Obstructive Sleep Apnea (OSA)

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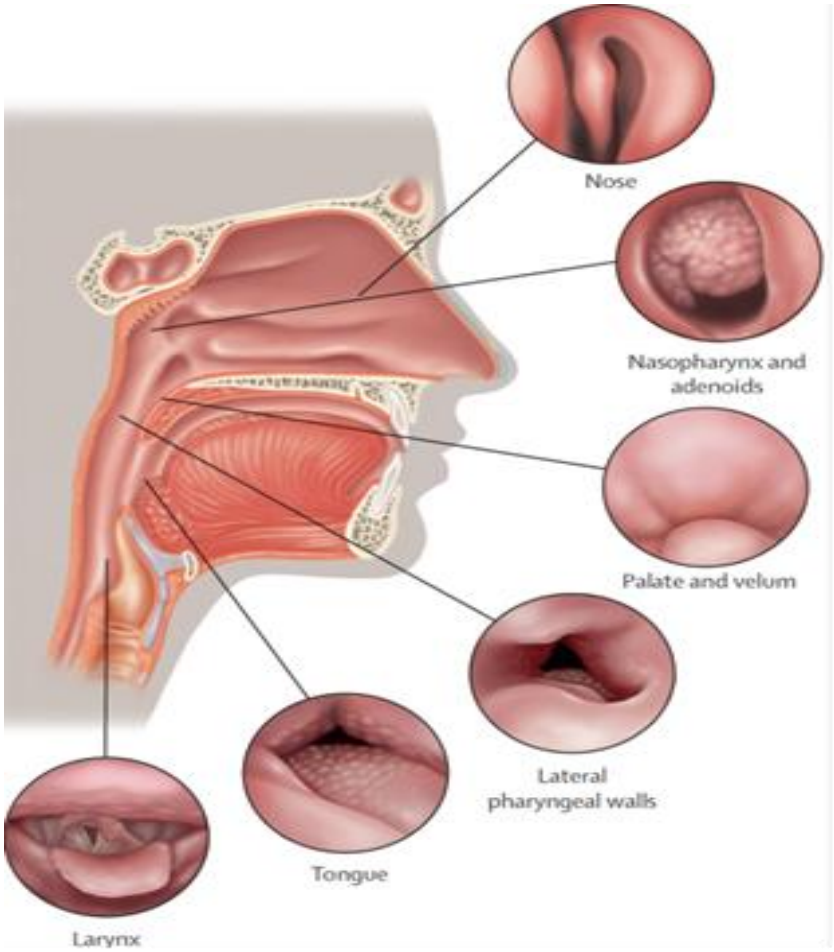
Objectives

- Identify patients at risk for obstructive sleep apnea.
- Determine the best diagnostic modality for each patient.
- The role of precision medicine in the management of obstructive sleep apnea.

Obstructive Sleep Apnea (OSA)

OSA is characterized by repetitive episodes of complete or partial obstruction of the pharyngeal airway during sleep that results in:

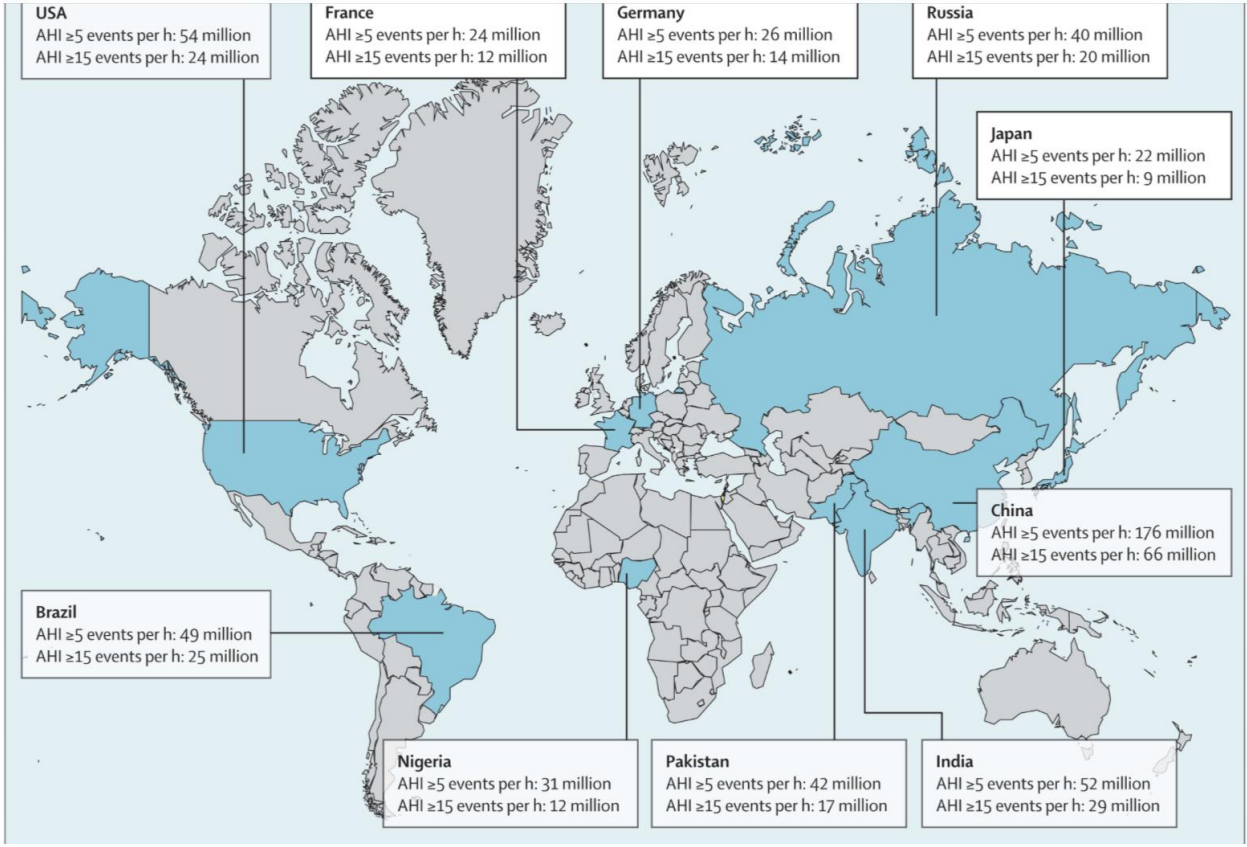
- ↓ airflow
- Increased respiratory effort
- Oxygen desaturation
- Recurrent arousals
- Sleep fragmentation



Source: International Classification of Sleep Disorders 3rd edition - Text Revision. Image: Google images – upper airway

Epidemiology

- OSA can occur in any age group.
- The prevalence of OSA increases with age
- The ratio of OSA in men compared to women's approximately 2:1.
- The prevalence and severity of OSA in women tend to increase after menopause.



Source: Unmasking obstructive sleep apnea: Estimated prevalence and impact in the United States, Respiratory Medicine,Vol 248, 2025, 108348, ISSN 0954-6111. Image: Google images – upper airway

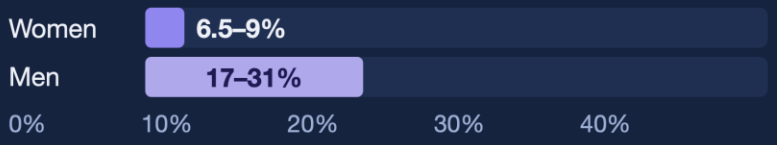
Epidemiology

OSA in the US: prevalence and burden

Prevalence has risen over time, partly with obesity, and most cases remain undiagnosed

Late 1980s to early 1990s: three US cohorts

Wisconsin Sleep Cohort, Sleep Heart Health Study, Penn State Cohort.
Sleep-disordered breathing = AHI above 5 events/hr



2024 burden: 32.4% overall

Adults aged 20 and older, adjusted for obesity



83.7 million adults: men and women



Severity



Current estimates and the diagnosis gap

24–38%
of US adults aged 30 and older (2013)

~80%
of cases remain undiagnosed

83.7M
US adults aged 20 and older with OSA (2024)

Why prevalence keeps rising: obesity

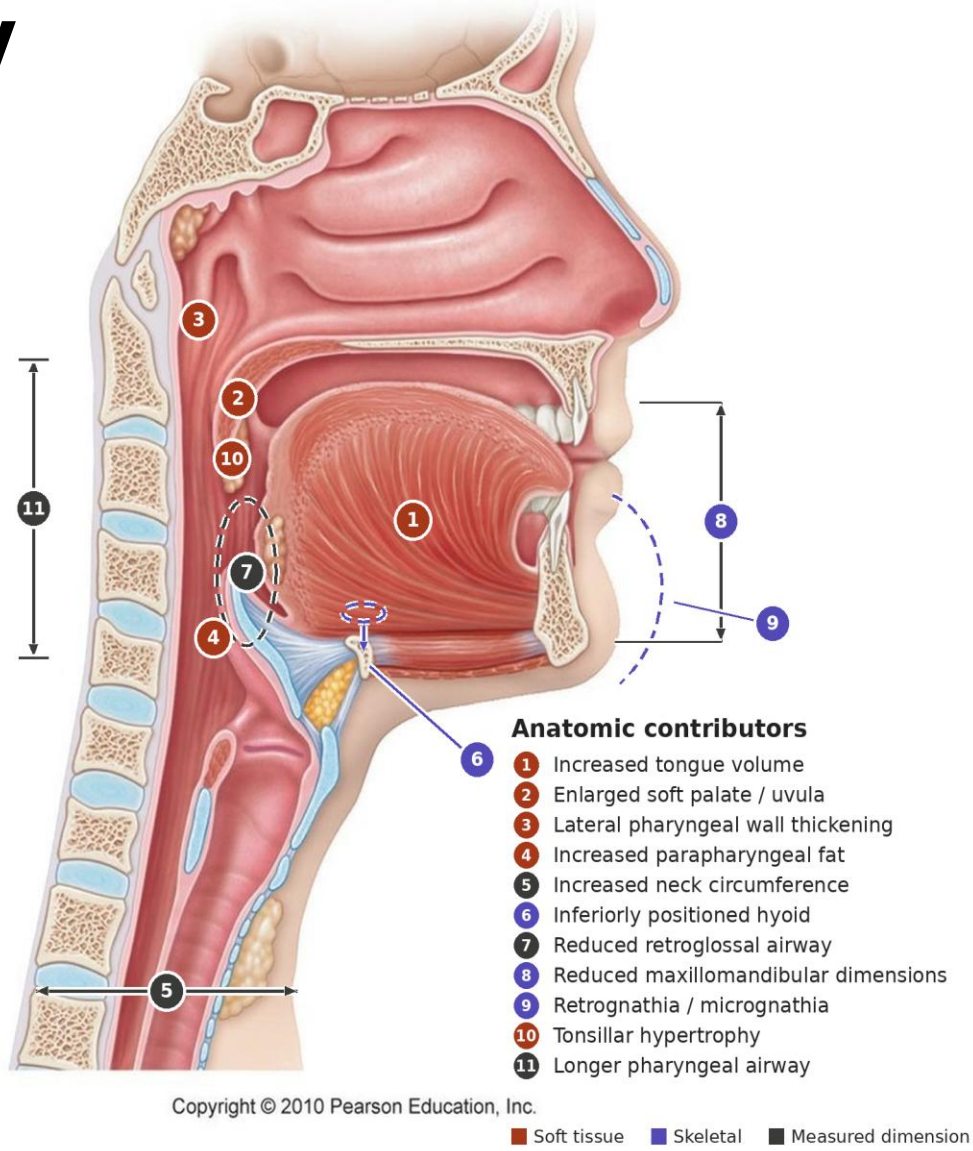
40.3%
of US adults aged 20+ with obesity, 2021–2023 (CDC)

