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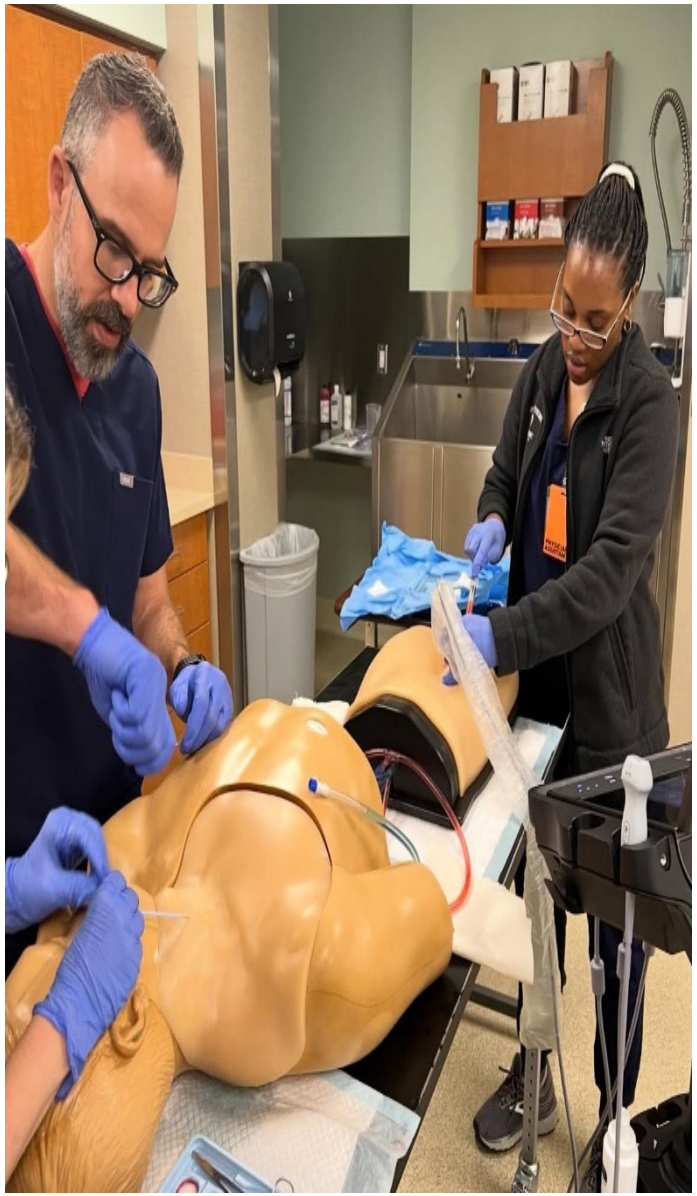
Obstructive Sleep Apnea

