

Obstructive Sleep Apnea

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Disclosure

Advisory Board: Solius Labs

Consultant: Neuronic Corporation; Solius Labs

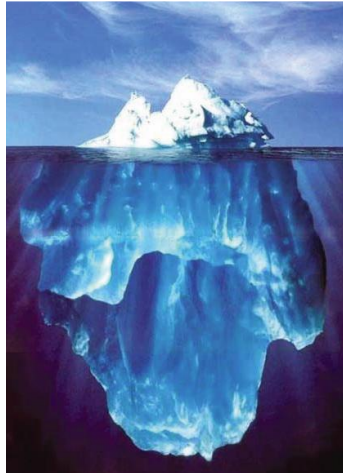
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Roger Seheult, MD
Obstructive Sleep Apnea

Obstructive Sleep Apnea: The Iceberg Disease



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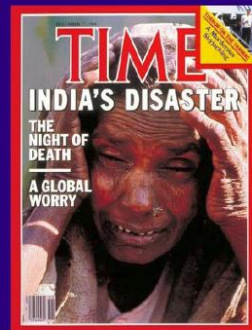
What do all three of these man made
disasters have in common?



EXXON-VALDEZ
1989



THREE MILE ISLAND
1979



BHOPAL, INDIA
1984

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Introduction

OSA

- Epidemiology and Pathogenesis
- Diagnosis and Consequences
- CPAP Treatment
- non CPAP Treatment
- Cost

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OSA

- Relatively new diagnosis
- Credit has gone to Sidney Burwell
 - American Journal of Medicine* in 1956
 - description of the first patient with OSA
- More careful review will find an article in *Lancet* by a London physician by the name of W. H. Broadbent:



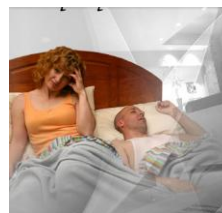
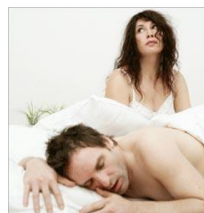
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OSA

“When a person, especially advanced in years, is lying on his back in heavy sleep and snoring loudly, it very commonly happens that every now and then the inspiration fails to overcome the resistance in the pharynx of which stertor or snoring is the audible sign, and there will be perfect silence through two, three, or four respiratory periods, in which there are ineffectual chest movements; finally, air enters with a loud snort, after which there are several compensatory deep inspirations before the breathing settles down to its usual rhythm. In the case to which I allude there was something more than this. The snoring ceased at regular intervals, and the pause was so long as to excite attention, and indeed alarm.”

Kapur VK, Auckley DH, Chowdhuri S, et al. Clinical practice guideline for diagnostic testing for adult obstructive sleep apnea. J Clin Sleep Med. 2017;13(3):479-504. doi:10.5664/jcsm.6506.

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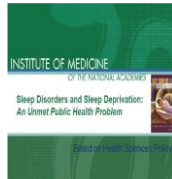
Epidemiology

- AHI (# of Apneas and Hypopneas in 1 hour)
 - 0-4 is normal
 - 5-14 is mild
 - 15-29 is moderate
 - 30+ is severe
- Prevalence of AHI 5+
 - Men = 24% (EDS = 4%)
 - Women = 9% (EDS = 2%)

Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. N Engl J Med. 1993;328(17):1230-1235. doi:10.1056/NEJM199304293281704.

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Epidemiology



Institute of Medicine of the National Academies

-Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem (2006)

“50-70 million suffer from a chronic disorder of sleep”

“Majority of these individuals are not appropriately treated”

“Awareness among health care professionals is low considering the size of the problem”

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Importance of Understanding Risk Factors for Sleep-Disordered Breathing

- Majority (70-80%) of patients with sleep-disordered breathing (SDB) not diagnosed and not treated^{1,2}
- Understanding underlying risk factors, varying clinical presentations, and phenotypes is crucial to case identification
- Clinical epidemiologic studies: significant proportion of occult SDB would be missed if screening based solely on obesity or male sex³
- Genetic epidemiologic studies: majority of genetic variance in sleep-disordered breathing mediated by obesity independent pathways

1. Young, Sleep, 1997
2. Kapur, Sleep and Breathing, 2002
3. Young, Arch In Med, 2002
4. Patel, Int J of Obesity, 2008

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Risk Factors for Obstructive Sleep Apnea

- Male gender
- Post-menopausal state
- Excess body weight
- Increasing age
- Race
- Craniofacial anatomy
- Familial and genetic predisposition
- * Not Hypothyroidism

