Continuous Positive Airway Pressure (CPAP) for the Basic EMT

What is CPAP?

- Continuous Positive Airway Pressure (CPAP)
- A non-invasive alternative to intubation
- Does not require any sedation
- It provides comfort to the patient with acute respiratory distress by reducing work of breathing

Key Points of CPAP

- CPAP has been successfully demonstrated as an effective adjunct in the management of a variety of respiratory distress states.
- CPAP may prove to be a viable alternative in many patients previously requiring endotracheal intubation by prehospital personnel.

CPAP vs. Intubation

- CPAP
  - Non-invasive
  - Easily discontinued
  - Easily adjusted
  - Use by EMT-B
  - Does not require sedation
  - Comfortable
- Intubation
  - Invasive
  - Usually don’t extubate in field
  - Potential for infection
  - Requires highly trained personnel
  - Can require sedation
  - Traumatic

How does CPAP work

- Helps to splint the airways open, preventing collapse of alveoli
- Uses continuous oxygen flow with pressure to improve diffusion of oxygen into the blood
- Recruits alveoli that have collapsed

Benefits

- Decreases work of breathing.
- Improves oxygenation by increasing FRC with PEEP.
- Induces positive pressure in thorax with resultant decrease in preload of RV.
### CPAP Mechanism

- Increases pressure within airway.
- Airways at risk for collapse from excess fluid are stented open.
- Gas exchange is maintained.
- Increased work of breathing is minimized.

![CPAP Mechanism Diagram](image)

### Indications

**CPAP:**
- Respiratory distress / hypoxemia secondary to CHF, acute pulmonary edema, pneumonia, asthma and/or COPD without ventilatory failure.

**BiPAP:**
- Respiratory distress/ hypoxemia secondary to CHF, acute pulmonary edema, pneumonia, asthma and/or COPD with impending or existing ventilatory failure.

### Contraindications

1. unconscious
2. respiratory arrest
3. agonal respirations
4. pneumothorax
5. hypovolemic shock
6. acute MI with hypotension
7. chest trauma
8. persistent nausea/vomiting
9. active upper GI bleeding or recent history of gastric surgery
10. facial anomalies/stroke/facial trauma

### Risks

- Gastric distention, vomiting, aspiration
- Drying of secretions, mucus plugging
- Hypotension
- Pneumothorax
- Corneal drying

### Disease States Where CPAP May Be Indicated

#### Pulmonary Edema/Congestive Heart Failure

- Defined
  - Fluid which collects in the lung tissue and alveoli.
- Signs/Symptoms/Assessment
  - Anxious, Pale, Clammy, Dyspnea, Tachypnea, Confusion, Edema, Hypertension, Diaphoresis
  - Rales, Ronchi, Tachycardia, JVD, Pink Frothy Sputum, Cyanosis
Pulmonary Edema/Congestive Heart Failure

• Signs/Symptoms/Assessment
  – Fatigue
  – Dyspnea on exertion
  – Orthopnea
  – Chest Pain?
    • Evaluate for MI

• Treatment
  – Focused history and physical exam
  – Complains of trouble breathing.
    • Airway control w/ adequate ventilation
    • Oxygenation (will have decreased SaO2)

Pulmonary Edema/Congestive Heart Failure

– What about nitro?
  • Does patient have Rx?
    – Facilitate administration of nitroglycerine
  • Consult medical direction.
  – Baseline vital signs
  – Reassess

Chronic Obstructive Pulmonary Disease (COPD)

• Defined
  – Lung tissue loses elasticity secondary to destruction of the alveoli (Emphysema)
  – Inflammation of the bronchial tree.
    Diagnosed by productive cough which lasts at least three months a year for at least two consecutive years (Chronic Bronchitis)
  – COPD patients often have both

Chronic Obstructive Pulmonary Disease (COPD)

• Signs/Symptoms/Assessment
  – Low exercise tolerance
  – Productive cough/wheezing
  – Minor hemoptysis
  – Accessory muscle use
  – Pursed lip exhalation
  – May have coarse crackles, wheezes or just diminished breath sounds
  – Barrel-chested

• Signs/Symptoms/Assessment
  – Tachypnea, cyanosis, agitation, tachycardia, hypertension
  – Confusion, tremor, stupor, apnea
**Chronic Obstructive Pulmonary Disease (COPD)**

- **Treatment**
  - Focused history and physical exam
  - Complains of trouble breathing.
    - Airway control w/ adequate ventilation
    - Oxygenation
  - Has a prescribed inhaler available.
    - Consult medical direction.
    - Facilitate administration of inhaler
    - Repeat as indicated.
  - Baseline vital signs.
  - Reassess

**Asthma**

- **Defined**
  - Condition which causes the bronchi to constrict making it difficult to exhale (air trapping)
  - May be caused by allergic reactions and/or emotional distress
  - The most serious form, status asthmaticus, is a true life-threatening emergency

**Asthma**

- **Signs/Symptoms/Assessment**
  - Dyspnea, chest tightness, wheezing, and cough
  - Obvious SOB, wheezing, accessory muscle use, paradoxical respirations, hyperresonance, prolonged expiration
  - Change in Mental Status: agitation, confusion, lethargy, exhaustion
  - Cardiac Arrhythmias

**Pneumonia**

- **Defined**
  - Inflammation of both the bronchioles and alveoli
  - May be viral, bacterial, or fungal. Spread by droplets or contact with infected person
  - Common cause of death in North America

**Pneumonia**

- **Signs/Symptoms/Assessment**
  - Acute onset of chills, fever, dyspnea, pleuritic chest pain, cough, adventitious breath sounds.
  - In geriatric patients, the primary sign may be an altered mental state.
Pneumonia

• Treatment
  – Focused history and physical exam
  – Complains of trouble breathing.
    • Airway control w/ adequate ventilation
    • Oxygenation
  – Has a prescribed inhaler available.
    • Consult medical direction.
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Components Of A CPAP System

1. CPAP Control Unit

Components Of A CPAP System

2. Breathing Circuit and Positive Pressure Face Mask

Components Of A CPAP System

Lots and Lots of Oxygen!