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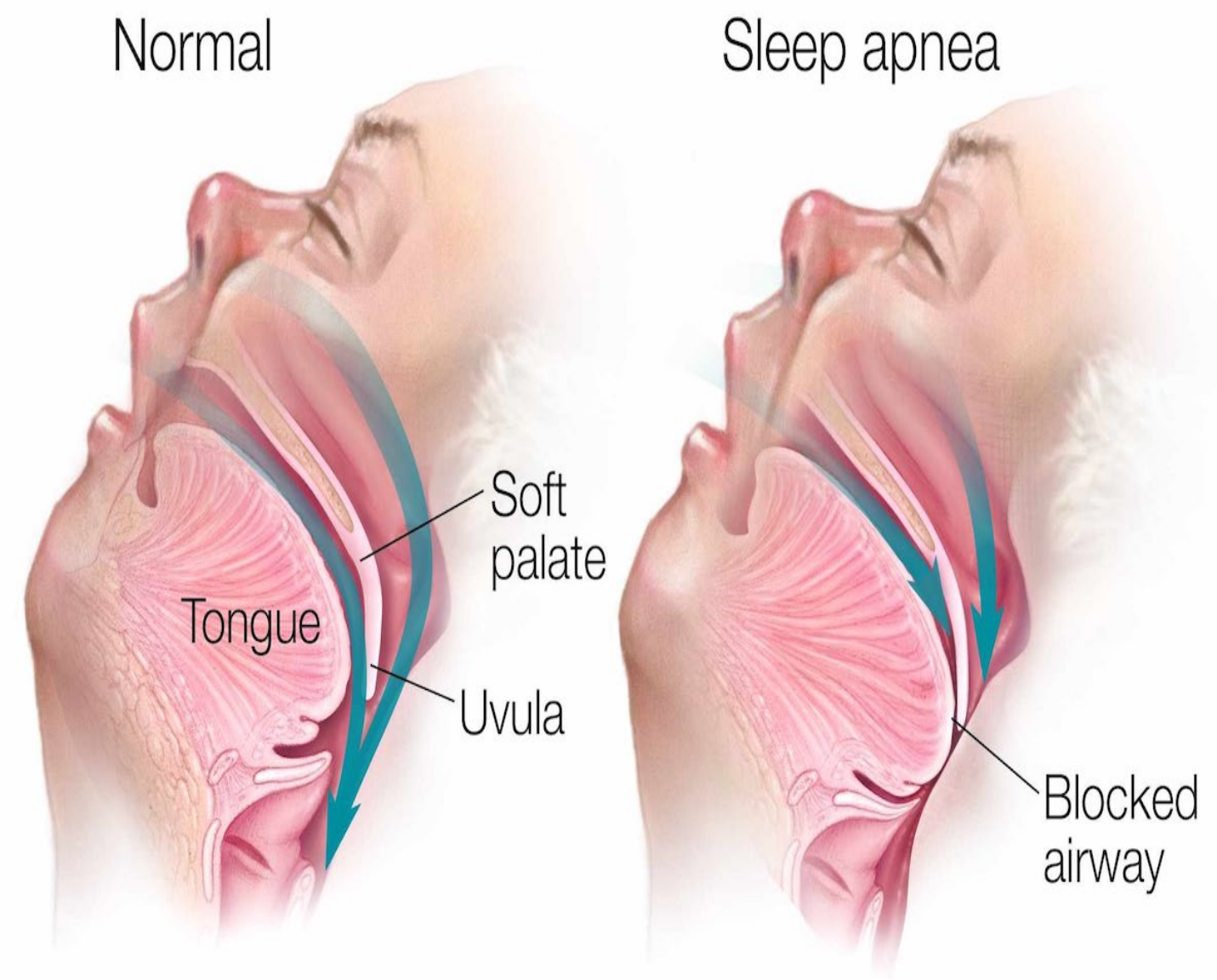
Disclosures

- Biodesix

Objectives

- Discuss Obstructive Sleep Apnea
- Prevalence
- Complications
- Evaluation
- Treatment

What is Obstructive Sleep Apnea?



Definitions

Obstructive Sleep Apnea Hypopnea Syndrome

- Repeated collapse (apnea) and/or narrowing of the upper airway (hypopnea)
- Respiratory effort persists, snoring goes away
- Minimum 10s in length

AHI Scoring at a Glance

- Apnea: ≥90% airflow reduction ≥10 s.
- Hypopnea: ≥30% flow drop ≥10 s with ≥3% desaturation or arousal (AASM 1A).
- CMS coverage relies on 4% desaturation rule—reports should show both when relevant.
- Many commercial insurance continue to acknowledge 3% desaturation rule.

Apnea-Hypopnea Index (AHI)

AHI = **(Number of apneas + hypopneas) ÷ hours of sleep**

Severity classification (adults)

Normal: < 5 events/hour

Mild: 5–14

Moderate: 15–29

Severe: ≥ 30

Both apneas **and** hypopneas count equally toward AHI.

Epidemiology

THE OCCURRENCE OF SLEEP-DISORDERED BREATHING AMONG MIDDLE-AGED ADULTS

TERRY YOUNG, PH.D., MARI PALTA, PH.D., JEROME DEMPSEY, PH.D., JAMES SKATRUD, M.D.,
STEVEN WEBER, PH.D., AND SAFWAN BADR, M.D.

- ~936M adults (30–69) have OSA worldwide (AHI≥5).
- U.S. prevalence rising with age & BMI; many undiagnosed.
- By 2050, ~46% of U.S. adults 30–69 may have OSA (~76.6M).

References: Benjafield 2019; Boers 2025; Peppard 2013.

