

# CPAP Standard Operating Procedure

## - COVID19 PANDEMIC

### 1 INTRODUCTION

Continuous positive airway pressure (CPAP) is the delivery of mechanical positive pressure to support the patient's inspiratory effort via a variety of interfaces. Application of positive pressure ventilation decreases the work of breathing, improves alveolar ventilation and facilitates oxygenation.

### 2 PURPOSE

The procedure has been developed to assist health care professionals in the use of continuous positive airway pressure non-invasive ventilation (CPAP) for the management of non-hypercapnic (type I) respiratory failure due to acute respiratory illness. At the current time it is anticipated that CPAP will most often be used as a bridge to invasive mechanical ventilation, or as a treatment entity in its own right, in patients who have confirmed or suspected COVID19. The document provides indications as to those patients for whom CPAP may be appropriate, contraindications, potential complications and specific care for a patient undergoing CPAP in the respiratory and COVID wards, and the emergency department (ED).

### 3 SCOPE

This procedure is for use by the multi-professional team (trained nursing staff and medical staff) in the acute hospital setting.

### 4 DUTIES

**Nursing Staff** on the respiratory and COVID wards and the emergency department are required to follow the procedure once they have had training. CPAP will be a nurse led service, heavily supported by the respiratory consultants and registrars. It is the responsibility of the individual nursing staff to ensure that they are competent in the use of CPAP devices if caring for patients who require this therapy. An annual update must be completed by staff who are trained in CPAP/BiPAP.

**Ward managers or Matrons** should keep records of staff training and achievement of competence in the use of CPAP/BiPAP.

**Respiratory consultants** will provide clinical management of the patients on CPAP and support the nurse led service across the Trust. They will also participate in providing staff training on CPAP.

**Intensive care / anaesthetic consultants** may directly advise CPAP as a bridge to mechanical ventilation having reviewed a patient on the respiratory or COVID wards, or ED. The responsibility for support for CPAP will remain with the respiratory team, however.

**Physiotherapists working with CPAP patients** are required to have an awareness of this procedure. Physiotherapists can obtain advice and support on the care of CPAP patient from the nursing staff on the respiratory ward.

The **Lead Respiratory Nurse** will support the NIV Clinical Leads with updating and implementation of the procedure. The lead nurse will also provide advice to staff and training.

**Respiratory Nurses** will support the implementation and training associated with this document.

## 5 KEY PRINCIPLES

Non-invasive ventilation is “the provision of ventilatory support through a patient’s upper airway using a mask or similar device”. The choice of NIV therapy will depend on the patient’s underlying problem and may be:

- Continuous Positive Airways Pressure (CPAP) or
- Bi-level positive airways pressure (BiPAP).

These treatments may be used as the sole treatment, a holding measure, a trial prior to intubation or the ceiling of treatment with the aim to produce:

- Decreased work of breathing
- Increased tidal volume
- Decreased respiratory rate

This procedure identifies the expected standard of care required for patients receiving CPAP and identifies the minimum standard for:

- patient management
- knowledge and skills
- equipment
- documentation
- monitoring for effectiveness

### 5.1 Patient Selection Criteria

#### Inclusion Criteria

- Pneumonia /LRTI, most often secondary to COVID/suspected COVID
- Sick but not moribund
- Able to protect airway
- Conscious and co-operative
- No excessive respiratory secretions
- Potential for recovery to quality of life acceptable to the patient
- Patient’s wishes considered

#### Exclusion Criteria

- Acute or chronic type 2 (hypercapnic) respiratory failure
- Cardiogenic pulmonary oedema (relative contraindication)
- COPD (relative contraindication)
- Undrained pneumothorax
- Haemodynamically unstable
- Facial burns / trauma / recent facial or upper airway surgery
- Fixed upper airway obstruction
- Severe co-morbidity
- Inability to protect airway (relative contraindication)
- Copious respiratory secretions (relative contraindication)
- Vomiting

### 5.2 Patient Groups who should be offered CPAP

**Patients with lower respiratory tract infection / pneumonia most often secondary to COVID/suspected COVID and type 1 (non-hypercapnic) respiratory failure.**

## Patient groups who should not be offered CPAP

Patients with recognised Type 2 (hypercapnic) respiratory failure - acute or chronic.

