

# Obstructive Sleep Apnea

## *Evaluation and Management*

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- Disclosure: *None*

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## Three Cases with Sleep Apnea:

- Ed S, a 62-year-old man with severe obstructive sleep apnea



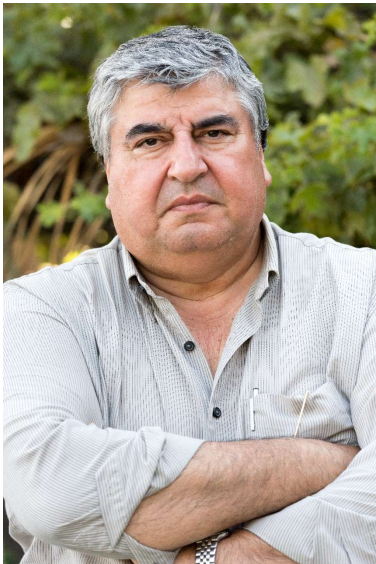
- Brian J, a 34-year-old man with mild sleep apnea



- Sally W, a 74-year-old woman with COPD and mild sleep apnea



## Patient #1 – Ed S



"I'm only doing this because *she* made me do it. I don't have a problem. My wife says I snore and choke during the night. I've never heard it. I sleep fine. I can sleep whenever I want. I usually manage to sleep through my mother-in-law's visits on Sunday afternoon, and that's a plus."

*"When do you think the snoring and choking began?"*

"Well, my wife's been complaining about it for years. I guess I snored even in college, now that you mention it. My roommates complained that I kept them up. I'm 62 now, so probably for the last 35 years or so."

## Patient #1 – Ed S (cont.)

- **“Are there times during the day when sleepiness is a problem?”**
  - “I am a programmer and I work in a cubicle. I do nod off now and then in the afternoon, but so does everyone else. My boss has mentioned it to me, though. It’s hard to hide when you are in a cubicle. (Wife: Tell him about the car accident.) Right. I did dose off at a red light and tapped the car in front of me. No big deal.”
- **“Any other medical problems?”**
  - “I’m on two medicines for hypertension, and one makes me get up to pee during the night, otherwise I am in good shape. Well, my shape is not so good. It’s rounder than I’d like it to be. I’ve gained about 25 pounds in the last two years.”

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## Key Elements of Ed’s Story

- Loud snoring, choking sounds
- Daytime sleepiness
  - Nods off in cubicle enough to attract boss
  - Car accident from sleepiness
- Poorly-controlled hypertension
- Obesity
  - Recent weight gain
  - Large neck

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## The Referral



“Ed, I’m sending you to the sleep specialist. I think you may have sleep apnea. They will perform testing, and they’ll discuss the results and treatment options with you afterward.”

## Evaluation by the Sleep Specialist

- Includes a thorough sleep history, highlighting symptoms of sleep related breathing disorders, hypersomnias including narcolepsy, insomnia, sleep related movement disorders, parasomnias and circadian rhythm sleep disorders
- Reviews past medical history for possible comorbid conditions/educate patient for associated comorbidities
- Vital signs and examination of the upper airway
- Discussion of testing (if appropriate), including pre-test instructions, patient expectations and sleep study protocols

## Choice of Testing

- Home sleep apnea testing (HSAT)
  - Testing performed at patient's home.
  - Simplified multi-channel monitoring device, limited amount of data collected
  - Appropriate for patients with suspected moderate to severe sleep apnea, with typical symptoms, and without significant comorbidities and or insomnia or movement disorder.
- In-laboratory polysomnography
  - Gold standard in diagnosis of sleep-disordered breathing and any other sleep disorders.
  - Requires an overnight stay at the sleep laboratory.