Scope of the Problem

OSA increases risk of:

- Hypertension
- CAD
- Pulmonary HTN
- CHF
- Atrial Fibrillation
- Stroke (Ischemic/hemorrhagic)
- Motor Vehicle Crashes

CV and Sleep

Not uncommon to see all types of arrhythmias in NREM/REM sleep

- Mobitz type II and 3rd degree AV block raises some concern/likely needs further evaluation

Normal BP dip

- Cardioprotective?

Morning peak of sudden cardiac death 6am-12noon (surge of sympathetic activity, platelet aggregability)

- **Increase** in sudden cardiac death 12am – 6am in patients with OSA (Gami et al, NEJM 2005)
- OSA independent risk factor for SCD; higher risk with worsening OSA, O2 desaturation (Gami et al, J Am Coll Card, 2013)

OSA and Hypertension

- Hypertension
  - Well established independent risk factor (Peppard et al NEJM 2000; Marin et al JAMA 2012)
  - Dose response (higher AHI, higher the risk)
  - Increased sympathetic output, higher nocturnal BP
  - Most national guidelines recommend OSA be considered in the setting of HTN/refractory HTN

OSA and Coronary Artery Disease

- Strongly Associated with OSA
  - Independent risk factor
- Etiology
  - Increased sympathetic drive
  - Atherosclerosis (Fig 2, Nathani et al, Sleep Med Clinics, 2024)
  - Increased Myocardial Oxygen Demand

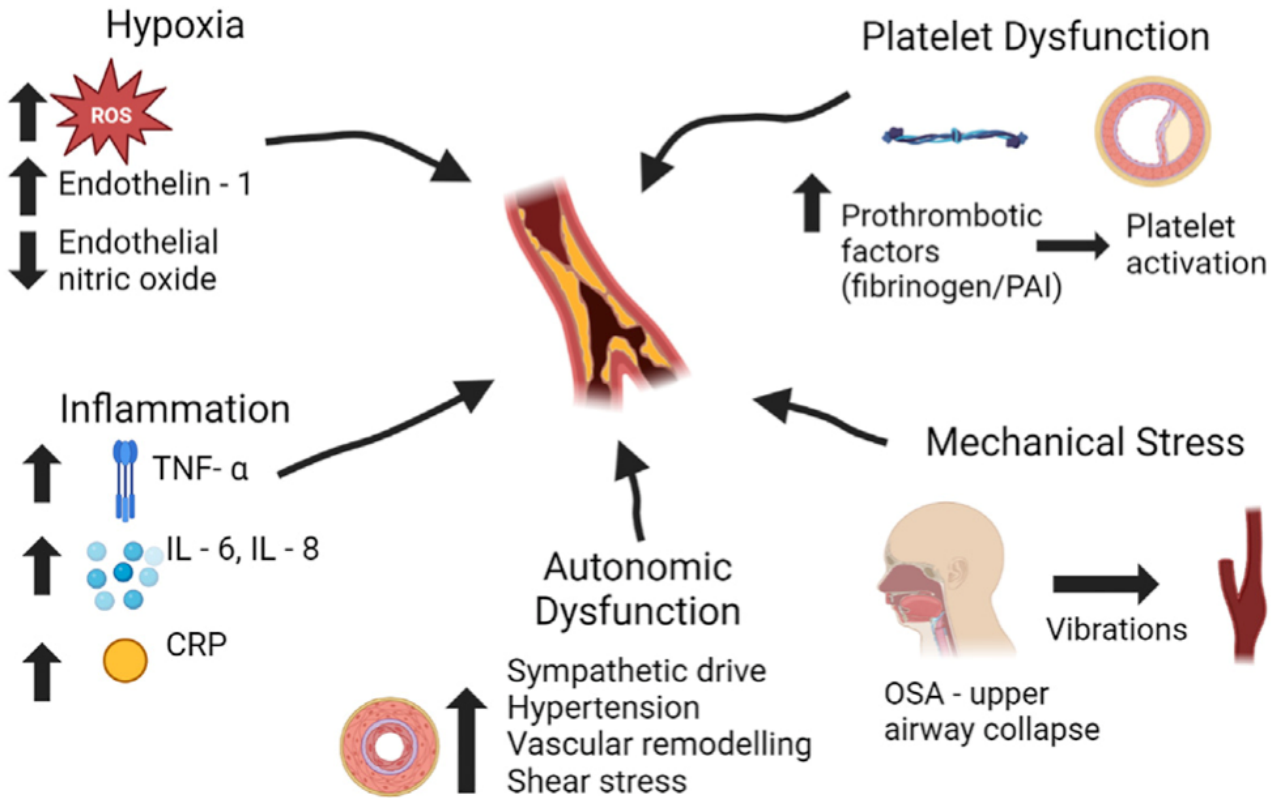


Fig. 2. Mechanisms of development of atherosclerosis in obstructive sleep apnea (OSA). CRP, C-reactive protein; IL-6, interleukin 6; IL-8, interleukin 8; PAI, plasminogen activator inhibitor; ROS, reactive oxygen species; TNF-α, tumor necrosis factor-alpha. (Created with BioRender.com.)

