NON-INVASIVE VENTILATION MADE RIDICULOUSLY SIMPLE

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Mentor: Patrick Strollo Jr, MD
Myth or Fact ?!?
Myth or Fact ?!?
Obstructive Sleep Apnea

**Common Physical Findings**
1. Enlarged Uvula
2. Hyperplastic soft palate
3. Nasal congestion
4. Nasal polyps
5. Enlarged tonsils
6. Enlarged tongue
7. Small lower jaw
8. Receded chin
9. Neck size > 17”
10. Overweight & Obese

**Common Signs & Symptoms**
1. Snoring
2. Stop breathing at night
3. Excessive daytime sleepiness
4. Morning headache
5. Nighttime gasping
6. Restless sleep
7. Insomnia
8. Nightmares
9. Irritability
10. Memory loss
11. Decreased attention and concentration
12. Performance deficiencies
13. Depression
14. Shortness of breath
15. GERD
16. Nocturnal
17. Impotence
18. Poor sleep quality
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The Cycle that Kills

Resume Sleep
Decreased UA Muscle Tone

Relieve Hypoxia & Reduced CO₂
Obstructive Apnea/Hypopnea

Relief of Obstruction
Hypoxia & Elevated CO₂

Sleep Onset
Arousal
Increased Ventilatory Effort
Treatment for Obstructive Sleep Apnea

■ Lifestyle Modifications
  - Weight loss, increased fitness
  - Avoid alcohol, sleep deprivation, sedatives
  - Lateral position, head of bed elevation

■ Surgical
  - Upper airway reconstruction (UPP) or tracheostomy
  - Upper airway stimulation

■ Positive Airway Pressure via mask
■ Oral appliance therapy
Treatment for Obstructive Sleep Apnea

- **Lifestyle Modifications**
  - Weight loss, increased fitness
  - Avoid alcohol, sleep deprivation, sedatives
  - Lateral position, head of bed elevation

- **Surgical**
  - Upper airway reconstruction (UPP) or trach

- **Positive Airway Pressure via mask**

- **Oral appliance therapy**
3 decades later...
Continuous Positive Airway Pressure (CPAP)

- Continuous level of positive pressure provided to overcome airway obstruction
- Patient must inhale and exhale over continuous pressure
- Patient initiates all breaths
- No additional pressure above level of CPAP is provided
Continuous Positive Airway Pressure (CPAP)

- **Fixed CPAP**
  - Fixed level of pressure between 4-20 cm H20 (ex: 10 cm H20)

- **Auto-CPAP**
  - Variable pressure according to patient needs as detected by machine
  - If apnea, hypopnea, flow limitation, or snoring are detected, pressure is increased until events are eliminated
  - If no events are detected over set time period, pressure is decreased
  - Set pressure range (ex: min 4 cmH20 – max 20 cmH20)
Continuous Positive Airway Pressure (CPAP)

- **Fixed CPAP**
  - Fixed level of pressure between 4-20 cm H2O (ex: 10 cm H2O)

- **Auto-CPAP**
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  - Set pressure range (ex: min 4 cmH2O – max 20 cmH2O)
Compared to CPAP, there was no significant advantage of APAP:
- *In reducing AHI or sleepiness*
- *In substantially improving adherence to therapy*

APAP reduced the mean applied pressure across the night by 2.2 cm water compared to CPAP

APAP may be useful in other situations (eg, home titrations, detection of mouth leak) or in certain subgroups of patients with OSA.

APAP is more expensive than CPAP
Bi-level Indications

- Intolerance of the CPAP pressure
- Difficulty exhaling on CPAP
- Chest wall discomfort on CPAP
- Hypercapnia
Bi-level Positive Airway Pressure

- Provides inspiratory positive airway pressure (IPAP) and expiratory positive airway pressure (EPAP)
- EPAP is set to maintain upper airway patency
- Pressure support (IPAP minus EPAP) sustains/augments the tidal volume
- Breath rate and respiratory pattern determined by the patient
Bi-level Positive Airway Pressure

- **Fixed Bi-level**
  - *Fixed IPAP and EPAP*
  - *Pressure range 4-25 cm H20*
  - *Ex: IPAP 15 cm H20, EPAP 12 cm H20 or “15/12”*

- **Auto Bi-level**
  - *Variable pressures according to patient needs as detected by machine*
  - *If apnea or snoring is detected, EPAP is increased*
  - *If hypopnea or flow limitation is detected, IPAP is increased*
  - *If no events are detected over set time period, pressure is decreased*
  - *Pressure range 4-25 cm H20*
  - *Ex: IPAP max 18 cm H20, EPAP min 4 cmH20, pressure support 3 cm H20*
Designer Wear
Designer Wear
Designer Wear
Designer Wear
Designer Wear
Designer Wear
Designer Wear
Troubleshooting

- Mask troubles
  - Too big?
  - Too small?
  - Not on right?
  - Straps need repositioning?
  - Too much beard?
  - Not enough teeth?
  - Talking too much?

