BEHAVIORAL HEALTH ECHO

MODULE 4: SLEEP DISORDERS

May 9, 2019
Jeremy Stoddart MD
Assistant Professor (Clinical)
Department of Psychiatry
Sleep | Wake Center
Identifying and Treating Sleep Apnea
I have no pertinent financial or commercial conflicts to disclose.

Special thanks to Milton Chua MD for assistance with presentation content.
OBJECTIVES

- Gain an understanding of obstructive sleep apnea pathology
- Recognize symptoms of sleep apnea
- Employ the proper diagnostic modalities
- Familiarize with the treatment modalities of sleep apnea
- Be able to give basic education to our patients
A 64-year-old man is evaluated for a 3-month history of loud snoring and “gasping” during sleep. He also frequently falls asleep in a chair while reading in the evening. His medical history is otherwise unremarkable.

On physical examination, temperature is 37.4°C (99.3°F), blood pressure is 130/82 mm Hg, pulse rate is 80/min, and respiration rate is 14/min; BMI is 36. Neck circumference is 45.7 cm (18 in), and a low-lying soft palate is noted.

Polysomnography discloses severe obstructive sleep apnea, with an apnea–hypopneaa index of 44 per hour.
Which of the following is the most appropriate next step in treatment?

A. Continuous positive airway pressure
B. Nocturnal oxygen therapy
C. Oral appliance
D. Upper airway surgery
WHY DO WE CARE?

- OSA in 4% of men and 2% in women
- Obesity epidemic
- Poor sleep quality
- Increased sleepiness affecting productivity
- Preventable motor vehicular accidents related to sleepiness
DEFINITION OF TERMS

Apnea

Cessation of breathing

Obstructive Apnea (continued effort with no air flow)

Central Apnea (no respiratory effort, similar to holding your breath voluntarily)

Hypopnea

Shallow breathing

Respiratory flow reduction of about 30% from baseline

3% or 4% desaturation
DEFINITION OF TERMS

AHI
Apnea-Hypopnea Index: frequency of apneas and hypopneas per hour of sleep
Used to determine severity of sleep apnea
Mild OSA : 5-14 events/hr plus symptoms
Moderate OSA : 15-29 events/hr
Severe OSA : 30 or more events/hr
PATHOPHYSIOLOGY

Upper airway mechanics
- Decreased muscle activity
- Changes in airway caliber and compliance
- Breathing muscle dynamics

Structural Factors
- Craniofacial structure
- Soft tissue structure
PATHOPHYSIOLOGY

- Pharyngeal obstruction during sleep
- Intermittent hypoxemia
- Cortical arousals from sleep
- Increased sympathetic activity
Nighttime symptoms

- Loud persistent snoring
- Witnessed pauses in breathing
- Choking or gasping for air
- Restless sleep
- Frequent visits to the bathroom

Daytime symptoms

- Early morning headaches
- Daytime sleepiness
- Poor concentration
- Irritability
- Falling asleep during routine activities
SCREEN FOR OBSTRUCTIVE SLEEP APNEA

Obesity

accounts for 41% of all OSA cases, 58% of moderate to severe cases

High Risk Occupations

Commercial drivers
Public Transit operators
Heavy machinery operators
SCREEN FOR OBSTRUCTIVE SLEEP APNEA

- **Drug Resistant Hypertension**: 83%
- **Obesity**: 77%
- **Congestive Heart Failure**: 76%
- **Stroke**: 63%
- **Metabolic Syndrome**: 60%
- **Pacemakers**: 59%
- **Depression**: 58%
- **Atrial Fibrillation**: 49%
- **Diabetes**: 48%
- **All Hypertension**: 37%
- **Coronary Artery Disease**: 30%
STOP-BANG scores >= 3

Specificity - 28%
Sensitivity - 95%

STOP BANG scores >= 5

Specificity – 74%
Sensitivity – 56%

EXCESSIVE DAYTIME SLEEPINESS

Epworth Sleepiness Scale

Name: ____________________________ Today's date: ____________

Your age (Yrs): ______________ Your sex (Male = M, Female = F): ____________

How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired?

This refers to your usual way of life in recent times.

Even if you haven’t 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

It is important that you answer each question as best you can.

