



Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive



Ospidéal Ollscoile Chorcaí
Cork University Hospital

POLICY AND PROCEDURE ON

THE MANAGEMENT OF PATIENTS REQUIRING

BI-LEVEL POSITIVE AIRWAY PRESSURE

(BIPAP) NON INVASIVE VENTILATION (NIV)

IN CORK UNIVERSITY HOSPITAL GROUP

Reference Number: PPG-CUH-CUH-62	Revision No: 02	Review Cycle: 2 years
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1 Procedure

1.1 Indications/contraindication for BiPAP

Indications

BiPAP is indicated in the following instances:

- Patients with acute exacerbation of COPD where PH less than 7.35, P_{CO2} greater than 6 and respiratory rate greater than 20 despite maximum medical treatment on controlled oxygen therapy.
- Patients with acute pneumonia and hypoxemia that are resistant to high flow oxygen and will require intubation. (In this context, trials of BiPAP should only occur in Observation Units or Intensive Care Unit setting).
- As a ceiling for treatment in patients who are not candidates for intubation.
- Tried in cases of acute exacerbation of bronchiectasis, with a pH less than 7.35 in consultation with the department of respiratory medicine. Excessive secretions are likely to limit its effectiveness and should not be used routinely in patients with bronchiectasis.
- As an alternative to intubation if the pneumonia patient becomes hypercapnic. (In this context patient should be cared for in observation or Intensive Care Unit settings).
- To wean patients from invasive ventilation and should be used when conventional strategies fail.

Contraindications

BiPAP is contraindicated in the patients with:

- Recent facial or upper airway surgery
- Undrained pneumothorax
- In certain upper gastrointestinal surgery
- Inability to protect airway
- Copious respiratory secretions
- Life threatening hypoxemia
- Bowel obstruction
- Severe encephalopathy
- Cardiac or Respiratory arrest

Respiratory Physician or Medical registrar/SHO/anaesthetist on call may decide to commence BiPAP in the presence of these conditions if BiPAP is the ceiling treatment.

1.2 Prior to Commencing BiPAP

Prior to commencing BiPAP ensure the following steps are followed. Physiotherapist can commence patient on BiPAP following discussion with patient's medical doctor.

Respiratory Physician, Medical Registrar / SHO / Anaesthetist on call / Physiotherapist / Respiratory Nurse should:

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1. Confirm and document in medical notes patients suitability for BiPAP (Appendix 1).
2. Decide the next step to take if BiPAP fails. The ceiling of care, be it progression onto endotracheal intubation or not and best supportive care in discussion with Respiratory consultant or registrar. (Appendix II & III).
3. Decide on BiPAP settings and document same in the patient's medical notes and on the flow sheet at the end of the bed (Appendix IV). This flow sheet is to be filed in patient's medical notes after use. Physiotherapist/nurse to discuss setting with doctor prior to commencement of therapy.
4. Give full explanation to both patient and family on the purpose and need for BiPAP therapy and obtain verbal consent.

Nursing staff to ensure patient will be closely monitored as per section **7.7** of this policy and procedure and is close to working oxygen. Ideally move patient to observation unit if possible.

1.3 Management of BiPAP settings (Appendix 1)

Below is a guide to the usual settings when commencing a patient on BiPAP. These settings may change as patient's circumstances dictate. All initial settings and subsequent changes must be recorded on flow sheet (Appendix IV).

- Explain the procedure to the patient and allow time for the patient to ask questions and express anxieties.
- Set up BiPAP machine (Appendix X).
- Commence BiPAP at IPAP 10cmH₂O/EPAP 4cmH₂O (usual settings) or as per flow sheet (Appendix IV)
- If patient's saturations are less than 88% consider commencing patient on oxygen or if already on oxygen consider increasing FiO₂ to improve O₂ saturation to 88-92% or above.
- Repeat ABG after 1 hour of BiPAP treatment.
- Titrate IPAP upwards if pH less than 7.35, respiratory rate greater than 20bpm, PaCO₂ greater than 6kPa or persistent use of accessory muscles.
- Titrate EPAP upwards if persistent hypoxia. (IPAP must be increased accordingly). All changes to EPAP require a corresponding change to IPAP.
- Titrate in increments of 2cmH₂O to peak/maximum IPAP 20 cmH₂O/EPAP 8cmH₂O.
- Repeat ABG again after 4 hours of BiPAP treatment. Titrate pressure as above. If after 4 hours patient condition does not improve consider treatment failure (Appendix II). However, if significant clinical deterioration during the initial four hour period contact doctor to review patient as endotracheal intubation may be required. If patient is for possible intubation, contact admissions/anaesthetist on call as soon as possible as bed needs to be arranged in ITU.

