



**Coming Soon!**

- **July, Sepsis Prevention Training**
- **August, CAD: Emphasis on Secondary Prevention, Post AMI/PCI**
- **September, Highlights of Emerging and New Drug Trends**
- **October, COPD: Recognizing Severity, Current Treatments of Exacerbation and Readmission Avoidance**

**Evaluation and Treatment of Obstructive Sleep Apnea**

John Morrissey, M.D.

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**Introducing Your Faculty**



John Morrissey, M.D.

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**Presentation Objectives**

At the end of this educational activity, participants should be able to:

- State the relationship between obstructive sleep apnea and its impact on one's general health.
- Discuss the importance of a multidisciplinary approach when treating obstructive sleep apnea.
- Identify optimal clinical management strategies for management of obstructive sleep apnea.

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### Why Do We Need Sleep?

Overall, very little is known about sleep! Experts believe the purpose of sleep, may be for:

- Restoring energy
- Clearance of metabolites
- Restoring/sorting out memory and brain pathways

However, experts do know that fragmentation of sleep cycles (through OSA) has a clear impact on:

- Cognitive function/memory
- Cardiovascular/neurologic impact

UpToDate: [https://www.uptodate.com/contents/stages-and-architecture-of-normal-sleep?search=Stages%20of%20Sleep&source=search\\_result&selectedTitle=1~150&usage-type=default&display\\_rank=1](https://www.uptodate.com/contents/stages-and-architecture-of-normal-sleep?search=Stages%20of%20Sleep&source=search_result&selectedTitle=1~150&usage-type=default&display_rank=1)

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### Stages of Sleep

“Sleep is a rapidly reversible state of reduced responsiveness, motor activity, and metabolism.”

Adults typically should sleep for at least one-third of a 24-hour day.

Sleep is segmented into:

1. Rapid Eye Movement (REM)
  - Vivid dream time
  - Usually happens 90 minutes after falling to sleep
2. Non-Rapid Eye Movement (NREM) is divided into new standards of sub-stages of sleep
  - N1 = Lightest sleep, 5 to 10% of total sleep time
    - ❖ Sleep starts with getting drowsy-enter NREM sleep
  - N2 = Sleep time, 45-55% of sleep time
  - N3 = Deep Sleep, 10-20% of sleep time
    - ❖ Limited motor activity –“paralysis”

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### Common Sleep Disorders

- Insomnia
- Sleep Apnea
- Narcolepsy
- Restless Leg Syndrome

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### Obstructive Sleep Apnea Syndrome (OSA)



OSA is repeated upper airway closure during sleep

Signs & Symptoms:

- Loud disruptive snoring
- Unrefreshed sleeping
- Excessive daytime sleepiness/fatigue

UpToDate: [www.uptodate.com/contents/clinical-presentation-and-diagnosis-of-obstructive-sleep-apnea-in-adults?search=Sleep%20Apnea%20Syndrome&source=search\\_result&selectedTitle=1~108&usage\\_type=courseware\\_link](http://www.uptodate.com/contents/clinical-presentation-and-diagnosis-of-obstructive-sleep-apnea-in-adults?search=Sleep%20Apnea%20Syndrome&source=search_result&selectedTitle=1~108&usage_type=courseware_link) Clinical Features

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### OSA Syndrome

**Overview:** Presentation of nocturnal breathing disturbances

**Complications:** Can involve repeated arousals from sleep and periods of hypoxia

**Complications:** Progressive impairment of daytime neurocognitive function

**Diagnosing:** Bed partners can be a source of information with reporting loud snoring, gasping, or snorting during sleep

**Diagnosing:** Can remain undetected for long period of time

**Diagnosing:** Apnea testing, Sleep Study

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### OSA Epidemiology, North America

Male predominance, 20-30% Male and 10-15% Females <sup>1</sup>	Highly linked to obesity BMI >30, (fat deposits around the upper airway can obstruct breathing) <sup>2</sup>
Increases with advancing age (middle age, over the age 40) <sup>1</sup>	Post menopausal women (due to hormonal changes) <sup>1</sup>
Use of alcohol, sedatives or tranquilizers (relaxes the muscles in the throat) <sup>2</sup>	Possible genetic factors in the central control of ventilation <sup>2</sup>
African Americans younger than 35 years of age are more vulnerable and Hispanic <sup>1</sup>	Multifactorial (obesity-environmental-genetic) <sup>2</sup>
Smoking (can increase the amount of inflammation and fluid retention in the upper airway) <sup>2</sup>	History of stroke (increases risk) <sup>2</sup>
Nasal congestion, (from an anatomical problem or allergies) <sup>2</sup>	