Young; Am J Respir Crit Care Med 2002

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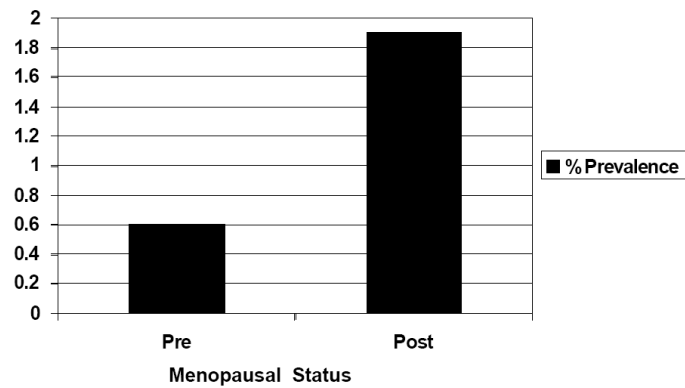
Epidemiology

Man versus Woman:

- women less likely to endorse “classic symptoms”
- women more likely to have
 - daytime fatigue
 - morning headaches
 - mood disturbances

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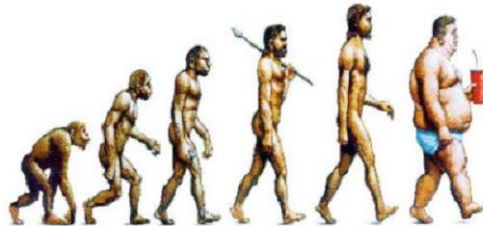
Prevalence of OSA in Women by Menopausal Status



Bixler; Am J Respir Crit Care Med 2001

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Weight: Size Matters

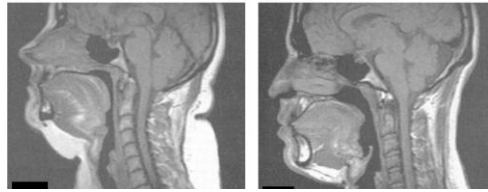
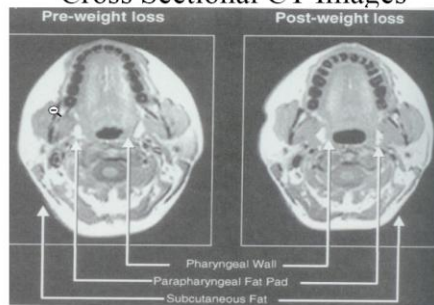


10% = 6X risk

Peppard PE, Young T, Palta M, Dempsey J, Skatrud J. Longitudinal study of moderate weight change and sleep-disordered breathing. JAMA. 2000;284(23):3015-3021. doi:10.1001/jama.284.23.3015.

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Weight:

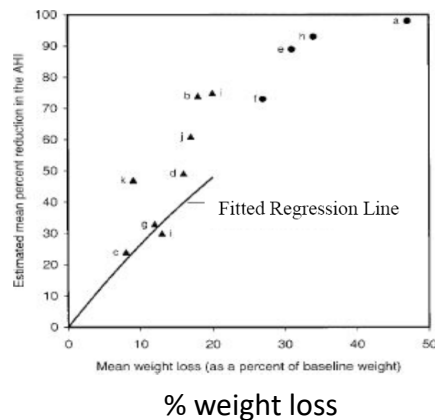
Impact of Weight on the Upper Airway:
Sagittal MR ImagesImpact of Weight on the Upper Airway:
Cross Sectional CT Images

Schwab; Clinics Chest Med 1996

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Weight Loss – Does It Help?
Impact of Weight Reduction on Sleep Apnea

% reduction in the AHI



Young; Am J Respir Crit Care Med 2002

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AGE:

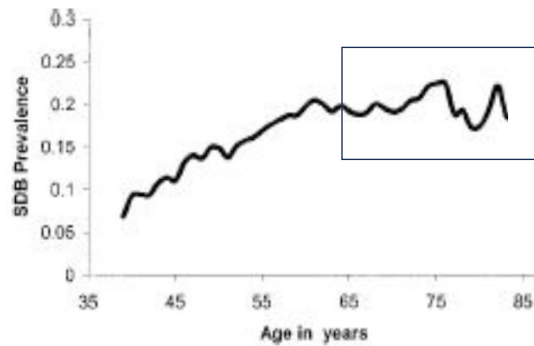
AHI > 20 versus Age:

20-44 = 2%

45-64 = 6%

65-100 = 5% (not higher)

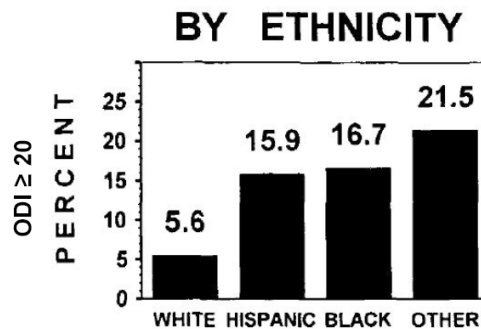
Prevalence of OSA by Age



Young; Arch Intern Med 2002

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Prevalence of Sleep-disordered Breathing in Ages 40-64



Kripke, Sleep, 1997

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Craniofacial Anatomy among Asian and White patients with OSA