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- All patients should have a documented weaning plan in their medical notes e.g. Day 1: 24 hours, Day 2: intermittent during the day and nocturnal BIPAP overnight, Day 3: aim to discontinue may need one more night of nocturnal BIPAP, day 4: review to discontinuing. This plan may change as the patient's condition changes. The plan should always be multidisciplinary. The aim should be to increase the length of time the patient stays off BiPAP or slowly to decrease IPAP setting. Weaning process should be carried out during the day if possible but continue to offer it overnight or as per documented in weaning plan. See Appendix XII for suggested weaning plan.
- Further ABGs and pressure titrations are guided by patient's clinical condition.
- If the facial mask needs to be removed for any reason during treatment e.g. eating and drinking, oral care consider supplementary oxygen in the form of nasal prongs to maintain patient's oxygen saturations.
- Monitor patients as per section **7.7**.

1.4 Patient Monitoring while on BiPAP

Below is the suggested minimum monitoring of patients on a BIPAP machine. Any problems noted during patient monitoring should be reported to medical team.

Clinical	Method
Neurological status	Glasgow Coma Scale on initiation of BiPAP therapy to establish a baseline and as patient's condition indicates thereafter.
Respiratory Distress	Observe Use of accessory muscles, abdominal paradox BORG scale (Appendix XIII) of breathlessness to be scored by physiotherapist
Vital signs	Record respiratory rate, blood pressure oxygen saturation (Spo2) and pulse rate every 15 minutes for the first hour and every 30 minutes for the first hour after any change of settings. - Respiratory rate as per clinical assessment and from BIPAP machine monitor - If SpO2 is dropping check for leaks around the mask and tubing and that the oxygen tubing is connected
Skin integrity	1. Waterlow score. 2. Ask patient re: comfort levels from mask and observe pressure areas paying particular attention to bridge of nose. As patient mobility is restricted while on

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	BIPAP all other pressure areas should be assessed and monitored.
Oral hygiene	Perform oral care as per hospital policy. Consider supplementary oxygen while performing oral care.
Physiology	
Arterial Blood saturation (SaO2) Carbon Dioxide Retention (CO2)	Continuous Pulse oximeter monitoring Arterial blood gas sampling. (frequency as per section 7.6)
BIPAP Machine Setting	The below setting/recordings must be checked each time patient vital signs are performed.
Patient – BIPAP Machine Interaction	Observe patient's respiratory rate and rhythm recorded by BIPAP machine.
IPAP / EPAP Settings	Ensure prescribed settings match BIPAP machine settings.
Tidal Volumes	Monitor BIPAP reading of patients tidal volume
Psychological	
Tolerance	Constantly reassure patient while on BIPAP to promote tolerance