Patients with a history of COPD should be discussed with the respiratory team / medical consultant prior to initiation of therapy and SpO<sub>2</sub> should be targeted at 88-92%.

Patients with cardiogenic pulmonary oedema should not routinely be offered CPAP therapy but may be considered on a case by case basis at the discretion of the respiratory team / POD.

### 5.3 Patients with their own CPAP machine

Patient coming in from home with their own CPAP machine should continue on their own machine but with their normal interface changed to a NON-VENTED mask and a similar circuit setup to that described for in-patients below. Home CPAP patients do not always require supplemental oxygen. Depending on their clinical presentation to hospital, they may or may not require supplemental oxygen at that time; seek medical advice. The department looking after the patient from a ventilation point of view should be informed that the patient is in hospital. It is accepted that this may not be possible should the clinical tempo increase significantly.

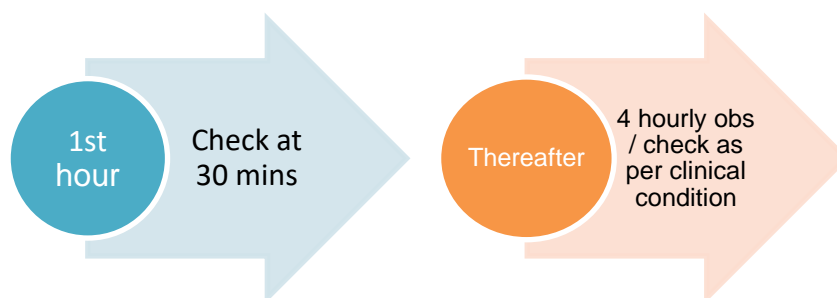
If the patient deteriorates then advice should be sought from the respiratory team, or if out-of-hours from the on-call POD who may wish to take advice over the telephone from the COVID respiratory consultant.

### 5.4 Assessment

The patient's suitability for CPAP should be assessed. If CPAP is indicated, the prescription sheet (appendix 3) should be completed. The CPAP prescription must be completed prior to any transfer and should accompany the patient.

**A decision regarding the patient's further management and escalation of care should CPAP fail must be agreed before commencing CPAP or within the first hour of treatment as far as practicable. This must be documented in the patient's notes and on the prescription sheet. Treatment Escalation Plans (and if necessary, DNACPR forms) should be completed on all patients.** It is best practice to discuss these decisions with the patient and their family. It is also important to gain an understanding of the patient's wishes for their treatment.

### 5.5 Observations



#### Observations to be completed:

The following observations/checks should be completed and recorded in the patient notes:

- respiratory rate
- heart rate
- consciousness level
- comfort, chest wall movement
- mask fit/leaks

A medical consultant should review the patient at least once a day.

### 5.6 Optimising CPAP

Patients improving with CPAP in the first 4-6 hours should receive continuous CPAP as much as possible during the first 24 hours. Treatment can be continued as per the CPAP prescription and monitoring charts.

### 5.7 Escalation

Once treatment has been optimised, failure to improve hypoxia and reduce 'work of breathing' is a poor prognostic sign, and the continuation of CPAP should be reviewed by the respiratory consultant (8am-8pm) or the medical team (POD if available) overnight.

**If the patient that is for escalation is failing to respond adequately or is deteriorating, the doctor in charge of the patient's care should alert the critical care team to this. It should be made clear to the patient (and their relatives if required) that advice is being sought and the final decision regarding escalation lies with critical care.**

### 5.8 Treatment Failure: Palliation

We know that in the setting of aggressive respiratory diseases such as COVID, that failure to respond to NIV is a poor prognostic sign. Critical Care will take this into account when reviewing a patient that deteriorates on NIV and in the light of this new information it may be that the patient will not gain sustained benefit from escalation to Critical Care. In this setting NIV should not be continued if the deterioration is to the extent of being moribund (NIV should not be used to extend the dying period) and usual palliative care should be instigated. If the decision is made to palliate or remove NIV/CPAP, ensure that anticipatory medications are prescribed in keeping with local Trust guidelines. Be aware that patients with COVID 19 may require larger doses than usual of anticipatory medications and early involvement of palliative care (before withdrawal) is recommended. Palliative care contact in working hours: DMH 07798 617571 and UHND 07917 581089. Out of hours use the UHND number.

