

CPAP Tips and Tricks

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Outline

1. Work of breathing (WOB)
2. Applying CPAP
3. Selling NIV
4. Knowing when to quit



NIV

- Non Invasive Ventilation
 - Respiratory support via the upper airway using a mask or similar device
- Invasive Ventilation
 - Respiratory support that bypasses the upper airway



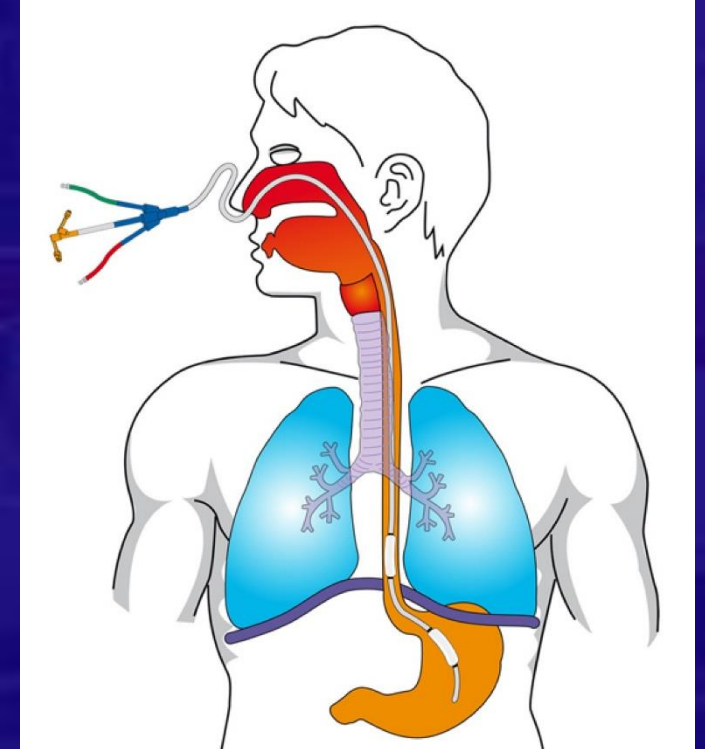
NIV - CPAP

A golden retriever is looking out of the open window of a car. The dog's head is in the foreground, and the background shows a road and a clear blue sky. A semi-transparent blue rectangular box is overlaid on the image, containing white text. The text is a bulleted list describing CPAP therapy. The overall image has a warm, orange-toned background on the left side.

- Continuous Positive Airway Pressure
 - Pressure applied throughout resp cycle
 - Treats dyspnea 2° to ↑ WOB
 - CPAP is a form of Non Invasive Ventilation
 - Disposable EMS CPAP units available (oxygen powered)

Work of Breathing (WOB)

- WOB = energy expended to breathe
 - RR traditionally used (>30, >40/min)
 - Not a great surrogate, need transpulmonary pressure
 - $WOB = P \times V$ (pressure x volume)
 - J/L or J/min (1 Joule = e needed to move 1L gas thru 10 cmH₂O pressure gradient)
 - Use gastroesophageal (2L) balloon cath and pneumograph
- Not practical in prehospital care



Non-Invasive WOB Evaluation

- Assessment findings
 - Retractions, nasal flaring, pursed lip, posture
- EtCO₂ (↑ if muscle load > capacity)
 - Textbook failure definition > 70 mmHg in absence of COPD
- SpO₂
 - Without supplemental O₂
- LOC (↓ or ↑)
- Patient
- Clinical judgement



Obstructive Sleep Apnea (OSA)