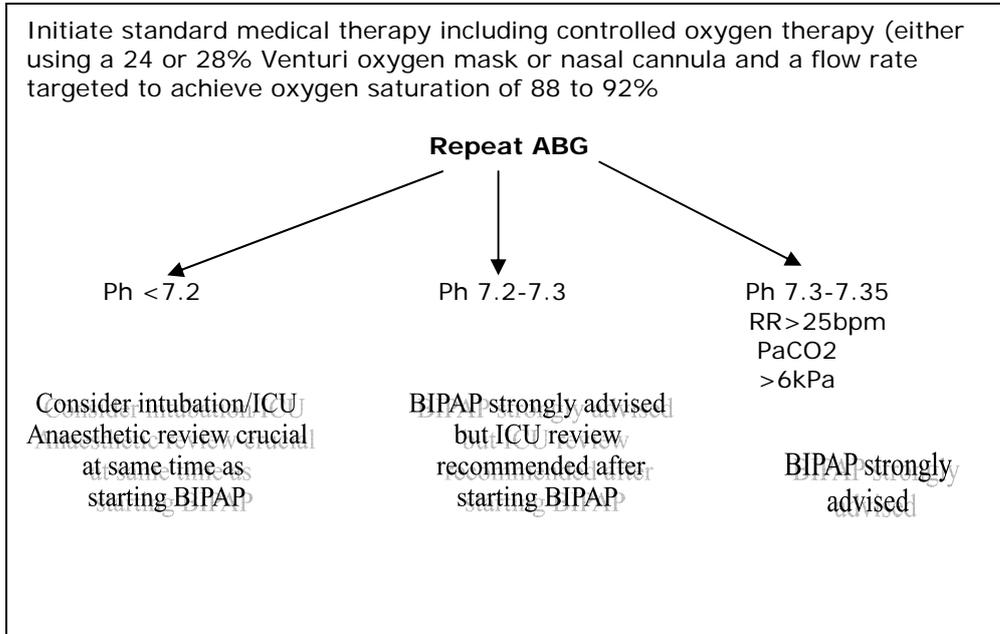
In addition to the above the patient should also be closely monitored for complications associated with BiPAP therapy which include:

- Gastric distension:
 - If present consider inserting a nasogastric tube and commencing patient on an antiemetic.
- Pressure sores on the face
 - Apply duoderm to sore and consider using an alternative BIPAP mask see section 7.4.1.
 - Open wound care chart.
- Increased anxiety:
 - Reassure patient.
- Poor treatment tolerance consider:
 - Changing type of mask in use.
 - Giving patient breaks off treatment (if appropriate) applying nasal oxygen during breaks.
 - Changing machine setting following discussion with Doctor/physiotherapist

If patient continues to have poor tolerance of therapy even with constant reassurance and if all observations have been checked and satisfactory, contact medical doctor to re-assess the patient's condition as there maybe a possible underlying medical condition causing non-compliance e.g. infection.

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1.5 Appendix 1 Patient suitability for BiPAP



1.6 Appendix II - What to do if BiPAP treatment fails

A decision about what to do if BiPAP fails and whether tracheal intubation is an option for the patient should be made before commencing BiPAP on every patient. This decision should be made by the Respiratory Team Consultant or the medical registrar who should discuss this with the respiratory team during the next working day. The decision should be made after discussion with patient and their family (if appropriate) taking into account patient and family (if appropriate) wishes and patient's quality of life. If the decision is to proceed to endotracheal intubation should BiPAP fail, this should be discussed with the anaesthetic registrar or consultant on call who should review the patient at this stage. All decisions should be documented clearly in the patient's notes.

Full ventilation considered if:

- Arterial pH less than 7.2
- Arterial pH between 7.2 and 7.25 on two occasions 1 hour apart
- Hypercapnic coma (GCS less than 8 and PaCO₂ greater than 8 kPa)

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- PaO₂ less than 6 kPa despite maximum tolerated F_iO₂
- Cardio respiratory arrest
(GOLD and NICE Guidelines, 2004,)

The use of BiPAP for patients should be classified into three categories:

1. BiPAP as life support with no pre-set limitations on life-sustaining treatments;
2. BiPAP as life support when patients and families have decided to forego intubation.
3. BiPAP as a palliative measure when patients and families have chosen to forego all life support, receiving comfort measures only following discussions with medical team. Outcomes and decision made following these discussions must be documented by the doctor in patient's medical notes.

1.7 Appendix III - Factors associated with BiPAP success and failure

FACTORS ASSOCIATED WITH SUCCESS IN NIV

- High paO₂, with low A – a oxygen gradient pH 7.25 – 7.35.
- Improvement in pH, PaCO₂ and respiratory rate after 1 hour of NIV
- Good level of consciousness