### 5.9 Weaning

A trial of weaning CPAP to conventional oxygen therapy can be considered when  $FiO_2 < 40\%$  is required to maintain sats of  $>94\%$  and work of breathing has reduced.

Weaning from CPAP should begin during the day. CPAP should not be stopped abruptly.

When weaning the patient from CPAP, a daily plan based on clinical findings should be agreed by the clinical team and documented on the CPAP chart and in the medical notes.

Consider continuation of CPAP throughout the night whilst weaning if there is clinical suspicion of nocturnal hypoventilation / known OSA with home CPAP.

**It is recognised that many patients with COVID will require prolonged periods of time on CPAP; a week would not be unusual under these circumstances.**

### 5.10 Pressure Sores

Pressure sores across the nose bridge are a significant risk, especially if the mask is tight fitting. A degree of mask leak is acceptable and the mask should be fitted to obtain the best balance between leaks and mask comfort. Should signs of pressure damage occur, check mask fit or consider loosening head straps and accepting a larger degree of air leak. The greater the degree of air leak, however, the less effective the treatment, and the greater the risk of aerosolisation of virus. A padded adhesive dressing can be used over the bridge of the nose as extra protection.

### 5.11 Air Leak

Air leak into the eyes can cause dryness and irritation and can be addressed by altering fit or style of mask.

Remember that conjunctivitis can be caused by COVID and therefore all eye irritation may not be due to air leak into the eyes.

### 5.12 Fluid Intake

Patients on CPAP easily become dehydrated and should therefore have their fluid balance monitored. IV fluids should be **considered** for any patient on CPAP. NG feeding should also be considered by medical staff, accepting that some leak will be introduced from the mask. This will be assessed on risk / benefit grounds. The majority of patients should be able to tolerate short breaks from CPAP for drinks and light meals. The aim would be a neutral to slightly negative fluid balance, to aid oxygenation.

Patients using CPAP may experience problems with clearance of secretions. Using an HME (heat moisture exchange) bacterial/viral filter if possible will mitigate this risk to a degree. Where this is a problem, consider nebulising normal saline through an oxygen driven nebuliser (with supplementary nasal oxygen as required). Nebulising saline or bronchodilators through the CPAP circuit using a T-piece is physically possible but the filter may become saturated and subsequently blocked (causing a reduction in the delivered positive pressure to the patient) therefore this should be avoided if possible.

If CPAP has been commenced for treatment of cardiogenic pulmonary oedema IV fluids are unlikely to be of benefit and may cause significant harm.

### 5.13 Infection Control

CPAP tubing, masks, exhalation ports and headgear are for single patient use only.

The inlet filter must be checked prior to the machine being used and must be replaced if discoloured.

A bacterial AND VIRAL filter **MUST** be used in the circuit. Nursing staff must change this filter daily or if it becomes wet/blocked.

Following use, the electrical equipment should be un-plugged and decontaminated before being returned to the store cupboard.

The electrical equipment must be serviced and checked for electrical safety yearly.

### 5.14 Training

It is the responsibility of the individual nursing and medical team to ensure that they are competent in the use of CPAP/BiPAP devices if regularly caring for patients who require this therapy. Ward managers should keep records of staff training and achievement of competence in the use of CPAP/BiPAP.

An annual update must be completed by staff trained in CPAP/BiPAP.

# Appendix 1

**CPAP prescription chart:** (prior to the completion of this form please read the flowchart on the back of this sheet to ensure that the patient is suitable for CPAP) **(ALL SECTIONS MUST BE COMPLETED)**

Patient Name:.....  
 Hospital number:.....  
 Dates of birth:.....

Referring Clinician:.....Ward/Unit.....

Indication for CPAP(\*\*):.....

ABG result	Time	FiO <sub>2</sub>	pH	PaO <sub>2</sub>	PaCO <sub>2</sub>	HCO <sub>3</sub> <sup>-</sup>	Base Excess
Initial:							
After one hour of NIV^:							

^If worse, please re-discuss with registrar/ consultant

**Initial CPAP setting: 10cmH20**

Record changes to settings below. Refer to CPAP standard operating procedure for treatment guidelines.