Situation

<table>
<thead>
<tr>
<th>Chance of Dozing (0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and reading</td>
</tr>
<tr>
<td>Watching TV</td>
</tr>
<tr>
<td>Sitting, inactive in a public place (e.g. a theatre or a meeting)</td>
</tr>
<tr>
<td>As a passenger in a car for an hour without a break</td>
</tr>
<tr>
<td>Lying down to rest in the afternoon when circumstances permit</td>
</tr>
<tr>
<td>Sitting and talking to someone</td>
</tr>
<tr>
<td>Sitting quietly after a lunch without alcohol</td>
</tr>
<tr>
<td>In a car, while stopped for a few minutes in the traffic</td>
</tr>
</tbody>
</table>

THANK YOU FOR YOUR COOPERATION

© M.W. Johns 1990-97

0-5 Lower Normal Daytime Sleepiness
6-10 Higher Normal
11-12 Mild Excessive Daytime Sleepiness
13-15 Moderate EDS
16-24 Severe EDS

HISTORY OF PRESENT ILLNESS

- Loud snoring characterized as “bothersome to others”
- Choking, gasping during sleep
- Witnessed apneas
- Excessive daytime sleepiness (Epworth Score of 10/24)
- Self medication with caffeine
- Insomnia
- Fatigue
- Morning headaches
- Nocturnal bruxism
- Irritability
PHYSICAL EXAMINATION

- Vital signs, note weight
- Neck Circumference
- Check for macroglossia, tonsillar hypertrophy, enlarged or elongated uvula
- Retrognathia
MODIFIED MALLAMPATI CLASSIFICATION
ATTENDED DIAGNOSTICS

Diagnostic Polysomnogram (In-Lab Sleep Study)
Titration Polysomnogram
Split-Night Sleep Study
ATTENDED POLYSOMNOGRAPHY

Sensor at nose to measure air flow

Sensors on face and scalp measure eye movement and brain activity

Wires transmit data to a computer. A technician in a nearby room monitors the data.

Elastic belt sensors around chest and belly measure amount of effort to breath

Sensor on finger measures amount of oxygen in blood
ATTENDED POLYSOMNOGRAPHY

- EEG
- EMG
- EOG
- Air Flow
- Thermistor
- ECG
- Respiratory effort
- Pulse Oximetry
- EtCO2/TcCO2
- Audio/video
- PAP
FULL-NIGHT DIAGNOSTIC PSG
UNATTENDED DIAGNOSTICS

Home Sleep Testing
Overnight Pulse Oximetry
HOME SLEEP TEST (HST)
HOME SLEEP TESTING

- Air Flow Cannula
- Thermistor
- Respiratory effort (chest/abdomen)
- Pulse oximeter
- Audio
- Position/movement
HOME SLEEP TESTING
OVERNIGHT CONTINUOUS PULSE OXIMETRY

Condition of test: Overnight Room Air

Session ID: 15144722

- Useful for screening but cannot diagnose OSA
# Overnight Continuous Pulse Oximetry

<table>
<thead>
<tr>
<th>SpO2 Data</th>
<th>Pulse Data</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time ≤ 88%</td>
<td>High pulse</td>
<td>Oxygen</td>
</tr>
<tr>
<td>Time ≤ 89%</td>
<td>Low pulse</td>
<td>It appears this patient qualifies for Nocturnal Oxygen per Medicare guidelines; please inquire with respiratory company for Coverage Guidelines for Group I.</td>
</tr>
<tr>
<td>High SpO2</td>
<td>Artifact events</td>
<td></td>
</tr>
<tr>
<td>Low SpO2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basal SpO2</td>
<td>99.0%</td>
<td></td>
</tr>
<tr>
<td>Delta SpO2</td>
<td>78.0%</td>
<td></td>
</tr>
<tr>
<td>Time consecutive ≤ 88%</td>
<td>89.8%</td>
<td></td>
</tr>
<tr>
<td>Awake SpO2</td>
<td>37.6 MIN</td>
<td></td>
</tr>
<tr>
<td>Artifact events</td>
<td>9.8 MIN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>94.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.4 MIN</td>
<td></td>
</tr>
</tbody>
</table>

The above are key values to assess qualifications under Medicare guidelines.