UpToDate: [www.uptodate.com/contents/overview-of-obstructive-sleep-apnea-in-adults?search=Obstructive%20Sleep%20Apnea%20Epidemiology&source=search\\_result&selectedTitle=1~108&usage\\_type=display\\_rank\\_1](http://www.uptodate.com/contents/overview-of-obstructive-sleep-apnea-in-adults?search=Obstructive%20Sleep%20Apnea%20Epidemiology&source=search_result&selectedTitle=1~108&usage_type=display_rank_1)

<sup>1</sup>Mayo Clinic: [www.mayoclinic.org/diseases-conditions/sleep-apnea/symptoms-causes/syc-20137263](http://www.mayoclinic.org/diseases-conditions/sleep-apnea/symptoms-causes/syc-20137263)

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### Medical Conditions Linked to OSA

The prevalence of OSA is increased in patients with a variety of medical conditions, such as the following

- Obesity
- Congestive Heart Failure
- Chronic Obstructive Pulmonary Disease
- End Stage Renal Disease
- Cerebrovascular Accident
- Pregnancy
- Pulmonary Hypertension

UpToDate: [www.uptodate.com/contents/overview-of-obstructive-sleep-apnea-in-adults](http://www.uptodate.com/contents/overview-of-obstructive-sleep-apnea-in-adults), Section, Medical Conditions  
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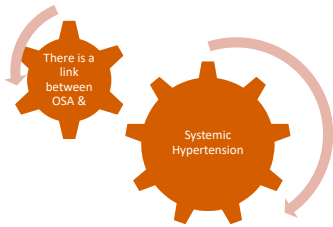
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### OSA Risk Factor

American Academy of Sleep Medicine, 2018 Provider Fact Sheet



American Academy of Sleep Medicine: [pub3.kdnr.com/11c1b4d2-wpengine.netdna-ssl.com/wp-content/uploads/2018/09/ProviderFS\\_Obesity\\_18.pdf](http://pub3.kdnr.com/11c1b4d2-wpengine.netdna-ssl.com/wp-content/uploads/2018/09/ProviderFS_Obesity_18.pdf), Section, Quick Facts  
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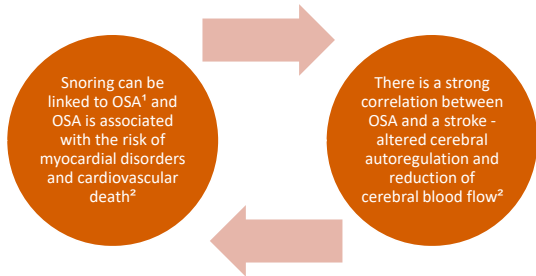
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### OSA Cardiovascular Morbidity



<sup>1</sup>Mayo Clinic: [www.mayoclinic.org/diseases-conditions/deep-sleep-symptoms-causes/dcc-20377831](http://www.mayoclinic.org/diseases-conditions/deep-sleep-symptoms-causes/dcc-20377831)  
<sup>2</sup>American Academy of Sleep Medicine: [pub3.kdnr.com/11c1b4d2-wpengine.netdna-ssl.com/wp-content/uploads/2018/09/ProviderFS\\_Obesity\\_18.pdf](http://pub3.kdnr.com/11c1b4d2-wpengine.netdna-ssl.com/wp-content/uploads/2018/09/ProviderFS_Obesity_18.pdf), Section, Quick Facts  
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### OSA Pathophysiology

Recurrent upper airway "collapse" or closure during sleep

Airflow stops or greatly reduced

Leads to hypoxia, hypercapnea

Sleep is fragmented

- OSA can occur in REM (Rapid Eye Movement) or non-REM sleep but the muscle relaxation that occurs in REM is most important
- Humans need REM sleep - psychological benefits of dreams
- The breathing disruption causes arousals (though may not awaken) repeatedly through the night disrupting the amount of time patient spends in the important late stages of sleep

UpToDate: [www.uptodate.com/contents/overview-of-obstructive-sleep-apnea-in-adults](http://www.uptodate.com/contents/overview-of-obstructive-sleep-apnea-in-adults) section, Pathophysiology

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### OSA Pathophysiology

Obstruction sites:

Soft palate (velopharynx): most common site

Tongue (oropharynx): second most common site

Throat (hypopharyngeal area): especially during REM sleep

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### OSA Physical Examination



Assessment starts in the waiting room—patient sleeping?

