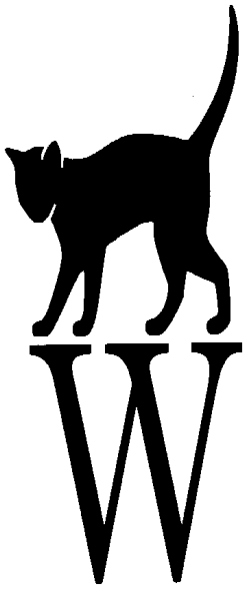


Continuous Positive Airway Pressure for hospital inpatients – Guideline for use

Version:	Three
Ratified by:	Clinical guidelines Committee
Date ratified:	November 2012, reviewed minor change Nov 2014
Name of originator/author:	Rainer Bohlin
Name of responsible committee/individual:	Rainer Bohlin Dr Sarah Gillis
Date issued:	November 2014
Review date:	3 years hence
Target audience:	Trust wide



A Whittington Hospital Clinical Management Guideline

Guideline for the Use of Continuous Positive Airway Pressure (CPAP)

Speciality: **Critical Care Outreach**
 Directorate: **Trust wide**
 Owner/sponsor: **Critical Care Outreach Team (CCOT)**

Relevant to: All medical and nursing staff dealing with acutely ill patients

Key words: Respiratory failure – Type 1 & Type 2, Hypoxia, Left Ventricular Failure (LVF), Pulmonary Oedema, CPAP

➤ **Background/ introduction**

CPAP supports breathing (with a tight fitting mask) by providing oxygen under continuous positive pressure throughout the respiratory cycle.

- CPAP improves oxygen transfer by increasing alveolar recruitment and increases functional residual capacity so reducing the work of breathing.
- The pressure valve determines the minimum inflation of the alveoli throughout the respiratory cycle.

CPAP is only to be placed by CCOT (bleep 2837) or ITU registrar on-call (bleep 2613).

Respiratory Failure	Type I	Non-acidotic Type II	Acidotic Type II
pH (power of hydrogen)	Normal 7.35-7.45	Normal 7.35-7.45	Low < 7.35
PaCO ₂ (partial carbondioxide pressure)	pCO ₂ normal to Low <6.5 kPa (kilo pascal)	High pCO ₂ >6.6kPa	High pCO ₂ >6.6kPa
PaO ₂ (partial oxygen pressure)	Low pO ₂ < 8kPa	Low pO ₂ < 8 kPa	Low pO ₂ < 8kPa

The key to success of CPAP therapy is

- Early detection of respiratory distress.
- Careful selection of patients.
- Prompt use of CPAP.
- Ensure a good seal between the patient's face and the face mask.
- Patient compliance to treatment.

The normal ability to swallow, eat, speak and cough is preserved as endotracheal intubation is avoided.

CPAP is not the same as non-invasive ventilation (see non-invasive ventilation guidelines).

➤ Indications for CPAP

- Type I respiratory failure - Hypoxaemia with $\text{paO}_2 < 8\text{Kpa}$ despite high flow oxygen of $>45\%$ and $\text{RR} > 25$
e.g. pulmonary oedema, post operative basal collapse
- Only in Type 2 respiratory failure ($\uparrow\text{CO}_2$) due to LVF and when COPD (Chronic Obstructive Pulmonary Disease) is excluded.
- Weaning from the ventilator if not hypercapnic.
- Prophylactic use post-operatively after abdominal surgery.

➤ Contraindications for CPAP

- Patient may need to be intubated and ventilated
e.g. GCS (Glasgow Coma Scale) <9 , Respiratory rate >40 , $\text{PaO}_2 < 10\text{kPa}$ on $\text{FiO}_2 > 0.6$ (exception acute LVF temporary FiO_2 requirement of up to 1.0 may be acceptable).
- Type II respiratory failure (unless acute LVF)– acute exacerbation of COPD.
- Pneumonia being the main cause of respiratory failure.
- Asthma.
- Basilar skull # at risk of pneumocephalus.
- Bowel obstruction.
- Recent Ear Nose and Throat surgery.
- Laryngeal trauma, recent tracheal anastomosis.
- Epistaxis.
- Systolic BP less than 90mmHg.
- Pneumothorax.
- Recently performed ($<24\text{h}$) pleural drainage or diagnostic tap.
- Unconscious with an unprotected airway.
- Patient won't tolerate mask – confused and agitated.
- Facial trauma.
- Moribund, highly likely to die.