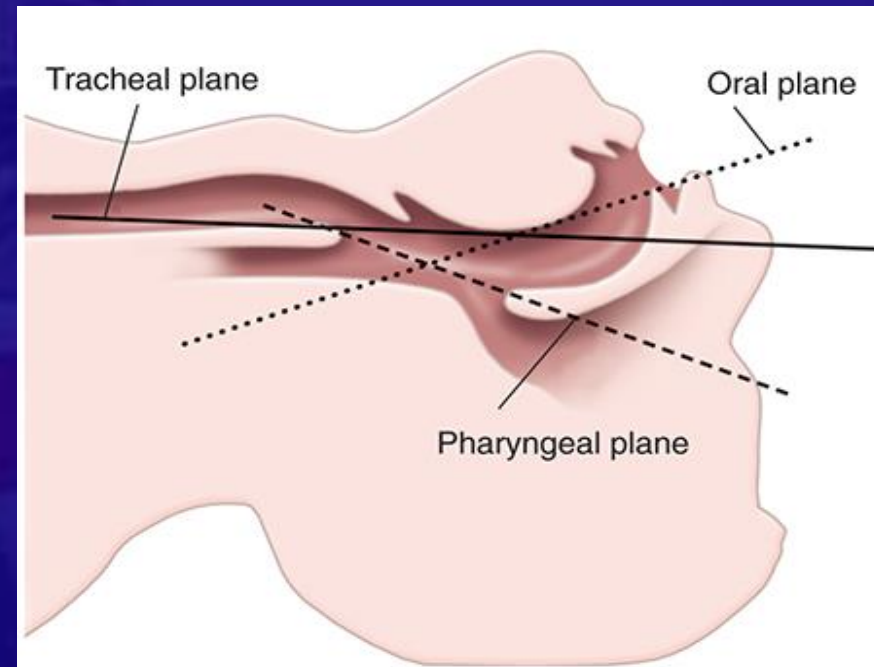
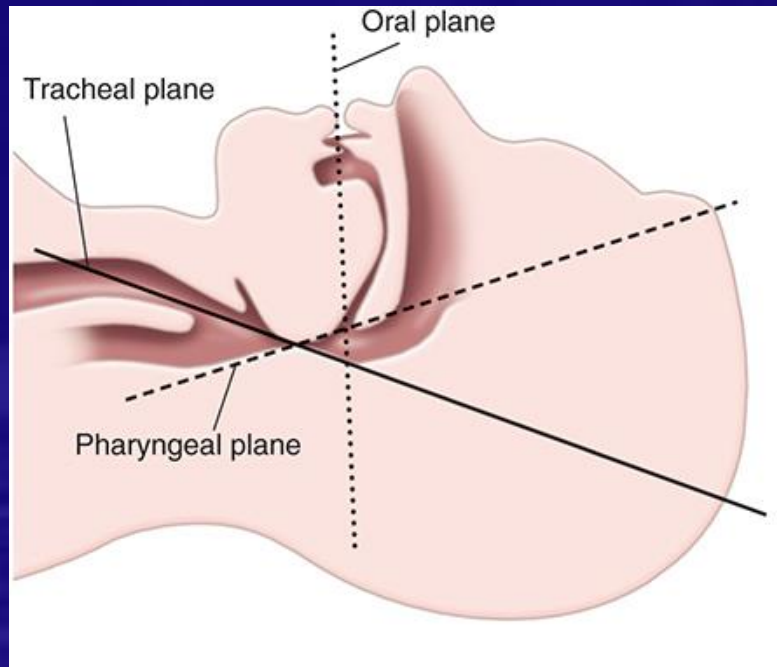
- Cessation of airflow \geq 10 seconds
- Snoring
- Limited tx options until 1981 (trach...)
- 1985 – 100 CPAP patients
- 1990 – mask variations
- Use expanded to HF, COPD, etc...
- 2020 – millions of CPAP users
 - Compliance: **minimum 4^h/night on 5 nights/week**



