded.
- In case of agitation, a mild sedative (under exclusively consultant supervision) could be given (1-2 mg Lorazepam sublingually or 2.5mg Midazolam subcutaneously).
- Patients with a pneumothorax should have a chest drain in place prior to initiating treatment with NIV.
- However, facial trauma, facial burns, fixed obstruction of the upper airway, vomiting, are formal contraindications to NIV trial.

If a patient requires admission to the ARCU a referral must be made to the on call respiratory registrar or consultant 24 hours, 7 days a week. Patients much be reviewed and accepted by the respiratory team before bed allocated on the ARCU. There will be no transfer of patients without prior approval.

Facilities:

Hethel ward has a protected, designated bed space (side room 4), easily identifiable by a boarder on Wardview. This bed space is for the sole purpose of facilitating direct admits from the emergency department, AMU's and transfers from other wards within NNUH. This will avoid delays in initiating treatment for patients requiring acute respiratory care, in the form of non- invasive ventilation.

All transfers must be agreed by the accepting Respiratory Consultant or Respiratory Registrar.

The ARCU comprises of six beds in an open plan bay, with further potential to utilise side rooms if required for infection control purposes.

NB: Level 2 mixed sex patients can be cohorted together in an open plan bay due to clinical need. Screens will be used to protect dignity and privacy.

Each bed space will have an allocated NIV machine, dedicated observation machine with continuous pulse oximetry and access to shared transcutaneous monitoring. A dedicated ABG analyser is available on the ward.

Maintaining NIV Capacity:

In order to maintain NIV direct admit capacity and to maintain NIV capacity 24/7, once the designated NIV bed becomes occupied, the ward coordinator will liaise with the medical bed manager, matron, clinician, specialist nursing team and discharge co-ordinator, to identifying and create an appropriate alternative direct admit NIV bed space on Hethel.

This will be managed by effective communication between all parties, facilitating discharges and internal ward patient movements. e.g., creating capacity through discharges or stepping down a lower risk patient to Intwood ward.

Where demand out ways capacity, the accepting respiratory consultant/registrar will liaise with the on call critical care consultant for their clinical opinion and consideration for admission to the critical care complex.

3.4. Initiating Therapy

In the ARCU, 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 nursing staff will set prescribed pressure settings, select appropriate mask and initiate therapy.

The nursing staff will monitor the patient for respiratory rate, heart rate, blood pressure, Sp02, urine output and temperature. Other data may be helpful such as respiratory secretions and change in mood. Any change in settings must be prescribed by Respiratory consultant, SpR or Senior VSSN.

Monitoring will take place every 15 minutes during the first hour and then hourly and will be **documented on a dedicated NIV observation chart. Acute Non-invasive Ventilation Observation Chart (Hethel Ward)** Trustdocs Id: 13401

3.5. Suggested initial NIV Settings

- ST mode.
- **Inspiratory Positive airway pressure (IPAP)**: Start at 16 cm H20.
- **Expiratory Positive airway pressure (EPAP)**: Start at 6 cm H20.
- Backup respiratory rate **12 breaths/minutes.**
- Inspiratory time: 1.7 Sec

- Rise 3

Indirect measurement of tidal volume (vT) on the ventilator should give a vT around 7mL/kg to provide adequate ventilatory support.

- Titrate Fi02 to ensure prescribed target SpO_2.
- The mask should not be strapped too tightly and up to 60 L/min leakage is acceptable.

3.6. Ongoing Care

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

- An improvement in PaO2
- An improvement in $PaCO_2$ by at least 1 kPa.
- Improvement in pH.

After initial ABG consider transcutaneous carbon dioxide monitoring as an alternative to multiple ABG sampling.

NIV, when successful, should be administered for as long as possible on day 1 with breaks for mouthcare, medications, food and drink.

