

## EM Basic- Non-invasive Ventilation

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### Non-invasive Ventilation

- Provides positive pressure to the patient via a tight fitting facemask

### CPAP- Continuous Positive Airway Pressure

- Provides a constant level of positive pressure that doesn't vary based on the patient's breathing
- Example- CPAP at a pressure of 10 centimeters of water

### BiPAP- Bi-Level Positive Airway Pressure

- Provides a baseline level of pressure all the time and increases pressure above that baseline with each inhalation
- Technically BiPAP is a proprietary term but it is often used universally to encompass all modes of non-invasive ventilation
- Example- BiPAP at a pressure of 10/5 (centimeters of water)
  - Pressure of 5 all the time, 10 when the patient inhales

### BiPAP vs. CPAP

- No differences in any clinically important outcomes in studies
- BiPAP may be more comfortable since it lets patient "rest" in between breaths
- CPAP tends to be more portable (more used in EMS systems)

### How non-invasive ventilation (NIV) works

- Improves laminar flow of air- stents open smaller airways
- This decreases atelectasis which improves pulmonary compliance and decreases the patient's work of breathing
- For pulmonary edema- does not "blow the fluid out of the lungs"
  - Increases intrathoracic pressure -> decreases venous return
  - Decreases preload and afterload

### When to use NIV

- Any patient with respiratory distress who is not responding to simple interventions like albuterol
- Common indications- COPD, Asthma, CHF, Pulmonary edema, pneumonia
- Can also use NIV to pre-oxygenate prior to intubation
- Don't need to figure out the diagnosis before you start NIV- shoot first and ask questions later- use it early and often
- Least evidence for use in asthma
- Can also use for patients with DNR/DNI to relieve air hunger and/or buy time to address resuscitation status

### When NOT to use NIV

- Patients who are unconscious or altered- aspiration risk
- Hypotension- decreasing intrathoracic pressure can decrease BP
- If the patient's mental status decreases, move to intubation

**PEARL-** Make sure the BiPAP machine doesn't have a backup rate that kicks in if the patient goes apenic- you are supporting the patient's ventilation- not providing it

### NIV and MI

- Early study with CPAP vs. BiPAP in patients with acute pulmonary edema- more myocardial ischemia in BiPAP group
- Newer and larger studies have not shown this relationship
- Don't let concern for MI stop you from using NIV

### How to use NIV

- Get the machine- best to have it already in the ED but call for it early if you don't have it readily available
- Have your airway equipment ready to go if patient gets worse
- Don't just slap it on the patient and turn it up!**
  - This will get you slugged by the patient!
- Coach the patient through it- my standard script

"We are going to help you breathe by giving you a mask. It will blow some air into your face and it will feel really weird but if you relax and let it do some of the breathing for you, I promise you will feel better"

**“How to Sell Ice Cream in the Desert”**- adapted from mdaware.org  
(Seth Treuger- Twitter- @mdaware)

- Put the mask on with no tubing attached
- Strap the mask firmly onto the patient’s face with an assistant on the other side of the patient
- Set the BiPAP to 0/0 setting at 100% FiO<sub>2</sub>
  - Blows pure oxygen into the patient’s face to get them used to it
- Start at 0/2 and alternate increasing top and bottom numbers by 1-2
  - Increase settings every 10-15 seconds
  - First target 10/5
  - Can go up to 20/10 as a maximum, some say 25/10
- Keep reassuring the patient
  - Seth recommends a hand on the shoulder or “smooth jazz PRN”
- SMALL, TINY dose of fentanyl
  - Can help with air hunger
  - 12.5 to 25 mcg of fentanyl IV
  - If you get this far, be 100% ready to intubate
- Ketamine and DSI
  - This represents the first step of Delayed Sequence Intubation (DSI)
  - This is an advanced airway technique- can hear all about it at emcrit.org

**The bare bones approach to the above technique**

- Coach the patient through the process, reassure them constantly
- Initial settings of 10/5, go higher after a few minutes if needed

Contact- [steve@embasic.org](mailto:steve@embasic.org)

Twitter- @embasic