

Lineboro Volunteer  
Carroll County



Fire Department  
Maryland

## Continuous Positive Airway Pressure

Pulmodyne O2-MAX System

**Pulmodyne®**

# Overview



- Indications & Physiology
- Setting up CPAP
- Capnography Waveforms

# Indications



- Respiratory distress or failure due to:
  - Pulmonary Edema
  - COPD/Asthma
- Patients ages 13 and over
- Use in DNR Patients:
  - MOLST- Attempt CPR
  - MOLST- Option A
  - MOLST- Option A, DNI

# Contraindications



- Patients must have spontaneous respirations
- Do not use when intubation is preferred
- Discontinue if the patient continues to deteriorate, attempt another treatment

# COPD/Asthma



- Used in **moderate to severe** cases
  - Continue Nebulizer treatments during CPAP

# Pulmonary Edema/CHF



- **Asymptomatic**
  - Dyspnea on exertion but no symptoms at rest.
- **Mild**
  - Mild dyspnea at rest, despite O2 treatment. Able to speak in full sentences.
- **Moderate**
  - Moderate dyspnea. O2 saturation less than 93% on oxygen. Systolic BP usually greater than 150. Unable to speak in full sentences. Normal mental status.
- **Severe**
  - Severe dyspnea, respiratory failure, hypoxia (O2 saturation less than 90% on oxygen), diaphoresis, Systolic BP commonly greater than 180. One word sentences, altered consciousness.

# Pulmonary Edema/CHF



- Consider for moderate distress, must use for severe
- Attempt three doses of NTG while setting up CPAP
- For patients with hypertension and moderate to severe symptoms, administer NTG
  - No IV needed before administration
  - Asymptomatic
    - Apply oxygen to maintain O2 saturation greater than 93%.
  - Mild
    - Administer low dose NTG
      - 0.4 mg SL at 3–5 minute intervals to a maximum dose of 1.2 mg.
  - Moderate and severe
    - CPAP is preferred therapy.
    - Until CPAP is applied, administer high dose NTG.
      - Assess BP before each administration.

# Pulmonary Edema/CHF



- Moderate and severe
  - CPAP is preferred therapy.
    - DO NOT REMOVE CPAP TO CONTINUE ADMINISTERING NTG.
  - Until CPAP is applied, administer high dose NTG.
    - Dose at 3 – 5 minute intervals
    - 1<sup>st</sup> dose of NTG 0.4 mg SL, apply 1 inch of NTG paste.
    - 2<sup>nd</sup> dose of NTG 0.8 mg SL.
    - Repeat at 0.8 mg SL NTG
      - to achieve a 20% reduction in SBP
    - **Assess BP before each administration.**

# Setting Up CPAP



- Pulmodyne O2 Max Kit
  - BiTrac ED Mask
  - CPAP generator and tubing
  - Smart CapnoLine Plus (Oral/Nasal with O2 tubing)

# Pulmodyne O2-MAX



- Adjuster allows in-out and up-down adjustments.
- Adjustable, 3-setting PEEP valve
  - 5 cmH<sub>2</sub>O, 7.5 cmH<sub>2</sub>O, and 10 cmH<sub>2</sub>O
- Anti-asphyxiation valve
- Integrated nebulizer connection port
- Auxiliary O<sub>2</sub> port

# Pulmodyne O2-MAX



- Oxygen Connection,
  - High Pressure Only, non-regulated
- CPAP Generator
  - DO NOT OCCLUDE THIS DISC. OCCLUSION WILL RESULT IN THE IMMEDIATE LOSS OF CPAP.
- Corrugated tubing, 72"

# Pulmodyne O2-MAX



- Medication injection port
  - Insert tip of albuterol or atrovent bullet into this port.
- O2 connection, set to 8 LPM

# Setting Up CPAP



- Administer NTG per protocol while setting up
- Apply SmartCapnoline, nasal cannula, sidestream capnography monitoring
- Apply Bi-Trac mask to patient
  - Adjust to eliminate leaks
- Connect O2 supply to green Oxygen Connection
  - High pressure only, not regulated
- Connect CPAP to Mask
- Size mask appropriately to ensure no leaks
- Set PEEP as necessary
  - Increase if desired improvement is not achieved on current setting
- Apply nebulizer if necessary
  - Set to 8 LPM from additional O2 source
- Observe ETCO2 waveform