- Obesity raises OSA risk and severity
- OSA contributes to metabolic dysfunction and weight gain
- Earlier estimates often did not account for obesity prevalence

Source: Unmasking obstructive sleep apnea: Estimated prevalence and impact in the United States, Respiratory Medicine,Vol 248, 2025, 108348, ISSN 0954-6111. Image: created with AI

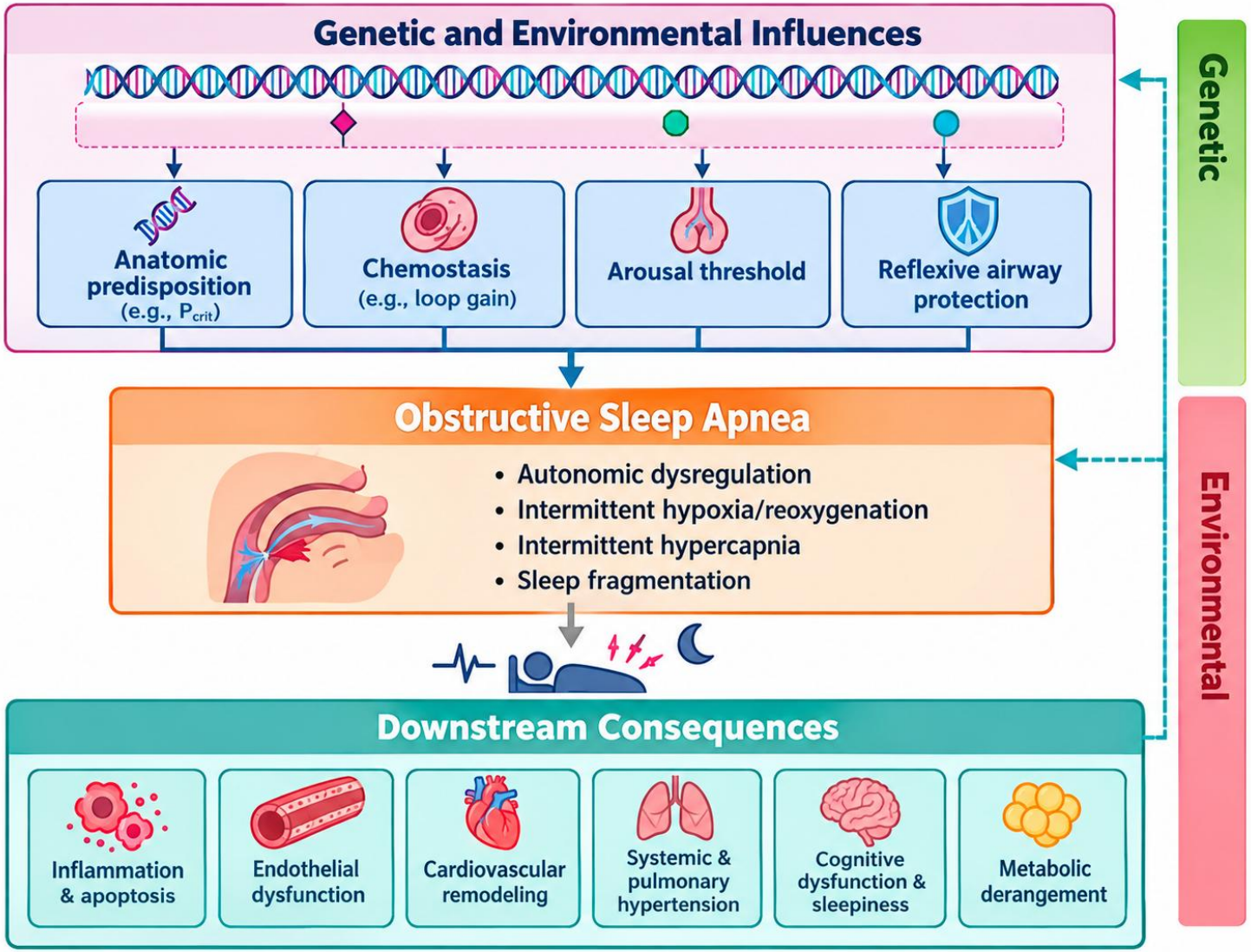
Pathophysiology

- Sleep is associated with decreased muscle tone of the upper airway, leading to partial or complete obstruction of the nasopharynx, oropharynx, or both.
- Upper airway patency is determined by craniofacial structure, surrounding tissues, intrinsic properties of the upper airway and the neuromuscular function of the upper airway.
- Airway patency tends to oscillate, causing recurrent periods of apnea and recovery.
- Dynamic factors, including redistribution of dependent edema to the neck during the night while the patient is recumbent, may contribute to narrowing of the upper airway.
- Other factors thought to be important include upper airway muscle responsiveness, sleep stability, and ventilatory control



Source: Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed. Image: Google images – upper airway tract, Pearson education, inc + schematic positioning by AI

Pathophysiology



Source: Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed. Image: Figure 128.1 enhanced for clarity using AI

Symptoms of OSA

Nocturnal symptoms

- Loud habitual snoring
- Witnessed apneas
- Gasping / choking
- Restless sleep
- Recurrent awakenings
- Nocturia
- Bruxism
- Night sweats
- Reflux

Daytime symptoms

- Excessive daytime sleepiness
- Fatigue / low energy
- Morning headache
- Non-restorative sleep
- Poor concentration
- Memory problems
- Irritability / mood changes
- Reduced exercise tolerance

Source: Obstructive Sleep Apnea, International Classification of Sleep Disorders ICSD- TR 3rd ed.

Clinical Presentation

OSA presentation subtypes:

- Patients with complaints of insomnia or disturbed sleep.
- Patient's reporting minimal symptoms
- Patient reporting daytime sleepiness; current evidence indicates a link with adverse cardiovascular outcomes and mortality.



OSA is often under-recognized older adult patients, although it can be associated with daytime sleepiness, neurocognitive dysfunction, falls, diminished quality of life and mood disturbances.

Source: Obstructive Sleep Apnea, International Classification of Sleep Disorders ICSD-TR 3rd ed. Image: Google images

Pediatric OSA

Clinical Presentation

Snoring

Labored, paradoxical or obstructed breathing during the child's sleep.

A daytime symptom:

- Sleepiness
- Hyperactivity
- Learning difficulties
- Behavioral challenges





Source: International Classification of Sleep Disorders 3rd edition - Text Revision. Image Source: Google images

Risk Factors

Excess body weight: The major predisposing factor for OSA is excess body weight, it is estimated that approximately 60% of moderate to severe OSA is attributable to obesity

First-degree relatives of individuals with OSA are twice as likely to have OSA.

Craniofacial features:

- mandibular size (micrognathia)
- mandibular position (retrognathia)
- palatal height (narrow maxillary width)
- adenotonsillar enlargement



Source: International Classification of Sleep Disorders 3rd edition - Text Revision. Image: Google images – obesity

Risk Factors

Other health conditions associated with the development of OSA include:

- Trisomy 21
- Acromegaly
- Hypothyroidism
- Neurologic disorders including peripheral muscles like myotonic dystrophy and ALS
- End-stage renal disease due to CKD fluid retention and OSA related hemodynamic and other stress that adversely impact renal function

