**Presentation Overview**

- A few definitions
- An overview of APE
- What is CPAP and why is it necessary
- CPAP systems and how to use them

**CPAP To The Rescue**

Terry L. Forrette, M.H.S., RRT

Sponsored by Medical Specialties

**Just So We Are Clear …**

- FRC – Functional Residual Capacity
- CPAP – Continuous Positive Airway Pressure
- Ventilation – the process of removing CO₂
- Oxygenation – adding O₂ to the blood

**FRC: What is it?**

There is always a minimal amount of gas left in the lungs at the end of exhalation. This is called the FRC (functional residual capacity).

**What Alters the FRC?**

- Pulmonary Contusions
- Acute Pulmonary Edema
  - Congestive Heart Failure
  - Hydrocarbon Inhalation
  - Drug Induced
- Acute Respiratory Insufficiency
  - Smoke Inhalation
  - Drowning
- Lung Infiltrates (gram negative pneumonia)

**Changes in FRC**

- A low FRC results in:
  - Poor oxygenation
  - Increased work of breathing

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Distribution of Inspired Gas

Why is FRC Important?
Which one is harder to inflate?

Continuous Positive Airway Pressure (CPAP)

- The patient breathes spontaneously from a continuous flow of gas, at a set pressure
- Positive pressure is generated in the lung during inspiration and exhalation

Physiology of CPAP

- Lung units are re-recruited
- Oxygenation is improved, work of breathing is minimized

CPAP takes the lungs from this

To This

Using CPAP to Restore FRC

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Indications for CPAP

<table>
<thead>
<tr>
<th>Condition</th>
<th>Area for Treatment</th>
</tr>
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<tbody>
<tr>
<td>ARDS</td>
<td>Emergency</td>
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<tr>
<td>Pulmonary edema</td>
<td>Emergency</td>
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<tr>
<td>Acute Respiratory Failure</td>
<td>Emergency</td>
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<tr>
<td>CHF/COPD</td>
<td>Emergency</td>
</tr>
<tr>
<td>Anesthesia</td>
<td>Pre Operative</td>
</tr>
<tr>
<td>Atelectasis</td>
<td>ICU/General Ward</td>
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<td>Alternative to Mechanical Ventilation</td>
<td>ICU/General Ward</td>
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<tr>
<td>Weaning from Mechanical Ventilation</td>
<td>ICU/General Ward</td>
</tr>
</tbody>
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Acute Pulmonary Edema

We Have All Seen This Patient

- Labored breathing
- SpO2 <85%
- Tachy and febrile
- Mild cyanosis
- Mild confusion
- Distant breath sounds

Terminology

- Heart Failure: The inability of the heart to maintain an output adequate to maintain the metabolic demands of the body.
- Pulmonary Edema: An abnormal accumulation of fluid in the lungs.
- CHF with Acute Pulmonary Edema: Pulmonary Edema due to Heart Failure (Cardiogenic Pulmonary Edema)

Hypertension

- Hypertrophic Cardiomyopathy

Pulmonary Edema & Acute Pulmonary Edema

- An abnormal accumulation of fluid in the lungs
CPAP – To the Rescue
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Normal CHF with PE

CPAP with Acute Pulmonary Edema (APE)

“CPAP is to APE like D50 is to insulin shock”
Russell K. Miller Jr. MD, FACEP

CPAP and Gas Exchange

Why Not Just Tube Him?

Believe it or not, there are people who might actually enjoy intubation.
Your patient however, may not be among them.

CPAP Exclusions

- Unstable Airway
- Traumatic Etiology of Respiratory Distress
- Severe Altered Mental Status
- Facial Trauma or Impossible Face Seal

Important Consideration

- Emphysema and Asthmatic patients do NOT respond predictably to CPAP.
  - They have a higher risk of complications such as pneumothorax, and thus caution should be used when treating with CPAP
Some Patients May Need CPAP but …

CPAP Systems

Early CPAP Systems

The Early Equipment

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Basic Components of a Traditional CPAP System

- Mask
- Tubing
- Gas Source
- PEEP Regulation
- Generator

And You Thought Your Truck Was Crowded

Pneumatic Flow Generators

Application of CPAP

Application Continued

CPAP System
New Generation of CPAP Systems

Vitala
Boussignac
Philips Respironics
Mercury Medical®
Flow-Safe™

Virtual Valve CPAP Systems

Mercury Medical
Flow-Safe
Vitala
Boussignac

Virtual CPAP Valve

CPAP delivered to patient is determined by liter flow set on the Flowmeter.

Virtual Valve CPAP Systems

- CPAP is titrated by flow.
- 2.5 – 10 cm H₂O
- O₂ flow 5 – 25 LPM
- Use in-line gauge to measure pressure

How Much CPAP is Being Delivered

Objectives of CPAP Therapy?

Support Gas Exchange
Minimize Work of Breathing
Prevent Ventilatory Failure

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If you find me on the road …
Please try not to intubate me

Comments and Questions

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Thank You