If patient continues to improve consider weaning NIV as follows:

- DAY 2: Daytime therapy of 2 hours on and off NIV plus overnight
- DAY 3: Daytime intermittent therapy aiming for 8 hours in total plus NIV overnight.
- DAY 4-5: Weaning to nocturnal NIV for 1-2 nights prior to stopping.
- Early morning ABG 24 hours after NIV therapy discontinued.

3.7. Unsuccessful Therapy

NIV is deemed to have failed when.

- The patient remains tachypnoeic, less alert despite the ventilatory support.
- pH below 7.35.
- $PaCO_2$ over 8 kPa.

The cause of failure must be sought by consultant or SpR:

- 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.
- Ensure appropriate oxygen flowrate to maintain prescribed target saturations.
- The mask fit should be checked for leaks.
- Lack of synchronisation between patient and ventilator.

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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 $PaCO_2$ over 8 kPa).
- PaO_2 below 6 kPa despite adjusted FiO_2 plus appropriate settings.
- Cardiorespiratory arrest.

Admission to HDU/ITU should be discussed at consultant level.

If NIV withdrawal is required, please follow flow chart in Appendix 1.

4. Training & Competencies

NIV should only be prescribed by Respiratory Consultant or Respiratory SpR

All staff caring for patients requiring NIV should complete nursing NIV competency document and attend the Respiratory NIV study day. Trustdocs Id: 15351

5. Related Documents

NIV prescription Chart Doc ID: 16146 http://nnvmwebapps01/TrustDocs/ViewDoc.aspx?id=16146

NIV observation chart
http://nnvmwebapps01/TrustDocs/ViewDoc.aspx?id=13401

Respiratory Department Welcome pack and Nursing Competencies
http://nnvmwebapps01/TrustDocs/ViewDoc.aspx?id=15351

6. References

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3. M.W.Elliott Non-Invasive Ventilation in acute exacerbations of COPD: What happens after hospital discharge. Thorax 2004:59;1006-1008
4. NCEPOD Report and Recommendations on Acute NIV: https://www.ncepod.org.uk/2017niv.html
5. 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.

7. Audit of the service to be delivered.

Compliance with the process will be monitored through the following:

Key elements	Process for Monitoring	By Whom (Individual / group /committee)	Responsible Governance Committee /dept	Frequency of monitoring
ABG to mask time	Audit	VSSN	Respiratory	Yearly
Mortality	Audit	VSSN	Respiratory	Yearly
Admission to ARCU time	Audit	VSSN	Respiratory	Yearly
Delays in process	Audit	VSSN	Respiratory	Yearly

The audit results are to be discussed at relevant governance meetings to review the results and recommendations for further action.

Appendices

Appendix 1 – NIV withdrawal

8. Equality Impact Assessment (EIA)

Type of function or policy	Existing

Division	Medicine 1	**Department**	Respiratory
Name of person completing form	Vicky Ershadi/Georgina Siggins	**Date**	26/6/23

Equality Area	**Potential Negative Impact**	**Impact Positive Impact**	**Which groups are affected?**	**Full Impact Assessment Required YES/NO**
Race	no			no
Pregnancy & Maternity	no			no
Disability	no			no
Religion and beliefs	no			no
Sex	no			no
Gender reassignment	no			no
Sexual Orientation	no			no
Age	no			no
Marriage & Civil Partnership	no			no
EDS2 – How does this change impact the Equality and Diversity Strategic plan (contact HR or see EDS2 plan)?	No change			

- **A full assessment will only be required if: The impact is potentially discriminatory under the general equality duty.**
- **Any groups of patients/staff/visitors or communities could be potentially disadvantaged by the policy or function/service.**
- **The policy or function/service is assessed to be of high significance**

IF IN DOUBT A FULL IMPACT ASSESSMENT FORM IS REQUIRED

The review of the existing policy re-affirms the rights of all groups and clarifies the individual, managerial and organisational responsibilities in line with statutory and best practice guidance.