## HSAT Exclusion Criteria

- Home sleep apnea testing is **NOT** appropriate for patients with:
  - Insomnia
  - Moderate to severe pulmonary disease
  - Heart failure
  - Neuromuscular conditions
  - Hypoventilation syndromes
  - Heavy narcotic use
  - Traumatic brain injury
  - Sleep comorbidities
  - Narcolepsy, parasomnias, central sleep apnea, circadian rhythm disorders, insomnia
  - Low suspicion of sleep apnea (population screening)

## Home Sleep Apnea Test Results

- Recording time: 7 h 58 min
- Obstructive apneas: 142
- Central apneas: 2
- Hypopneas 102
- (Can not accurately measure the total sleep time)

• RDI: 33.2

• Lowest saturation: 78%

RDI = Respiratory disturbance index; over 30 events per hour of recording is severe

Moderate oxygen desaturation

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## Communication

- Ed's doctor sends clinic notes with referral to sleep specialist -> sleep specialist sends test results and treatment plan to Ed's doctor
- The sleep specialist discusses test results with Ed, implements a treatment plan (including a CPAP titration study, when necessary) and is available when questions or problems arise



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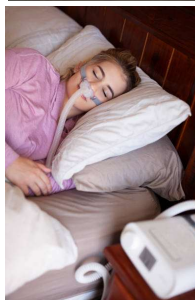
## Treatment Recommendations

- Continuous positive airway pressure (CPAP) is the most effective treatment
- Oral appliances and surgery are not as effective, especially with AHI/RDI above 15 and or significant hypoxemia ( desaturations below 80%)
- Recommend weight loss
- Monitor blood pressure – CPAP treatment may reduce the need for medication

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## Initiation of CPAP therapy

- CPAP titration study is needed to determine the correct pressure setting along with optimizing mask fit/ comprehensive education regarding what to expect with PAP therapy
  - *Adequate therapeutic pressure determination is the key to prevent common troubles.*
- APAP cannot be used in patients with:
  - Heart failure
  - Chronic lung disease
  - Central sleep apnea
  - Hypoventilation syndromes



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## CPAP Providers

- Most sleep centers work with several providers to deliver and set up CPAP equipment and instruct patients in CPAP use
- Sleep providers routinely check with patients during the first three months of treatment – resulting in increased compliance
- Mask fit and adequate pressure adjustment are critical factors in CPAP compliance
- Patient instruction and desensitization are also important for long-term CPAP use

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## Ed's Initial Response to Treatment

**"I wish I had done this years ago.** I have much more energy during the day, and I'm sleeping really well at night. I can't say that I enjoy having to put on a mask to sleep, but I think it's worth the effort. I'm more productive, and my boss isn't on my case anymore. My blood pressure went down, and I stopped the medicine that made me go to the bathroom at night.

My wife says that I don't snore with the mask on, and I'm not restless when I sleep anymore. She's getting a better night's sleep and is feeling better, too.

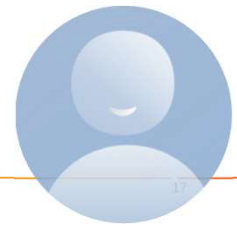


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## Problem Responses to Treatment

- ***It worked for a while but now it's not.*** The initial response to therapy may be a dramatic increase of sleep quality and energy level during the day. After a few weeks of treatment, the accumulated sleep deprivation may be resolved and a more stable level of alertness may be reached. Changes in weight may change pressure requirements.
- *Some patients a residual level of sleepiness remains even with optimal CPAP treatment. These cases must be further investigated for other sleep disorders.*



## Three Months Later ...

"Some nights I wake up and the mask is in my hand. The machine is making a beeping noise and the air is blowing like crazy.

On other nights I just can't seem to get comfortable with the mask. I have a little red mark on my forehead where the plastic rubs. I'm not sure the straps are right.

I think the air blows into my eye during the night – I wake up with a red eye most mornings.

I have a dry nose in the morning, and sometimes my whole mouth is dry.

I called my CPAP supplier, the company that delivered the machine, and they say they can't do anything else for me."



