Review of Sleep Apnea

Elizabeth Clauson
MSN, RN, APRN-BC
San Francisco VA Medical Center
Pulmonary and Sleep Medicine
Objectives

• Identify Sleep Apnea symptoms and causes
• Identify which patients to refer for testing
• Identify common treatments for Sleep Apnea
Sleep Disordered Breathing

- Obstructive Sleep Apnea
  - Central Sleep Apnea
  - Cheyne-Stokes Respiration
  - Obesity Hypoventilation Syndrome
  - Restless Legs Syndrome (Willis-Ekbom Disease)
  - Periodic limb movement disorder
  - REM Sleep Behavior Disorder
  - Insomnia
  - Narcolepsy
  - Nocturnal Hypoxemia
What is OSA?

• Cyclic cessation or partial cessation of airflow, resulting in drops in oxygen saturation
  – (usually caused by upper airway tissue/anatomy obstruction)
History of OSA

• **1836**: Described by Charles Dickens in the novel *The Pickwick Papers* where Joe, a “fat boy”, ate a lot and fell asleep in almost any situation

• **1918**: Sir William Osler coined the term “Pickwickian” to describe obese patients who were sleep all the time, and sometimes napped involuntarily

• **1956**: Dr. C.S. Burwell was treating patients with CHF, extreme sleepiness/fatigue and labeled this as Pickwickian Syndrome

• **1965**: a group of German and French doctors lead by Dr. Henri Gastaut started doing research on patients with Pickwickian Syndrome, recorded breathing and sleeping pattern and discovered distinctive/unique apnea patterns (later named OSA- *apnea*: Greek word for breathless)
Prevalence

• Wisconsin sleep cohort found that undiagnosed OSA (AHI >5 events/hr) is prevalent in 9% of women and 24% of men

• It is estimated that 17% of adults in the US have mild or worse SDB
  (Young T, Peppard, PE, Taheri, S. Excess weight and sleep-disordered breathing. J Appl Physiol. 2005: 1592-1599)
Risk Factors

• Male gender
  – 2-3 times greater prevalence in men than women
• Obesity (BMI >30)
• Airway anatomy/nasal congestion
• Excessive use of alcohol or sedatives
• Family Hx of OSA
  ▪ Smoking
  ▪ HTN
  ▪ Large neck
    (>17” men, >16” women)
Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2011

*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

Source: Behavioral Risk Factor Surveillance System, CDC.
Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2012

*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.
Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2013

*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

Source: Behavioral Risk Factor Surveillance System, CDC.
Signs and Symptoms

• Common presenting complaints
  – Daytime sleepiness (patient)
  – Witnessed apnea/choking/snoring (bed partner)

  ▪ Frequent awakenings
  ▪ Non-refreshing sleep/fatigue
  ▪ Morning headaches
  ▪ Memory changes, poor concentration
  ▪ Nocturia
  ▪ Body movements
History

• Patient with c/o daytime sleepiness, witnessed apnea, insomnia
• D/Dx: nonpathological snoring, laryngospasm 2/2 GERD, panic attacks, dyspnea

• Higher Risk:
  - Pre-bariatric surgery, CHF, treatment refractory HTN/am HTN, CVA, pulmonary HTN, nocturnal dysrhythmias, type 2 diabetes, commercial truck drivers
Physical Exam

- BMI
- Neck circumference
- Tongue/Mallampati
- Tonsillar hypertrophy
- Nasal abnormalities
- Retrognathia
The modified Mallampati classification for difficult laryngoscopy and intubation

The modified Mallampati classification\(^1\) is a simple scoring system that relates the amount of mouth opening to the size of the tongue, and provides an estimate of space available for oral intubation by direct laryngoscopy. According to the Mallampati scale, class one is present when the soft palate, uvula, and pillars are visible, class two when the soft palate and base of the uvula are visible, class three when only the soft palate is visible, and class four when only the hard palate is visible.

Suspect OSA?