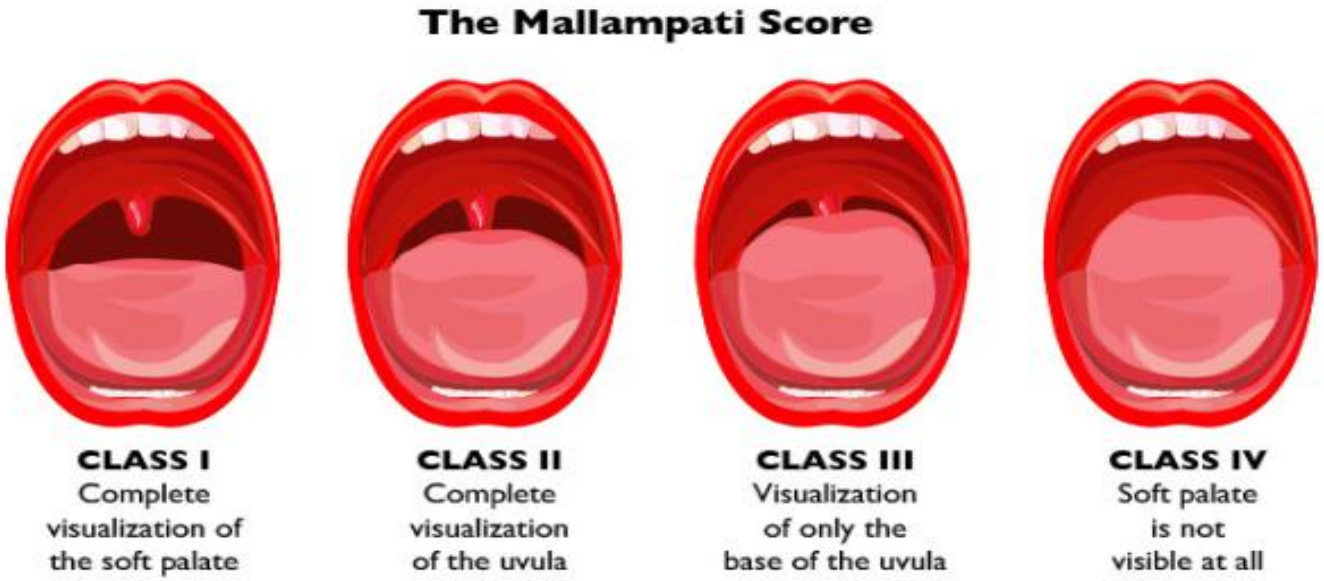




Source: International Classification of Sleep Disorders 3rd edition - Text Revision. Image: Google images – Trisomy 21

Physical Exam

- Obesity
- Neck Circumference
- Mallampati Classification
- Crowded Oropharynx
- Craniofacial abnormalities



Source: Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed. Image Source: Google images – Mallampati Score

OSA screening test

Enhanced STOP-Bang questionnaire[1-3]

☐ Yes	☐ No	**Snoring?** Do you **snore loudly** (loud enough to be heard through closed doors, or your bed partner elbows you for snoring at night)?
☐ Yes	☐ No	**Tired?** Do you often feel **tired, fatigued, or sleepy** during the daytime (such as falling asleep during driving or talking to someone)?
☐ Yes	☐ No	**Observed?** Has anyone **observed** you **stop breathing** or **choking/gasping** during your sleep?
☐ Yes	☐ No	**Pressure?** Do you have or are being treated for **high blood pressure**?
☐ Yes	☐ No	**Body mass index more than 35 kg/m^2?**
☐ Yes	☐ No	**Age older than 50 years old?**
☐ Yes	☐ No	**Neck size large? (measured around Adam's apple)** Is your shirt collar 16 inches or larger?
☐ Yes	☐ No	**Gender (biologic sex) = Male?**

Scoring criteria:
Low risk of OSA: Yes to 0 to 2 questions
Intermediate risk of OSA: Yes to 3 to 4 questions
High risk of OSA: Yes to 5 to 8 questions or Yes to 2 or more of 4 STOP questions + male gender (biologic sex) or Yes to 2 or more of 4 STOP questions + BMI >35 kg/m^2 or Yes to 2 or more of 4 STOP questions + neck circumference ≥ 16 inches/ 40 cm

This is an enhanced version of the STOP-Bang questionnaire. Patients who initially score at intermediate risk of OSA can be further stratified based on the specific STOP-Bang questions that are positive. Simpler STOP-Bang scoring is shown in the UpToDate graphic STOP-Bang questionnaire.

Source: Obstructive Sleep Apnea - UpToDate

Choosing the OSA Test



HSAT
(Home Sleep Apnea Testing)

- High risk of moderate–severe uncomplicated OSA
- Lab testing not feasible
- Follow-up when persistent moderate–severe OSA is suspected and lab testing is not feasible



In-lab polysomnography (PSG)

- Suspected mild OSA
- Significant cardiopulmonary disease or neuromuscular weakness
- Possible hypoventilation or chronic opioid use
- Prior stroke or suspected other sleep disorder
- Negative, inconclusive, or inadequate HSAT despite suspicion
- HSAT not practical; mission-critical evaluation; or assessment after oral appliance, surgery, or weight loss

If HSAT is negative or inadequate but suspicion remains → perform PSG.

HSAT is intended for selected adults with suspected uncomplicated OSA.

Source: Obstructive Sleep Apnea, International Classification of Sleep Disorders ICSD- TR 3rd ed. Image: created with AI

HSAT Devices Available in the U.S. Market

Common Classifications and Examples

Different sensors. Same goal: better sleep insights.

Flow-based (Airflow + Oxygen)

Measures airflow and oxygen saturation, typically using a nasal cannula and pulse oximeter.



- Airflow (nasal pressure)
- Oxygen saturation (SpO_2)
- Heart rate (often)

Example Devices

- ResMed ApneaLink® (ResMed)
- Alice NightOne® (Philips Respironics)

PAT-based (Peripheral Arterial Tonometry)

Uses a finger probe to measure arterial tone, along with respiratory effort, heart rate, and oxygen levels.



- Arterial tonometry (airflow surrogate)
- Oxygen saturation
- Heart rate
- Body position (often)

Example Devices

- WatchPAT® (Itamar Medical)

PPG-based (Photoplethysmography)

Uses a finger or wrist-worn sensor to measure blood oxygen and heart rate, often with motion and body position sensors.



- Oxygen saturation (SpO_2)
- Heart rate
- Motion (often)
- Body position (often)

Example Devices

- NightOwl® (Nox Medical)
- Embletta® MPR (Natus)

Effort-based (Respiratory Effort)

Measures respiratory effort using chest and/or abdominal belts to detect breathing patterns and events.



- Chest effort (belt)
- Abdominal effort (belt)
- Oxygen saturation (often)
- Heart rate (often)

Example Devices

- Somnolter® (Weinmann)
- Embletta® MPR (Natus)

Acoustic-based (Snoring + Breathing Sounds)

Uses a microphone to detect snoring and breathing sounds, often combined with other sensors (e.g., oximetry, effort).



- Snoring sounds
- Breathing sounds (often)
- May include oxygen, heart rate, and position (depends on device)

Example Devices

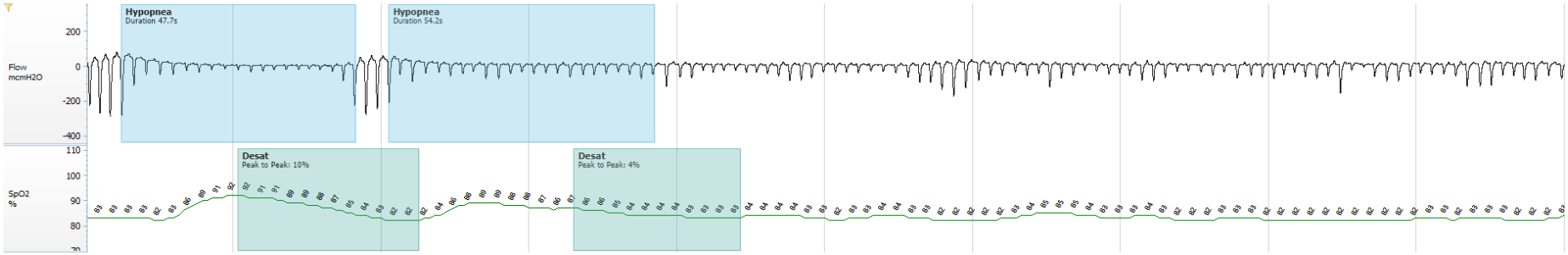
- ZzZ SleepTuner® (Sleep Therapeutics)

Note: Device features can vary by manufacturer and model. Many HSAT devices combine multiple sensors (e.g., airflow, oximetry, effort, and position) to improve accuracy and diagnostic yield.

Source: Home Sleep Apnea Test - American Academy of Sleep Medicine AASM Image: created with AI

