AMERICAN COLLEGE OF OSTEOPATHIC INTERNISTS

Internal Medicine Board Review

Sleep Medicine

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Course Disclosures

I'm not as old as I look,

I like pizza & beer

I have no disclosures, conflicts of interest related to this subject or talk

Learning Objectives

- Describe the normal & physiologic changes that occur during sleep.
- Define the risk, diagnosis and consequences of sleep related diseases, such as insomnia, narcolepsy and RLS.
- Define the risks, diagnosis and consequences of sleep apnea (OSA).
- Review potential treatment options for sleep related disorders.

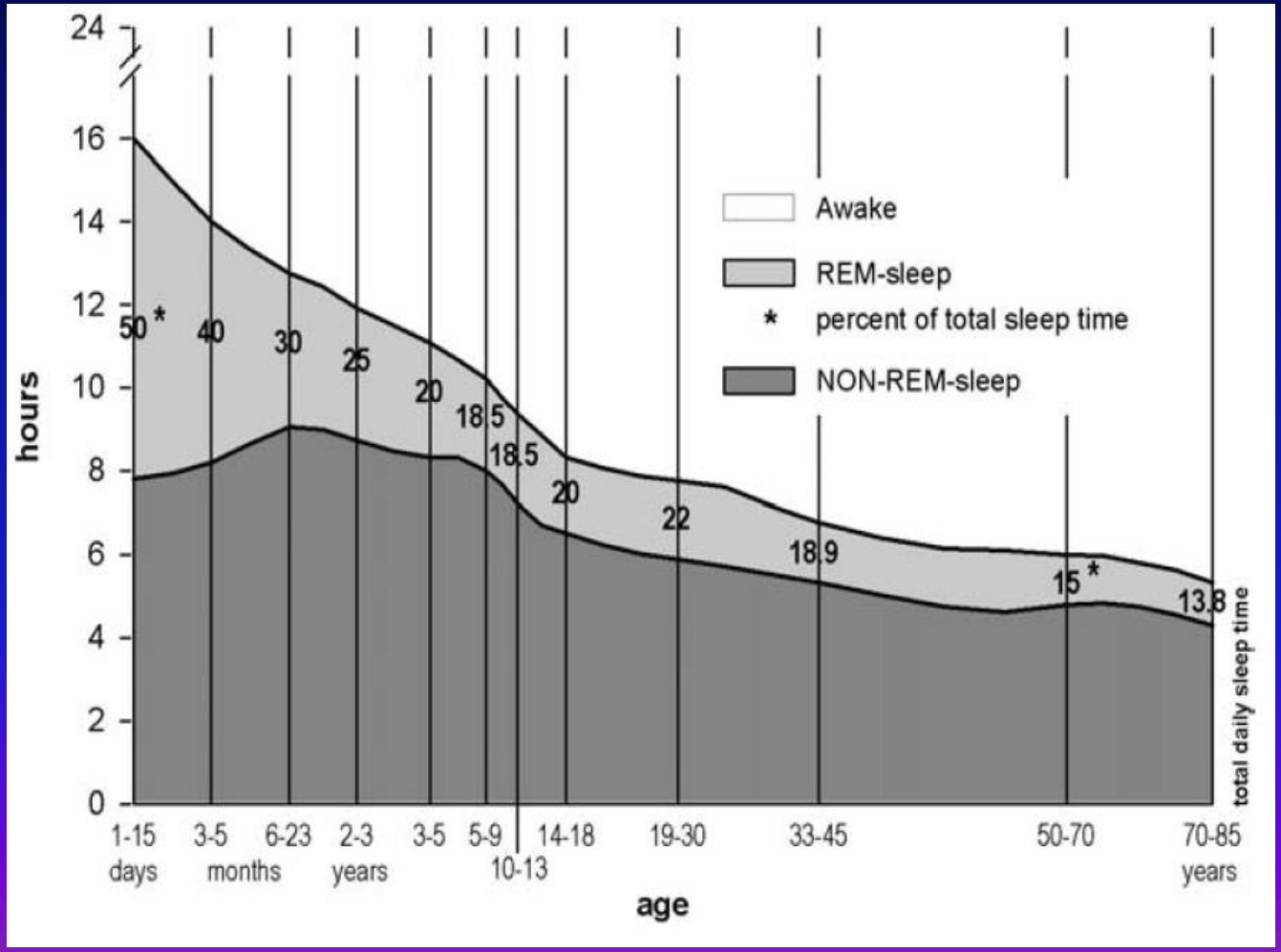
Normal Adult Sleep Overview

- **Non REM [Stages I – 3]**
  - Stage 1 light sleep (10 minutes long)
  - Stage 2
  - Stage 3 deep sleep
  - 80% of total sleep time (TST)
  - Majority of sleep is in Stage 2 (50%)
- **REM (Rapid Eye Movement)/Dream Sleep**
  - 20% of total sleep
  - Cycles every 90 - 120 minutes
  - Duration (time) prolongs during the night

Sources: ATS Core Curriculum 2014: Part III. Adult Sleep Medicine. Ann Am Thorac Soc Vol 11, No 9, pp 1480

Physiologic Changes in Sleep

- **Body clock shifts earlier with age.**



Sources: Hobson. Sleep and Dreaming. In: Fundamental Neuroscience. 1999; Roffwarg et al. Science, 1996; 152:604

Insomnia
Overview of the Problem

- **Lifetime prevalence 30 - 35% (“serious” in 15%)**

- **Much worse in elderly:** **Sex ratio: ♀ ≥ ♂**
- **Short-term insomnia:** **Days to weeks - stress event.**
- **Persistent insomnia:** **Months to years.**

Types:

  - **Medical (pain, thyroid, arthritis, GERD)**
  - **Psycho-physiological + substances**
  - **Primary insomnia**

Winkelman JW. Insomnia Disorder. N Engl J Med 2015; 373:(15): 1437 - 44.

Question

Which of the following statements about insomnia is false?

A. **> 50% with insomnia have a psychiatric disorder.**

B. **Various physical symptoms are associated with insomnia (pain, IBS, limitations in mobility).**

C. **A meta-analysis of 20 studies concluded that persistent insomnia is associated with doubling of the risk of depression.**

D. **Insomnia is a rare condition.**

Winkelman JW. Insomnia Disorder. N Engl J Med 2015; 373:(15): 1437 – 44

Ford DE et al Epidemiologic study of sleep disturbance and psychiatric disorders: an opportunity for prevention? JAMA 1989; 262: 1479- 84.

Psychophysiological Insomnia ("learned" or "behavioral")

- **Psychophysiological = "learned" insomnia:**
  - **"can't turn my mind off,"**
  - **iPhone and iPad / internet overuse in bed,**
  - **variable bedtimes,**
  - **start projects in late evening.**

- **Treatment:**
  - **Cognitive behavior therapy,**
  - **Sleep logs,**
  - **Correct erroneous ideas about sleep, relaxation,**
  - **Sleep study is rarely necessary,**
  - **Use of hypnotics = short-term only.**

Insomnia Treatment

- **Short-Term Insomnia: forms a huge fraction of general practice (exam stress, marital breakup, illness in family, financial).**
  - **Rx: BZDs, Zopiclone, Zaleplon for 1- 4 weeks.**
  - **Discuss/talk about the stressor!**
  - **Do not treat with long term medications.**

- **Persistent Insomnia: Keep up your search for diagnosis of depression, bipolar, anxiety disorders.**
  - **Treatment: Cognitive behavioral therapy, sedating antidepressants or mood stabilizers long-term.**

Sleep Case Question

A 23 year old is referred for excessive sleepiness after having fallen asleep while driving. She often struggles to remain awake. She occasionally feels weak when laughing. Once, she fell to the ground while laughing during a party and could not get up for a few minutes. If she is sleepy, she imagines seeing animals. Once she was terrified to find herself unable to move after awakening.