Picture: Stock Photo



BMI/Obesity

Picture: Stock Photo



Elevated blood pressure

Picture: Stock Photo



Neck size & shape

Picture: Google AdSense Search



Craniofacial abnormalities

Picture: Google AdSense Search



Inspect the oral cavity

Picture: Provided by John Morawski

UpToDate: [www.uptodate.com/contents/clinical-presentation-and-diagnosis-of-obstructive-sleep-apnea-in-adults?search=Assessment%20Ph%20OSA&source=search\\_result&selectedTitle=2~100&usage\\_type=default&display\\_rank=2](http://www.uptodate.com/contents/clinical-presentation-and-diagnosis-of-obstructive-sleep-apnea-in-adults?search=Assessment%20Ph%20OSA&source=search_result&selectedTitle=2~100&usage_type=default&display_rank=2)

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### Screening Questionnaires

There is not one clinical feature that has been found to have the sensitivity or specificity to be able to make the diagnosis of OSA. There are several screening tools available:

- **STOP-Bang** – The questionnaire is an eight-item survey that incorporates information on snoring, tiredness, observed apneas, blood pressure, BMI, age, neck circumference, and gender. A score of three or higher suggests a sensitivity for the diagnosis of OSA.
- **Sleep apnea clinical score (SACS)** – A four-item questionnaire that incorporates information on neck circumference, hypertension, habitual snoring, and nocturnal gasping or choking to generate a score ranging from 0 to 100; scores greater than 15 result in a probability of OSA.
- **Berlin questionnaire** – The questionnaire consists of 10 items relating to snoring, nonrestorative sleep, sleepiness while driving, apneas during sleep, hypertension, and BMI. The results stratify patients as having a high or low risk for OSA.
- **The NoSAS score** – Score assigns points based upon four parameters neck circumference / body mass index, snoring, age, and gender. A score  $\geq 8$  identifies individuals at risk of clinically significant sleep-disordered breathing.
- **Multivariable Apnea Prediction (MVAP) instrument** – The instrument is based on a formula consisting of three questions about the frequency of symptoms of sleep apnea, along with BMI, age, and sex. MVAP values ranged from 0 to 1, with 1 representing the highest likelihood of sleep apnea.

Uptodate: [www.uptodate.com/contents/clinical-presentation-and-diagnosis-of-obstructive-sleep-apnea-in-adults](http://www.uptodate.com/contents/clinical-presentation-and-diagnosis-of-obstructive-sleep-apnea-in-adults)

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### Who Should We Test for OSA?

The American Academy of Sleep Medicine (AASM):

- Any patient with **unexplained** excessive daytime sleepiness
- If **no** excessive daytime sleepiness, such as with:
  - Snoring
  - Professions that pose risk to others-bus/truck drivers/pilots
  - Periodic limb movement disorder
  - Parasomnia disorder

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### OSA Diagnostic Testing

#### Sleep Lab (polysomnography) and Home sleep Apnea Testing (HSAT)

Some controversies: Significant differences in capabilities, costs and if technician attendance versus unattended

##### Sleep Lab (polysomnography)

- The gold standard
- The first line diagnostic procedure for patients with complicated OSA (other cardiac or pulmonary comorbidities)
- Necessary testing if suspect other sleep disorders such as central sleep apnea or narcolepsy
- Technician attendance

##### Home sleep apnea testing (HSAT)

- Reasonable alternative for patients with a high clinical suspicion of OSA and do not have cardiac or pulmonary disease
- Technician unattended

**Check the member's specific benefit plan**

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### OSA Polysomnography

- EEG
- EOG
- Chin EMG & Limb EMG
- Oronasal airflow
- Thoracic & Abdominal effort
- EKG & Pulse oximetry



Picture Provided by John Morrissey, M.D.

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### Polysomnography Measurements

- Apnea/Hypopnea Index (AHI)
- Limb movement
- Sleep stage percentages
- Detect EEG arousals
- Position and sleep stage
- Cardiac arrhythmia
- O2 desaturation

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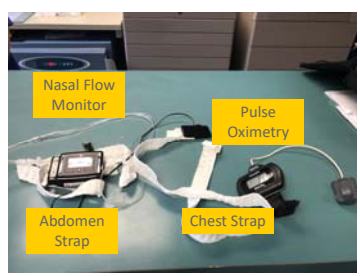
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### HSAT Device