- OSA patients had:
 - ↑ Thyromental angle, ↑ Mallampati score
- After controlling for BMI and neck circumference Asians had:
 - Higher Mallampati score, smaller thyromental distance and larger thyromental angle
 - More severe OSA than whites

Lam; Thorax 2005

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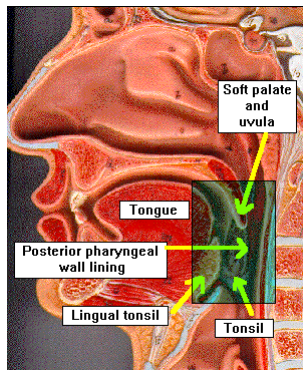
Risk Factors:

- Craniofacial Abnormalities
 - bone and soft tissue morphology
- Nasal Obstruction
 - Allergic Rhinitis
- Genetic Factors
 - 1st degree relatives increase prev 22 → 86%

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Pathogenesis:

- obstruction in the upper airway
- reduced neuromuscular dilatory compensation in PM
- ventilatory control instability

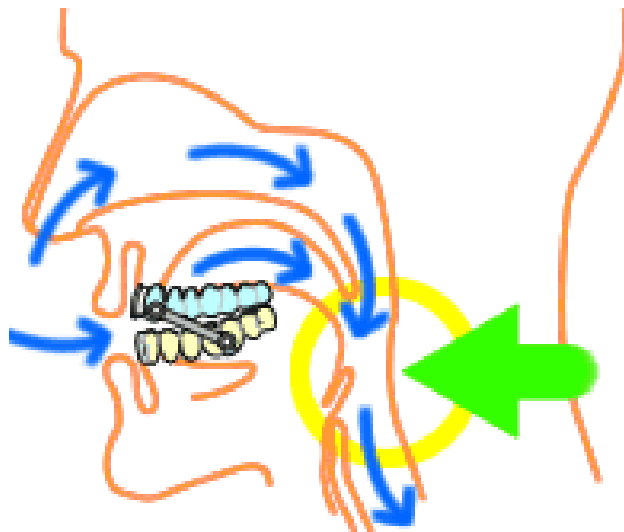


Normal Breathing
- Airway is open
- Air flows freely to lungs



Obstructive Sleep Apnea
- Airway collapses
- Blocked air flow to lungs

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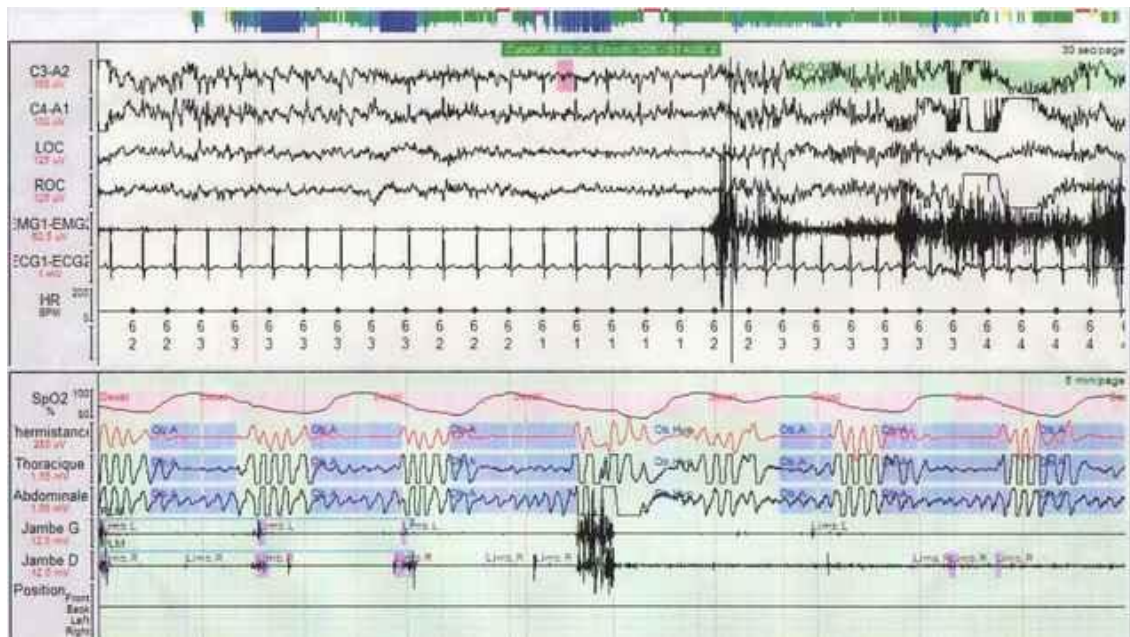
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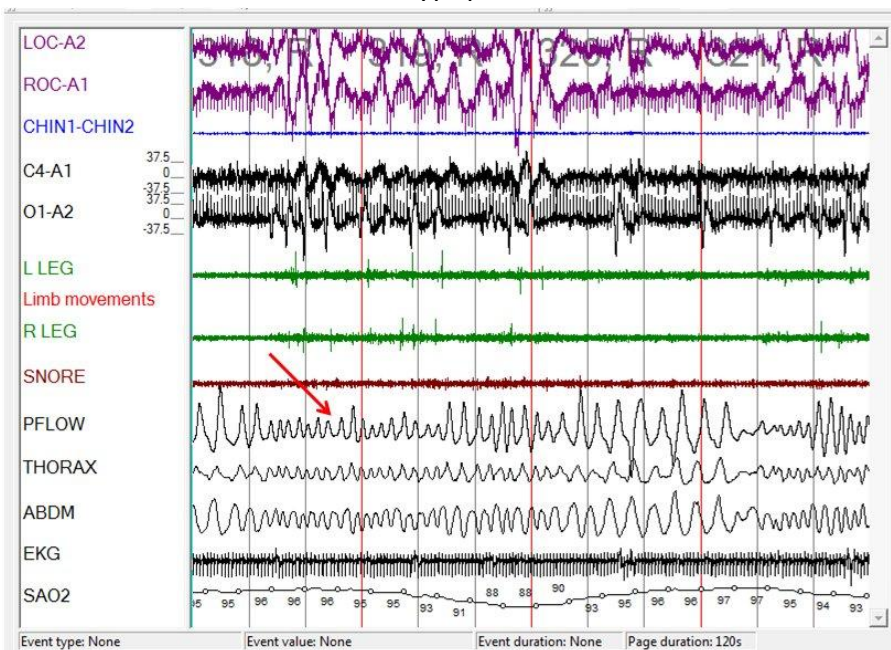
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Obstructive Apnea