OSA and Stroke

- Pre-stroke: ~2× incident stroke risk in OSA (prospective meta-analysis).
- Post-stroke: OSA highly prevalent (≈40–70%); worse functional/cognitive outcomes—screen early.
- Risk markers: hypoxemia severity and nocturnal timing of events.

Pre-stroke

OSA independent risk factor

Meta-analysis of 10 prospective studies – 2-fold increase in incident stroke with OSA (Li, et al Int J Cardiology 2014)

Wake-up Stroke

Suggestion OSA may play a role (limited studies, small size)

May be an issue in men more than women

Post-Stroke

Large meta-analysis (89 studies, 7096 patients) Seiler et al, Neurology 2019

- 71% (AHI> 5), 40% (AHI> 20), 30% (AHI > 30)
- Severity of OSA does diminish some over time but still elevated

OSA and CHF

- **Heart Failure**
  - Most frequent cause of hospitalization in the U.S (1-2% of all hospitalizations)
  - 50-80% of patients with heart failure (reduced and preserved EF) have SDB
  - Intrathoracic pressure swings leads to increased venous return (increased preload), increased left ventricular transmural pressure gradient (increased afterload) and ultimately remodeling
  - OSA and CSA can be present in the same patient
  - Treatment is CHF GDMT, use of PAP therapy (CPAP/ASV for predominant CSA/EF>45%, ?O2)

OSA and Atrial Fibrillation

- **Atrial Fibrillation**
  - Afib prevalence 1-2% general population
  - Afib patients have a high prevalence of OSA (JAMA Cardiology 2018)
  - Significant increase risk with severity of OSA (dose response)
  - Treatment of OSA can help maintain NSR after treatment
  - All patients with afib should be screened for OSA

Motor Vehicle Crashes

- ~20% of MVC attributed to fatigue/sleepiness
  - Insufficient sleep, OSA, hypersomnia syndromes
- OSA increases the risk by about 3-fold
  - Concern especially in long haul truck drivers
  - Treatment OSA reduces risk of accidents significantly

Signs and symptoms

- Quick screener for PCPs:
- Do you snore?
- Are you fatigued/sleepy?
- Obese

(NEJM, Veasey et al, 2019)

Table 1. Signs and Symptoms That Should Trigger Suspicion of Obstructive Sleep Apnea.

Sign or Symptom
Loud or irregular snoring
Daytime sleepiness
Unrefreshing sleep regardless of sleep duration
Increased fatigue when patient is sedentary
Nocturia
Choking and gasping in sleep
Dry mouth on awakening
Morning headaches
Body-mass index >30
Crowded oropharynx
Increased neck circumference (men, >17 in. [43.2 cm]; women, >15 in. [38.1 cm])

STOP-BANG

- Good screening tool
- Good sensitivity

STOP

S	So you **snore** loudly (louder enough to be heard through closed doors or louder than talking)?	Yes	No
T	Do you often feel **tired**, fatigued or sleepy during the daytime?	Yes	No
O	Has anyone **observed** you stop breathing or choking or gasping during your sleep?	Yes	No
P	Do you have or are you being treated for high blood **pressure**?	Yes	No

Bang

B	**BMI** more than 35?	Yes	No
a	**Age** – over 50 years old?	Yes	No
n	**Neck** circumference – is it greater than 17" if you are a male or 16" if you are a female?	Yes	No
g	**Gender** – are you a male?	Yes	No

Score your yes tally:

- 0 – 2 Low risk
- 3 – 4 Intermediate risk
- 5 – 8 High risk

Courtesy of Hennepin Healthcare

Fatigue vs Sleepiness

Sometimes hard for patients to distinguish

- 10-25% of the general adult population complains of sleepiness (Young, J Clinic Psych 2004)

Fatigue – body tiredness, sense of exhaustion, lack of energy/motivation

- Many sleep, medical and psychiatric conditions can result in fatigue

Excessive Daytime Sleepiness – inability to avoid falling asleep

Epworth Sleepiness Scale

- Main measure used in the sleep clinic to assess sleepiness
  - >/= 10 is a signal for EDS
  - 30% of patients with OSA will have normal ESS
  - Most insurances need this measure done

Epworth Sleepiness Scale[11]

How likely are you to nod 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. It is important that you answer each question as best you can.