Which of the follow test is most appropriate?

A. Order a sleep study
B. Obtain multiple sleep latency test
C. Cognitive behavioral therapy
D. Discuss sleep hygiene

Differential Diagnosis of Daytime Sleepiness

Diagnosis	Distinguishing Characteristics
Insufficient Sleep	Sleep decreases with more sleep on weekends and holidays.
Sleep Apnea	Snoring, witness sleep, obesity, Upper airway changes, Large tongue, Small jaw.
Periodic limb movement	Sleep disrupted by kicking movements, often occurs with the RLS, Iron deficiency, uremia, and neuropathy.
Shift work disorder	Sleepiness when working at night, insufficient sleep during the day.
Depression	Increase time in bed but little function sleepiness on testing.

Thorpy MJ. Delayed diagnosis of Narcolepsy Sleep Med 1004; 15: 502 -507.
Scammell, TE.N Engl J Med 2015; 373:2654-2662.

Narcolepsy (Na-1)

- The core feature of narcolepsy is chronic (≥3 months), excessive daytime sleepiness; Daytime Sleepiness.

- Two major forms:
  - Narcolepsy Type 1 (Na-1) = Cataplexy & low CSF Hypocretin-1
  - Narcolepsy type 2 (Na-2)

- Fragments of REM sleep

  Cataplexy - transient, sudden-onset loss of skeletal muscle tone with retained consciousness, most commonly in response to a strong emotion (eg, laughter, anticipation, or anger)

  Hypnagogic hallucinations - vivid, dream-like hallucinations at the beginning or end of sleep.

  Hypnopompic Hallucinations - (during awakenings).

  Sleep paralysis – temporary inability to move voluntary muscles at sleep-awake transitions.

Aldrich, MS. N Engl J Med 1990; 323:389-394.
Scammell, TE. N Engl J Med 2015; 373:2654-2662.

Narcolepsy Tetrad

Narcolepsy Symptoms	Sensitivity	Specificity
Daytime Sleepiness	100%	Low
Cataplexy	60 – 70%	100%
Hallucinations		
Hypnagogic	30 – 60%	Common
Hypnopompic	30 – 60%	Low
Sleep paralysis	25 – 50%	Low

Atri A et al. Sleep Medicine for the Neurologist. Hospital Med 13(5) 2009
Insomnia, parasomnias, and narcolepsy in children: clinical features, diagnosis, and management. Lancet Neurol 2016; 15: 1170–81

Sleep Case Question

Which one of the following statements about the clinical manifestations of narcolepsy is true?

A. Affected persons tend to have a low body-mass index (BMI).

B. Complex auditory hallucinations are common.

C. Rapid-eye-movement (REM) sleep can occur at any time of day.

D. Symptoms usually begin in midlife.

WHAT IS NARCOLEPSY?

THIS ISN'T....

THIS IS!

Multiple Sleep Latency Test

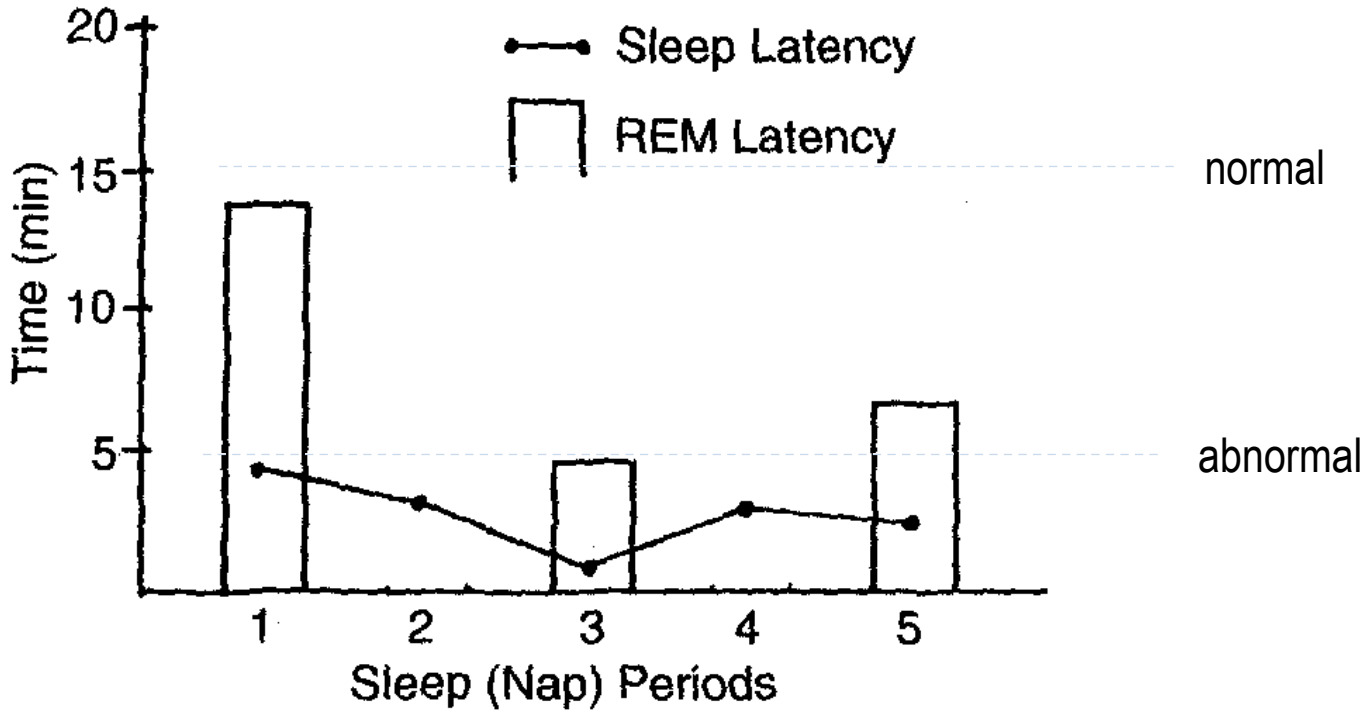


Figure 35. The results of L.I.'s Multiple Sleep Latency Test.

Sleep, Dreaming, & Sleep Disorders: An introduction" (2nd ed.)
by William H. Moorcroft, New York, University Press of America Inc., 1993,
ISBN 0-8191-9251-1. page 329.

Sleep Question

Which one of the following statements about the pathogenesis, diagnosis, and treatment of narcolepsy is true?