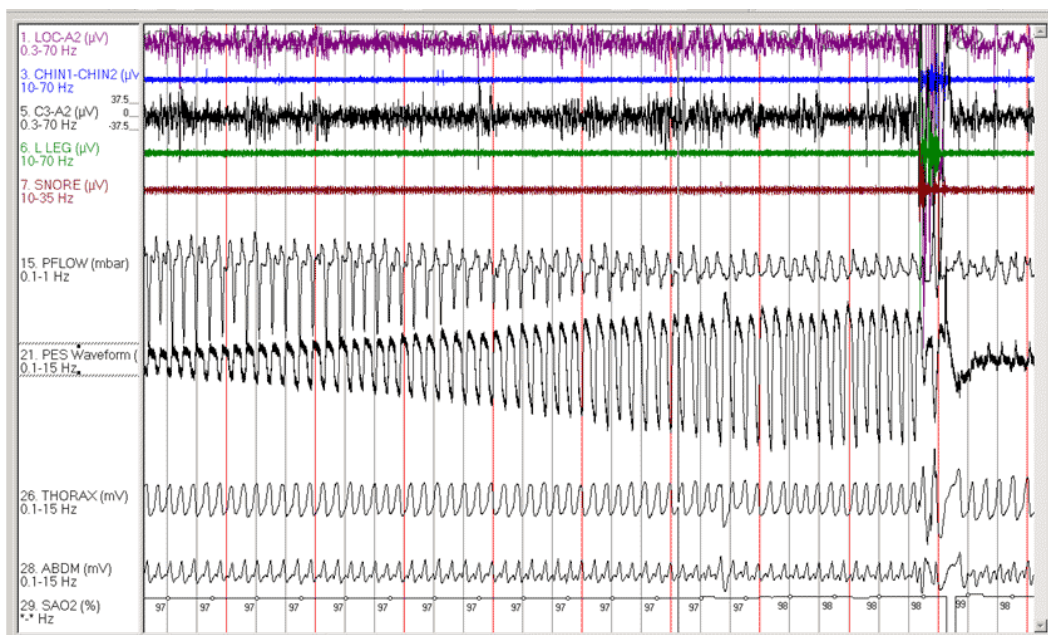
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Hypopnea



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Respiratory Effort Related Arousal (RERA) - UARS



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Diagnosis:

CPAP will be covered for adults with SDB, if:

- $AHI \geq 15$

[OR]

- $AHI \geq 5$ with ("mild, symptomatic")

- Hypertension
- Stroke
- Sleepiness
- Ischemic heart disease
- Insomnia
- Mood disorders

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Diagnosis:

- Overnight Pulse Oximetry can see it if desaturations but not a good screening tool
 - outcome data predicts abnormal AHI
 - look for desaturations of 2-4% and < 90%
- Polysomnogram is the **Gold Standard**
 - now reserved for those suspected of central sleep apnea
 - COPD on oxygen or CHF
- Home Sleep Test (HST)
 - now **acceptable** for most payors
 - great if no other co-morbidities** (CHF or COPD)
 - no tech needed – done at home (1-2 days)