## What is the Next Step?

"Ed, let's have you go back to the sleep clinic and they will work on identifying root cause of your troubles with your PAP therapy and help

You had a really nice response to the treatment at first, and they may be able to do something to make it more comfortable."



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## Why Can't Ed Use His CPAP?

After questioning Ed and his wife, the sleep specialist concludes that Ed is having interface problems

- The mask does not feel comfortable, and he wakes with the mask in his hand
- He has a mark on his forehead from mask rubbing
- He feels that the air blows into his eye during the night, indicating a mask leak
- He has a dry nose and mouth, possibly from mouth leakage

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# Compliance Report

- A download of the compliance card that is a part of most PAP systems and is used to monitor therapy and help with troubleshooting

## Compliance Summary

Date Range	8/11/2014 - 9/18/2014 (39 days)
Days with Device Usage	39 days
Days without Device Usage	0 days
Percent Days with Device Usage	100.0%
Cumulative Usage	9 days 17 hrs. 2 mins. 15 secs.
Maximum Usage (1 Day)	9 hrs. 53 mins. 25 secs.
Average Usage (All Days)	5 hrs. 58 mins. 31 secs.
Average Usage (Days Used)	5 hrs. 58 mins. 31 secs.
Minimum Usage (1 Day)	3 hrs. 8 mins. 12 secs.
Percent of Days with Usage >= 4 Hours	87.2%
Percent of Days with Usage < 4 Hours	12.8%
Total Blower Time	9 days 18 hrs. 36 mins. 56 secs.

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# Download of the Compliance Card

- Days used 84/90
- Average use: 4 h 43 mins
- Average use (days used) 5 h 2 mins
- Percentage of days with >4 use 58%
- Leak – median (L/min) 32.8
- Leak – 95%th percentile (L/min) 71.9
- Apnea-hypopnea index (AHI) 0.9
- Central apnea index (CAI) 0.2
- Obstructive apnea index (OAI) 0.1
- Hypopnea index (HI) 0.6

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## Interpretation of Compliance Card Data

- Attempted use almost every day
- Long nightly usage, almost meeting the compliance criteria
- Good control of obstructive apneas and hypopneas
- Significant mask leakage

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## Use of Compliance Reports

- Monitoring of:
  - Compliance (frequency and duration of usage)
  - Efficacy (residual AHI)
  - Mask leakage
  - Central apnea/periodic breathing
  - Respiratory rate and tidal volume (in some bi-level devices)

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## Solutions?

- Make sure the mask is the right size
  - Improper fit is a common cause of intolerance
- Change the interface
  - Switch to nasal pillows, a full-face mask or an oral interface
  - Switch from a gel mask to a lighter mask
- Add a chin strap to reduce mouth leak
- Adjusting pressures to minimum effective range and understanding/educating proper sleep positions.
- Important to adjust humidifier settings per symptoms ( dry mouth versus nasal congestion/runny nose )

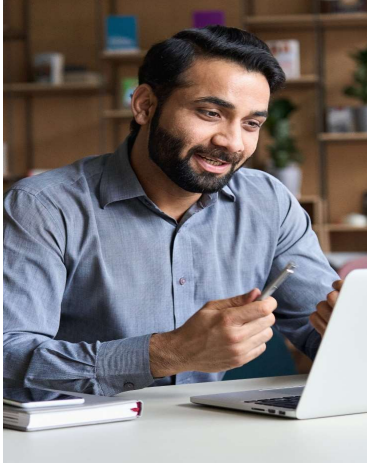
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## Treatment Recommendations

- Many patients need some modification of their CPAP equipment before they can use it consistently
- It is important to work with the DME provider (home health care company) to find the right size and type of interface
- Occasionally patients will require two interfaces that can be alternated
- Prescribe heated humidification
- Be proactive – call patients during the first few weeks of treatment to check on their progress – and be responsive to patient and spouse complaints

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## Patient #2 – Brian J



"I'm fine. Just here for my annual physical."