CPAP Continues to Evolve

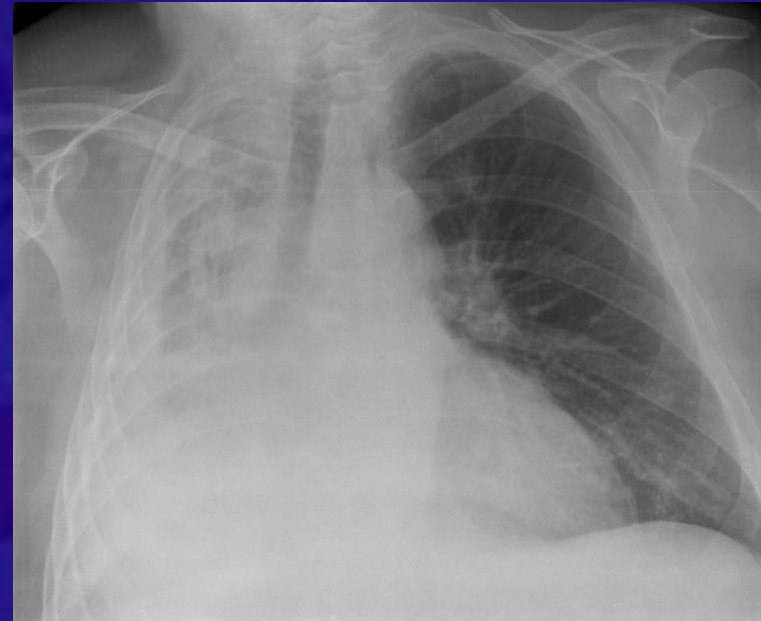
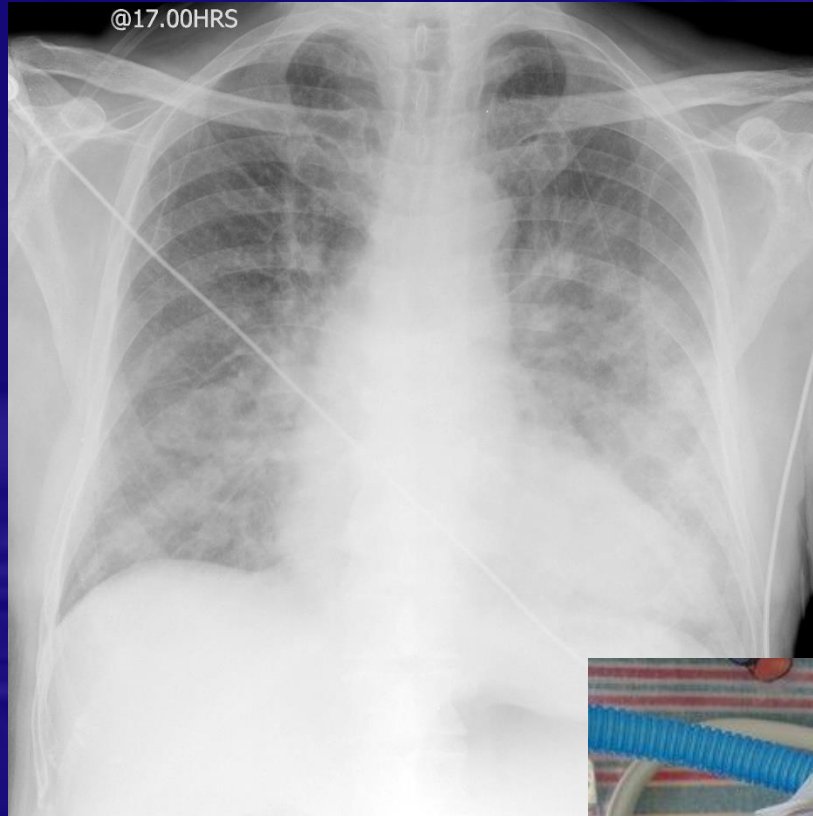