A. Patient report a normal QoL score.

B. MSLT is optional.

C. Cataplexy often is reduced with a low dose of an antidepressant.

D. No genetic factors are present.

Treatment of Narcolepsy

- Wake-promoting agents
  - Modafinil / Armodafinil (Provigil / Nuvigil)
    - Likely increase dopamine signaling
  - Amphetamines
    - e.g. Methylphenidate

- REM-suppressing drugs
  - Increases norepinephrine and serotonin
    - Venlafaxine (Effexor, Effexor XR, Lanvexin)
    - Fluoxetine (Prozac)
    - Tricyclic
    - Sodium oxybate (Xyrem) qHS (analog of GHB, GABA analog)

Bhattarai J, Sumerall S. Current and Future Treatment Options for Narcolepsy: A Review. *Sleep Sci*. 2017;10(1):19-27.

Hemodialysis
Levodopa/carbidopa
Ropinirole

Question

What kind of disorder is Willis-Ekbom disease?

- **A. Testing taking anxiety disorder**
- **B. Neurological disorder**
- **D. It is the name of the disorder where residents fail to know about RLS**
- **E. Both A and D**

Hemodialysis
Levodopa/carbidopa
Ropinirole

Question

Which is true regarding Willis-Ekbom disease?

A. Usually improves as people get older.

B. Does not significantly disturb sleep.

C. Coping stratifies, sleep hygiene and avoidance of alcohol, caffeine, nicotine can be helpful.

D. Dopamine agonist worsens disease.

Restless Leg Syndrome

- Prevalence is about 2% to 15% of the general population, depending on ascertainments.

- Varies in severity,
  - some mild, infrequent symptoms
  - some severe, daily symptoms that cause substantial sleep disturbance and reduce quality of life.

- More common in: chronic kidney disease, iron deficiency anemia, pregnancy, diabetes & chronic neurologic disorders
- Exacerbated by drugs: calcium channel blockers.

Guy Leschziner, and Paul Gringras. Restless legs syndrome BMJ 2012; 344: e3056.
Ekrom KA, Restless legs syndrome. A Clinical Study. Acta Med Scand 1945; 158 (suppl):1 -122.

Hemodialysis
Levodopa/carbidopa
Ropinirole

Question

Restless leg syndrome symptoms primarily occurs?

A. In the morning.
B. During this long board review lectures.
C. In the evening or at night.
D. In the winter months.

Hemodialysis
Levodopa/carbidopa
Ropinirole

Question

Who is most likely to suffer from RLS?

A. Men.
B. Women.
C. Children.
D. Residents but not medical students.

Hemodialysis
Levodopa/carbidopa
Ropinirole

Question

Which of the following is the best way to diagnose restless leg syndrome?

A. CT scan of the legs.
B. Specific list of criteria made clinically.
C. Via the results of a sleep study.
D. With the use of EMG.

Restless Leg Syndrome
Diagnostic Criteria for Restless Legs Syndrome

- **An urge to move the legs usually but not always accompanied by, or felt to be caused by, an uncomfortable and unpleasant sensations in the legs.**
- **The urge to move the legs and any accompanying unpleasant sensations begin or worsen during periods of rest or inactivity, such as lying down or sitting.**
- **The urge to move the legs and any accompanying unpleasant sensations are partially or totally relieved by movement, such as walking or stretching, at least as long as the activity continues.**
- **The urge to move the legs and any accompanying unpleasant sensations during rest or inactivity only occur or are worse in the evening or night than during the day.**
- **The occurrence of the above features are not solely accounted for as symptoms primary to another medical or a behavioral condition (e.g., myalgia, venous stasis, leg edema, arthritis, leg cramps, positional discomfort, habitual foot tapping).**

Allen RP, Picchietti D, Hening WA et al. RLS: NIH Workshop. Sleep Med 2003 4(2): 101 -19.
Restless Leg Syndrome in Neurologic and Medical Disorders., Askenasy N,Askenasy JJ,, Sleep Medicine Clinics, 2015 Sep

Diagnostic Mimics of Restless Legs Syndrome

Table. Diagnostic Mimics of Restless Legs Syndrome*

Symptom	Number of Criteria†	Distinguishing Factors	Coexists
Leg cramps	4 of 4	Muscle spasm	+
Neuropathy	1 of 4	Numbness, burning, tingling, no urge to move.	+++
Arthritis	2 of 4	Discomfort in joints at rest; improves with movement	++
Vascular	2 of 4	Varied: Worse with walking; ± relief with movement; varicosities, Signs of peripheral vascular disease	++
Akathisia	4 of 4	Urge to move, all over, caused by dopamine antagonists	++

Courtesy of J.W. Winkelman, MD, PhD. † The 4 criteria listed refer to the first 4 diagnostic criteria listed in the Box (Diagnostic Criteria for Restless Legs Syndrome From the International Restless Legs Syndrome Study Group).

Hemodialysis
Levodopa/carbidopa
Ropinirole

Question

What is the polysomnographic pattern associated with restless leg syndrome?

A. Reduced time in REM sleep.
B. Excessive body movement, frequent arousals.
C. There is no PSG pattern associated.
D. Periodic limb movements.

Hemodialysis
Levodopa/carbidopa
Ropinirole

Question

Which of the following medications is least likely to exacerbate restless leg syndrome?

A. Imipramine (Tofranil)
B. Paroxetine (Paxil)
C. L-dopa
D. Diphenhydramine (Benadryl)

Restless Leg Syndrome Treatment

- Non-pharmacologic treatment focusing on correcting contributing factors:
  - Replace low iron stores (< 50 mg/L),
  - Removal of offending medications,
  - Distraction strategies.

- Recommendations are formed mainly from clinical experience rather than empirical data.

- In patients with moderate – severe disease, the clinical efficacy of dopamine agonists, and more recently alpha-2 delta ligands (e.g., gabapentin or pregabalin) has been established.

Trenkwalder C, Hening WA, Montagna P et al. Treatment of Restless Legs Syndrome: an evidence base review and implications fro clinical practice. 308; 23: 2267-302. The International Restless Legs Syndrome Study Group).

Case Question

A 52-year-old is evaluated in follow-up after undergoing surgery weeks ago. The surgical procedure was uncomplicated, but he requires reintubation in the recovery room following to persistent hypoxemia. He was extubated 24 hours later without difficulty.

He is on three medications for high blood pressure. Examination reveals normal temperature and blood pressure of 128/84 mmHg; his heart rate is 78 bpm; respiratory rate is 14; BMI is 38. Oxygen saturation is 97% on room air. The examination is notable for a low-lying soft palate and thick neck. Lungs & cardiac examinations are normal. The surgical incision is healing, and the remainder of the examination is unremarkable.

Which are the following is most appropriate next step in management?

A. Overnight pulse oximetry
B. Polysomnography
C. StopBANG questionnaire
D. No additional testing

Practice guidelines for perioperative management of patients with obstructive sleep apnea: An updated report by the American Society of Anesthesiologist Task Force on Perioperative Management of patients with obstructive sleep apnea. Anesthesiology 2000; 14 (2): 268-286.