**Escalation of care:**

**DNACPR completed:** Yes No      **Treatment escalation plan MUST BE completed:** Yes No

**Consent**

Does the patient have capacity (Mental Capacity Act 2005): Yes No

If **yes** has patient consented to CPAP: Yes No

If **no** has a decision to initiate CPAP been taken in the patient's best interest: Yes No

Name of the person/s who has authorised the use of CPAP:

Name:..... Grade:..... Time:.....

Name.....	Signature:.....	Grade:.....
Date:.....	Time.....	Bleep:.....

**Record of initial CPAP treatment** (NB space is provided to record gases if done; there is no obligation to perform ABG / CBG after CPAP has been commenced unless there is clinical indication to do so):

Time	pH	PaCO <sub>2</sub>	PaO <sub>2</sub>	HCO <sub>3</sub> <sup>-</sup>	BE	CPAP	FiO <sub>2</sub>	Sig

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Date:  
Ward:

**CDDFT Respiratory Medicine  
CPAP Prescription and Record**

Patient Details

Plan from medical notes (Respiratory or intensive care consultant / registrar only):

**Filter change:**  
Time:                      Sig.:

**Record** time CPAP applied/removed and any changes to settings. **Document** clinical assessment overleaf.

CPAP Settings	Time											
	On/Off											
	CPAP (cmH <sub>2</sub> O)											
	Entrained oxygen											
	Tidal Volume											
	O <sub>2</sub> Sats (probe)											
	Resp Rate											
Blood Gases	pH											
	PaCO <sub>2</sub>											
	PaO <sub>2</sub>											
	Base Excess											
	Bicarb (HCO <sub>3</sub> )											
Arterial or Capillary												
Signature												

\* Use CPAP machine data for resp rate and tidal volume. Target SaO<sub>2</sub> usually 94-96%.

NB Blood gases do not routinely need to be done once CPAP is established unless hypercapnia suspected. Space is provided to record gases if done.





## Appendix 2 Management and care of patient on CPAP

1. Position the patient comfortably, as upright as possible.
2. Use a full face mask or CPAP hood (see Appendix 2 for CPAP set up).
3. Ensure ResMed Stellar 100 set to CPAP mode (“Setup” → “Mode” → “CPAP”). If the patient has their own CPAP machine for home use, use this if possible (but their mask/other interface must be changed for a NON-VENTED full face mask). Depending on clinical need, we may be using the hospital supply of CPAP machine designed for home use (ResMed AirSense 10 fixed pressure).
4. Start at CPAP 10cm H<sub>2</sub>O.
5. Higher settings by senior respiratory / critical care decision only. It would be unusual to exceed 15cm H<sub>2</sub>O.
6. Oxygen at 15 litres/minute should be entrained into the oxygen post connected to the machine to achieve target oxygen saturations of SpO<sub>2</sub> 94-96%, unless otherwise indicated by senior clinician. Using the oxygen port in the circuit (see below) should enable a higher FiO<sub>2</sub> delivered to the patient than simply attaching oxygen to the back of the machine.
7. Target SpO<sub>2</sub> should be prescribed on the drug chart.
8. Aim for continuous care for the first 24 hours, with breaks only for food, drink, skin and mouth care. Bronchodilators should NOT be administered via a T-piece in the circuit as the moisture can block the filter. Similarly, a humidification device should not be attached to the circuit BUT an HME (heat and moisture exchange) filter (which also filters bacteria and viruses) should be used
9. Document settings and observations on the CPAP daily record sheet.
10. Continuous clinical assessment of the patient is needed to ensure that they are managed safely in the initiation, optimisation, maintenance and weaning of CPAP. This will require increased nursing time to support the patient, particularly in the first 4 hours of therapy.
11. Repeat ABG/CBG should only be done routinely if hypercapnia is suspected. Peripheral oxygen saturation monitoring should suffice as a measurement of patient response.
12. Oxygen saturations and ECG should be monitored continuously for at least the first 12 hours.

# Appendix 3 NIV setup (CPAP and BiPAP)

Choose the correct sized NON-VENTED mask and connect it to the circuit as shown in the order:

Mask → filter → exhalation port → tubing → oxygen port → machine