HSAT





Source: Obstructive Sleep Apnea, UpToDate, 2024. Image: Nox

HSAT



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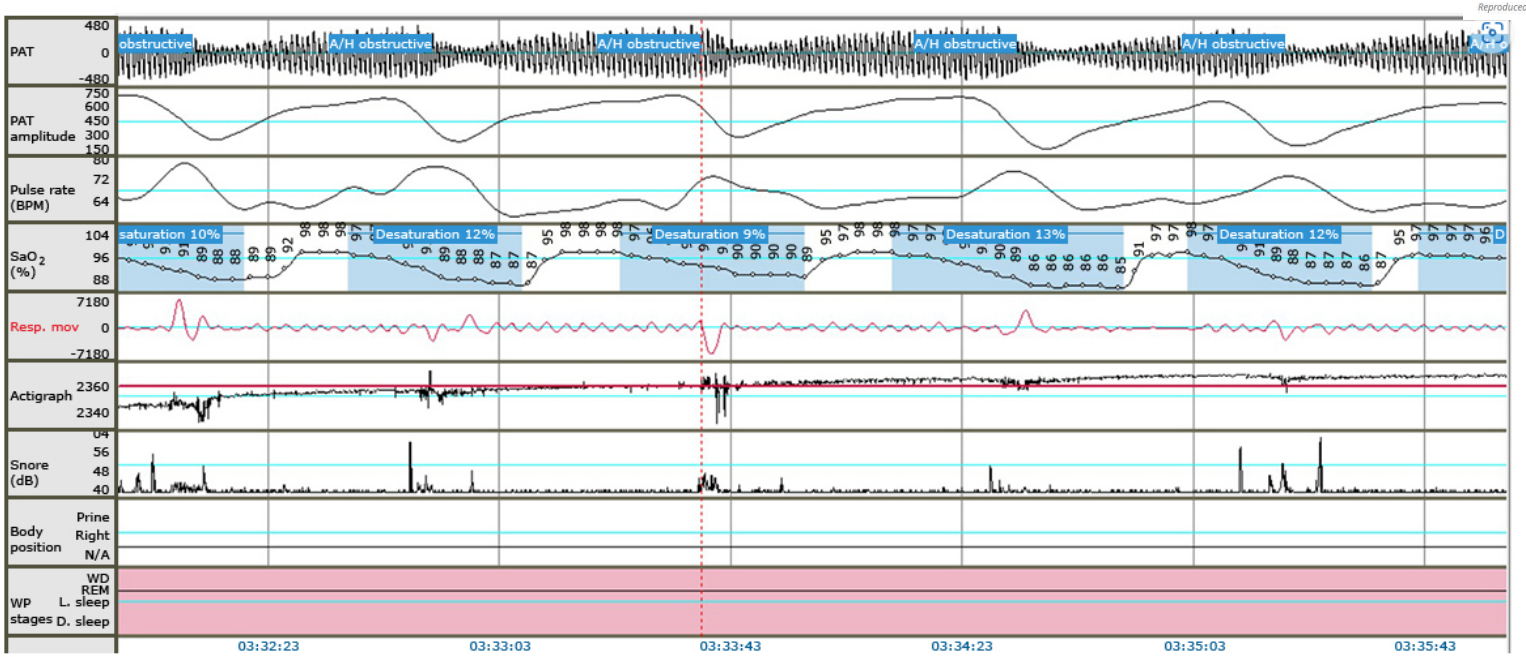
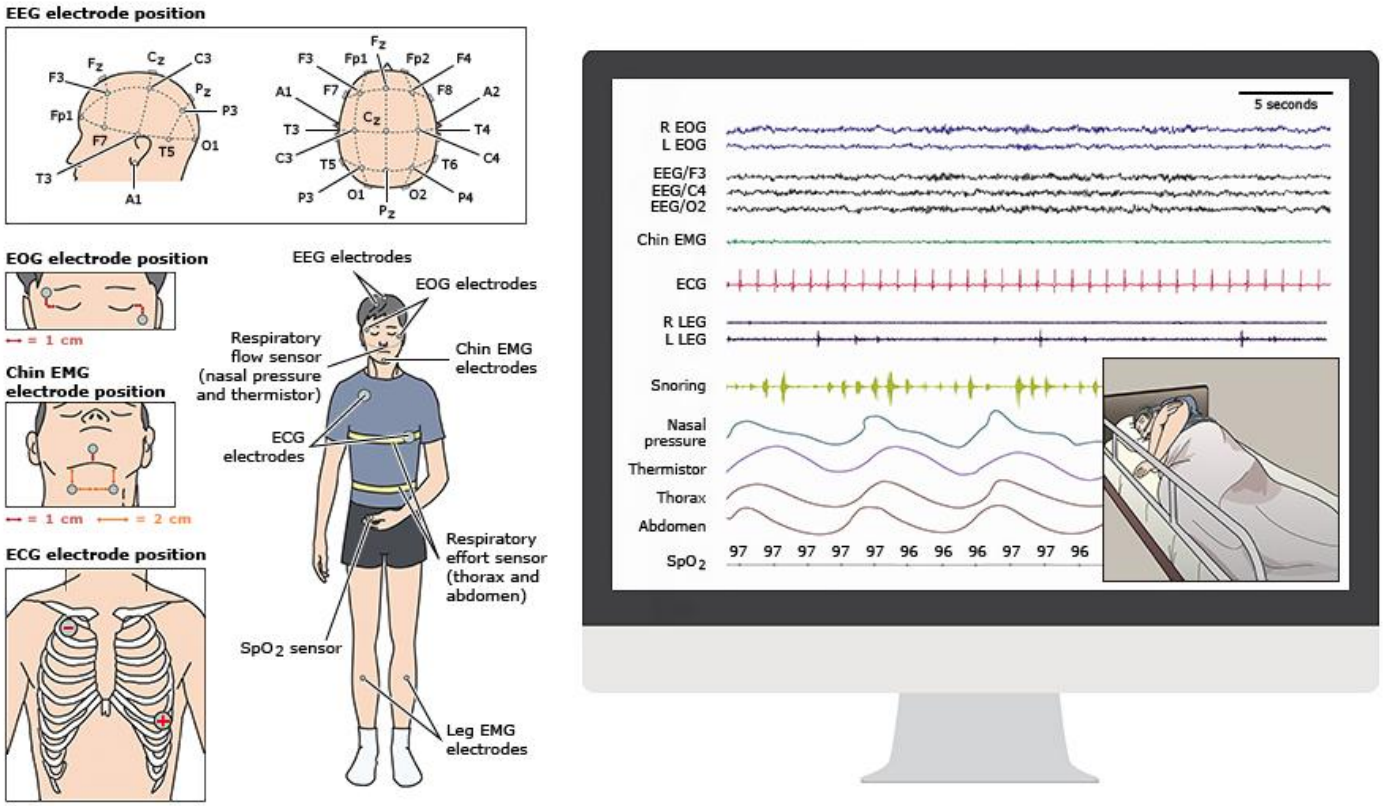


In this three-minute epoch from a WatchPAT device, there are recurrent oxygen desaturations. The PAT signal shows waxing and waning of the arterial tone which is associated with interruptions in sleep and the internal algorithm will score breathing events (marked A/H obstructive). The actigraph signal denotes wrist movement, likely associated with arousals from sleep, and the snore signal shows burst of snoring between breathing interruptions.

PAT: peripheral arterial tone, note beat-to-beat variability; PAT amplitude: the moving average of the PAT signal; pulse rate: heart rate in beats per minute; SaO_2: oxygen saturation; resp. mov: respiratory movement as measured by the sternal sensor; actigraph: actigraphy measuring arm movements; snore: snore signal derived from sternal sensor; body position: body position as measured from the sternal sensor; WP stages: sleep stages as estimated by the PAT signal.

Source: Obstructive Sleep Apnea, UpToDate, 2024. Image - google images

PSG



This figure shows the position of the electrodes for the EEG, EOG, chin and leg EMG, and ECG on a standard sleep study with video monitoring. The EEG is used to detect brain wave activity, EOG is used to capture eye movement, EMG is used to detect muscle activity and movement, and ECG captures electrical activity of the heart.

PSG: polysomnography; EEG: electroencephalography; EOG: electrooculography; EMG: electromyography; ECG: electrocardiography.

Source: Obstructive Sleep Apnea, UpToDate, 2024

Diagnostic Criteria for Obstructive Sleep Apnea (OSA)

Per AASM Guidelines

1 Symptoms or bedpartner report

At least one

symptom or reported finding by a bedpartner



AND

2 PSG or HSAT shows respiratory events

≥ 5

predominantly obsructive respiratory events per hour of sleep or per hour of monitoring

(depending on whether we are using a PSG or an HSAT, respectively)





OR

3 PSG or HSAT shows respiratory events

≥ 15

predominantly obstructive respiratory events per hour of sleep or per hour of monitoring

(depending on whether we are using a PSG or an HSAT, respectively)





AND

4 Not better explained by another cause

- other sleep disorder
- medical disorder
- medication
- substance use



The symptoms are not better explained by another current sleep disorder, medical disorder, medication or substance use.

OSA Classification Severity

Quantified primarily by the apnea-hypopnea index (AHI)

Mild

5 – 14

events/hour

Moderate

15 – 29

events/hour

Severe

≥ 30

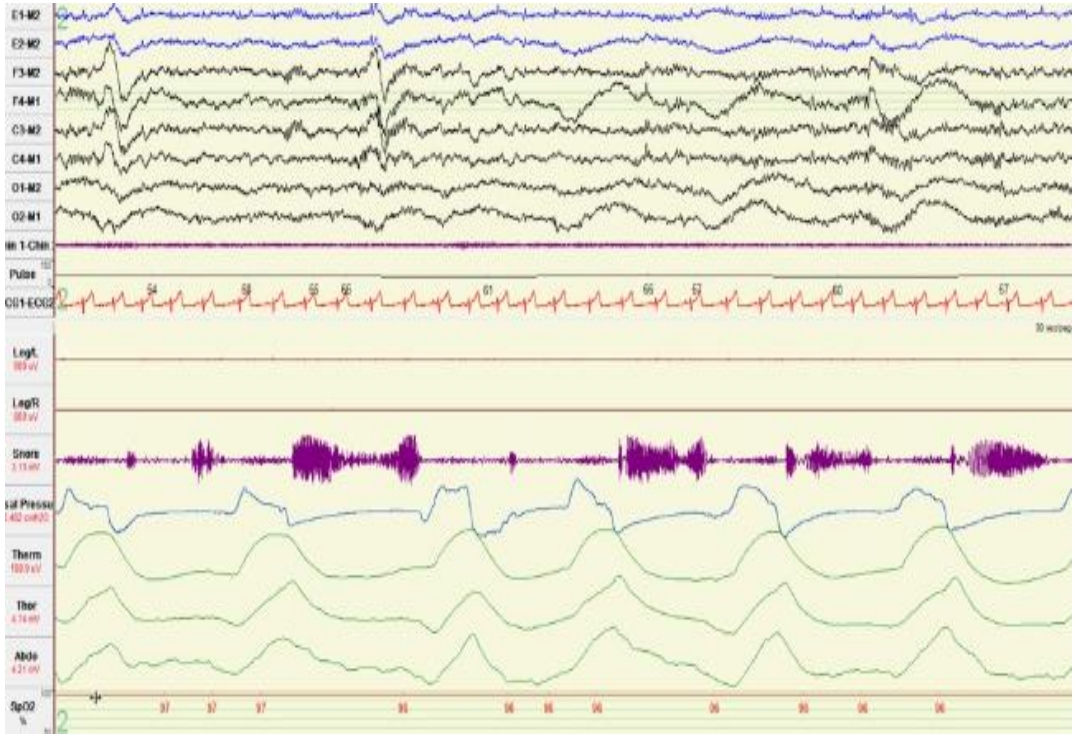
events/hour

Source: Obstructive Sleep Apnea, International Classification of Sleep Disorders ICSD-TR 3rd ed. Image: created with AI

Pediatric OSA

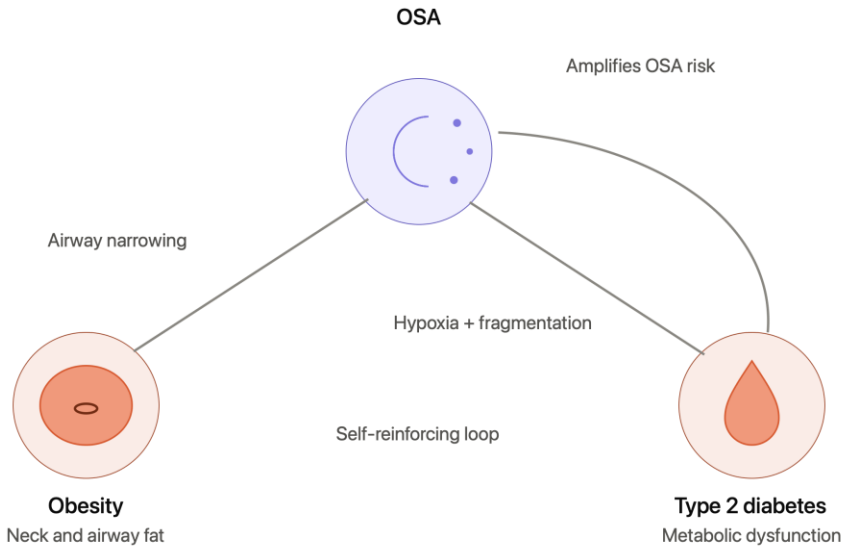
PSG findings:

- AHI >/= 1
- A breathing pattern consisting with obstructive hypoventilation with a TCO2 >50mmHg for more than 25% of their sleep time with evidence of snoring, paradoxical thoracoabdominal motion or flattening of the inspiratory nasal waveform.
- Symptoms are not better explained by another disorder.