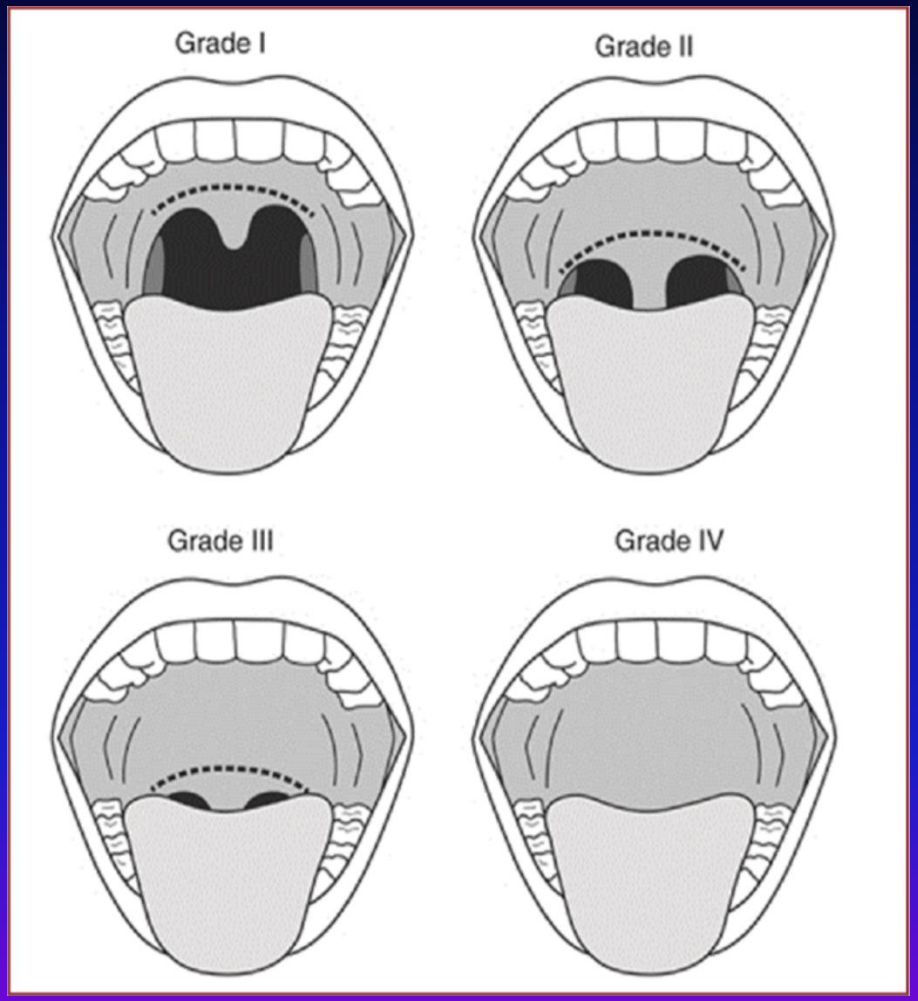
Obstructive Sleep Apnea
Risk Factors

- Age (≥ with age = 50% at 65 years old)
- Gender (♂ 2 -3x ≥♀)
- Post menopausal state (3x risk)
- Family History of Sleep apnea
- Overweight & Obesity (neck size, >BMI)
- Upper airway anatomic changes
  - (micrognathia, retrognathia, TMJ, macroglossia)
- Medical Conditions
  - Atrial Fibrillation
  - Heart Failure (Diastolic & Systolic)
  - Down's syndrome, Thyroid, Polycystic Ovarian)

Strohl KP, et al; An official American Thoracic Society Clinical Practice Guideline: sleep apnea, sleepiness, and driving risk in noncommercial drivers. Am J Respir Crit Care Med. 2013;187:1259-66. [PMID: 23725615]

Obstructive Sleep Apnea
Risk Factors

- **Airway anatomic changes:**
  - **Micrognathia,**
  - **Retrognathia,**
  - **TMJ,**
  - **Macroglossia,**
  - **Neck circumference;**
    - ♀ **> 17 inches**
    - ♂ **>16 inches**



Modified Mallampati Classification

The mouth is evaluated with the patient in a sitting position with higher risk for OSA. Grade I = soft palate, uvula, tonsillar fauces, and pillars visible; grade II = soft palate, uvular, and tonsillar fauces visible; grade III = only soft palate and base of uvula visible; grade IV = only hard palate visible.

Obstructive Sleep Apnea
Physical Examination

Structural Abnormalities

Guilleminault C et al. Sleep Apnea Syndromes. New York: Alan R. Liss, 1978.

Sleep Apnea Consequences

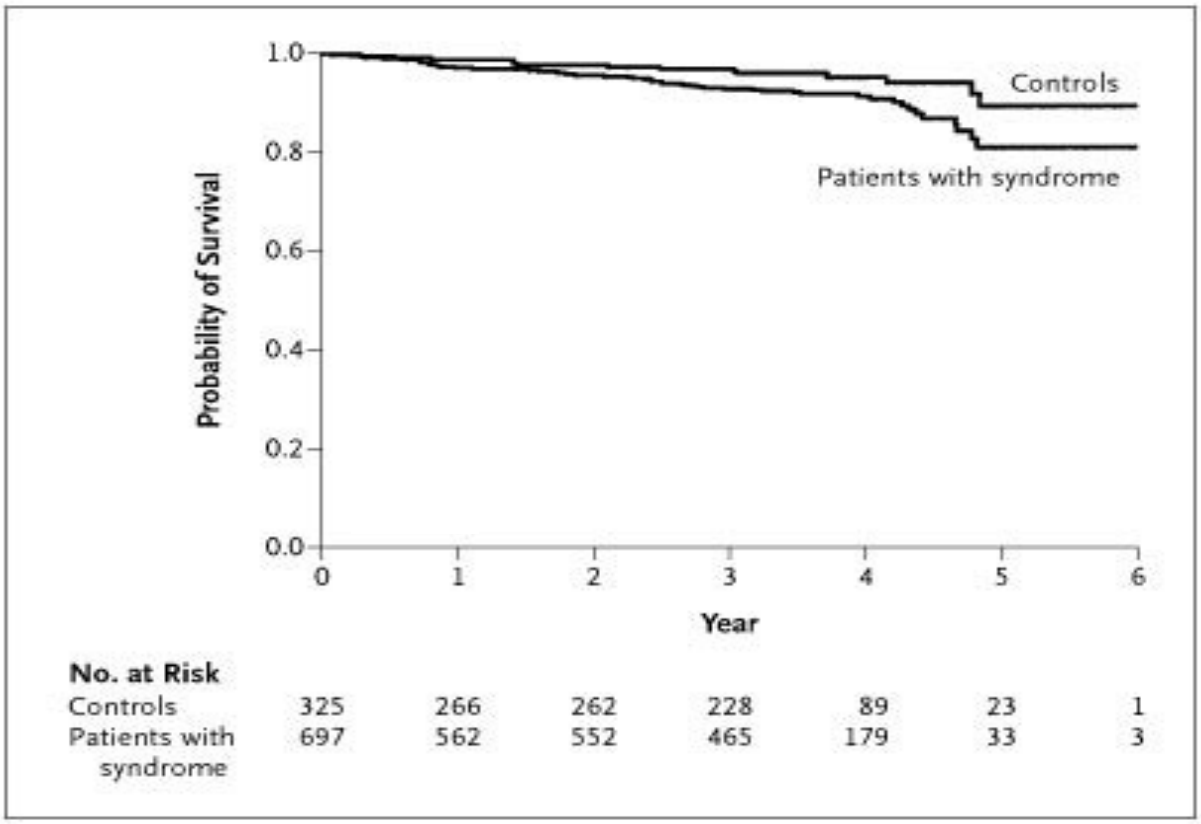
- **Cardiovascular**
  - Increase risk for HTN, MI, Strokes & Sudden Death
  - Possibly worsens Diabetes (insulin resistance)
  - Risks; Dependent of desaturations not AHI
- **Psychological**
  - Higher rates of depression
  - Worsen quality of life (QoL)
  - Sexual Dysfunction
- **Neurological**
  - Cognitive deficiencies are higher

OSA Increase Co-Morbid Health Risk

N =1022

Study mean AHI = 35
Control AHI = 2

Results: Stroke or Death from any cause (hazard ratio, 2.24; 95 percent confidence interval, 1.30 to 3.86; P=0.004).