### ***Any problems with your sleep?***

Well, I don't sleep as well as I used to. I toss and turn during the night. I have some trouble getting up in the morning, and I'm using two alarm clocks now. I wake up with a sore throat and my mouth is dry. Lots of mornings I wake with a headache. It goes away after my shower. I'm only 34, but I feel that I sleep like an old man.

### ***Do you know if you snore?***

I sleep alone since my divorce. I've had a few girlfriends one or two did complain that I snored a bit. I think it may have something to do with the bottle of wine we shared at dinner.

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## Key Elements of Brian's Story

- Snoring
- Disrupted sleep
- Trouble waking up in the morning
- Morning headaches
- Dry mouth
- Worse with alcohol

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## Presentations of Sleep Apnea

- Typical - snoring, apneas and excessive daytime sleepiness in an overweight individual
- Atypical presentations are common:
  - Sleepiness may be minimal
  - Normal body mass index (BMI)
  - Lack of snoring
  - Insomnia

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## Sleep Study Results

### Reduced sleep efficiency

- Bed time: 11:32 PM
- Sleep latency: 29 min
- REM latency: 72 min
- Wake up time: 7:02 AM
- Total sleep time: 257 min
- **Sleep efficiency: 61%**
- Stage 1: 45 min
- Stage 2: 108 min
- Stage 3: 11 min
- Stage 4: 55 min
- REM: 38 min

AHI in mild range (5 to 15); mild oxygen desaturation

### Mostly hypopneas

- Obstructive apneas: 8
- Mixed apneas: 9
- Central apneas: 1

• **Hypopneas: 44**

• **AHI: 14.5**

• **Lowest saturation: 89%**

• **Limb movements: 74**

• **Limb movement index: 17.2**

Mild periodic limb movements of sleep

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## Key Findings

- Frequent hypopneas
- Mild apnea hypopnea index
- Mild oxygen desaturation
- Poor sleep efficiency
- Mild periodic limb movement index

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## Treatment Recommendations

- CPAP is the most effective treatment, even for patients with mild AHI
- Oral appliances are effective in some patients
- Recommend weight loss
- Limb movements may be associated with restless legs syndrome and insomnia; treatment may be necessary to improve sleep efficiency, reduce the number of awakenings at night

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## Brian's Response

"I tried but I just couldn't do it. The doctor said it would make me feel more alert during the day, but I really didn't feel anything. It was really a hassle getting the straps on and adjusting the mask. I got a cold, and the mask made me feel even stuffier. It's no big deal, right? It was just too much trouble. And it's hard to get romantic with someone and go to the bedroom and see this thing by the bed. It's just not working for me. When my time is up it's up and that's it."

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## Why isn't Brian Tolerating Treatment?

- No immediate effect on sleepiness
- Unaware of long-term effects and health risks of untreated apnea
- Worried about effects on intimacy
- Inadequate motivation

*Why try CPAP first in patients with mild apnea?*

- Patients with mild apnea are just as likely to respond to CPAP as patients with severe apnea, and CPAP is the most effective treatment for apnea.

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## Solutions?



**Educate patient regarding the consequences of untreated sleep apnea**



**Provide short-term feedback**  
-For example, monitor effects on blood pressure



**Explain benefits of partial night or intermittent use**



**Discuss alternative therapies**  
-Oral appliances  
-Surgical modification of the upper airway

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## Behavioral Therapy of OSA

- Weight loss, ideally to body mass index of  $<25$  kg/m<sup>2</sup>
- Physical exercise
- Avoidance of the supine position of sleep
  - With help of positional devices
- Avoidance of sedatives and alcohol before bedtime



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## Treatment Recommendations

- Use CPAP as much as possible
- Don't give up if you skip a night
- Consult with a dentist for possible oral appliance
- Consult with an ENT for possible surgery options



Epstein LJ. J Clin Sleep Med. 2009 Jun 15;5(3):263-76.