• Is your patient **high risk?**
  – CAD, pulm HTN, sleepy driver

• Questionnaires to help assess who to refer
  – Epworth Sleepiness Scale
  – STOP-Bang

Referral to sleep specialist
Epworth sleepiness scale

How likely are you to doze off or fall asleep in the following situations in contrast to just feeling tired? This refers to your usual way in recent times. Even if you have not done some of these things recently, try to work out how they would have affected you. Use the following scale to choose the most appropriate number for each situation.

0 = would never doze
1 = slight chance of dozing
2 = moderate chance of dozing
3 = high chance of dozing

<table>
<thead>
<tr>
<th>Situation</th>
<th>Chance of dozing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and reading</td>
<td></td>
</tr>
<tr>
<td>Watching TV</td>
<td></td>
</tr>
<tr>
<td>Sitting inactive in a public place (eg, a theater or meeting)</td>
<td></td>
</tr>
<tr>
<td>As passenger in a car for an hour without break</td>
<td></td>
</tr>
<tr>
<td>Lying down to rest during the day when circumstances permit</td>
<td></td>
</tr>
<tr>
<td>Sitting and talking to someone</td>
<td></td>
</tr>
<tr>
<td>Sitting quietly after lunch without alcohol</td>
<td></td>
</tr>
<tr>
<td>In a car, while stopped for a few minutes in traffic</td>
<td></td>
</tr>
</tbody>
</table>

Redrawn from Johns, MW, Sleep 1991; 14:40.
### STOP-Bang questionnaire

<table>
<thead>
<tr>
<th>Question</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snoring: Do you snore loudly (louder than talking or heard through closed doors)?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Tired: Do you often feel tired, fatigued, or sleepy during day?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Observed: Has anyone observed you stop breathing during your sleep?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Pressure: Do you have or are you being treated for high blood pressure?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>BMI: &gt;35 kg/m2?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Age: &gt;50?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Neck circumference: &gt;40 cm?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Gender: Male?</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

"High risk" for OSA: ≥3 questions "yes".
"Low risk" for OSA: <3 questions "yes".

STOP Bang Scoring Criteria

• For general population
  
  **Low risk of OSA:** Yes to 0-2 questions
  
  **High risk of OSA:** Yes to 3-4 questions
  
  **Very high risk of OSA:** Yes to 5-8 questions
  
  ▪ Or yes to two of STOP questions + male gender
  
  ▪ Or yes to two of STOP + male + BMI >35kg/m2

• For obese (BMI >35 kg/m2)
  
  **Lower risk of OSA:** Yes to 0-3
  
  **High risk of OSA:** Yes to 4-5 questions
  
  **Very high risk of OSA:** Yes to 6-8 questions

Untreated sleep apnea *may* increase risk of

- HTN
- MI/CVA
- Obesity
- DM
- Driving accidents
- Daytime sleepiness
Figure Legend:

OSA indicates obstructive sleep apnea. Severity of OSA was defined by the apnea-hypopnea index (AHI) as mild OSA (AHI, 5.0-14.9), moderate OSA (AHI, 15.0-29.9), and severe OSA (AHI, ≥30.0). P value reflects an overall log-rank $\chi^2_3$ test, providing an overall survival difference among the 4 study groups.
Incidence of vascular events over an 18-month period after stroke in CPAP users (n=15) and those who discontinued the use of CPAP (n=36).

Durgan D J, and Bryan R M J Am Heart Assoc 2012;1:e000091
Figure 1. Kaplan-Meier survival curves across categories of the apnea–hypopnea index (AHI).

http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1000132
What causes OSA?