OSA syndrome significantly increases the risk of stroke or death (HR ratio, 2.24) from any cause, and the increase is independent of other risk factors.

H. Klar Yaggi, M.D., M.P.H., John Concato, M.D., M.P.H., et al. N Engl J Med 2005; 353:2034-2041

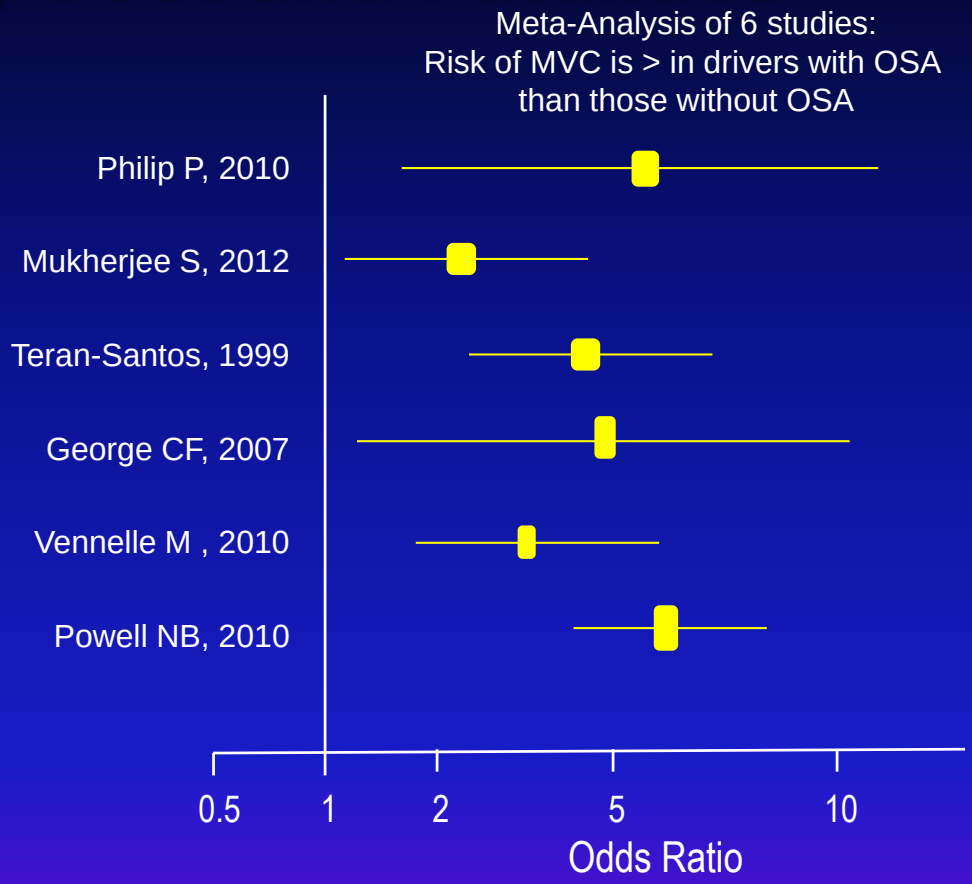
Excessive Sleepiness and Driving Collisions, Cost and Fatalities

Consequences of OSA

- 810K collisions
- $ 15.9 billion in cost
- 1,44 fatalities

Estimated cost-saving with CPAP

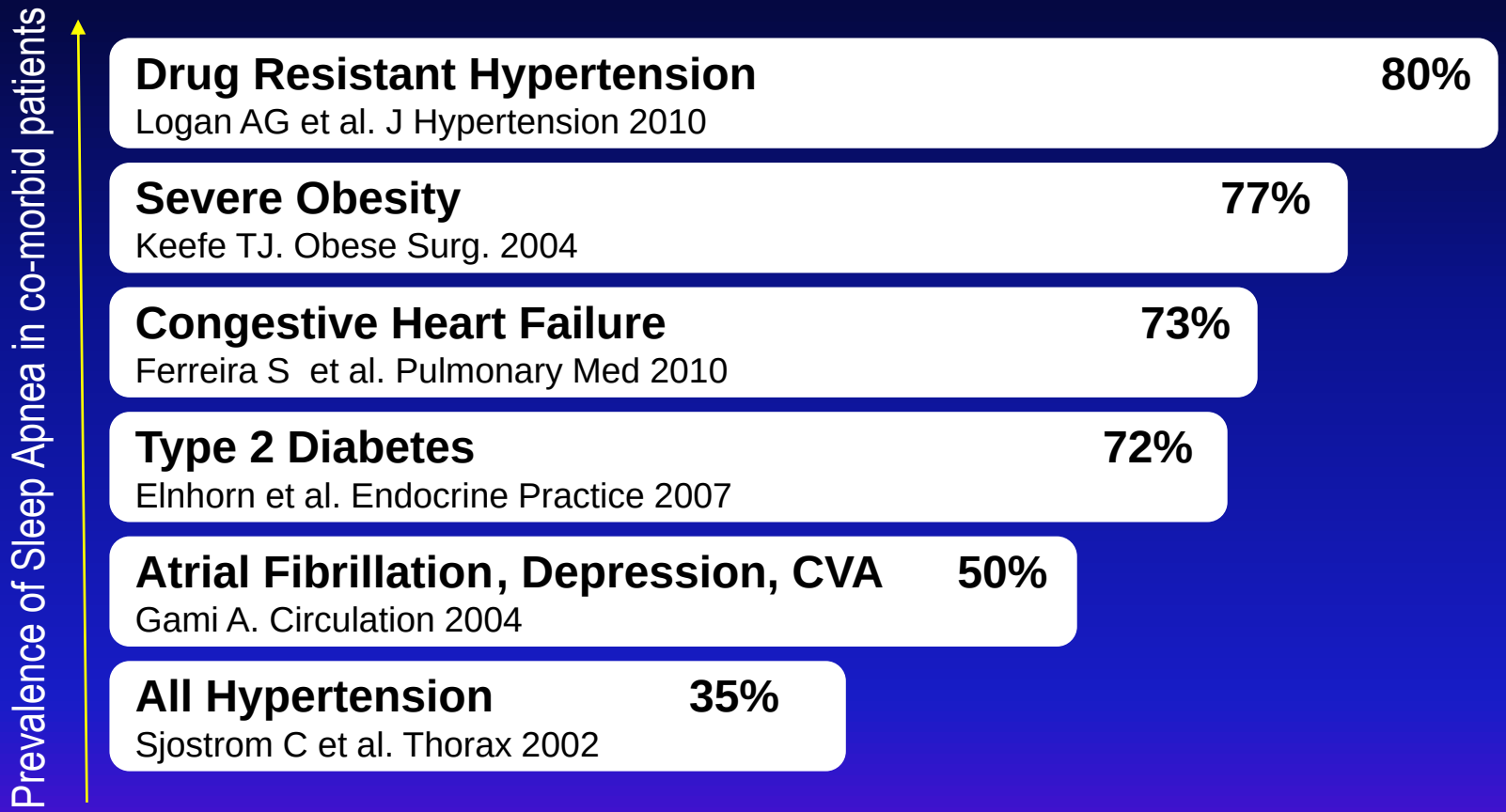
- Prevent > 500k collisions
- Reduced cost by $11 billion
- Save nearly 1,000 lives