Source: Obstructive Sleep Apnea, International Classification of Sleep Disorders ICSD- TR 3rd ed. Image: google images

Clinical Implications: OSA and Obesity



Obesity → OSA

Airway mechanisms

- ↑ Neck/parapharyngeal adiposity
- ↓ Pharyngeal caliber
- ↑ Collapsibility
- ↓ Functional residual capacity

OSA → metabolic dysfunction

Intermittent hypoxia + sleep fragmentation →

- ↑ Sympathetic tone
- ↑ Cortisol/catecholamine signaling
- ↑ Free fatty acids
- ↑ Oxidative stress
- ↑ Inflammatory signaling
- ↓ Insulin sensitivity
- Impaired glucose regulation

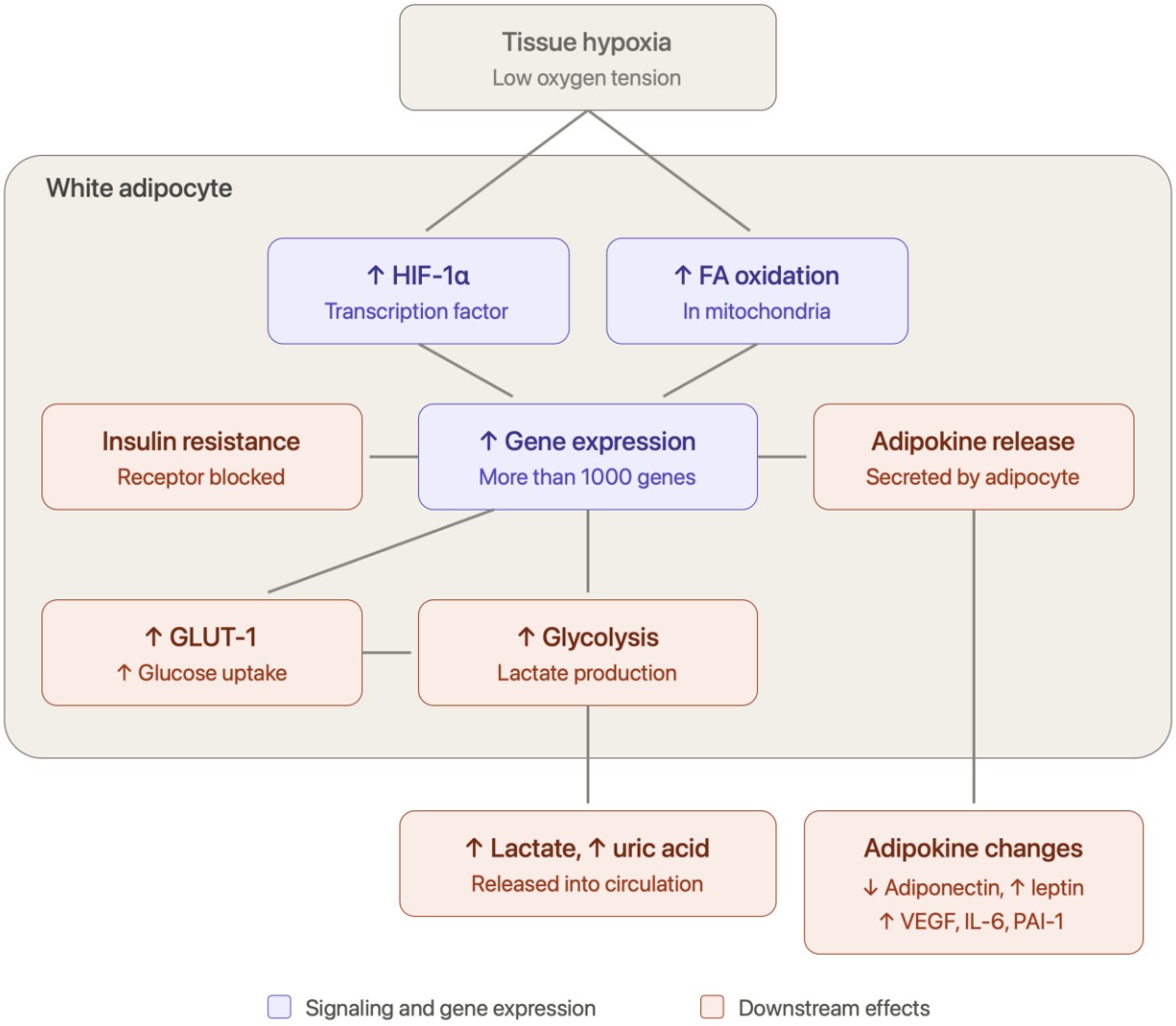
T2DM → OSA susceptibility

Diabetes may amplify:

- Autonomic dysfunction
- Fluid redistribution
- Obesity
- Neuromuscular dysfunction
- Vascular/metabolic abnormalities

Source: Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed. Images: created with AI

OSA and Obesity



Source: Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed. Image: Figure 155.4 - adaptation through AI

Epidemiology OSA and Obesity

Prevalence in the clinical setting



Wisconsin Sleep Cohort

+1 SD in BMI
(5.7 kg/m²)
4× risk of AHI ≥5/hr

±1% body weight
Weight gain or loss
±3% change in AHI

10% weight gain
From mild OSA (AHI 5–15)
6× risk of moderate-severe

Sleep Heart Health Study

BMI and OSA
Dose-dependent relationship, with parallel weight and AHI changes

5-year weight change
AHI rises more with gain than it falls with loss

Sex differences
Men: larger AHI rise with weight gain
Postmenopausal women: greater BMI effect

Source: Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed.

Precision Medicine in OSA

OSA endophenotypes: why one treatment does not fit everyone

Four major physiologic traits determine OSA expression

1 Anatomical collapsibility



Low Pcrit High Pcrit

- **High Pcrit**
- Small / collapsible pharyngeal airway
- Obesity and tissue loading
- Craniofacial restriction

2 Upper-airway muscle responsiveness



Preserved response Blunted response

- Ability of genioglossus and other dilator muscles to compensate for negative pressure
- Some patients have relatively preserved anatomy but inadequate neuromuscular compensation

3 Arousal threshold



Low threshold High threshold

- How easily the brain awakens in response to respiratory disturbance
- Low threshold: repeated arousals before airway recruitment can stabilize breathing
- High threshold: prolonged obstruction and hypoxemia before arousal

4 Loop gain



Stable breathing Unstable breathing

- Stability of the ventilatory control system
- High loop gain → exaggerated response to CO_2/O_2 perturbations → unstable breathing

Clinical implication

OSA is a syndrome, not a single mechanism.

The same AHI can arise from very different combinations of anatomy, neuromuscular compensation, arousal physiology and ventilatory control.

Source: Obstructive Sleep Apnea - Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed. Image: created AI

Management

- PAP therapy
- Oral Appliance Therapy
- Upper Airway Surgery
- Hypoglossal Nerve Stimulator – Inspire
- GLP-1 / GIP analog
- Conservative strategies



Source: Obstructive Sleep Apnea - Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed. Image: google images

Precision Medicine in OSA

1 **Anatomical collapsibility**

High Pcrit



Low Pcrit High Pcrit

- Small / collapsible pharyngeal airway
- Obesity and tissue loading
- Craniofacial restriction

Anatomical Collapsibility

GLP-1/GIP Analog: Tirzepatide

ORIGINAL ARTICLE

Tirzepatide for the Treatment of Obstructive Sleep Apnea and Obesity

This article has been corrected. VIEW THE CORRECTION

Authors: Atul Malhotra, M.D., Ronald R. Grunstein, M.D., Ph.D., Ingo Fietze, M.D., Terri E. Weaver, Ph.D., Susan Redline, M.D., M.P.H., Ali Azarbarzin, Ph.D., Scott A. Sands, Ph.D., +5, for the SURMOUNT-OSA Investigators* Author Info & Affiliations

Published June 21, 2024 | N Engl J Med 2024;391:1193-1205 | DOI: 10.1056/NEJMoa2404881 | VOL. 391 NO. 13

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Additional strengths of the Zepbound vial are available!

The Zepbound vial (2.5 mg, 5 mg, 7.5 mg, and 10 mg) is available **for patients, regardless of insurance**, including Medicare, Medicaid, and no insurance.[1]



FDA NEWS RELEASE

FDA Approves First Medication for Obstructive Sleep Apnea

Share | Post | Linkedin | Email | Print

For Immediate Release: December 20, 2024

Anatomical Collapsibility

-Moderate to Severe OSA. AHI > or = to 15 in a home sleep apnea test or documented in an attended polysomnogram.

-BMI: BMI ≥30 kg/m2 or (BMI ≥27 to <30 kg/m2 + 1 weight related comorbildity

Tirzepatide (Zepbound) is indicated in **combination with** a reduced-calorie diet and increased physical activity.

Goal of treatment:

Excess body weight reduction or long-term maintenance in adults with obesity or adults with overweight in the presence of at least one weight-related comorbid condition.