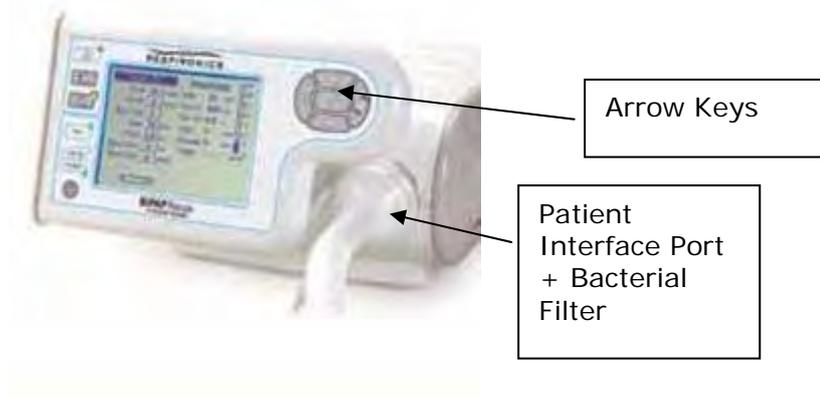
FACTORS ASSOCIATED WITH FAILURE IN NIV

- Pneumonia on chest radiography
- Copious respiratory secretions
- Poor nutritional status
- Confusion or impaired consciousness

BTS Standards of Care Committee Guideline: Non Invasive Ventilation in acute respiratory failure (2002). *Thorax*; 56: pp192 - 209

1.9 Appendix X Instruction on use of BiPAP machines in use in CUH

BiPAP Focus



Equipment Required

- Bacterial Filter
- Circuit tubing (BiPAP disposable circuit)
- Exhalation Port
- Face Mask

Circuit Set-up

- Connect Bacterial filter to the patient interface port.
- Connect Circuit tubing to the Bacterial filter with exhalation port
- at the patient end.
- Attach face mask to exhalation port.

Where to Place the BiPAP Focus

- The BiPAP Focus is mounted on a movable stand and should stay on this stand throughout treatment.
- Connect the power lead to the mains power connector on the rear panel. Plug into the mains power supply.

Starting the Focus (Refer to Providers Manual)

1. To Switch on press the on/off button. (Ensure that back panel on/off switch is on)
2. Use the arrow keys to highlight the desired Mode (Spontaneous timed) and press enter to select
3. Use the arrow keys to select and set the desired IPAP as decided by the medical team/anesthetist/physiotherapist.

CAUTION: Avoid starting off with the pressure too high. Start with a low pressure to avoid distressing the patient.

4. Use the arrow keys to select and set the desired EPAP as discussed with the medical team/anesthetist.
5. Use the arrow keys to select the desired back up rate. Ensure that this is at least breaths per minute less than the patient's current respiratory rate.
6. The patient may now hold the mask to the face.
7. Allow the patient to get used to the mask. Then gradually increase the IPAP setting until the patient feels comfortable and is being ventilated efficiently. 10 to 20cm H₂O will suit most patients.
8. Once patient comfortable strap the mask/headset to the patient.
9. Set an appropriate Rise Time. The Rise Time is dependent on the patient's respiratory rate. Set a lower rise time for tachypneic patients of 1 or 2.

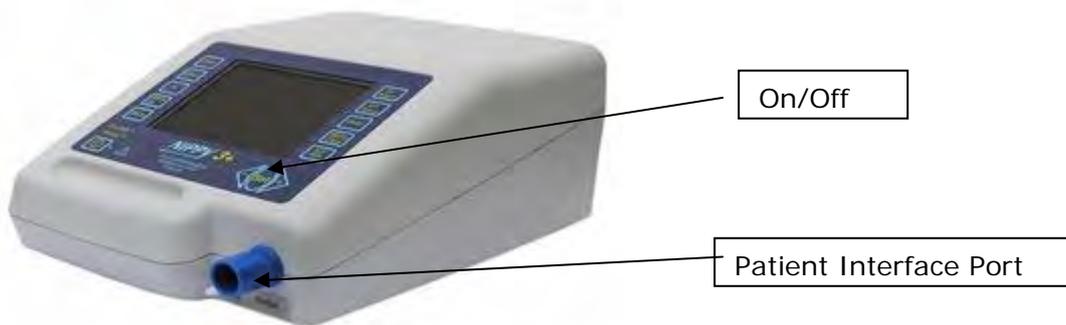
For patients with a normal respiratory rate set a rise time of 2 or 3. The rise time needs to be low enough to allow the IPAP to be delivered.

10. Make sure that no air is leaking from the mask into the patients eyes. If it is, adjust the mask and headgear until air stops leaking. See the instructions supplied with the mask.