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Consequences: (Association and Causation)

- Daytime sleepiness
- Neurocognitive/psychological functioning
- Mood Disorders (depression)
- Decreased Quality of Life (QOL)
- Hypertension (HTN)
- Diabetes (Glucose Intolerance)
- Stroke (CVA)
- Cardiovascular Disease
- Motor Vehicle Accidents

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Consequences: (Association and Causation)

“Patients with obstructive sleep apnea (OSA) have an increased prevalence of systemic and pulmonary hypertension, left ventricular (LV) hypertrophy, LV systolic and diastolic dysfunction, and congestive heart failure, increased platelet aggregability, and increased susceptibility to thrombotic and embolic cardiac and cerebrovascular events. Patients with OSA have an increased prevalence of coronary artery disease, myocardial infarction, nocturnal angina, and myocardial ischemia, arrhythmias, and sudden cardiac death. Patients with OSA also have an increased prevalence of stroke. Treatment of OSA with continuous positive airway pressure improves cardiac efficiency in patients with heart failure, causes a reduction in the frequency of nocturnal ischemic ST-segment depression, relieves nocturnal angina, and causes a reduction in the occurrence of new cardiovascular events and an increase in the time to such events.”

Cardiovascular Manifestations Seen in Obstructive Sleep Apnea [Comprehensive Therapy Volume 33, Number 2 / June, 2007](#) 82-86

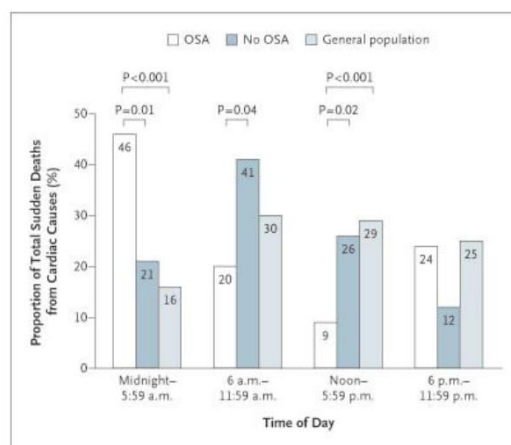
SAVE trial (secondary prevention) did **not** show a reduction in composite CV events overall, despite symptom/QOL improvements.

McEvoy RD, Antic NA, Heeley E, et al; SAVE Investigators and Coordinators. CPAP for Prevention of Cardiovascular Events in Obstructive Sleep Apnea. *N Engl J Med*. 2016;375(10):919-931. doi:10.1056/NEJMoa1606599. PMID:27571048.

“Evidence for reduction in major CV events is mixed; adherence likely matters.”

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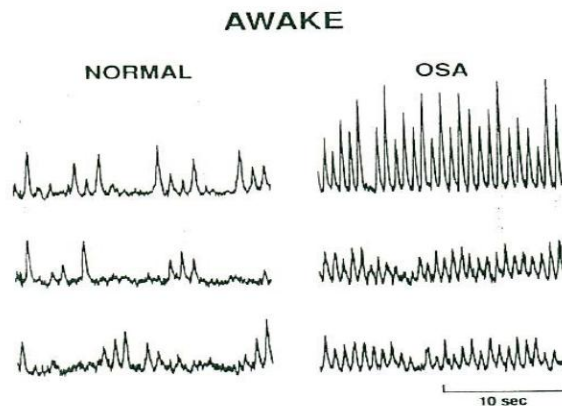
Day-night Pattern of Sudden Death in Obstructive Sleep Apnea



Gami; NEJM 2005

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Increased Sympathetic Nerve Activity in OSA and Systemic Hypertension



Somers; J Clin Invest 1995

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Sleep Apnea and Diurnal Hypertension

<u>Apnea Hyponea Index</u>	<u>Adjusted* Odds Ratio</u>
0	Reference
> 0 - < 5	1.42
≥ 5- <15	2.03
≥15	2.89

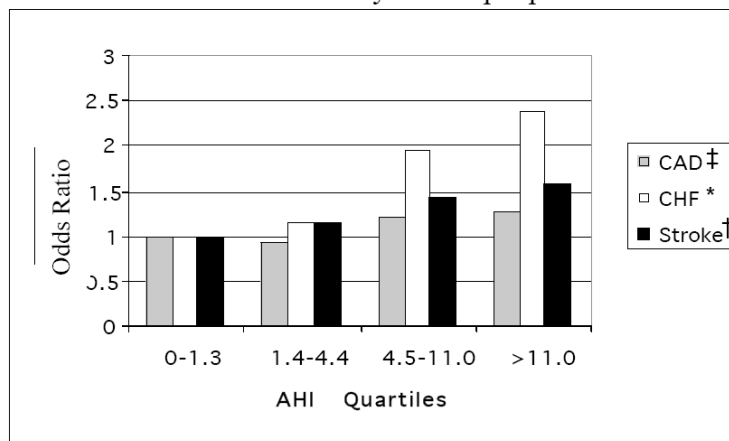
*adjusted for baseline hypertension, age, gender, BMI, waist circumference, alcohol, and tobacco use