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## Oral Appliances

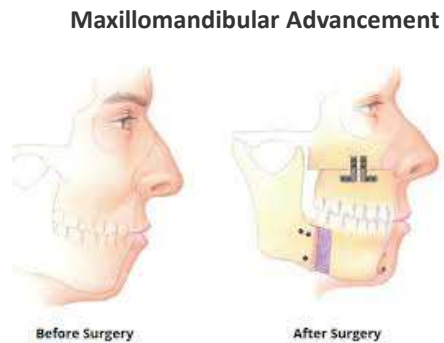
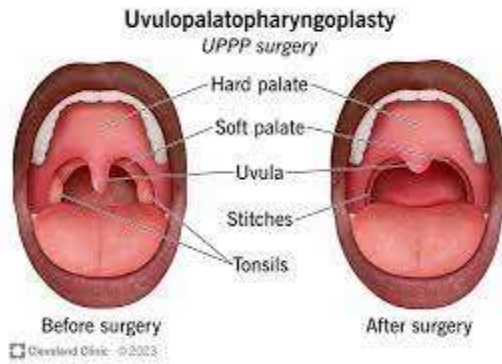
- Custom-fit appliances work better than “boil and bite” appliances, but require experience and expertise for construction and fitting
- May cause temporo-mandibular joint problems
- An experienced dentist, such as a member of the American Academy of Dental Sleep Medicine, is an important resource for treatment of snoring and obstructive sleep apnea (<http://www.aadsm.org/>).



Kushida CA. Sleep 29(2):240-243, 2006.

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## Surgical Approaches

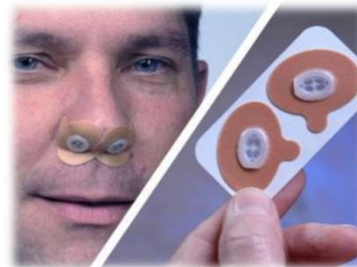


- A variety of soft tissue and mandibular procedures have been used for treatment of snoring and obstructive sleep apnea
- Treatment outcomes are variable, and no good predictors of success have been developed

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## New Alternative Therapies

- Upper airway stimulator
- Oral pressure therapy
- Positive pressure nasal valves



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## Patient #3 – Sally W

**“Can I have more medicine for my COPD at night?”**

***Why do you ask?***

My breathing is terrible at night. As soon as I lie down, I feel like I can't breathe. My husband says that my breathing gets very quiet at night and sometimes he's not sure I'm still alive. He's very nervous about it.

***Are you using the oxygen at night?***

Yes, but I'm not sure it's helping. I still wake up a lot during the night.

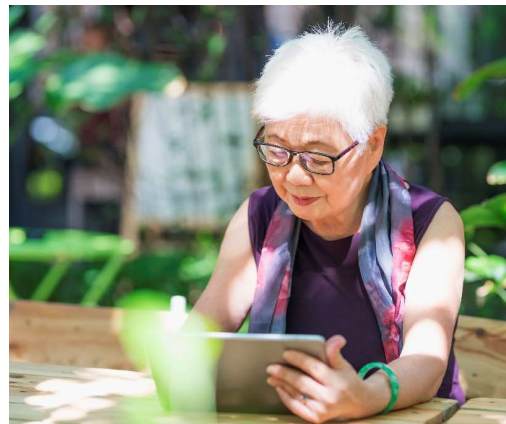
***Are you sleepy during the day?***

Oh, heavens yes! The grandchildren were visiting and running around the house as usual. I sat down for a minute at the dining room table and the next thing I knew little Jennifer was tugging at my sleeve and asking me why I fell asleep.