There is a strong association between sleep apnea, as measured by the apnea-hypopnea index, and the risk of traffic accidents.

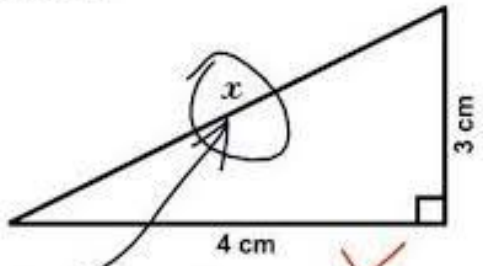
Strohl K, Brown D, Collop N., et al. American Thoracic Society Clinical Practice Guideline: Sleep Apnea, Sleepiness, and Driving Risk. An Update. Am J Respir Crit Care Med 2013; 187 (11): 1259–1266

OSA Prevalence Co Morbid Health Risk



H. Klar Yaggi, & John Concato, et al. N Engl J Med 2005; 353:2034-2041.
Kapur VK, Auckley DH, Chowdhuri S, Kuhlmann DC, Mehra R, Ramar K, et al. Clinical practice guideline for diagnostic testing for adult obstructive sleep apnea: an American Academy of Sleep Medicine clinical practice guideline. J Clin Sleep Med. 2017;13:479-504

3. Find x.



Here it is X O

There are 300 students in Year 10. Mary and Mark want to find out Year 10's favourite colour.
Mary asks 30 people.
Mark asks 150 people.
Mark says 'My conclusions are more likely to be reliable than Mary's'.
Why does Mark think he is right?

Because Mark is a man

8. The first cells were probably...?

lonely.

What ended in 1896?

1895

2p 1)Brian has 50 slices of cake. He eats 48. What he has now?

Diabetes. Brian has [illegible] diabetes X

Type I

Sleep Question 30%

A 59-year-old was evaluated for a 4 month history of worsening lower extremity edema and dyspnea. Medical history is positive for dyslipidemia, hypertension and diabetes. His current medications are simvastatin, lisinopril, aspirin and insulin.

His blood pressure is 144/86 mmHg, BMI is 42, neck circumference 18.5 inches. Exam is normal except venous stasis and bilateral edema. His hemoglobin is 16.8 g/dL. Arterial blood gases pH 7.36, PCO_2 of 52 mmHg, a PO_2 of 53 mmHg. Echocardiogram shows a normal ejection fraction with dilated right ventricle with elevated pulmonary systolic pressures. Chest radiograph and FEV_1 are normal.

Which of the following is the most likely diagnosis?

A. Cheyne-Stokes breathing
B. Chronic obstructive pulmonary disease
C. Interstitial lung disease
D. Obesity hypoventilation syndrome

Obesity Hypoventilation Syndrome

- Diagnosis:
  - BMI > 30 kg/m^2
  - (25%) with BMI > 40 kg/m^2
  - (50%) with BMI > 50 kg/m^2
  - Elevated awake $PaCO_2$ (> 45 mmHg)
  - Unable to attribute to other etiologies of hypoventilation (Drugs, CNS, Neuromuscular disease)
- Mechanism is unclear
- OSA is common (90%)
- Pulmonary HTN = OHVS >>> OSA

Obstructive Sleep Apnea Testing/Diagnosis

- Sleep partners history
- Snoring & Witness Apnea (PPV 64%)

Sleep Case Question

30-year-old is evaluated for daytime fatigue for 9 months. He denies falling asleep while driving but falls asleep at other times during the day. He reports no leg symptoms. He has no significant medical history and takes no medications.

On exam: the vital signs are normal, BMI is calculated at 33. Neck circumference is 43 cm (17 inches). Pharynx is normal. The lungs, cardiovascular, & neurologic examinations are unremarkable.

In addition to counseling regarding sleep hygiene & weight loss, which is the following is the most appropriate management in this patient?

A. Advise alcohol abstinence
B. Initiate therapy with zolpidem (Ambien)
C. Order iron studies
D. Referred for polysomnography

Obstructive Sleep Apnea Testing/Diagnosis

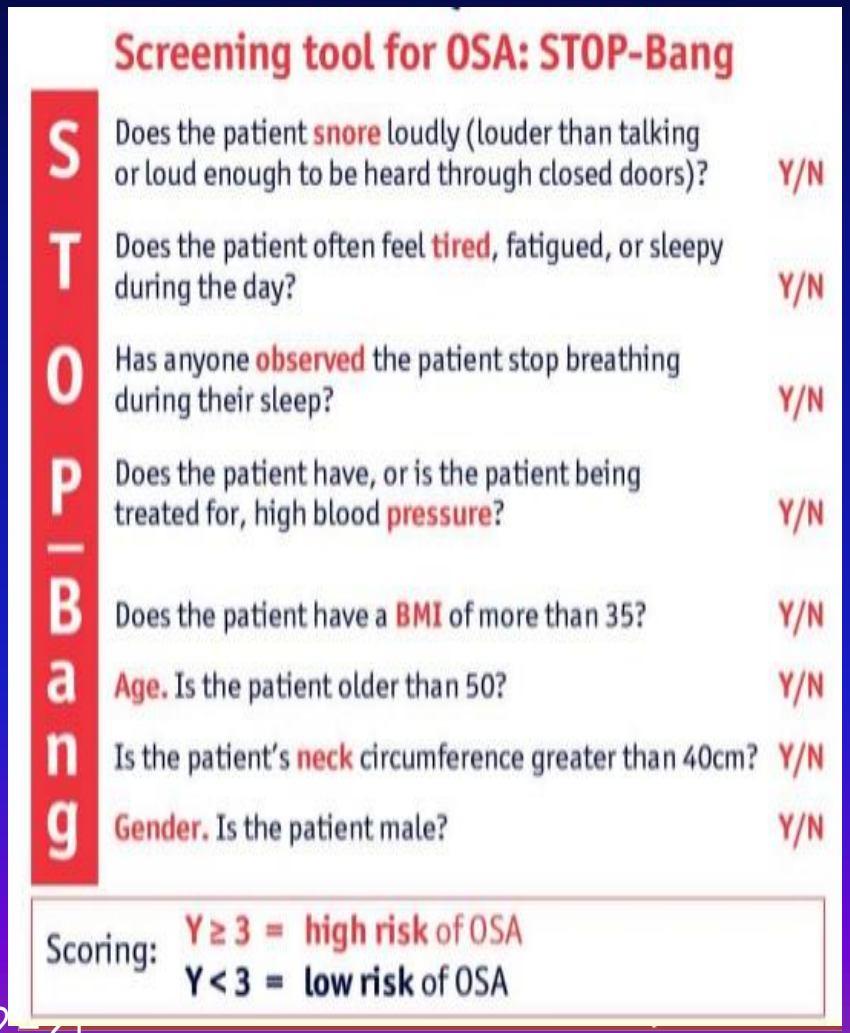
- Many patients won't have symptoms
  - > 50% don't have sleepiness
  - Key : the absence of daytime sympotms does not rule out the disease
  - Sleep partners history
    - Snoring & Witness Apnea (PPV 64%)