<table>
<thead>
<tr>
<th>Oxygen Desaturation Index (ODI)</th>
<th>RAD Protocol</th>
<th>Delta SpO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total desaturation events:</td>
<td>Sleep oximetry demonstrates oxygen saturation ≤ 88% for ≥ 5 minutes of nocturnal recording time (minimum recording time of 2 hours), done while breathing oxygen at 2 LPM or the patient's prescribed FIO2 (whichever is higher).</td>
<td>A measurement of cumulative SpO2 readings &gt; 5% below the recorded baseline SpO2. Medicare requires oxygen ≥ 5 minutes coverage in group I.</td>
</tr>
<tr>
<td>Average events per hour:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A desaturation event is defined as a decrease in SpO2 ≥ 3 percentage points within a 3 minute window of onset.

Desaturation
Cumulative minutes ≤ 88% Medicare requires ≥ 5 minutes for oxygen coverage in Group I

Cumulative minutes ≤ 89% Medicare requires ≥ 5 minutes for oxygen coverage in Group II

Considerations

RAD Protocol

Delta SpO2

Please refer to group I qualification, duration and test condition to see if patient qualifies. Effective date 2/1/2010.
TREATMENT

Who do we treat?

- Discuss with patient treatment options
- Potential symptom relief or sleepiness
- Moderate to Severe sleep apnea

Lifestyle changes

- Weight loss
- Change sleeping position
TYPES OF THERAPY

CPAP/APAP
Positional Sleeper Devices
Mandibular Advancement Devices
ENT surgical options
Novel therapy: Inspire
AASM GUIDELINES FOR USING CPAP

We recommend:
• ...that clinicians use PAP, compared to no therapy, to treat OSA in adults with excessive sleepiness.
• ...that clinicians use PAP, compared to no therapy, to treat OSA in adults with impaired sleep-related quality of life.
• ...that PAP therapy be initiated using either APAP at home or in-lab CPAP titration in adults with OSA and no significant comorbidities.
• ...that clinicians use either CPAP or APAP for ongoing treatment of OSA in adults.
• ...that educational interventions be given with initiation of PAP therapy in adults with OSA.

We suggest:
• ...that clinicians use PAP, compared to no therapy, to treat OSA in adults with co-morbid hypertension.
• ...that clinicians use CPAP or APAP over BPAP in the routine treatment of adults with OSA.
  ...that behavioral and/or troubleshooting interventions be given during the initial period of PAP therapy in adults with OSA.
• ...that clinicians use telemonitoring-guided interventions during the initial period of PAP therapy in adults with OSA.

CPAP (CONTINUOUS POSITIVE AIR PRESSURE)
APAP (AUTO-TITRATING POSITIVE AIR PRESSURE)
CPAP INTERFACE (MASKS)

Mirage™ FX
NASAL MASK

Swift FX Nano

Quattro™ FX

Swift™ FX Bella
DIAGNOSIS TO TREATMENT FLOW

• Clinical evaluation
  – HPI (Epworth, s/sx of OSA
  – Physical exam (BMI, neck circumference, mallampati)
  – Assessment/Plan (MDM/pre-test probability)

• Diagnostic testing (in-lab or home testing)

• Rx of CPAP to DME

• CPAP dispensed

• Clinic follow up
  – Within 90 days of starting treatment
  – Demonstrate compliance (>4hr/night >70% of nights in 30 days) based on machine usage download
  – Repeat testing if poor response/intolerance or to verify effectiveness of therapy
CPAP COMPLICATIONS

• Intolerance
  – Claustrophobia
    • Desensitization
    • Sedative medication (time limited Rx)
  – Aerophagia
    • Change mask
    • Adjust pressure
    • BIPAP

• Mask discomfort/leak
  – Adjust/change mask interface

• Treatment emergent central sleep apnea
  – Up to 15% of patients
  – Combination of hyperventilation, hypocapnia, stretch receptor reflex
  – Can spontaneously resolve
  – May need advanced PAP therapy

• Respiratory infections
  – Evidence suggests protective effects of CPAP
SLEEP POSITION TRAINERS
ORAL APPLIANCE THERAPY
AASM GUIDELINES

• When oral appliance therapy is prescribed by a sleep physician for an adult patient with obstructive sleep apnea, we suggest that a qualified dentist use a custom, titratable appliance over non-custom oral devices.

• We recommend that sleep physicians consider prescription of oral appliances, rather than no treatment, for adult patients with obstructive sleep apnea who are intolerant of CPAP therapy or prefer alternate therapy.