• Complete cessation or reduction in airflow during sleep, must last more than 10 seconds (can last >60 seconds)

• Repetitive obstruction of the upper airway often results in oxygen desaturation and arousals from sleep
Normally when a person sleeps, the airway remains open, and air can pass from the nose and mouth to the lungs. In a person with sleep apnea, parts of the throat and mouth drop into the airway and block off the flow of air. This can cause loud snoring and interrupt breathing for short periods.
OSA Definitions

- **Apnea**: cessation of airflow for at least 10 seconds
  
  *Usually results in drops in oxygen saturation*

- **Hypopnea**: reduction in airflow accompanied by a >3-4% drop in oxygen saturation

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**Apnea-Hypopnea Index (AHI):**

*Number of times you stop breathing/have shallow breaths per hour*
Sleep Apnea Categories

- **Obstructive Apnea**
  - Absent airflow despite respiratory effort

- **Central Apnea**
  - Absent airflow for $\geq 10$ seconds without respiratory effort
  - Neurological component- watch for narcotics, TBI

- **Mixed Apnea**
  - Initial central portion, followed by obstructive portion
Obstructive sleep apnea

Obstructive sleep apnea in which there is continuing respiratory effort, as shown by progressively increasing fluctuations in esophageal pressure (Pes) at the time of cessation of airflow. The arrow illustrates that arousal in obstructive apnea occurs simultaneously with the resumption of airflow.
Central sleep apnea

There is no respiratory effort, as shown by absence of changes in esophageal pressure (Pes), at the time of cessation of airflow. The arrow illustrates that arousal in central apnea typically occurs in the middle of the hyperpneic phase.
Mixed sleep apnea

The apnea initially appears as a central apnea (without respiratory effort as evidenced by the constant esophageal pressure [Pes]). This is followed by a period of obstructive apnea (with respiratory effort as evidenced by changes in esophageal pressure).
OSA Severity

• Normal Sleep, No OSA = 0-5 events/hr
• Mild = AHI 5-15 events/hr
• Moderate = AHI 15-30 events/hr
• Severe = AHI >30 events/hr
Common Sleep Apnea Tests

• In-laboratory polysomnography (EEM, EOG, EMG for sleep staging as well as monitoring of airflow, respiratory effort, SaO2 and leg EMG)

• Home Sleep Test
  – Level 1: Attended PSG (full monitoring)
  – Level 2: unattended PSG (with full monitoring)
  – Level 3: Cardiopulmonary study (attended or unattended)
  – Modified Portable Sleep Apnea Testing: Airflow, Respiratory effort, ECG or heart rate, SaO2
  – Level 4: continuous single or dual bioparameter (attended or unattended)
Polysomnogram with EEG
Home Sleep Study
Common Tx

• PAP (Positive Airway Pressure)
  – CPAP
  – APAP
  – BiPAP
  – Adaptive servo-ventilation
Alternatives to PAP

• Surgery (UPPP)
• Dental appliance
• Dental surgery (bimax surgery)
• Nasal EPAP/valves
• Weight Loss!!!
• Sleep apnea positioning belt
• Upper-Airway Stimulation
UPPP (uvulopalatopharyngoplasty)

https://www.kramesondemand.com/HealthSheet.aspx?id=41043&ContentTypeId=3
Mandibular Advancement Device

Tap 3 (Thornton Adjustable Positioner)

Mandibular Advancement Device

Silent Nite® Slide-Link

Nasal EPAP
Theravent/Provent™

Sleep Positioning Device

FDA-Cleared
Zzoma is the only FDA-cleared positional therapy for sleep apnea.

http://agencystudy.com/zma/
Upper-Airway Stimulation.

Primary Care...

• All patients who are on PAP should be able to use their own PAP without any problem
• Make sure that the patient brings all their PAP equipment for their hospital stay or sedated procedure
• Ensure that they use their PAP post-op
• Pain medication may make sleep apnea worse/more complex
• Re-evaluate HTN meds when treated on PAP
Common Complaints/PCP Troubleshooting

• “I can’t use my mask cause I feel like I choke.”
• “I can’t use my mask because of claustrophobia.”
• “The mask is blowing my face off, the pressure is too high!”
• “My bed partner doesn’t like the mask and it gets in the way of sex.”
When to refer back to Sleep Specialist:

• DME unable to find appropriate mask
• Unresolved/increased in symptoms
  – Consider NON-OSA causes of fatigue
    • DEPRESSION
    • Thyroid
    • Anemia
    • Other
• Major weight/craniofacial changes
• Patient refuses PAP therapy
Questions?