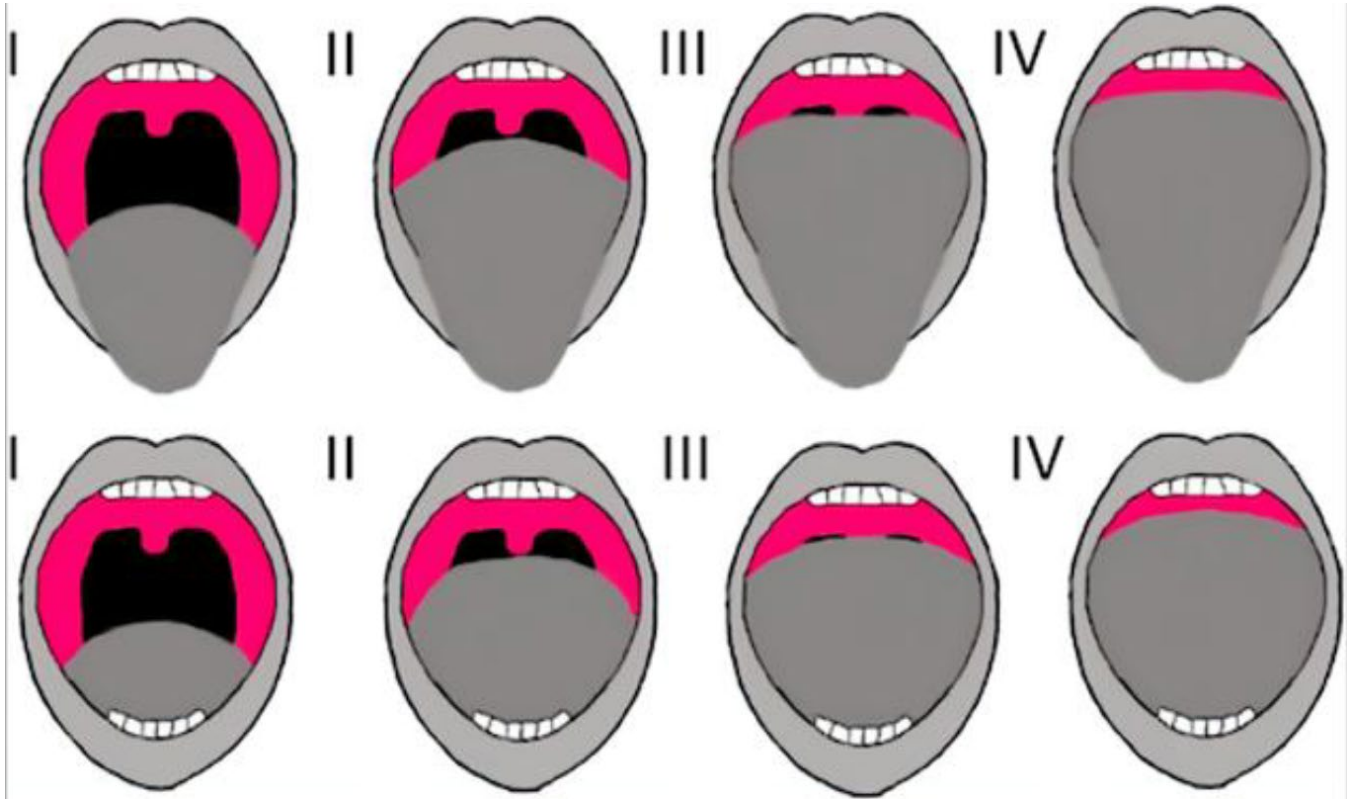
Use the following scale to choose the most appropriate number for each situation.