## Key Elements of Sally's Story

- COPD
  - Estimated 20% to 40% of COPD patients have sleep apnea
  - Some treatments for COPD (such as bronchodilators) cause insomnia
- Witnessed apnea
- Daytime sleepiness



## Sleep Study Results

- Bed time: 9:21 PM
- Sleep latency: 11 min
- REM latency: 48 min
- Wake up time: 4:42 AM
- Total sleep time: 325 min
- Sleep efficiency: 76%
- Stage N1: 49 min
- Stage N2: 211 min
- Stage N3: none
- REM: 65 min

Normal age-related changes of sleep pattern: early bedtime, reduced latency to REM sleep, reduced sleep efficiency, absence of Stage N3 sleep

- Obstructive apneas: 28
- Mixed apneas: 17
- Central apneas: 9
- Hypopneas: 4

Mild, predominantly obstructive apneas

• AHI: 10.7

• Lowest saturation: 59%\*

\* Recorded without supplemental oxygen

Marked oxygen desaturation

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## Key Findings

- Abnormal
  - Mostly obstructive, mild apnea
  - Severe oxygen desaturation
- Common in elderly patients
  - Early bedtime
  - Reduced REM latency
  - Poor sleep efficiency



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## Treatment Recommendations

- Either CPAP or BPAP can be used for patients with a combination of OSA and COPD (overlap syndrome)
- Additional oxygen may be necessary, and can be bled in through the PAP mask
- Early bedtime, reduced REM latency and reduced sleep efficiency are common in the elderly and usually do not require treatment

## Sally's Story Continues

"I knew from the start that I wasn't going to like the machine. Just the thought made me nervous. And when they put the mask on my face, I thought I was going to die. All that noise and the air rushing in. How do they expect anyone to sleep with that?"

## Why Isn't Sally Using CPAP?

- Anxiety about use of CPAP
- Feelings of claustrophobia
- Problems tolerating pressure

## What Can Be Done?

- Desensitization training – a Behavioral Sleep Medicine specialist can help (see <http://www.behavioralsleep.org>)
- Use of ramp feature to gradually increase pressure
- Trying different mask and/or adjusting pressures
- In some cases temporary use of a hypnotic may be helpful



## Treatment Plan



### Desensitization program –

Initially wear mask without pressure  
Provide reassurance and encouragement  
Wear mask while awake with low pressure  
Gradually increase pressure to prescribed level  
Use ramp feature at sleep onset if necessary



### Education, encouragement and reassurance



### Follow-up with additional treatment modifications as needed.

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## CPAP Compliance Statistics

- Compliance varies greatly – 46% to over 80% in various studies
- Compliance is not related to severity of apnea or pressure required for treatment
- Good sleep during the titration study predicts compliance
- Interventions have an effect
  - Several studies show positive effect of heated humidification
  - Desensitization programs increased compliance
  - Reducing anxiety and improving knowledge about sleep apnea improves compliance



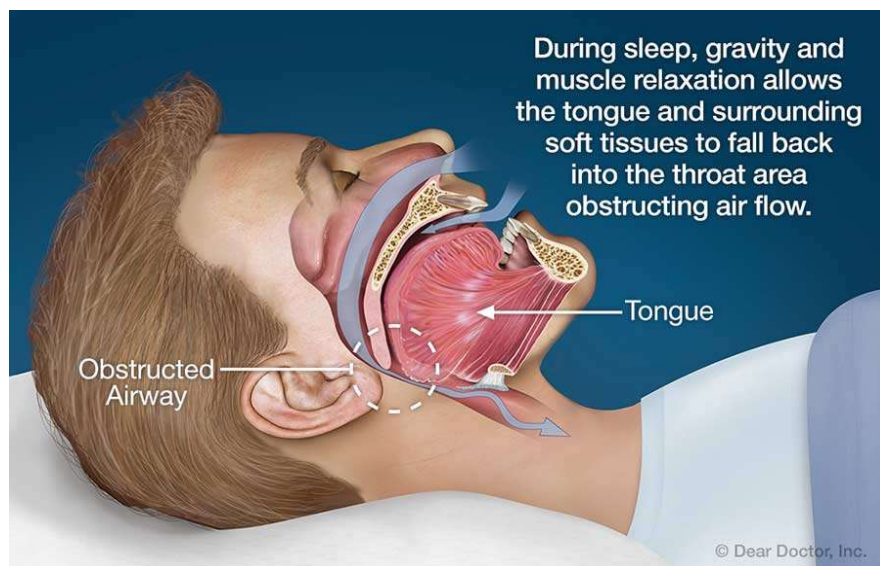
Gay, P. SLEEP 2006;29(3):381-401.