- No improvement in ABG, ↓RR or ↓FiO₂ – early review by ITU consultant if patient dependent on CPAP (i.e. does patient tolerate periods off CPAP).

➤ Cautions to CPAP

- Recent upper GI anastomosis (CPAP can cause gastric distension).
- Weak Cough/copious secretions.
- Sputum retention.

➤ Complications of CPAP

- Reduction in cardiac output.
- Pneumothorax – barotraumas.
- Gastric distension leading to vomiting and aspiration of gastric contents.
- Sleep disturbance.
- Nasal bridge ulceration.
- Drying of secretions.
- Drying of eyes and conjunctivitis.

➤ Equipment

- CPAP machines and equipment are stored on the critical care unit

➤ Setting up CPAP

CPAP may only be set-up by members of the CCOT or a night nurse practitioners (who must have been trained in the use of CPAP and set-up of machines, within the previous year) together with the ITU registrar or a senior ITU nurse with the ITU registrar

- A full face mask should be used initially.
- Protect bridge of the nose with Granuflex.
- Consider heated humidification if patient is on ≥ 0.4 FiO₂ at any time on CPAP.
- Turn CPAP on prior to attaching to patient and check that gas flows through the tubing and mask.
- If patient requiring >0.5 FiO₂ turn flow up to maximum if patient tolerates and discuss patient with ITU consultant.
- Explanation and reassurance is very important to maximize patient comfort and co-operation.
- Examine the expiratory CPAP valve at least hourly, to ensure it remains open throughout the respiratory cycle i.e. on inspiration and expiration.
- Check oxygen concentration every time the flow is altered.

- Avoid interruptions in CPAP, as it takes 20-30minutes to re-expand collapsed alveoli. Plan treatments, care and feeding in advance to prevent interrupting CPAP.
- Position the patient in an upright or side lying position. These both improve lobar ventilation. Sit out of bed (if possible).
- Avoid a slumped position.
- Ensure the tight seal between mask and face, as CPAP will be lost in presence of a leak. Correct positioning of facemask and straps as opposed to over tightening the straps to keep the seal. This avoids patient discomfort and reduces facial swelling.
- Ensure patient is able to clear their secretions. Most patients cannot cough against the CPAP, and mask removal is generally necessary for coughing and expectoration.
- Continue oxygen therapy by facemask immediately after CPAP is taken off. If facemask is not tolerated then use nasal cannulae (remembering that you cannot deliver more than 6l/min = 44% oxygen)

➤ Observations of patients on CPAP

- Arterial blood gases within one hour of setting up CPAP and if patient's condition deteriorates. Rationale – to monitor pCO₂. Increasing pCO₂ indicates that the patient is becoming tired. Discuss this patient with ITU ASAP as they may need to be intubated and ventilated.
- Patient should be reviewed after one hour ideally by the person who set it up.
- Ensure that alarm settings on O₂ analyser are at 5% above and below actual O₂ settings and calibrate analyser at least once a day.
- Continuous pulse oximetry monitoring.
Rationale – to monitor oxygen saturations.
Increase oxygen delivery as appropriate.
- Respiratory observations each hour whilst on CPAP. Observe respiratory rate, colour, use of accessory muscles, bilateral chest expansion and breath sounds.
Check expiratory valve on the facemask hourly to ensure it is moving with respiration.
Rationale – to monitor function, ensure adequate ventilation and to detect fatigue, distress and pneumothorax.
- Observations of heart rate, rhythm, blood pressure and urine output, each hour when on CPAP.
Rationale – to monitor for changes in cardiac output.
Detect deterioration in cardiac output and preload caused by CPAP.
- AVPU observations each hour while on CPAP – If patient only responsive to pain do full GCS assessment.
Rationale - conscious level is vital in order to monitor airway protection mechanisms and recognition of CO₂ retention.
- Patient should be as close as possible to the nursing station, unless requiring side-room for a particular reason.
- Extreme caution in patients with hypotension, tachycardia, oliguria or ↓ conscious level – early discussion with ITU consultant.