Epstein LJ et al; Adult Obstructive Sleep Apnea Task Force of the American Academy of Sleep Medicine. Clinical guideline for the evaluation, management and long-term care of obstructive sleep apnea in adults. J Clin Sleep Med. 2009;5:263-76. [PMID: 19960649]

Obstructive Sleep Apnea Testing/Diagnosis

http://epworthsleepinessscale.com

- **Dissatisfied with sleep then…**
- **Screening Tests**
  (All have low quality of evidence)
  - **Epworth Sleepiness Scale**
  - **Berlin Questionnaire (PCP)**
  - **STOP-BANG (Pre-Op)**
  - **Sleep Quality Index**



Screening tool for OSA: STOP-Bang

S	Does the patient snore loudly (louder than talking or loud enough to be heard through closed doors)?	Y/N
T	Does the patient often feel tired, fatigued, or sleepy during the day?	Y/N
O	Has anyone observed the patient stop breathing during their sleep?	Y/N
P	Does the patient have, or is the patient being treated for, high blood pressure?	Y/N
B	Does the patient have a BMI of more than 35?	Y/N
a	Age. Is the patient older than 50?	Y/N
n	Is the patient's neck circumference greater than 40cm?	Y/N
g	Gender. Is the patient male?	Y/N

Scoring: Y ≥ 3 = high risk of OSA
Y < 3 = low risk of OSA

Abrishami A,
A systematic review of screening questionnaires.
Can J Anaesth. 2010;57:423-38. & Anesthesiology 2008; 108: 812 – 21
Qaseem A. Clinical Guidelines of OSA. Ann Intern Med 2014; 161: 210 -220.

Sleep Case Question

A 73 year old man is evaluated for sleep difficulties. He notes unrefreshing sleep that is interrupted by nocturia. He also experiences episodes of dyspnea that awakened him. His normal sleep schedule is 10:30 p.m. to 6:20 a.m. During the week, he feels sleepy during the day and naps for 45 minutes. His medication are Lisinopril, atorvastatin, warfarin, and metoprolol.

On physical examination his temperature is 97.6, blood pressure is 120/70 mmHg, pulse rate is 76/min, with a respiratory rate of 14/min; BMI is 27. Respiratory examination shows a low-lying soft palate and clear lung fields. Cardiac examination discloses irregularly irregular rhythm but no murmurs. The rest of the exam is unremarkable.

Which of the following is the most appropriate next step in management?

A. Auto-titrating positive airway pressure (APAP)
B. In-laboratory polysomnography
C. Out-of-center sleep testing
D. Overnight pulse oximetry

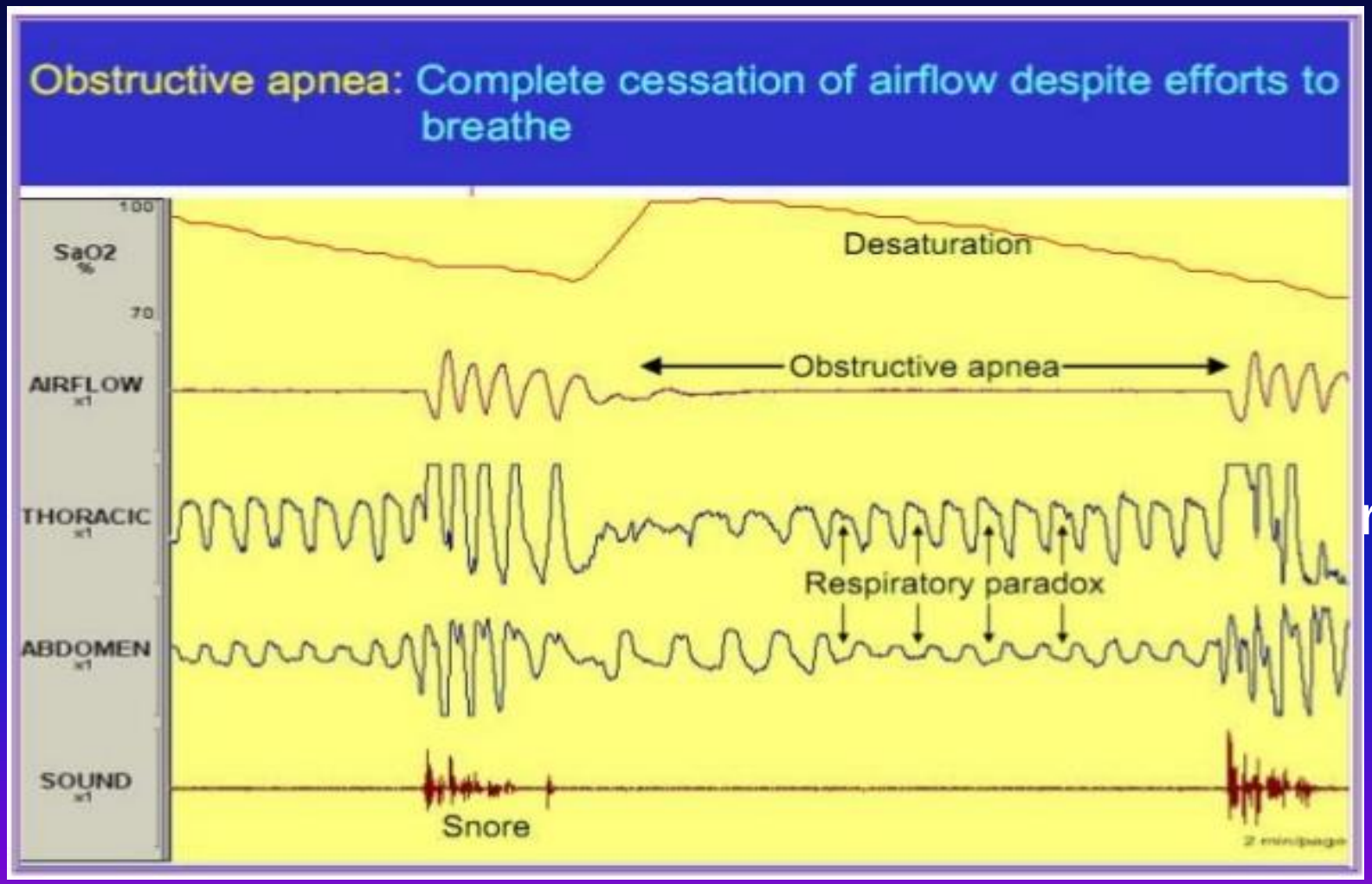
Sleep Apnea Syndrome
Diagnostic Testing

- **Polysomnography / Overnight Sleep Study**
  - **Considered the gold standard**
  - **> 5 events / hour with symptoms**
  - **> 15 events / hour with or without symptoms**