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# Sleep Apnea

It's common	It's easily diagnosed	It's treatable
Estimated 9% of men and 4% of women ages 35 – 65	A polysomnogram is the gold standard, but a home sleep apnea test is acceptable in a high-risk patient	Most patients tolerate CPAP therapy Other options are available

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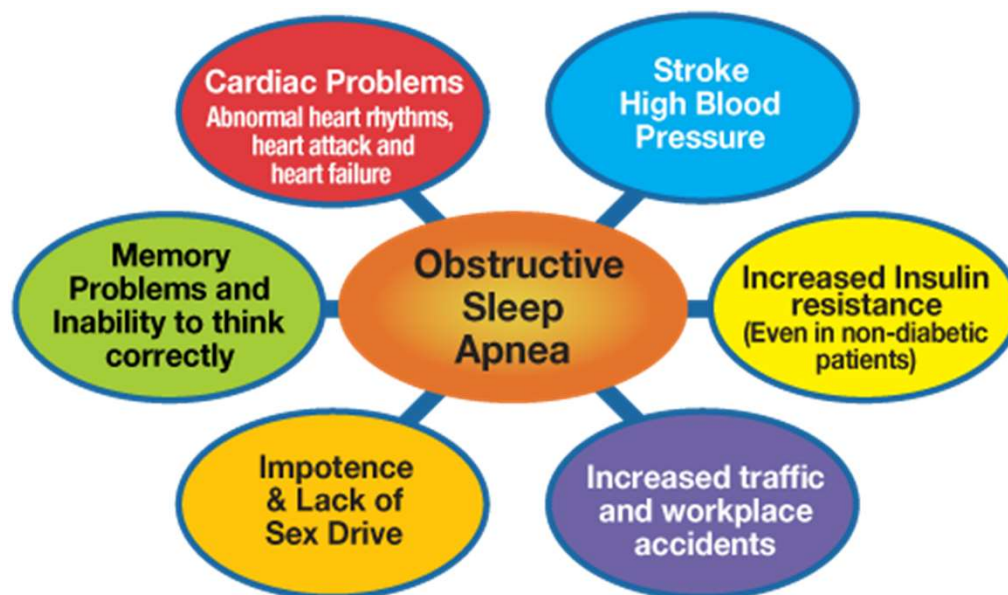
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TABLE. APNEA-HYPOPNEA INDEX SCORE CLASSIFICATION FOR ADULTS	
APNEA SEVERITY	APNEA-HYPOPNEA INDEX (AHI) (EVENTS/HOUR OF SLEEP)
Normal	<5
Mild	$5 \leq \text{AHI} < 15$
Moderate	$15 \leq \text{AHI} < 30$
Severe	$\geq 30$

Apnea: The complete cessation of airflow at least 10 sec.

Hypopnea: at least 50% reduction of airflow for at least 10 sec with oxygen desaturations of 3-4 %.

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## For More Information

- Patient information developed by the American Academy of Sleep Medicine (AASM) is available at <http://sleepeducation.org/>
- Up-to-date versions of AASM Practice Parameters may be downloaded from: <http://www.aasmnet.org/Practiceguidelines.aspx>
- AASM courses are listed at: <http://www.aasmnet.org/upcomingcourses.aspx>
- AASM educational products are available at: <http://www.aasmnet.org/educationandcareer.aspx>
- Become an AASM member: <http://www.aasmnet.org/Membership.aspx>

