

APPENDIX: 6

TITLE: CPAP

REVISED: July 01, 2024

**I. Introduction:**

Continuous Positive Airway Pressure (CPAP) is a non-invasive method to provide respiratory support to certain patients. CPAP has been shown to rapidly improve vital signs, gas exchange, the work of breathing, decrease the sense of dyspnea, and decrease the need for endotracheal intubation in some patients. In others it is an effective precursor and bridge to other therapies such as an advanced airway or BiLevel (AKA BiPAP).

**II. Device Choice:** This procedure is general and not-device specific. The two primary devices used in the ACCESS system are:

- a. **The FLOWSAFE II** family of disposable non-invasive ventilation devices and
- b. **The Zoll Z Vent Mechanical Ventilator** (*See Appendix 32: Mechanical Ventilator Use for further procedures*)

This procedure may have to be modified based on other specific device parameters. When another device is used, and there is a conflict with this procedure and the devices recommended guidelines; use the manufacturers recommended guidelines when they will not result in a detriment to patient care.

**III. Mechanism of Action:**

CPAP works by providing increased continuous gas pressures at the level of the lower airway structures, improving gas exchange in the alveoli. In patients with CHF, CPAP improves hemodynamics by reducing preload and after load.

In certain cases, CPAP is also shown to improve dyspnea associated with pneumonia, chronic obstructive pulmonary disease (asthma, bronchitis, emphysema).

**IV. Indications:**

For **consideration** in moderate to severe respiratory distress secondary to asthma/reactive airway disease, near drowning, COPD, CHF, acute pulmonary edema (cardiogenic and non-cardiogenic), or pneumonia who present with *any* of the following:

- a. Signs of respiratory fatigue or failure
- b. Pulse oximetry < 88% not improving with standard therapy
- c. ETCO<sub>2</sub> > 50mmHg
- d. Accessory muscle use / retractions
- e. Respiratory rate > 25
- f. Wheezes, rales, rhonchi

CPAP may also be considered as a method of pre-oxygenation prior to airway placement

**V. Contraindications:****a. Anatomic**

- i. Inability to obtain a mask seal
- ii. Facial trauma with SQ air or significant fluids in airway

**b. Physiologic**

- i. Unconscious, Unresponsive, or inability to protect airway
- ii. Inability to sit up
- iii. Respiratory arrest or agonal respirations (Consider Intubation)
- iv. Persistent nausea/vomiting

**c. Pathologic**

- i. Systolic Blood Pressure less than 90 mmHg
  1. **Medical Control Contact: If BP <90 systolic contact Medical Control prior to beginning CPAP**
- ii. Suspected Pneumothorax
- iii. Penetrating chest trauma (untreated)
- iv. Has active upper GI bleeding or history of recent gastric surgery

**VI. CPAP pressure and Oxygen Concentration:****a. Pressure:**

- i. Begin at 2-5 cmH<sub>2</sub>O, Titrated to 10 cmH<sub>2</sub>O
- ii. MAX CPAP PRESSURE: 10 cmH<sub>2</sub>O (**May call Medical Control to exceed**)

**b. Oxygen Concentration (FiO<sub>2</sub>):**

- i. 100%. Depending on device, titration may be used
- ii. Ideally titrated to FiO<sub>2</sub> 0.5 (50%) if tolerated while targeting SpO<sub>2</sub> 94-99%
- iii. FiO<sub>2</sub> 21% -100% permissible based on clinical judgement

**VII. Procedure:****a. General**

- i. Treat underlying conditions as needed
- ii. Asses for indications and contraindications (especially suspected pneumothorax)
- iii. Place patient in a sitting position or similar position of comfort
- iv. Explain the procedure to the patient
- v. Anticipate and control anxiety. CPAP may produce anxiety in some patients. Verbal coaching is often very effective in reducing this. Verbally coach breathing as needed.
  1. In some patients, **low dose** sedation may be needed. See *Adult Pain Control and Sedation Protocol (M-12)*

**b. Assemble CPAP.** Attach CPAP to O2/device

- i. Consider use of nebulized medications as indicated by patients clinical presentation and suspected etiology.

**c. Apply mask.** Consider having the patient hold the mask in place for a minute or so to reduce anxiety. As an option the medic may hold it in place when a mask of good seal is obtained.

- i. Check for air leaks
- ii. Using the head Straps: The use of the head straps is at the providers discretion based on ability to keep a continuous face mask seal weighed against the increased anxiety the head straps may cause.
- iii. Place head strap over occipitoparietal area.
- iv. Gently hold the delivery device to the patient's mouth and nose
- v. Attach the straps, loosely at first, gradually tightening as the patient tolerates. Proceed with tightening the straps until air leaks are eliminated.
- vi. Continue to coach patient to keep mask in place and readjust as needed.

d. **Adjust initial CPAP Pressure and Oxygen Concentration as needed.**

e. **Assess and monitor** the patient

- i. Vital signs q5 min
- ii. Lung sounds before and after CPAP, and as feasible thereafter
- iii. Attach ECG (if available) and pulse oximeter

f. **Additional Considerations**

- i. BLS providers may consider transition to positive pressure ventilation if needed.
- ii. ALS providers may consider transition to BiLevel (BiPAP) or other advanced airway interventions (i.e. intubation) as needed.

### VIII. **Removal of CPAP**

CPAP therapy needs to be continuous and **should not** be removed unless the patient cannot tolerate the mask, requires suctioning or airway intervention, experiences continued or worsening respiratory failure, or a pneumothorax is suspected. Intermittent positive pressure ventilation and/or intubation should be *considered* if patient is removed from CPAP therapy.

### IX. **Intubation considerations**

These patients are often in a state of crisis and respiratory failure. Intubation will be inevitable in some patients regardless of the use of CPAP, and the paramedic must be prepared for rapid intervention by appropriate means. Indications to proceed to ET placement are (not all inclusive):

- a. Deterioration of mental status
- b. Increase of the EtCO<sub>2</sub>
- c. Decline of SpO<sub>2</sub>
- d. Progressive fatigue
- e. Ineffective tidal volume
- f. Respiratory or cardiac arrest

**X. Documentation:**

- a. Documentation on the patient care record should include:
- b. CPAP level
- c. Oxygen Concentration/ $F_iO_2$
- d. Vital Sign and SPO2 q5 minutes
- e. Response to treatment
- f. Any adverse reactions
- g. Justification for sedation, intubation, or discontinuation of CPAP. Be specific.

**XI. Physical PEARLS:**

- a. Advise receiving hospital as soon as possible so they can prepare for the patient's arrival. Use of CPAP is a **CODE CRITICAL** criteria
- b. Inline nebulization may be utilized with CPAP in place
- c. Do not remove CPAP until hospital therapy is ready to be placed on the patient
- d. Monitor patient for gastric distension which may lead to vomiting. Consider placement of a Gastric Tube or administration of anti-emetics. Monitor patients closely for vomiting and or gastric distention
- e. If Nitrates are indicated (i.e. in CHF) consider administration of nitro-paste, as nitro spray may be impractical to use.
- f. Success is highly dependent upon patient tolerance, and providers ability to coach the patient. Instruct patient to breath in through nose and exhale through mouth as long as possible
- g. Monitor closely for the development of pneumothorax and or hypotension
- h. Most patients will improve in 5-10 minutes. If no improvement within this time, assess for other causes and problems. Re-evaluate for intermittent Positive pressure ventilation or Intubation
- i. CPAP is an acceptable treatment option for a patient with a DNR/DNI order who is in respiratory failure

APPENDIX

06

**C.P.A.P. Procedure**