➤ Care of Patients having CPAP

• Patient Comfort

Rationale: Patient co-operation is essential for CPAP therapy.

Action: Give full explanation and reassurance.

Relieve pressure points - Granuflex on bridge of nose and sponge around the harness straps and under mask to prevent air leaks.

Re-examine mask strapping for displacement regularly

Ensure the CPAP valve is open on inspiration and that gas flow is not obstructed.

Patients should be taken off CPAP at least 4 hourly to allow for eating, drinking, mouth-care and pressure sore prevention.

Treatment Goal: Patient is not distressed or unable to comply with CPAP treatment and to avoid pressure sores.

• Promoting breathing

Rationale: Improves gaseous exchange

Action: • Keep patient positioned upright or high side lying, to promote good ventilation – consider physio input.

• Avoid the slump position.

• Early mobilization and sit out in chair.

• Listen for air entry to determine which side position is required (if unilateral pathology usually lie the patient with the quieter side upper most).

• Encourage patient to take deep breaths every hour.

• When coughing and expectorating remove the CPAP mask.

• Use saline nebuliser if secretions are thick, viscous and difficult to expectorate (prescribed regularly 2-4 hourly).

• Ensure the patient is adequately hydrated, as dehydration causes thick secretions.

• In-between CPAP treatment use humidified oxygen.

Treatment Goal: Workload of breathing is reduced, oxygen saturations increased and improved V/Q mismatch and reduced FiO_2 .

• Preventing dry and swollen eyes

Rationale: Eyes become dry and oedematous if the position of the mask prevents blinking and if air is leaking around the mask.

Action: • Ensure the mask is positioned to allow the patient to blink.

• Re-position to prevent air leaks or plug the leaks with foam.

• Lubricate eyes using Hypermellose eye drops if necessary.

Treatment Goal: Patient does not develop eye problems as a result of CPAP.

• Mouth Care

Rationale: Mouth and lips become very dry because of the high gas flow. Very dry mucous membrane will inhibit expectoration of secretions.

- Action:
- Frequent mouth care to moisten lips/mouth.
 - Apply Vaseline cream to the lips

Treatment Goal: Mucous membranes do not become too dry, so patient is able to expectorate secretions.

- **Nutrition and hydration**

Rationale: To maintain hydration and nutrition, and ensure secretions are not too thick to expectorate.

- Action:
- If short breaks to CPAP therapy can be tolerated, these should be given at meal times if possible.
 - Administer oxygen via mask/nasal specs; monitor SaO₂ during this time.
 - Small frequent meals, offer frequent drinks – depending upon fluid balance requirements.
 - Pass an N/G tube for patients on continuous CPAP/NBM to deliver enteral nutrition and because high airflow O₂ can cause patient to swallow air, which can cause gastric distension.
 - If patient feels nauseous aspirate N/G tube. If patient is vomiting ensure face mask is removed promptly.

Treatment Goal: Patients receive optimal nutrition and hydration whilst having CPAP.

➤ CPAP Prescription

- Prior to using CPAP a full discussion and agreement should be obtained from ITU/CCOT and the patient's consultant/duty registrar.
- Discussion should happen regarding resuscitation status and whether patient is for ITU/HDU at the time CPAP is started.

This treatment needs to be prescribed in the medical notes and CPAP prescription chart and the instruction should contain:

- FiO₂.
- Level of CPAP in cmH₂O.
- Duration of treatment.
- Frequency of treatment.
- Desired aims of oxygen saturations.
- Arterial blood gas to be taken one hour after starting CPAP.
- In-between CPAP sessions - what means of oxygen administration should be used and FiO₂.