CPAP “splints” the upper airway

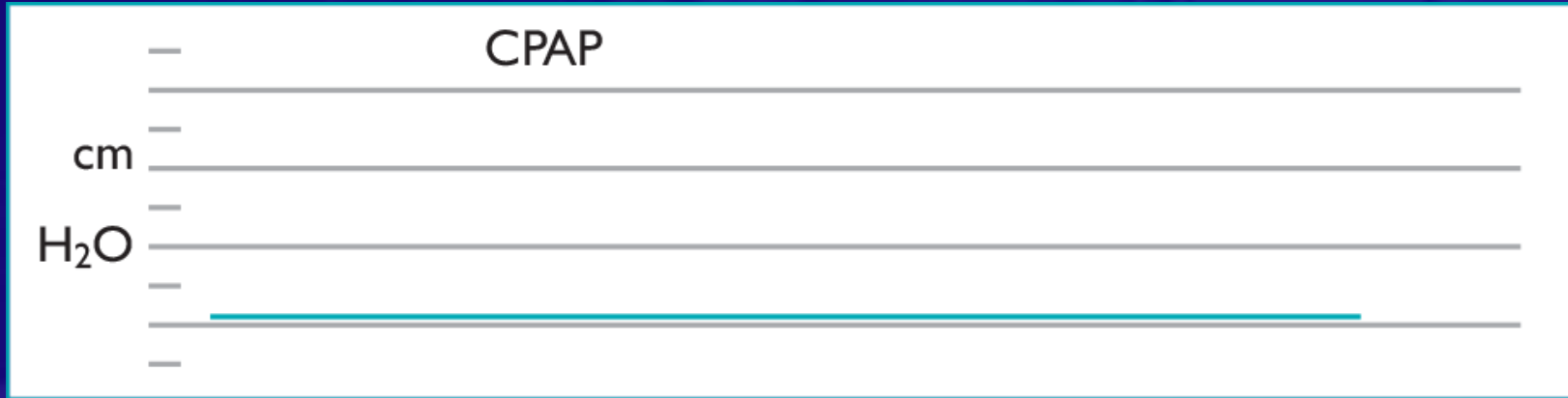


Courtesy Jones & Bartlett Learning

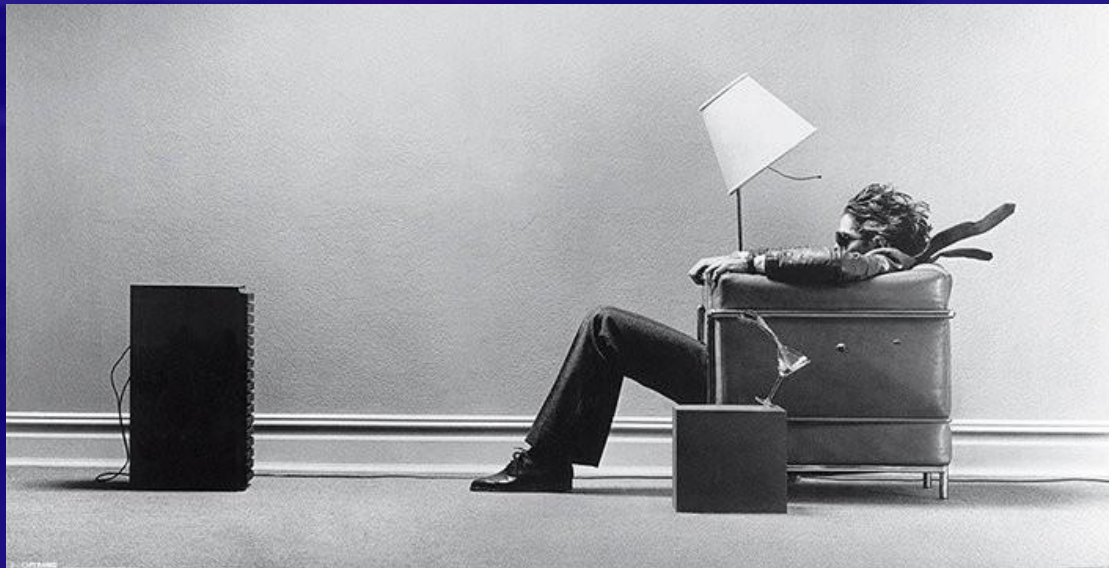
How 'bout the Lower Airway?