- **Home testing**
  - **Becoming more common (economics)**
  - **Indicated for high clinical suspicion without associate comorbidities (HF, Hypoventilation, COPD, Stroke)**
  - **Not for patients with insomnia, RLS, Narcolepsy**

Kapur VK, Auckley DH, Chowdhuri S, Kuhlmann DC, Mehra R, Ramar K, et al. Clinical practice guideline for diagnostic testing for adult obstructive sleep apnea: an American Academy of Sleep Medicine clinical practice guideline. J Clin Sleep Med. 2017;13:479-504. PMID: 28162150 doi:10.5664/jcsm.6506

Types of Sleep Apnea
Obstructive apnea



Sleep Case Question

A polysomnography demonstrates moderate obstructive sleep apnea (apnea–hypopnea index 18/hour).

Which of the patient's conditions is the strongest indication for positive airway pressure therapy?

A Atrial fibrillation

B Diabetes

C Excessive daytime sleepiness

D Hypertension

McEvoy RD, Antic NA, Heeley E, Luo Y, Ou Q, Zhang X, et al; SAVE Investigators and Coordinators. CPAP for prevention of cardiovascular events in obstructive sleep apnea. N Engl J Med. 2016;375:919-31. PMID: 27571048 doi:10.1056/NEJMoa1606599

Sleep Case Question

A 60-year-old is evaluated for 3 month history of loud snoring and "gasping" during sleep. He frequently falls asleep in a chair while reading. Examination reveals a blood pressure of 135/90 mmHg. BMI is 38, neck circumference is 45.7 cm (18 inches), he has a low-lying soft palate.

Polysomnography discloses severe obstructive sleep apnea with an apnea index of 44 per hour. (normal <5 per hour) ***Which of the following is the most appropriate treatment?***

A. Continuous positive airway pressure
B. Nocturnal oxygen therapy
C. Oral dental appliance
D. Upper airway surgery

Gottlieb DJ, et al. "CPAP versus oxygen in obstructive sleep apnea" N Engl J Med 2014; 370: 2276-2285.
Chirinos JA, et al. "CPAP, weight loss, or both for obstructive sleep apnea" N Engl J Med 2014; 370 2265-2275.

Sleep Apnea
Treatment Options

- Avoidance of alcohol, sedatives & narcotics
- Position therapy
  - Works only in combination
- Weight loss (watch this answer)
- Continuous Positive Airway Pressure (CPAP)
- Oral Appliance
  - PAP more effective
  - Best for (obstructive) & mild disease
- Surgery (UPPP, Maxillary Advancement)
- Hypoglossal nerve stimulator

Morgenthaler TI, et al; Standards of Practice Committee. Practice parameters for the medical therapy of obstructive sleep apnea. Sleep. 2006;29:1031-5.

Sommer JU, Kraus M, Birk R, Schultz JD, Hörmann K, Stuck BA. Functional short- and long-term effects of nasal CPAP with and without humidification on the ciliary function of the nasal respiratory epithelium. Sleep Breath. 2014;18:85-93.

Sleep Case Question

A 45 year old obese male presents with snoring, witness apnea and daytime sleepiness. History includes HTN, depression and atrial fibrillation. Sleep study demonstrates severe OSA (AHI = 40). You initiate CPAP therapy.

Which of the following outcomes would be most likely to improve with CPAP therapy alone?

A. Hypertension
B. Excessive daytime sleepiness
C. Mood (depression)
D. Inflammatory serum markers

Basner RC. "Cardiovascular morbidity and obstructive sleep apnea"
N Engl J Med 2014; 370: 2339-2341.

AASM Practice Parameters & Clinical Guidelines

- CPAP indications (standard)
  - Treatment for mild disease with symptoms
    - Improved BP control
    - Improves QoL
  - Treatment for moderate to severe disease
    - Improves subjective sleepiness

Qaseem A, Holty JE, Owens DK, Dallas P, Starkey M, Shekelle P. Management of obstructive sleep apnea in adults: a clinical practice guideline from the American College of Physicians. Ann Intern Med. 2014; 161:210-220.1

Obstructive Sleep Apnea Treatments

- Surgery (UPPP, Maxillary Advancement)
  - Best surgical options
    - Bariatric surgery
    - Maxillo-mandibular Advancement (MMA)
    - Adenotonsillectomy for pediatric population
- Data supporting other upper airway procedures are inconsistent or incomplete.

Surgical management of obstructive sleep apnea.
Proc (Bayl Univ Med Cent). 2000 Oct; 13(4): 338–342.

Sleep Disorder Treatment Summary

- PAP/nCPAP
  - Mainstay of treatment across the spectrum
  - Best data for moderate to severe disease
  - Improvements in CV, Afib are inconsistent
  - Overall compliance @ 6 months is only <50%
  - Compliance: lower if < 30 events per hour (index)
  - Almost 100% effective if used

Strohl K, Brown D, Collop N., et al. An Official ATS Clinical Practice Guideline: Sleep Apnea, Sleepiness, and Driving Risk in Noncommercial Drivers. Am J Respir Crit Care Med 2013; 187 (11): 1259 –1266

Sleep Case Question

A 52-year-old male is evaluated in follow-up after being dose diagnosed with obstructive sleep apnea. CPAP therapy was prescribed based on a titration during an in-lab polysomnography. He notes some improvement in his sleep with therapy, but he still feels drowsy during the day. He denies a problem with nasal congestion. Medical history is otherwise negative and he takes no medications.

On physical examination, his vital signs are normal except for a elevated blood pressure of 148/86 mmHg; His BMI is 32. A low-lying soft palate is noted. Cardiopulmonary and neurologic examinations are normal.

Which of the following is most appropriate next step in the management of this patient's continued drowsiness?

A. Prescribed eszopiclone (Lunesta)
B. Start Modafinil
C. Review data from patient's device
D. Switch to bi-level positive airway pressure (BiPAP)

OSA: The Bottom Line

- OSA is common, yet underdiagnosed.
- Know the risk factors
  - > 50 % don't have symptoms "I sleep fine."
- Overnight Polysomnography remains the standard.
- Portable (home) testing = no comorbidities.
- Most patient with continued sleepiness on CPAP are noncompliant, gained weight or are sleep deprived.

Sleep Disorder Summary

- Sleep apnea is common.
- Risk factors for OSA: Obesity, Family history, Retrognathia, Treatment resistant hypertension, CHF, Atrial fibrillation, Stroke, & DM_2.
- PSG is the gold standard test; MSLT is for narcolepsy.
- Home testing is for high clinical suspicion and no significant comorbid conditions.
- Treatment: Weight loss (> mild and moderate) & CPAP in all, check for compliance if not improved.