	Would never nod off 0	Slight chance of nodding off 1	Moderate chance of nodding off 2	High chance of nodding off 3
Sitting and reading				
Watching TV				
Sitting, inactive, in a public place (e.g., in a meeting, theater, or dinner event)				
As a passenger in a car for an hour or more without stopping for a break				
Lying down to rest when circumstances permit				
Sitting and talking to someone				
Sitting quietly after a meal without alcohol				
In a car, while stopped for a few minutes in traffic or at a light				

Add up your points to get your total score. A score of 10 or greater raises concern: you may need to get more sleep, improve your sleep practices, or seek medical attention to determine why you are sleepy.

Assessment- PE

- Neck size (17 inches M, 15-16 inches F)
- Obesity (but many non-obese have OSA)
- Oropharynx- Mallampati Score, Friedman Tongue Position Index



Diagnosis

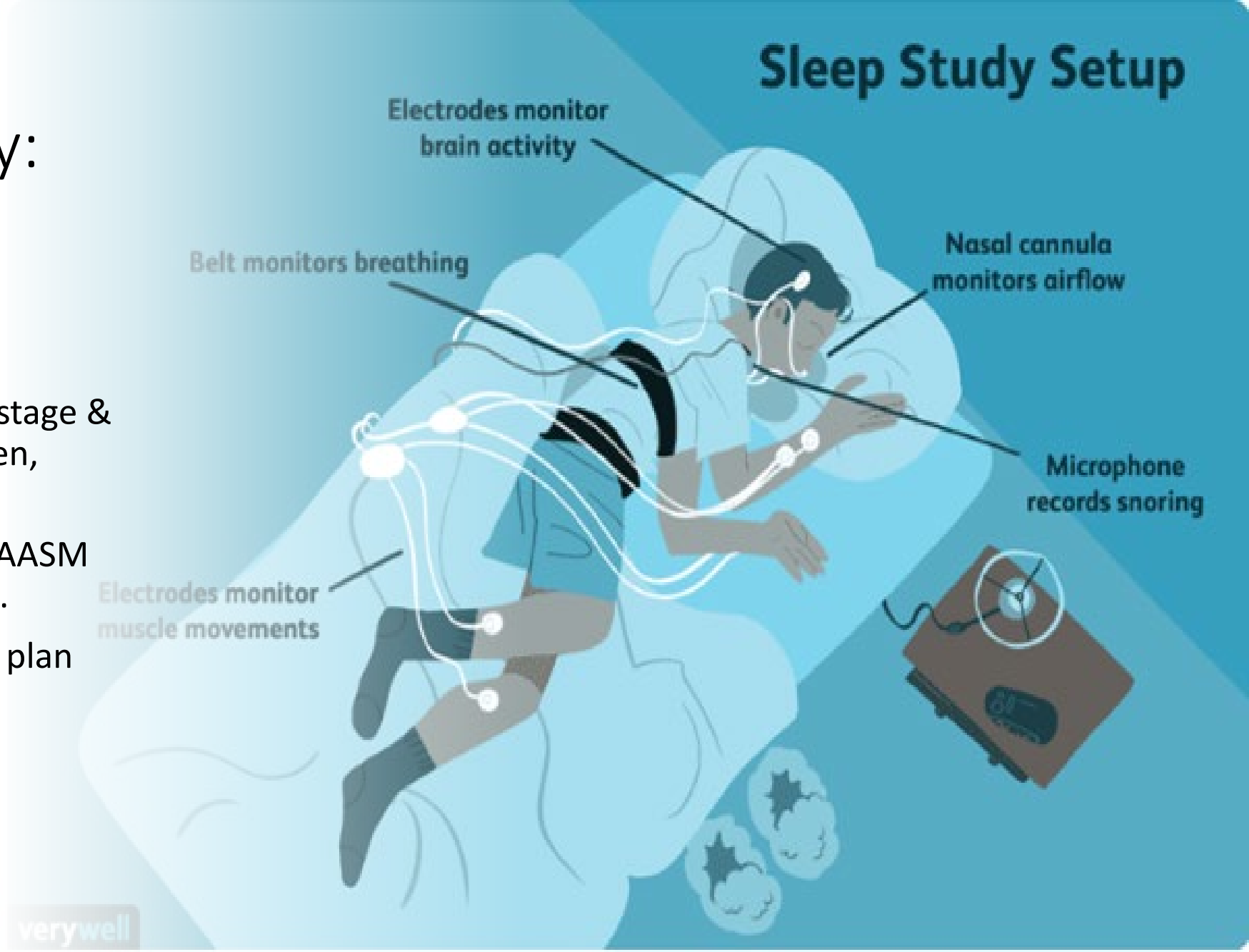
Polysomnography (in-lab at sleep center)