P for trend=0.002

Peppard; NEJM 2000

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Adjusted Odds Ratios for Coronary Artery Disease (CAD), Congestive Heart Failure (CHF), and Stroke as a Function of Severity of Sleep Apnea

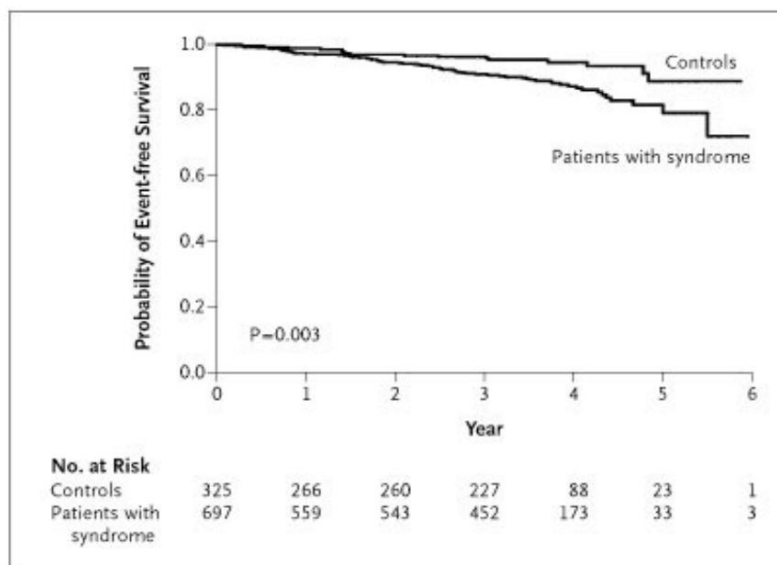


*P=0.004, † P=0.002, ‡ P=0.03 for linear trend across quartiles

Shahar; Am J Respir Crit Care Med 2001

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Event-free Survival (TIA, Stroke, Death)



Yaggi; NEJM 2005

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Dose-Response (Trend) Analysis

<u>Severity of Syndrome</u>	<u>Stroke or Death</u>		<u>Follow-up</u>	<u>Hazard Ratio</u>
	<u>No. of events</u>	<u>No. of patients</u>	<u>yrs.</u>	<u>(95% C.I.)</u>
AHI ≤ 3 (ref)	13	271	3.08	1.00
AHI 4-12	21	258	3.06	1.75 (0.88-3.49)
AHI 13-36	20	243	3.09	1.74 (0.87-3.51)
AHI >36	34	250	2.78	3.30 (1.74-6.26)

P=0.005 (Chi-square test for linear trend)

Yaggi; NEJM 2005

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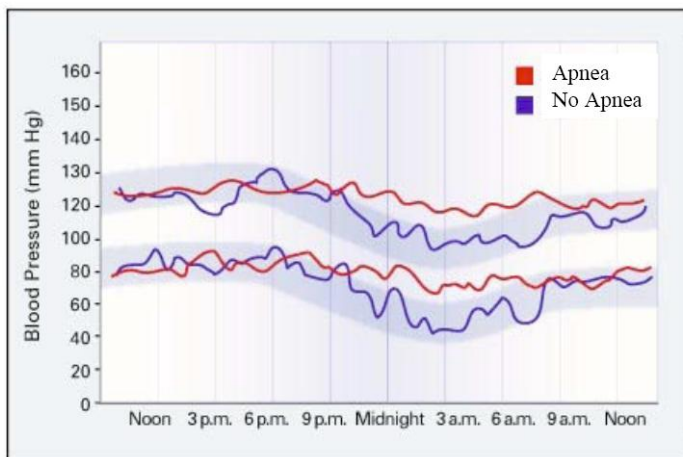
Risk of Stroke or Death

<u>Covariate</u>	<u>Unadjusted Hazard Ratio</u>	<u>Adjusted Hazard Ratio</u>
	<u>(95% C.I.)</u>	<u>(95% C.I.)</u>
Age (yrs)	1.09 (1.06-1.11)	1.08 (1.06-1.11)
Male sex	0.99 (0.62-1.60)	0.78 (0.48-1.28)
Body Mass Index	0.99 (0.97-1.02)	0.99 (0.96-1.02)
Current Smoker	1.21 (0.90-1.64)	1.46 (0.78-2.98)
Diabetes Mellitus	1.56 (1.02-2.59)	1.31 (0.76-1.26)
Hyperlipidemia	1.04 (0.64-1.68)	1.01 (0.61-1.66)
Hypertension	1.48 (0.95-2.28)	1.20 (0.75-1.90)
Atrial Fibrillation	1.56 (0.79-3.12)	0.91 (0.45-1.86)
Obstructive Sleep Apnea	2.24 (1.30-3.86)	1.97 (1.12-3.28)