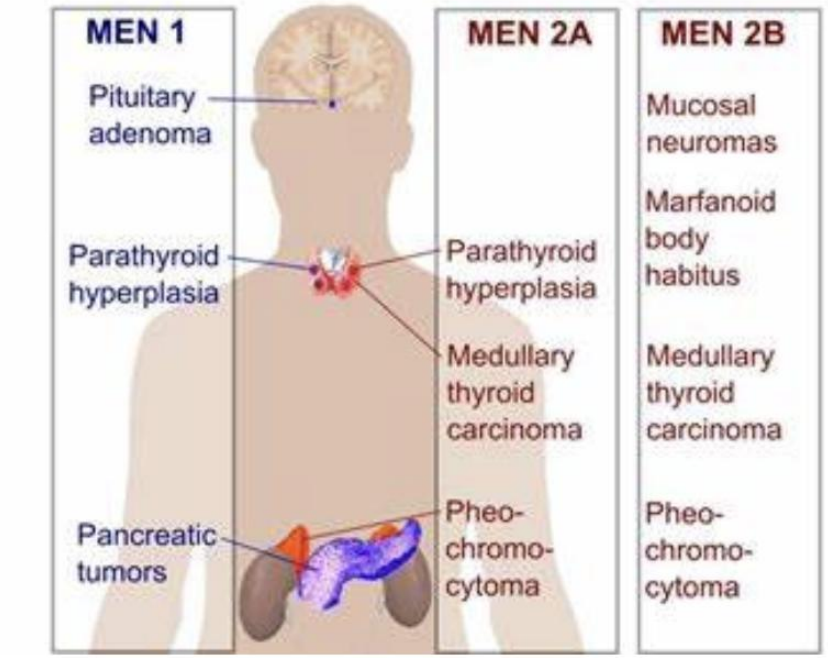


Source: SURMOUNT – OSA study 2024. Image: Lilly/ Zepbound

Contraindications and Side Effects

- **Contraindications:**
- Personal of family history of medullary thyroid carcinoma (MTC).
- History of Multiple Endocrine Neoplasia syndrome type 2 (MEN 2).
- History of serious allergic reaction to tirzepatide or any of the ingredients in Zepbound.

- **Common side effects:**
- GI: nausea, diarrhea, vomiting, constipation, stomach (abdominal) pain, indigestion, , belching, and heartburn.
- Other: injection site reactions, feeling tired, allergic reactions, hair loss.



Source: SURMOUNT – OSA study 2024. Images Source: Google images

Anatomical Collapsibility

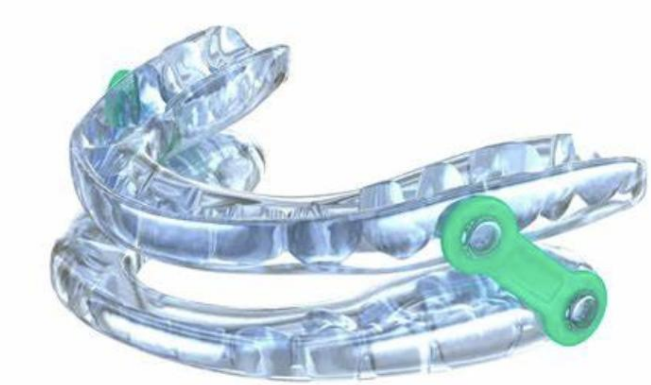
MAD

Most likely to benefit from MADs include:

- Those with mild-to-moderate sleep apnea
- Young individuals
- People with positional OSA that improves when sleeping on their side
- Females
- Those with a receding jaw structure (retrognathic mandible)

Less likely to benefit from MADs include:

- Older adults
- Individuals with obesity and those with excess fatty tissue around the neck
- Those with a stiff jaw, which makes advancement difficult
- People with dental conditions, periodontal disease





Source: Mandibular Advancement Device- American Academy of Dental Sleep Medicine . Image: Google images – MAD

Precision Medicine in OSA

2 **Upper-airway muscle responsiveness**

Neuromuscular compensation

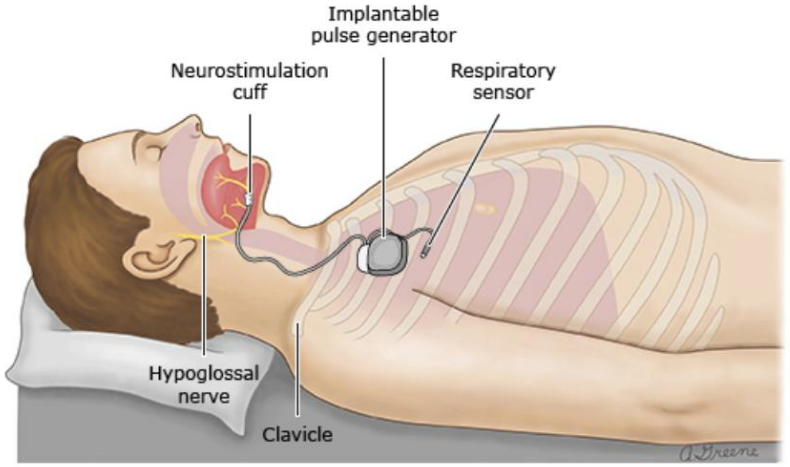


Preserved response Blunted response

- Ability of genioglossus and other dilator muscles to compensate for negative pressure
- Some patients have relatively preserved anatomy but inadequate neuromuscular compensation

HGNS

- Anatomy and Mechanism of action of the device.
- **Patient selection:**



Patient selection criteria for hypoglossal nerve stimulation therapy

Parameter	Criteria
Age	18 years or older
AHI	15 to 100 events/hour
BMI	40 kg/m^2*
Central and mixed apneas	<25% of total events
Drug-induced sleep endoscopy findings	No complete concentric collapse of the velopharynx or soft palate
Failed or declined PAP therapy	Yes

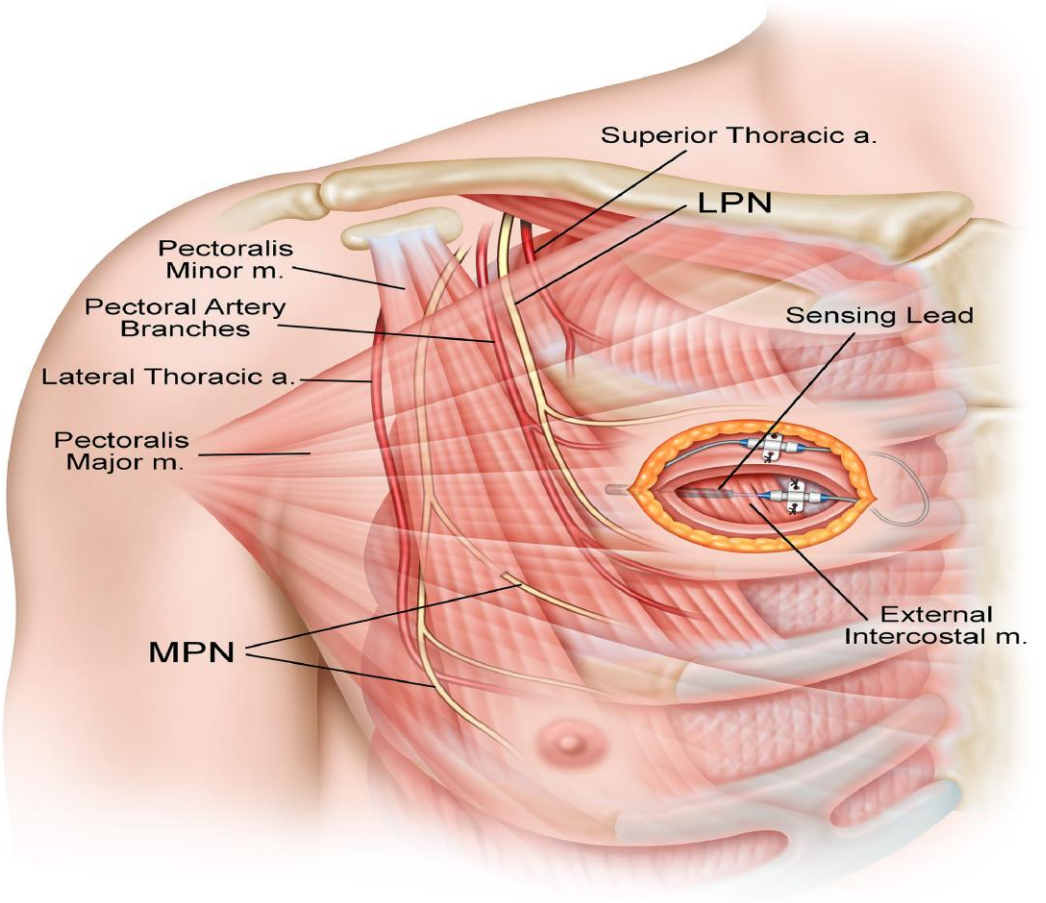
HNS: hypoglossal nerve stimulation; AHI: apnea hypopnea index; BMI: body mass index; PAP: positive airway pressure.

HGNS - INSPIRE

Data to support HNS are largely derived from:

- **Stimulation Therapy for Apnea Reduction (STAR) trial,** which demonstrated efficacy of HNS in select patients with OSA.

- Approximately two-thirds had a successful outcome (defined as a reduction of AHI by 50 percent to below 20 events per hour). Subjective measures, including the Epworth Sleepiness Scale and the Functional Outcomes of Sleep Questionnaire improved too.



HGNS: Efficacy

Adherence and Outcome of Upper Airway Stimulation for the OSA International Registry (ADHERE) global registry.