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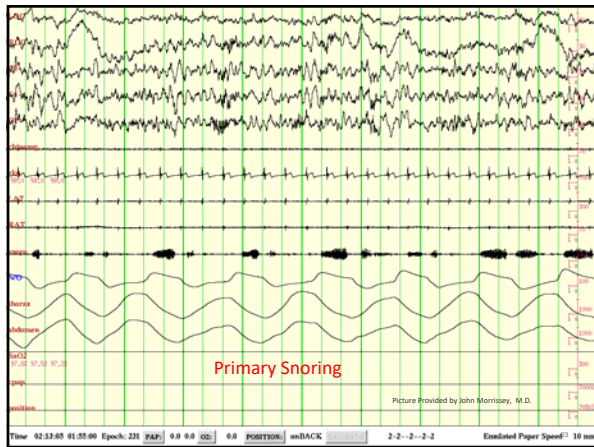
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**Scoring a Sleep Study**

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**Obstructive Apnea (OA)**

- Respiratory Effort Related Arousals (RERA), total cessation of airflow for 10 seconds with continued effort to inspire
- Statement confirming the recommended definition of hypopnea, which includes diminished airflow accompanied by **either**  $\geq 3$  percent oxygen desaturation **or** an arousal from sleep

**Obstructive Hypopnea (OH)**

- 30% drop in airflow for 10 seconds with 3% desaturation or EEG arousal

UpToDate: [www.uptodate.com/contents/polysomnography-in-the-evaluation-of-sleep-disordered-breathing-in-adults?sectionName=rule%20out%20alternatives&search=polysomnography&source=search\\_result&source=see\\_link#H000000000](http://www.uptodate.com/contents/polysomnography-in-the-evaluation-of-sleep-disordered-breathing-in-adults?sectionName=rule%20out%20alternatives&search=polysomnography&source=search_result&source=see_link#H000000000) © UnitedHealth Care. UnitedHealth Care medical policy: Obstructive sleep apnea treatment. [www.uhospovider.com/content/dam/uhospovider/docs/public/policies/comm-medical-drug/obstructive-sleep-apnea-treatment.pdf](http://www.uhospovider.com/content/dam/uhospovider/docs/public/policies/comm-medical-drug/obstructive-sleep-apnea-treatment.pdf).

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### Diagnosis of OSA

- 5 or more respiratory events per hour of sleep (polysomnography) or recording time (with HSAT) in patients with:
  - Excessive daytime sleepiness or insomnia
  - History of waking up breath holding, choking or gasping
  - History of habitual snoring or stopping breathing (witnessed)
  - HTN, CAD, CHF, Atrial fib, CVA, diabetes, mood disorders or cognitive dysfunction
- 15 or more obstructive respiratory events per hour or recording time with or without any other symptoms or comorbidities

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### Treatment of OSA

*OSA is a Chronic Disease and requires a Multidisciplinary Approach*

#### Behavioral Recommendations:

- Weight loss, rarely will lead to complete remission of OSA, but has been shown to improve overall health
  - Reduces # of apneas & O2 desaturation
  - CPAP should be used in the meantime
- Exercising may modestly improve OSA
- Avoidance of CNS depressants
- Positional therapy, patients with positional OSA should change their sleep position

UpToDate: [www.uptodate.com/contents/management-of-obstructive-sleep-apnea-in-adults?search=Obstructive%20Sleep%20Apnea%20Treatment&source=search\\_result&selectedTitle=1~150&usage-type=default&display\\_rank=1](http://www.uptodate.com/contents/management-of-obstructive-sleep-apnea-in-adults?search=Obstructive%20Sleep%20Apnea%20Treatment&source=search_result&selectedTitle=1~150&usage-type=default&display_rank=1) Behavioral Modification

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### Continuous and Bi-level PAP (CPAP/BPAP)

- CPAP = Continuous Positive Airway Pressure
  - The majority of OSA patients the first line of treatment is Continuous Positive Airway Pressure (CPAP)
- BPAP = Bi-level Positive Airway Pressure
  - Rarely indicated as first-line therapy
- How does PAP work?
  - Compresses room air at certain pressure
  - Pneumatic “splint” to keep upper airway open
- Goal
  - Abolish recurrent upper airway “collapse” or closure during sleep events!

UpToDate: <http://sleepeducation.org/news/2010/09/21/what-happens-to-my-positive-airway-pressure-doll>

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### Taking one for the team...



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### What is BIPAP?

- Bi-Level Positive Airway Pressure
- Inspiratory > expiratory pressures
- Intolerant to CPAP (requires too high a setting)
- Improves compliance
- Restrictive pulmonary dynamics
- Higher range of inspiratory pressures
- Significantly more expensive machine



Picture Provided by John Morrissey, M.D.