- Hosing disconnected

Well I think we fixed that little leak that was bothering you.
Troubleshooting

- Mask troubles
  - Too big?
  - Too small?
  - Not on right?
  - Straps need repositioning?
  - Too much beard?
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  - Talking too much?

- Hosing disconnected

Solution:
Order for home care company to refit mask
An approach to poor adherence with CPAP

1. Rhinitis
   - Nasal sprays

2. Leaks
   - Skin lesions
   - Conjunctivitis
   - Noise

3. Dry Mouth

4. Lack of Improvement
   - Avoid leaks
   - Humidification
   - Chinstrap
   - FFM

5. Involuntary removal asleep
   - Suboptimal pressure
   - Non-pulmonary sleep disorder

6. Anxiety / Phobia

7. Negative social aspects

8. Tooth problems, Sinus problems
   - Ear problems

9. Thoracic pain, Expiration difficulties,
   - Aerophagia, Cold and pressure sensation

ENT / OMF

Review steps 1-4

CBT, Desensitization

Frequently transient

Sleep Med Rev 2007
11:195-207
“Look! I said I’m using it now! Why don’t you come over and read the meter again?”
## Tracking Therapy

**Compliance Report**

**Usage**

<table>
<thead>
<tr>
<th>Usage</th>
<th>04/22/2015 - 05/19/2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage days</td>
<td>26/28 days (93%)</td>
</tr>
<tr>
<td>&gt;= 4 hours</td>
<td>26 days (93%)</td>
</tr>
<tr>
<td>&lt; 4 hours</td>
<td>0 days (0%)</td>
</tr>
<tr>
<td>Usage hours</td>
<td>240 hours 38 minutes</td>
</tr>
<tr>
<td>Average usage (total days)</td>
<td>8 hours 36 minutes</td>
</tr>
<tr>
<td>Average usage (days used)</td>
<td>9 hours 15 minutes</td>
</tr>
<tr>
<td>Median usage (days used)</td>
<td>9 hours 25 minutes</td>
</tr>
</tbody>
</table>

**AirSense™ 10 AutoSet™ for Her**

- Serial number: 001024999060
- Mode: AutoSet
- Minimum pressure: 4 cmH2O
- Maximum pressure: 10 cmH2O
- EPR: Fulltime
- EPR level: 3

**Therapy**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Median</th>
<th>95th percentile</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure - cmH2O</td>
<td>6.8</td>
<td>7.1</td>
<td>7.5</td>
</tr>
<tr>
<td>Leaks - L/min</td>
<td>21.1</td>
<td>23.6</td>
<td>24.3</td>
</tr>
<tr>
<td>Events per hour</td>
<td>AI: 6.1</td>
<td>HI: 0.4</td>
<td>AHI: 6.1</td>
</tr>
<tr>
<td>Apnea Index</td>
<td>Central: 4.6</td>
<td>Obstructive: 1.3</td>
<td>Unknown: 1.0</td>
</tr>
<tr>
<td>RERA Index</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cheyne-Stokes respiration (average duration per night)**

- Cheyne-Stokes respiration: 20 minutes (9%)

**SpO2**

- Time spent SpO2 < 88%:
  - Median: 92
  - 95th %: 97

**Usage - hours**

![Usage hours chart]
Excellent results, Alexander! As you start to see the benefits in your life, you’ll never look back.

- 5:50 usage hours: 60 / 70
- Good mask seal: 16 / 20
- 3.1 events per hour: 5 / 5
- 2 mask on/off: 4 / 5
- Total myAir score: 85 / 100

It seems you had a poor mask fit, click to walk through the Troubleshooting section.

You asked to be reminded to change your device filters.
NON-INVASIVE VENTILATION

- CPAP = continuous positive pressure during both inspiration and expiration
  - Auto CPAP is not superior to fixed CPAP

- Bi-level positive airway pressure
  - Includes an inspiratory pressure (IPAP) and expiratory pressure (EPAP)

- EPAP = overcomes airway obstruction, improves hypoxia

- IPAP = improves ventilation

- Indications: intolerance of CPAP, hypercapnia

- Make sure the mask fits!

- The data download doesn’t lie!
That's all Folks!