11. Provide reassurance to the patient.

NOTE: A small amount of mask leak is normal and acceptable. Large mask leaks or eye irritation from an air leak should be corrected as soon as possible.

NIPPY 3



Equipment Required

- Bacterial Filter
- Circuit tubing(BiPAP disposable circuit)
- Exhalation Port
- Face Mask

Circuit Set-up

- Connect Bacterial filter to the patient interface port.
- Connect Circuit tubing to the Bacterial filter with exhalation port at the patient end.
- Attach face mask to exhalation port.

Machine Set-up (Refer to Providers Manual)

To Switch On

- Place the NIPPY 3 on a clean, smooth, hard surface.
- Connect the power lead to the mains power connector on the rear panel. Plug into the mains power supply.
- Press the Start/Stop button.

To Switch Off

Press the Start/Stop button. The "Switch Ventilator Off" message will appear on screen. Press the Start/Stop button again after 2 seconds. There must be a delay of 2 seconds before each push, to prevent accidental operation.

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The Main Screen

The Main Screen is divided into 3 areas:

1. The left-hand side shows the basic ventilator settings, IPAP, EPAP, Ti (Timed Inspiration), BACK-UP and Mode, adjacent to its setting button.
2. The centre section shows the airway pressure, estimated tidal volume and breath rate.
3. The right-hand side shows the Total hours, hours used and symbols for alarm mute and locked settings.

How to adjust the NIPPY 3

- Select the desired parameter with the relevant button.
- The reading adjacent to the button will be highlighted by a purple flashing box.
- Alter it with the - or + buttons.
- When you have finished, move on to the next adjustment or wait a couple of seconds for the flashing box to disappear.

E.g. Press IPAP.

IPAP setting will be surrounded by a purple flashing box.

Press +/- to increase/decrease the pressure setting.

SETTING UP THE NIPPY ST in PRESSURE SUPPORT MODE

1. Place the NIPPY 3 on a clean, level surface.
2. Press the Start/Stop button and select Pressure Support mode.
3. Set IPAP to around 8cm H₂O as discussed with the physiotherapist and/or medical team.

CAUTION: Avoid starting off with the pressure too high. Start with a low pressure to avoid distressing the patient.

4. Set desired EPAP as decided by medical team /anesthetist /physiotherapist.
5. Ensure that the back-up rate is set to a lower value than that observed when assessing the patient.
6. The patient may now hold the mask to the face.
7. Allow the patient to get used to the mask. Then gradually increase the IPAP setting until the patient feels comfortable and is being ventilated efficiently. 10 to 20cm H₂O will suit most patients.
8. Make sure that no air is leaking from the mask into the patients eyes. If it is, adjust the mask and headgear until air stops leaking into the patients' eyes. See the instructions supplied with the mask.

NOTE: A small amount of mask leak is normal and acceptable. Large mask leaks or eye irritation from an air leak should be corrected as soon as possible.

Lockout Deactivation

If the keypad is locked out, to deactivate, press and hold the up and down arrows at the same time for 5 seconds.

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1.10 Appendix XI - Trouble Shooting

Poor synchrony with the machine.	Consider changing the rise time. Check for leaks. Check mask fit.
Patient is unable to tolerate the mask.	Consider reducing the pressures temporarily. Use the ramp setting that allows the set pressures to be reached over a period of time e.g. 15 minutes. Consider medication to help reduce panic/anxiety. Involve the patient's family.
Low SaO2	Check Oxygen connected correctly Check mask for leaks Check SaO2 monitoring machine Consider warming patient peripheries if cold
IPAP setting not being reached	Check for leak Consider if rise time is too long Check tidal volume Check Patient positioning Check Glasgow Coma Scale observations

1.11 Appendix XII - Suggested weaning plan

Weaning a COPD patient from BIPAP:

Day 1: Advise BIPAP continuously over 24 hours.

Day 2 – 3: Advise for intermittent BIPAP during the day and nocturnal BIPAP overnight

Day 3: Aim to discontinue BIPAP. May need one more night of nocturnal BIPAP

Day 4: Aim for no further BIPAP treatment required – Day or Night.

To initiate Weaning, Please follow the algorithm below.