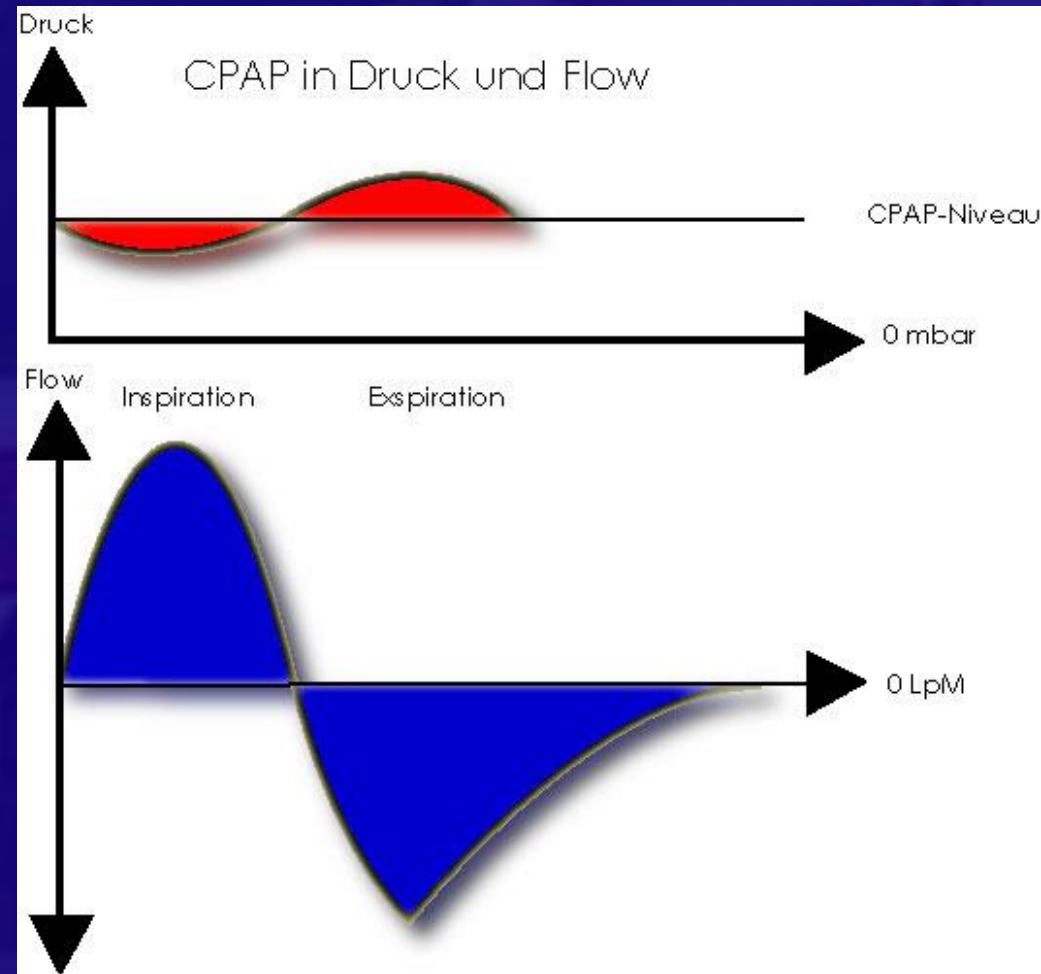
CPAP



Continuous Positive Airway Pressure



CPAP supports respirations



Emergent PortO2 CPAP



Caradyne Whisper Flow



Disposable CPAP

- Single use
- Low cost
- Less O₂ needed
- Compatible masks
- Nebulizer fittings



EMS: Proof in the pudding (2000)

- APE: effect often instantaneous
- 19 Cincinnati, OH pts suspected APE
- All imminently needed intubation
- Placed on trial of CPAP
- SpO₂ average ↑ 83.3% to 95.4%
- None intubated in field (2 ED, 5 in-hospital)
- Hospital LOS ↓ 11 to 3.5 days



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Prehospital CPAP Benefits

- **Decreases need for intubation** (up to 48%)
 - Comps: ETI, barotrauma, VAP...
- **Decreased hospital length of stay** (by 2/3)
 - Significant cost savings, more efficient bed turnover (less crowding)
- **Decreased overall complications** (by 32%)
 - All hospital associated comps (med errors, CLABI, CAUTI...)
- **Decreased in-hospital mortality** (by > 20%)
 - All cause mortality

Earlier use increases benefits!

CPAP for Who?