Unattended Home Sleep Apnea Test (HST)

- Flow based, PAT (peripheral arterial tonometry – WatchPat)

Polysomnography: What to Read in the Report

- Report essentials: AHI/RDI by stage & position, O2 nadir, hypoxic burden, arousal index.
- Hypopnea rule documented: AASM 3%/arousal (1A) vs 4% (1B/CMS).
- Use results to phenotype and plan therapy.



Verywell / Emily Roberts

Home Sleep Apnea Test (HSAT)

- Use is becoming more common (comfort of home, cost, etc.)
- OSA diagnosis only
- Flow Based (5 channels, Alice Night One Phillips Respironics), WatchPat (peripheral arterial tonometry)
- Ideally for high pre-test probability of OSA
- Should not be used if significant cardiopulmonary disorders (CHF, COPD, stroke, opioid use, ?insomnia)
- PSG should be done if "normal" result but high index of suspicion for OSA

Why HSAT vs PSG:

1) Suspected OSA + high pretest probability, uncomplicated → HSAT

2) If HSAT negative/inconclusive but suspicion remains → PSG.

3) Complex pts (CHF, COPD, stroke, opioids, suspected CSA/insomnia) → PSG first.

Treatment of OSA

- Lifestyle modifications
  - Weight loss (appropriate diet/exercise)!
  - Positional therapy (side sleep, HOB elevation)
- PAP Therapy
- Oral appliance therapy (MAD)
- Surgery
    - Upper airway modification, bariatric surgery
- Hypoglossal Nerve Stimulation (Inspire Systems)
- Medications (Tirzepitide,
- Myofunctional therapy (Didgeridoo, ExciteOSA/neurostimulation)

CPAP

- Indicated for AHI 5-14 with clinical symptoms; AHI > 15
- Longest track record (Dr. Colin Sullivan, Lancet 1981)
- First line therapy for all levels of OSA
- Auto-CPAP commonly prescribed
- Adherence is an issue
  - ~50% sufficient use (>4hours/night, 70% nights), but varies