# Capnography Waveforms

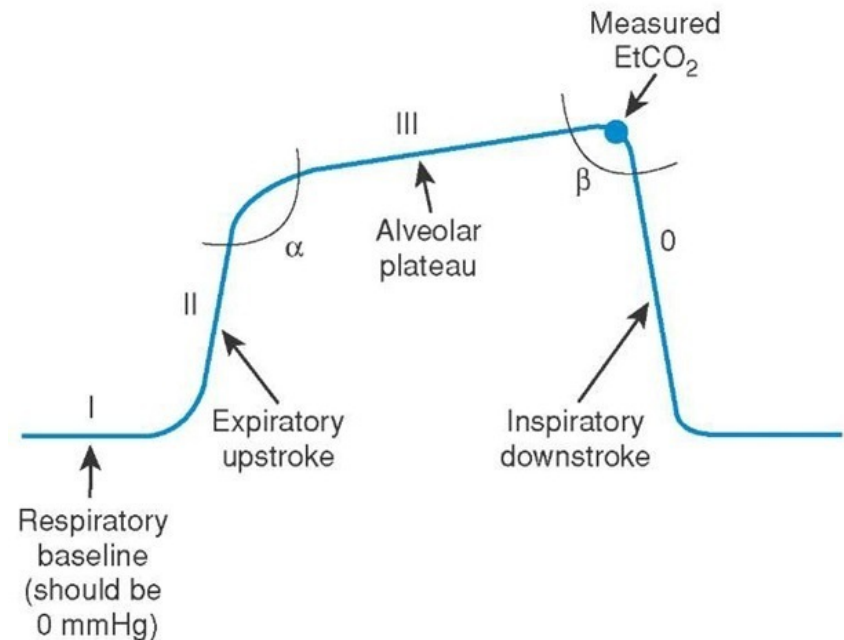


- End Tidal Waveform Monitoring is the golden standard in respiratory care. It is basically an EKG for breathing.

# Capnography Waveforms



- **Phase I**- Initial expiration. No CO<sub>2</sub> should be present because dead space gas is being exchanged.
- **Phase II**- Expiration involving exhaled gasses from the alveoli. Rise in CO<sub>2</sub> is seen here as it is expelled out during expiration.
- **Phase III**- The displayed capnometry number is calculated at this point, the last, maximal point before inspiration.
- **Phase 0**- Inspiration.

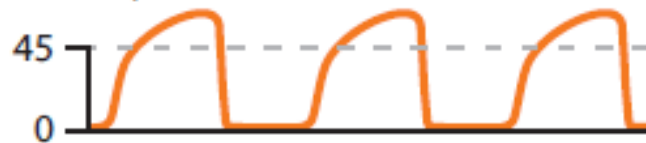


# Capnography Waveforms



## Bronchospasm (shark-fin appearance)

Asthma, COPD



## Hypoventilation



## Hyperventilation



- **Bronchospasm-** Air trapping causes prolonged exhalation, creating the classic “Shark-fin” appearance.
- **Hypoventilation-** A retention of gasses due to a slow respiratory rate causes an increase in CO<sub>2</sub>.
- **Hyperventilation-** An elevated respiratory rate causes CO<sub>2</sub> to be removed at an excessive rate, resulting in a decrease in CO<sub>2</sub>

# Review



- Expectation of LVFD ALS Providers
  - Waveform Capnography should be used on all respiratory distress patients, and is required on all patients receiving CPAP
  - The provider will consult with the receiving facility early enough to allow time for them to prepare. The driver will notify ECC and request that notification be made via public service to the ED as well.
  - LP 15 data, to include Capnography waveforms, will be transmitted to the eMeds PCR at the conclusion of the call.

# Review



- Indications & Physiology
- Setting up CPAP
- Capnography Waveforms
- Sources
  - Maryland Medical Protocols for EMS Providers
  - JEMS.com