- FDA to expand approval to including an AHI between 65 and 100/hr and pts with BMI 35-40kg/m2

- Longstanding benefit with persistent reduction in AHI for up to 3 years provided adherence to therapy

-The ADHERE registry reported that 92 percent of patients had a better experience than with PAP therapy

ADHERE Registry

3,741 Enrolled

3,630 Implanted

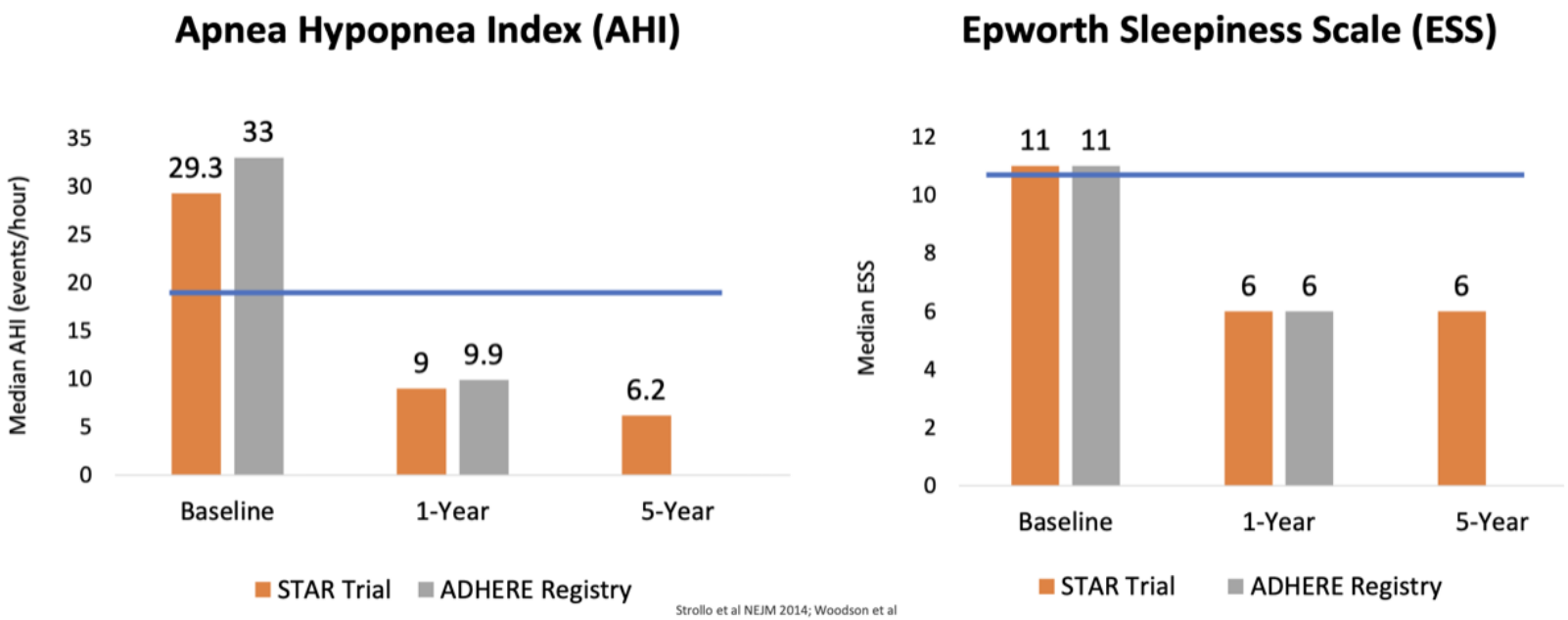
2,485 Post Titration

1,883 Completed 12-month Visit

58 centers from US and Europe, total enrollment goal of 5,000

Patient Characteristics[1]	Value
Age	60 ± 11 (22-86)
Sex	73% Male
Ethnicity	94% Caucasian
Body Mass Index	29.2 ± 3.8
Baseline AHI	33.0
Baseline Co-morbidities[2]	**Value**
Hypertension	47%
Depression	23%
Diabetes	14%
Atrial Fibrillation	6%
Heart Attack	4%
Stroke	4%

HGNS - INSPIRE

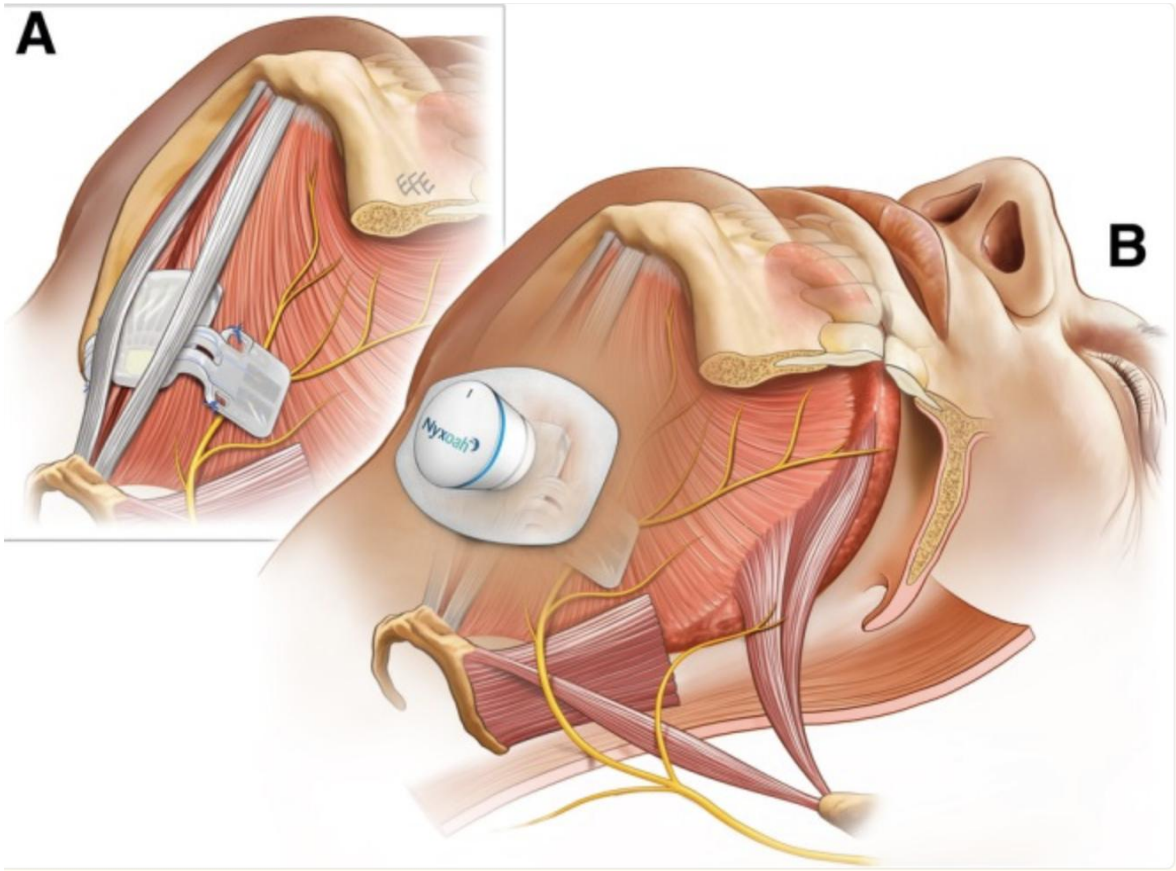


Strollo et al NEJM 2014; Woodson et al ADHERE 2020: Suurna et al, Laryngoscope 2021 Pietzsch et Marin; 2018;

HGNS

The Genio bilateral hypoglossal nerve stimulator consists of a relatively noninvasive, involving dissection to the GG and the placement of the electrodes of the IS on both the left and right hypoglossal nerve branches.

Indications are comparable to Inspire, except BMI limitations, ideally a BMI <32



Source: Woodson BT, Kent DT, Huntley C, et al. Bilateral hypoglossal nerve stimulation for obstructive sleep apnea: a nonrandomized clinical trial. *J Clin Sleep Med*. 2025;21(11):1883–1891.

HGNS - Genio

DREAM trial: bilateral hypoglossal nerve stimulation (Genio)

12-month efficacy, patient-reported outcomes, use and safety

Study and baseline

115
patients implanted in a multicenter, prospective, open-label US pivotal study

28.0	27.0	28.5
mean AHI	mean ODI	mean BMI

Co-primary endpoints at 12 months: AHI responder rate (Sher criteria) and ODI responder rate, both intent-to-treat

Efficacy at 12 months

AHI responder rate (co-primary, ITT)
63.5% (p=0.002)

ODI responder rate (co-primary, ITT)
71.3% (p<0.001)

Median AHI reduction, all positions
70.8%

Median AHI reduction, supine
66.6%

AHI below 15 (patients completing PSG)
82%

AHI below 10 (patients completing PSG)
67.4%

Symptoms, quality of life, use

–3.4 points
Epworth Sleepiness Score

+2.3 points
FOSQ (functional outcomes of sleep)

83.5% → 30.4%
snoring score, baseline to 12 months

85.9%
used the device on over 70% of nights

90%
expressed satisfaction with therapy

Safety
8.7% SAE rate
11 serious adverse events in 10 subjects; 3 device-related, 3 explants

Open-label, single-arm study. Source: DREAM pivotal study (J Clin Sleep Med, 2025); Nyxoah releases

Precision Medicine in OSA

OSA endophenotypes: why one treatment does not fit everyone

Four major physiologic traits determine OSA expression

1 Anatomical collapsibility



Low Pcrit High Pcrit

- **High Pcrit**
- Small / collapsible pharyngeal airway
- Obesity and tissue loading
- Craniofacial restriction

2 Upper-airway muscle responsiveness



Preserved response Blunted response

- Ability of genioglossus and other dilator muscles to compensate for negative pressure
- Some patients have relatively preserved anatomy but inadequate neuromuscular compensation

3 Arousal threshold



Low threshold High threshold

- How easily the brain awakens in response to respiratory disturbance
- Low threshold: repeated arousals before airway recruitment can stabilize breathing
- High threshold: prolonged obstruction and hypoxemia before arousal

4 Loop gain



Stable breathing Unstable breathing

- Stability of the ventilatory control system
- High loop gain → exaggerated response to CO_2/O_2 perturbations → unstable breathing