Yaggi; NEJM 2005

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Circadian Blood Pressure and “Nondipping”



Somers; J Clin Invest 1995
Ancoli-Israel; Chest 2002
Hla, Sleep, 2008

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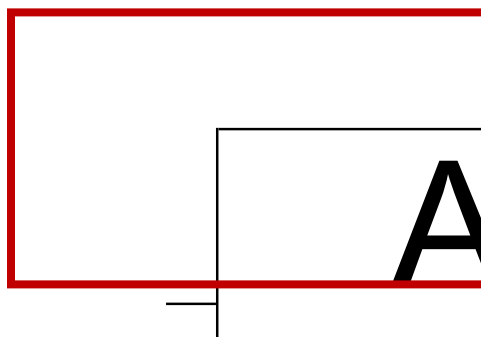
Introduction

OSA

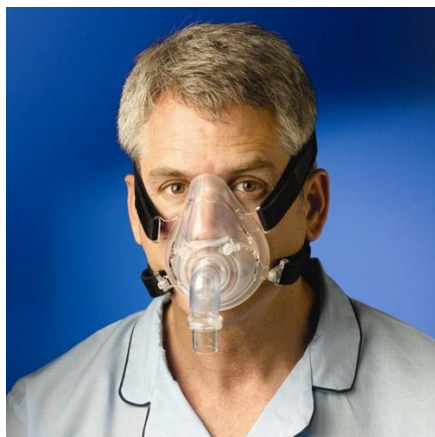
- Epidemiology and Pathogenesis
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Full Face Mask

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Nasal Mask

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Nasal Pillows

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Chin Strap

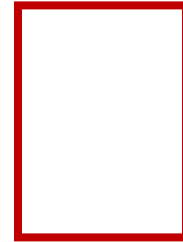
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CPAP (Continuous Positive Airway Pressure) Machine

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10-

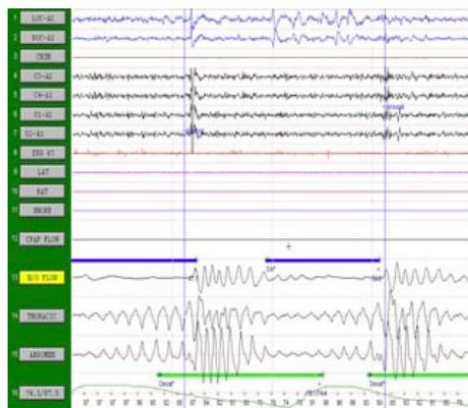


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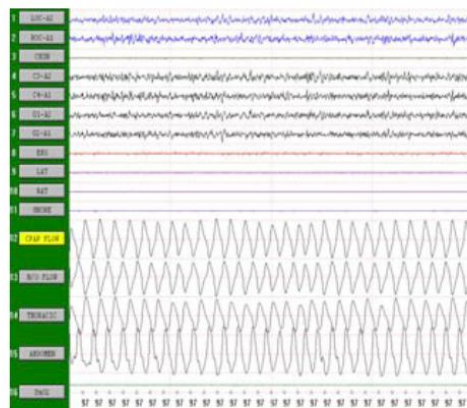
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CPAP Therapy: CPAP Eliminates Obstructive Sleep Apnea Cycle

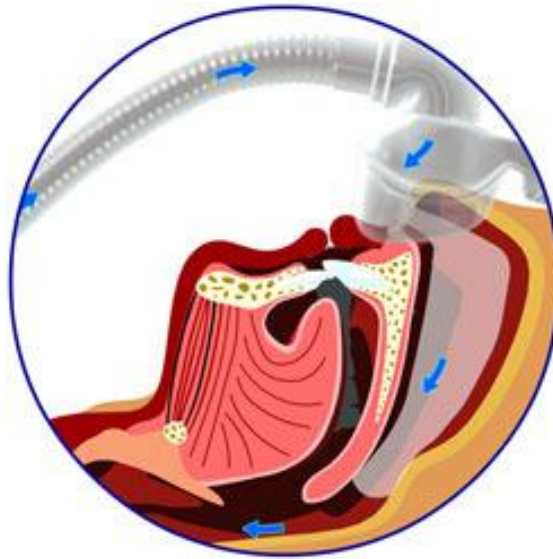
Untreated sleep apnea



On CPAP



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CPAP Therapy to Open the Obstruction