UpToDate: <https://www.uptodate.com/contents/what-happens-to-my-positive-airway-pressure-data>

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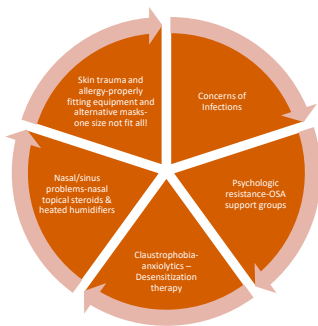
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### Few Tips to Improve Patient's Compliance with CPAP



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### CPAP/BIPAP Compliance

- Long term compliance - fair
- Comparable to medications compliance
- Mainstay treatment for OSA
- Recommended to still use CPAP/BIPAP while awaiting goal achievement if using other modalities

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### Alternatives to CPAP Therapy

Uvulopalatopharyngoplasty (UPPP)  
surgery is usually reserved as a second-line therapy

- Surgical consultation should be considered for patients who do not use CPAP or CPAP is a failure
- Surgery is rarely a complete cure for OSA
- Complications:
  - Nasal reflux & nasal speech
  - Loss of taste & tongue numbness
  - Scarring and palatal stenosis

UpToDate: [http://www.uptodate.com/contents/surgical-treatment-of-obstructive-sleep-apnea-in-adults?search=Uvulopalatopharyngoplasty&source=search\\_result&selectedTitle=1~150&usage\\_type=default&display\\_rank=1](http://www.uptodate.com/contents/surgical-treatment-of-obstructive-sleep-apnea-in-adults?search=Uvulopalatopharyngoplasty&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1)

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### Dental Appliance

Oral appliance therapy is an alternative to positive airway pressure therapy who have failed or declined CPAP

- Put on every night while asleep
- Advantages includes
  - Portability
  - Tolerability
  - Improved adherence
- Increase posterior pharyngeal space
- Oral appliances are generally less effective than positive airway pressure; effective in mild-moderate cases
- Complications: Myofacial pain and mouth malocclusion

UpToDate: [www.uptodate.com/contents/oral-appliances-in-the-treatment-of-obstructive-sleep-apnea-in-adults?search=Oral%20appliance%20in%20the%20treatment%20of%20obstructive%20sleep%20apnea%20in%20adults&source=search\\_result&selectedTitle=1~150&usage\\_type=default&display\\_rank=1](http://www.uptodate.com/contents/oral-appliances-in-the-treatment-of-obstructive-sleep-apnea-in-adults?search=Oral%20appliance%20in%20the%20treatment%20of%20obstructive%20sleep%20apnea%20in%20adults&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1)

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### Dental Appliance



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### Care Management of OSA – Value Pillars

#### Right Provider

- Obesity Specialist
- Nutrition Specialists
- Behavioral Health
- Surgeon
- Sleep Specialists

#### Right Treatment

- Sleep Study
- Pharmacologic
- Surgical
- CPAP/PAP/Oral Machine
- Dental Appliance

#### Right Care

- Ensuring right diagnosis
- Ensuring right treatment and compliance

#### Right Lifestyle

- Tobacco avoidance
- Avoidance of alcohol, sedatives or tranquilizers
- Maintain healthy weight
- Management of co-morbidities

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### Case Example

- AR is a 58 year-old post-menopausal woman who works fulltime as a cardiac nurse and has had type 2 diabetes for 20 years.
- She suffers from gastroesophageal reflux disease daily and has moderate depression.
- For 11 years, she has maintained a weight of 210–220 lb (BMI of 31 kg/m<sup>2</sup>), and she does have hypertension.
- AR drinks 2 glasses of wine nightly.
- AR has no other known diabetes complications. However, her husband states she snores and she reports being excessively sleepy all the time.

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**Case Example Questions**

Respond to the questions within the Web-ex chat area.

#1. Would AR benefit from a sleep study?

- a. Yes
- b. No

Answer a. Yes

#2. What Respiratory Disturbance Index (RDI) would qualify AR for treatment?

- a. 5 or more per hour
- b. 2 or more per hour
- c. 1 or more per hour

Answer a. 5 or more per hour

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**Case Example Questions**

Respond to the questions within the Web-Ex chat area.

#3. AR is diagnosed with OSA, the recommendation for the initial treatment therapy should be?

- a. BPAP
- b. CPAP
- c. Medication
- d. Dental appliance

Answer: b. CPAP

#4. What behavioral therapies should be discussed with AR?

- a. Weight loss program
- b. Avoid alcohol and benzodiazepines
- c. CBD oil
- d. a and b are correct

Answer: d. a and b are correct

(a. Weight loss program and b. avoid alcohol and benzodiazepines)

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**Q&A**

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