D Cylinder duration = \( \frac{0.16 \times \text{tank psi}}{\text{LPM}} \)

\[ 2000 \times 0.16 = 320 \div 25 = 12 \text{ minutes} \]

Procedure

• Apply CPAP mask and ensure snug fit without air leak
• Adjust air flow to achieve PEEP of 5 cm H2O (may increase to 7.5 cm H2O if patient’s condition does not improve in 15 minutes).
• Discontinue CPAP and consider BVM ventilation or intubation:
  • If mental status declines significantly
  • For significant drop in blood pressure (to a systolic BP <90 mmHg)
  • For worsening hypoxia or severe respiratory fatigue.
Treatment With CPAP

• Patient improvement indicated by:
  – Improvement in dyspnea
  – Decreased respiratory rate
  – Improved pulse oximetry
  – Improved patient comfort

Treatment With CPAP

• Removal
  – CPAP needs to be continuous and should not be removed unless the patient cannot tolerate the mask or experiences respiratory arrest and/or begins to vomit
  – Intermittent positive pressure ventilation (IPPV) with a BVM should be considered if CPAP is removed
  – A Laryngo Tracheal Device (King Airway, Combitube, etc.) should be used with a bag valve device if the patient is in respiratory arrest

Treatment With CPAP

• Special Considerations
  – Do not remove CPAP until hospital therapy is ready
  – Watch for gastric distention which can cause vomiting
  – CPAP may be used with patients who have POLST forms or DNR orders

Cases

CPAP Indicated?

• Patient #1: 68 year old male in moderate respiratory distress with history of CHF. Now has diffuse inspiratory crackles with SpO2 of 85% on NRB mask. His BP is 148/80, HR 96, RR24.

CPAP Indicated?

• Patient #2: 72 year old female with long history of COPD. She is in severe resp. distress, alert & oriented, able to talk only in short bursts. HR 116, BP 132/78, RR20 with obvious accessory muscle use, SpO2 88% on NRB mask. Patient wants to avoid intubation if at all possible.
**CPAP Indicated?**

Patient #3: 78 year male with history of COPD/CHF with respiratory failure and decreased level of consciousness. HR 124, BP 90/68, RR 16 with obvious accessory muscle use, SpO2 82% on NRB mask. Pt. is obtunded with GCS 7. Only response is moaning to noxious stimuli.

**CPAP Indicated?**

Patient #4: 62 year old acute anterior MI, required several defibrillations, is now in CHF with inspiratory crackles and SpO2 of 88% on NRB mask. He is in moderate respiratory distress, is dizzy & has vomited several times. HR 116, BP 78/50

**CPAP Indicated?**

Patient #5: 28 year old female presents with shortness of breath and audible expiratory wheezes. HR 132, RR 24, BP 134/80, SpO2 94% on rm air

**CPAP Indicated?**

Patient #6: 67 year old obese female patient recently released from the hospital after gall bladder surgery. She is short of breath with inspiratory crackles in her lungs. HR 112, RR24, BP 108/56, SpO2 78% room air Febrile

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**Post-test**

1. CPAP:
   - A. Is poorly tolerated and requires that patients be sedated
   - B. Is an ALS skill only
   - C. Can be a BLS skill with the proper equipment and training
   - D. Is a technically difficult skill requiring invasive airway adjuncts

2. CPAP may be indicated in the management of which of the following?
   - A. CHF
   - B. Pulmonary Edema
   - C. Asthma
   - D. Pneumonia
   - E. All of the above
Post-test

3. Which of the following is/are contraindication(s) of CPAP?
   A. Unconscious pt
   B. Hypoxia
   C. Allergy to Oxygen
   D. Patient is DNR status
   E. All of the above

Post-test

4. Which of the following is/are risks of CPAP therapy?
   A. Gastric distention
   B. Aspiration
   C. Hypotension
   D. Pneumothorax
   E. All of the above

Post-test

5. You have started a lethargic pt with history of CHF & COPD on 5 cm of CPAP due to low oxygen saturation. Her SpO2 improves slightly but her LOC deteriorates and she is no longer arousable. What is the most appropriate action?
   A. Continue current therapy, CPAP cannot be discontinued in the field once it has been started
   B. Discontinue CPAP, assist with BVM with suction ready
   C. Continue CPAP but turn down her oxygen flow
   D. Turn her level of CPAP up to 7.5

Special thanks to Sheila Crow of Stitchin’ Dreams Embroidery
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For providing our Secret Question prize

Questions/Comments?
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Updates Please

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Email updated name, address and email to:

Michelle Ensminger – ensminm@inhs.org
NEW THIS SEASON!!

NEW THIS SEASON – Web based EMS Live@Nite Recordings, DVD's will no longer be available. Agencies can now access the recorded series by registering through the Health Training website.

Once an agency registers for this course, an online access code will be emailed to the email listed on the registration account. This access code is to be shared with employees of the purchasing agency throughout the 2013-2014 training season.

Videos will be posted within 1 week of the live program.

To register visit: https://courseregistration.inhs.org/CourseListing.aspx