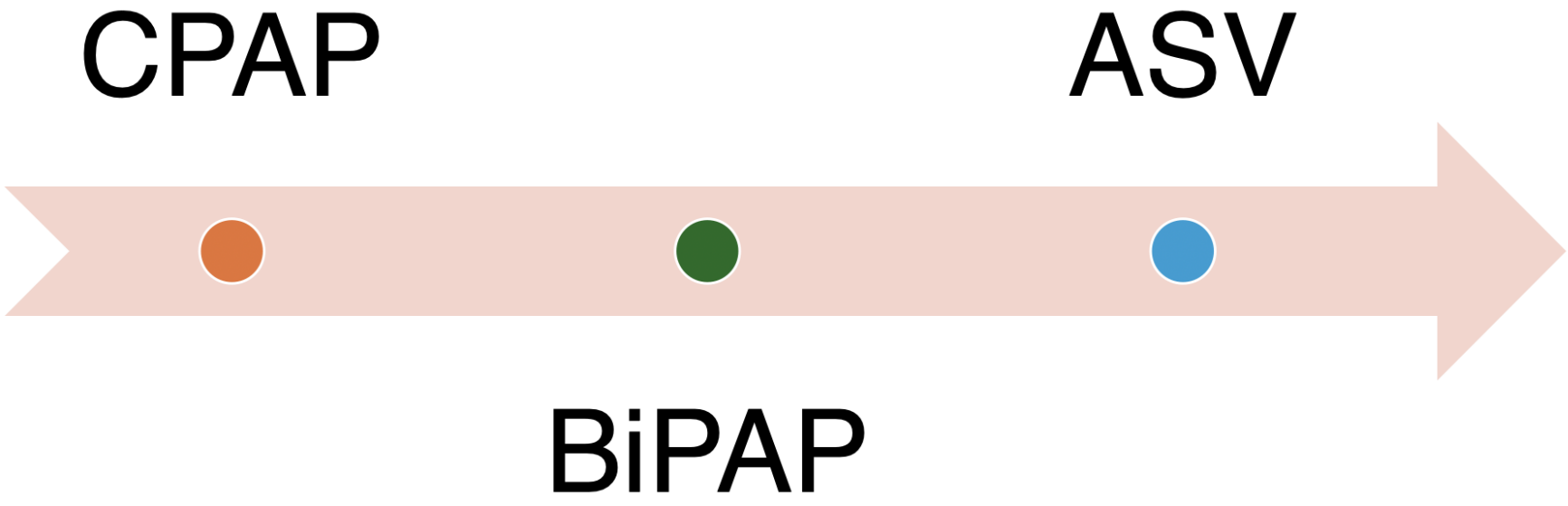
Clinical implication

OSA is a syndrome, not a single mechanism.

The same AHI can arise from very different combinations of anatomy, neuromuscular compensation, arousal physiology and ventilatory control.

Source: Obstructive Sleep Apnea - Principles and practice of sleep medicine – Kryger, Roth, Goldstein, Dement 7th ed. Image: created AI

PAP Therapy



PAP Therapy





PAP compliance

-Time Interval

-Usage days

-Average usage

-PAP mode/pressure/EPR

-Leaks

-AHI

Usage	28/10/2018 - 26/11/2018
Usage days	**12/30 days (40%)**
>= 4 hours	**10 days (33%)**
< 4 hours	**2 days (7%)**
Usage hours	67 hours 58 minutes
Average usage (total days)	2 hours 16 minutes
Average usage (days used)	5 hours 40 minutes
Median usage (days used)	5 hours 54 minutes
Total used hours (value since last reset - 26/11/2018)	1,276 hours

AirSense 10 AutoSet	
Serial number	22141309642
Mode	AutoSet
Min Pressure	6 cmH2O
Max Pressure	12 cmH2O
EPR	Fulltime
EPR level	3
Response	Standard

Therapy						
Pressure - cmH2O	Median:	**7.1**	95th percentile:	**9.9**	Maximum:	**11.0**
Leaks - L/min	Median:	**6.5**	95th percentile:	**23.3**	Maximum:	**85.9**
Events per hour	AI:	**5.4**	HI:	**0.4**	AHI:	**5.8**
Apnoea Index	Central:	**1.5**	Obstructive:	**1.6**	Unknown:	**2.1**
Cheyne-Stokes respiration (average duration per night)						**2 minutes (1%)**

Usage - hours



Conservative strategies

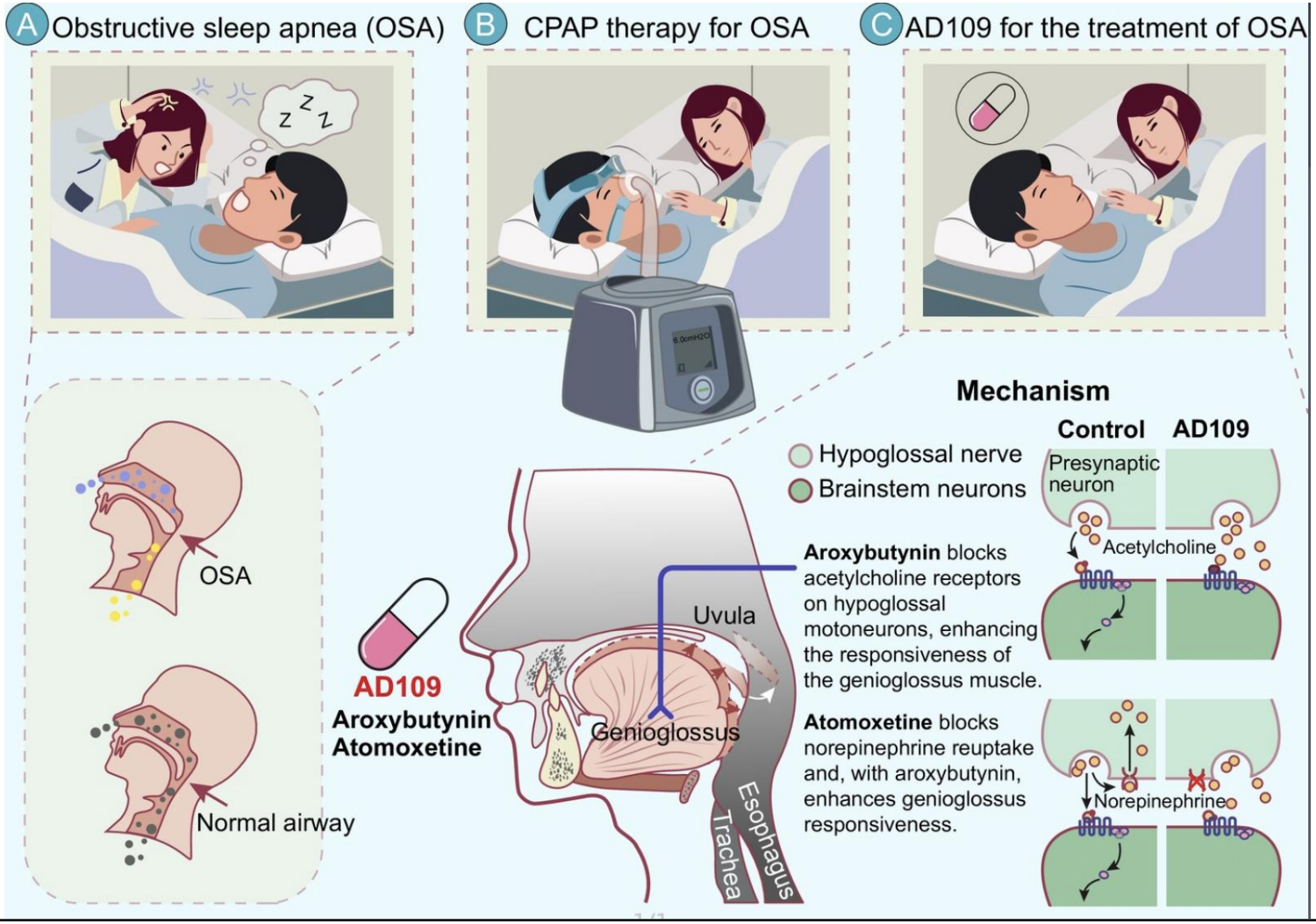
Avoiding sedatives and alcohol

Treat any nasal congestion

Positional Sleep Device



Novel therapies



Retatrutide: The Next Metabolic Wave

GIP + GLP-1 + Glucagon receptor agonism

Greater metabolic impact. Broader benefits.

Why triple agonism?

GIP

Insulinotropic / metabolic effects

GLP-1

Appetite suppression + glucose lowering

Glucagon

Increased energy expenditure / altered substrate metabolism

TRIUMPH-1 — 2026 Phase 3

Adults with obesity without diabetes:

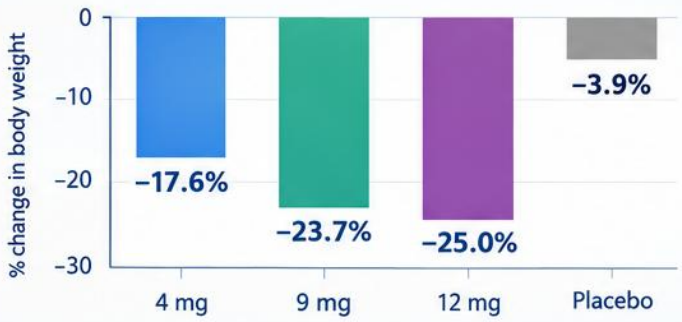
- **2,339** randomized
- **80** weeks
- Retatrutide 4, 9 or 12 mg vs placebo
- **OSA subgroup:** **243** participants



Three receptors. One powerful approach.

- GIP
- GLP-1
- Glucagon

Body weight at 80 weeks

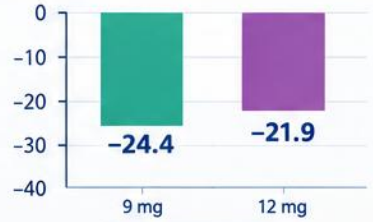


OSA Subgroup: Change in AHI

Hybrid-treatment estimand (events/hour)



Treatment differences vs placebo (events/hour)



Both $P < 0.001$

ITT analysis produced similar AHI reductions.

Retatrutide delivers meaningful weight loss and OSA improvement, with the potential to transform metabolic and sleep health.

Source: The New England Journal of Medicine, Retatrutide, a Triple Hormone Receptor Agonist, for Treatment of Obesity, September 2026. Image created with AI

THANK YOU

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