➤ Discontinuation of CPAP

CPAP should be discontinued once **ALL** the following are achieved

- Respiratory rate < 25.
- Oxygen saturations > 93%.
- FiO₂ <40%.
- Normal work of breathing (no respiratory distress, no use of accessory muscles, no tracheal tug)

➤ **Contacts**

CCOT bleep: 2837
ITU Registrar bleep: 2613
ITU Consultant on call: contact via ITU or switchboard

➤ **References (evidence upon which the guideline is based)**

1. BTS Guidelines Thorax 2002; 57:192-211
2. Bersten A D, Holt A W, Vedig A E, Skowronski G A, Baggoley C J. 1991, Treatment of Severe Cardiogenic Pulmonary Edema with Continuous Positive Airway Pressure delivered by face mask, The New England Journal of Medicine, 325, 26, p1825-30.
3. Brigg C. 1999, The benefits of non-invasive ventilation and CPAP therapy, British Journal of Nursing, 8, 20, p 1355-61.
4. Bolton R, and Bleetman A, (2008) Non-invasive ventilation and continuous positive pressure ventilation in emergency departments: where are we now?, Emergency Medicine Journal, 25(4): 190-4 (40ref)
5. Engleman H M, Martin S E, Deary I J, Douglas N J. 1994, Effect of continuous positive airway pressure treatment on day time function in sleep apnoea/hypopnoea syndrome, The Lancet, 343, March 5th, p 572-5.
6. Hough A. 1996, Physiotherapy in Respiratory Care, (2nd Ed) Chapman Hall, London.
7. Kannan S. 1999, Practical issues in non-invasive positive pressure ventilation, Care of the Critically Ill, 15, 3, p 76-9.
8. Keen A. 2000, Continuous positive airway pressure (CPAP) in the intensive care unit – uses and implications for nursing management, Nursing in Critical Care, 5, 3, p 137-41.
9. Miro A M, Shivaram U, Hertig I. 1993, Continuous positive Airway Pressure in COPD Patients in Acute Hypercapnic Respiratory Failure, Chest, 103, 1, p 266-8.

10. Moritz F et al 2007, Continuous positive Airway Pressure versus bilevel noninvasive ventilation in acute pulmonary edema: a randomized multicenter trial. *Annals of Emergency medicine*, 50(6): 666-75, 675.e1 (33ref).

11. Oh T E. 1997, *Intensive Care Manual*, (4th Ed), Butterworth-Heinemann, Oxford.

12. Peruzzi W T. 1996, The Current Status of PEEP/CPAP, *Respiratory Care*, April, 41, 4, p273-80.

13. Pryor J A, Webber B A. 1998, *Physiotherapy for Respiratory and Cardiac Problems*, (2nd Ed) Churchill Livingstone, Edinburgh.

➤ **Compliance with this guideline (how and when the guideline will be monitored e.g. audit and which committee the results will be reported to)**

Critical Care Outreach Team to audit and monitor compliance.

Appendix A

Plan for Dissemination and implementation plan of new Procedural Documents

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

Acknowledgement: University Hospitals of Leicester NHS Trust

Title of document:	Guideline for the use of Continuous Positive Airway Pressure (CPAP)		
Date finalised:	Re-issued November 2014	Dissemination lead: Print name and contact details	Critical Care Outreach team
Previous document already being used?	Yes		
If yes, in what format and where?	Guideline on the intranet		
Proposed action to retrieve out-of-date copies of the document:	Removal of old guideline from Intranet once new one is approved		
To be disseminated to:	How will it be disseminated/implemented, who will do it and when?	Paper or Electronic	Comments
All medical staff	Regular Teaching	Electronic	
All nursing staff	Regular Teaching	Electronic	
Is a training programme required?	No - CCOT will teach in planned teaching sessions and ad-hoc		

	teaching in the clinical environment		
Who is responsible for the training programme?	CCOT		

Appendix B

Equality Impact Assessment Tool

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval.

Impact (= relevance) 1 Low 2 Medium 3 High	Evidence for impact assessment (monitoring, statistics, consultation, research, etc)	Evidential gaps (what info do you need but don't have)	Action to take to fill evidential gap	Other issues
Race	1	N/A	N/A	N/A
Disability	1	N/A	N/A	N/A
Gender	1	N/A	N/A	N/A
Age	>17	N/A	N/A	N/A
Sexual Orientation	1	N/A	N/A	N/A
Religion and belief	1	N/A	N/A	N/A

Once the initial screening has been completed, a full assessment is only required if:

- The impact is potentially discriminatory under equality or anti-discrimination legislation
- Any of the key equality groups are identified as being potentially disadvantaged or negatively impacted by the policy or service
- The impact is assessed to be of high significance.

If you have identified a potential discriminatory impact of this procedural document, please refer it to relevant Head of Department, together with any suggestions as to the action required to avoid/reduce this impact.