• We suggest that qualified dentists provide oversight—rather than no follow up—of oral appliance therapy in adult patients with obstructive sleep apnea, to survey for dental-related side effects or occlusal changes and reduce their incidence.

• We suggest that sleep physicians conduct follow-up sleep testing to improve or confirm treatment efficacy, rather than conduct follow-up without sleep testing, for patients fitted with oral appliances.

• We suggest that sleep physicians and qualified dentists instruct adult patients treated with oral appliances for obstructive sleep apnea to return for periodic office visits—as opposed to no follow-up—with a qualified dentist and a sleep physician.

MANDIBULAR ADVANCEMENT/REPOSITIONING DEVICES
During sleep there is restricted airway space 

Mandibular repositioning device (MRD) increases airway space
SURGICAL OPTIONS

- Tracheostomy
- Maxillo-Mandibular Advancement (MMA)
- Uvulopalatopharyngoplasty (UPPP)
- Multi-Level/Stepwise Surgery (MLS)
- Laser Assisted Uvuloplasty (LAUP)
- Radiofrequency Ablation (RFA)
- Palatal Implants

"THE SLEEP APNEA SURGERY"

- **UPPP**
  (uvulopalatopharyngoplasty)

**Before**
Appearance of throat prior to UPPP surgery. Note the anatomy which is common to sleep apnea patients to include the large tonsils, long uvula and narrow arch behind the tonsils.

**After**
Appearance after UPPP surgery. The tissue in the front part of the throat is trimmed and the uvula is folded and sutured.
HYPOGLOSSAL NERVE STIMULATOR

inspire®
UPPER AIRWAY STIMULATION
MEDICAL INTERVENTIONS FOR OSA

- Selective serotonergic uptake inhibitors (SSRIs) are **not recommended** for treatment of OSA
- Protriptyline is **not recommended** as a primary treatment for OSA
- Methylxanthine derivatives (aminophylline and theophylline) are **not recommended** for treatment of OSA
- Estrogen therapy (estrogen preparations with or without progesterone) is **not indicated** for the treatment of OSA
- Modafinil is **recommended** for the treatment of residual excessive daytime sleepiness in OSA patients who have sleepiness despite effective PAP treatment and who are lacking any other identifiable cause for their sleepiness.
- Oxygen supplementation is **not recommended** as a primary treatment for OSA.
- Positional therapy, consisting of a method that keeps the patient in a non-supine position, is an effective **secondary therapy** or can be a supplement to primary therapies for OSA in patients who have a low AHI in the non-supine versus that in the supine position.
- Short-acting nasal decongestants are **not recommended** for treatment of OSA.
- Topical nasal corticosteroids may improve the AHI in patients with OSA and concurrent rhinitis, and thus may be a **useful adjunct** to primary therapies for OSA.

FOLLOW UP

• Assess treatment adherence
• Optimize mask fitting
• Discuss other therapies if intolerant
• Address other residual symptoms
• Consider testing to evaluate treatment efficacy
A 55-year-old woman is evaluated in follow-up after starting nasal continuous positive airway pressure (CPAP) 6 weeks ago for obstructive sleep apnea. She is unable to wear the mask for more than 3 or 4 hours per night because of nasal congestion. She continues to have residual sleepiness during the day. Her husband notes that she does not snore or have apnea when the mask is on.

On physical examination, temperature is 37.4°C (99.3°F), blood pressure is 122/74 mm Hg, pulse rate is 76/min, and respiration rate is 14/min. BMI is 26. Nasal mucosa is boggy and erythematous with a clear mucoid discharge.
Which of the following management steps is most likely to improve this patient’s adherence to CPAP therapy?

A. Add heated humidification to the CPAP circuit
B. Initiate oral modafinil
C. Initiate oxymetazoline nasal spray
D. Refer for nasal septal surgery
OTHER SLEEP-BREATHING DISORDERS

• Obesity hypoventilation
  – BMI >50 kg/m²

• Primary central sleep apnea
  – Neurodegenerative disease/stroke

• Cheyne-Stokes Respirations
  – Congestive heart failure

• Hypoventilation secondary to neuromuscular or restrictive chest physiology
  – ALS, polio, kyphoscoliosis, etc.
Thank U