- APE (Acute Pulmonary Edema)
- COPD exacerbation
- Pneumonia
- AOC resp failure
- ARDS
- Atelectasis
- Refractory hypoxia
- Acute asthma
- DNI or palliative care patients
- Extubation failures
- Acute dyspnea
- Near drowning
- CO poisoning

Any patient
in distress
with ↑ WOB

CPAP Contraindications

- Apnea
- Inability to protect the airway
- Excessive secretions/vomiting
- Altered LOC (Level Of Consciousness)
- Unable to achieve mask seal
- ? PTX (pneumothorax)
- ? Pregnancy
- ? Hypotension

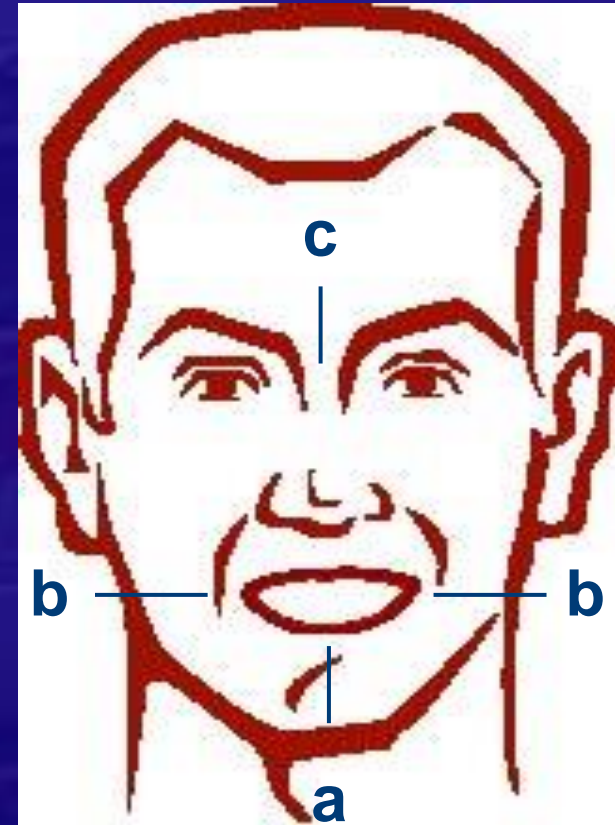
OK for kids

Mask Selection/Placement

- Pt. comfort
- Prevent leaks
- ↓ eye irritation
- Avoid skin injury

Landmarks

- a) Below the lower lip with mouth open
- b) Corners of the mouth
- c) Just below the junction of nasal bone and cartilage



Courtesy of Respironics, Inc

CPAP Machines and Devices

- Usually single-limb circuit
- Require continuous leak through one (or more) small ports in mask or circuit (necessary to clear CO₂)
- Most masks have anti-asphyxia valve (in case machine powers off or gas flow is lost)
- Tolerable leak 12 – 20 L/min (if measured)
 - Leaks over 40 – 50 L/min too high

Two CPAP/BiPAP Pearls

1. “Selling NIV”
2. Knowing when to quit



“Selling CPAP”

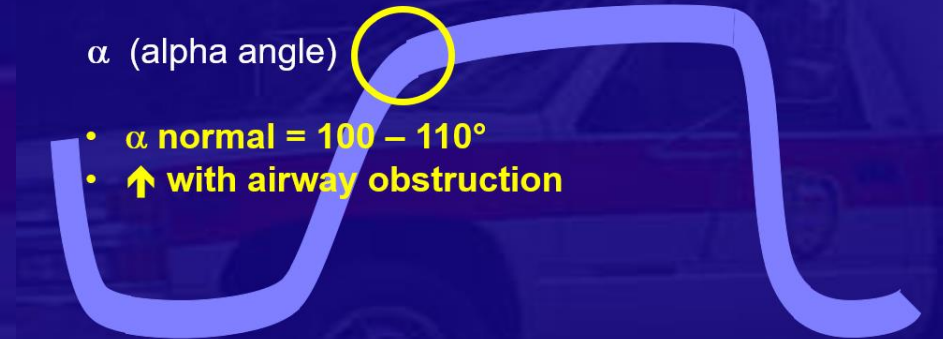
- Finesse (subtle and delicate manner)
- Titrate up? (usual start 8-10 CWP)
- Continued reassurance



Monitoring

How do you know it's helping?

- Subjective (consider Borg Scale)
- Objective
 - ↓ RR
 - ↑ SpO₂
 - Capnography: ↓ EtCO₂ ↓ α angle
 - ↓ WOB
- Reasonable CPAP trial = 20 min.



NIV: Nasal Capnography

- Requires cannula w/ pillow (oral)



Thank you!

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