CPAP Mask Types Explained: Expert Guide for All Sleepers - cpap.com

Visit >

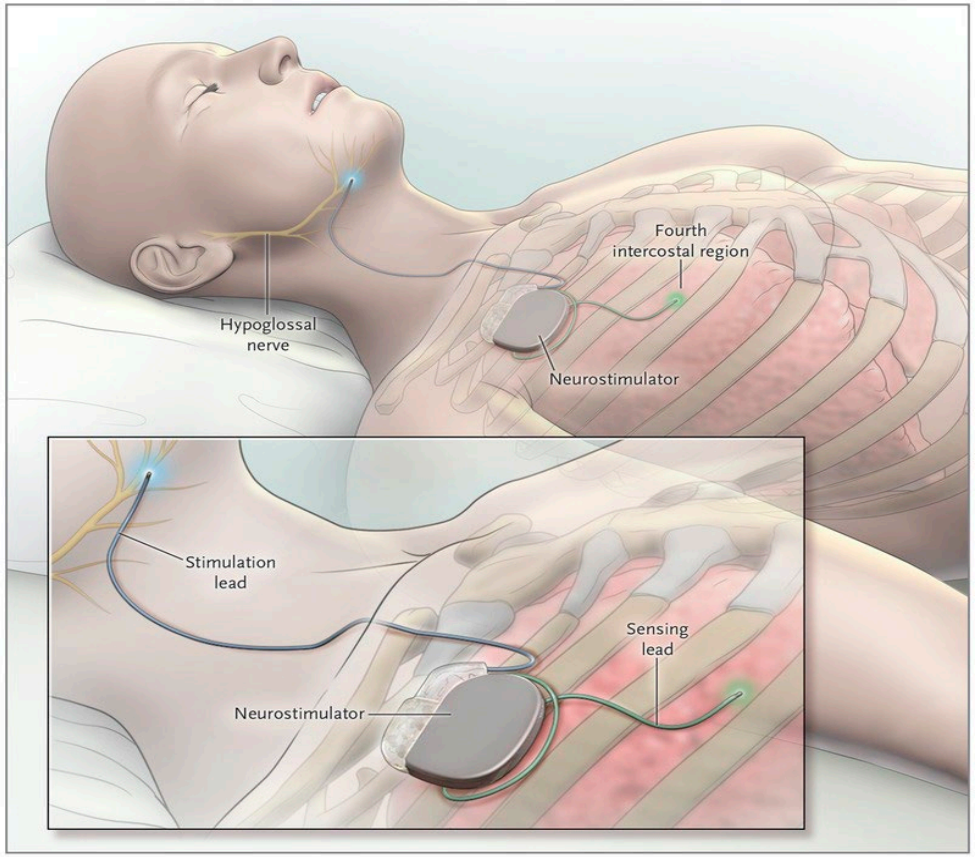
Oral Appliance Therapy

- Mandibular Repositioning/Advancement Device (MRD, MAD)
- Adequate dentition
- Dental Sleep Medicine Practitioners should fabricate
- Typically consider for snoring, mild/moderate OSA

Treatment of OSA

Hypoglossal Nerve Stimulator

- Inspire Medical Systems
- **STAR Trial Group** (Strollo et al, NEJM 2014)
- BMI 32 or less, AHI 20-50
- DISE, no concentric collapse of the retropalatal airway



Courtesy of Inspire

- Updated indication (FDA, 2023): AHI 15–100, BMI ≤40; failed PAP; no complete concentric collapse on DISE.

Hypoglossal Nerve Stimulation (INSPIRE)

For patients who cannot tolerate PAP therapy

Sleep medicine, ENT collaboration

DISE study (Drug Induced Sleep Endoscopy)

FDA approved for BMI up to 40 kg/m2 but efficacy seems to be lower at higher BMIs?

- BMI <35 probably best
- AHI 15-100
- Insurance coverage varies

Follow-up PSG/HSAT to gauge effectiveness

Not superior to CPAP, but can be good option for the right patient

Medications: **Tirzepitide**
SURMOUNT-OSA: Targeting Obesity to Treat OSA

Population: Adults with moderate–to–severe OSA and obesity (mean BMI ≈39 kg/m²; baseline AHI ≈50/h)

Design: 52-week, randomized, double-blind, placebo-controlled trial

Cohorts: Not using PAP vs on stable PAP therapy

Intervention: Tirzepatide 10–15 mg weekly + lifestyle vs placebo

Primary endpoint: Change in AHI

Key results: 55–63% AHI reduction vs 5–6% with placebo; ~18–20% weight loss

Clinical Pearls from SURMOUNT-OSA

- FDA-approved (Dec 20, 2024) for moderate–severe OSA with obesity
- Diet and Physical Activity are key
- Not a CPAP replacement
- Re-test prior to de-escalation.

Weight loss meaningfully improves OSA severity and hypoxic burden

Dual benefit: Improves cardiometabolic risk and sleep quality

Adjunct to PAP therapy: Further AHI reduction even in PAP-treated patients

Disease modification possible: ~50% achieved near-normal OSA metrics

Patient-centered outcomes: Improved sleep-related impairment and quality of life

Therapy Snapshot: What Works for Whom

- CPAP: greatest AHI/ESS reduction; adherence critical.
- OAT: mild–moderate or CPAP-intolerant; dental oversight; re-test efficacy.
- Positional therapy: positional OSA; can be combined with OAT
- HNS: PAP-intolerant, AHI 15–100, BMI ≤40, no CCC on DISE.
- Tirzepatide: OSA with obesity; weight-loss mediated AHI drop; re-test before de-escalation.

Final Thoughts

- OSA is a very common (and still underrecognized) disorder with multiple associated comorbidities
- Would inquire about sleep with all your patients as part of overall health evaluation
  - If concern about OSA, ask about snoring, feeling tired/sleepy, witnessed apneas, obese (BMI > 30 – but remember not all OSA patients are obese!)
  - Inquire about SDB when patient is hospitalized for decompensated CHF, afib, acute stroke, hypercapnic respiratory failure (in the morbidly obese patient)
- Refer on to the sleep center if there are concerns you may have about your patient

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Questions?

THANK YOU!

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