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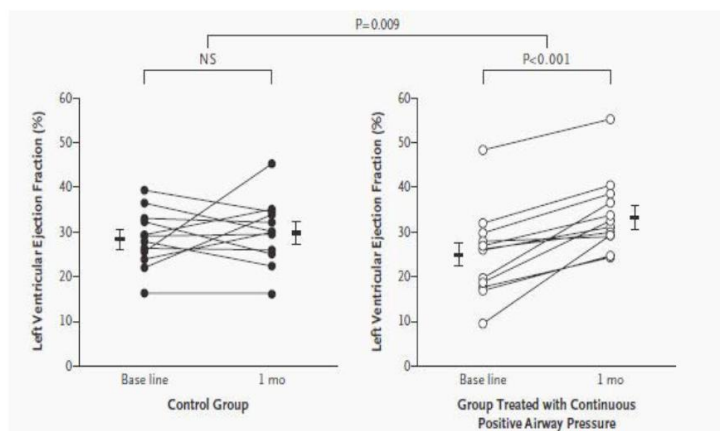
CPAP Therapy:

- first line therapy for OSA for all severity
- improves or resolves daytime sleepiness
- reduces BP
- mixed results for neurocognitive/psychological
- 3-12 months in memory and cognition
- improvement in depression was minimal if at all
- QOL improves with CPAP

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CPAP Therapy:

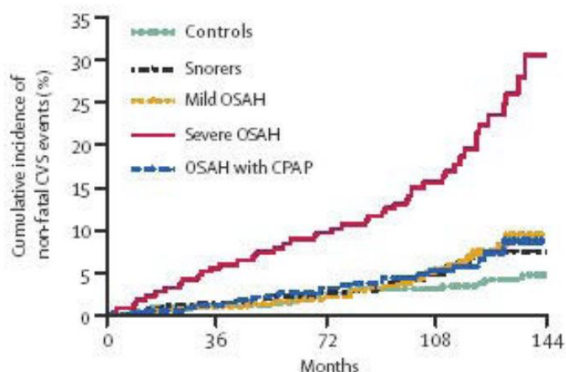
Effects of CPAP on LVEF in Patients with Heart Failure and OSA



Kaneko; NEJM 2003

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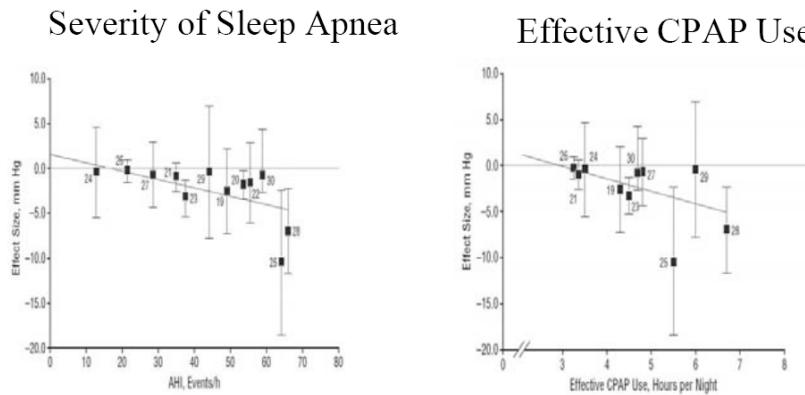
CPAP Therapy:

Cardiovascular outcomes in Obstructive Sleep Apnea With and Without Treatment

Marin; Lancet 2005

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CPAP Therapy: Impact of CPAP on Blood Pressure



Haentjens; Arch Int Med 2007

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CPAP Therapy: CPAP Treatment and Cardiovascular Risk

- ↓ Blood pressure¹
- ↓ Sympathetic activity and catecholamines^{2,5}
- ↓ Recurrent atrial fibrillation³
- ↑ Left ventricular function⁴
- ↓ Early Signs of Atherosclerosis⁵

1. Haentjens; Arch Int Med 2007
2. Faccenda; AJRCCM 2001
3. Kanagol; Circulation 2003
4. Kaneko; NEJM 2003
5. Drager; AJRCCM 2007

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CPAP Therapy:

- compliance
 - defined as ≥ 4 h/night on $\geq 70\%$ of nights in a consecutive 30-day period during the first 90 days
 - CPAP pressure is not predictive
 - experience the first night is predictive
 - 68% of patients use CPAP after 5 years
 - claustrophobia, nasal congestion, fit
- ways to improve compliance
 - humidification¹, education, follow-up
 - work on the right fit

1. [Respir Care](#). 2016 May 24. pii: respcare.04536. Effect of Heated Humidification on CPAP Therapy Adherence in Subjects With Obstructive Sleep Apnea With Nasopharyngeal Symptoms. Soudorn C1, Muntham D2, Reutrakul S3, Chirakalwasan N4.

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CPAP Therapy:

- other variations
 - Auto CPAP
 - C-flex (? may improve compliance)
 - BiPAP
- can now do a few options
 - LAB: CPAP titration → fixed CPAP
 - Home: AutoCPAP titration → fixed CPAP
 - just given them a AutoCPAP!
 - Home sleep study -> AutoCPAP
 - not for CHF or if needing supplemental oxygen

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Introduction

Snoring

OSA

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Non CPAP Therapy:

- Weight Loss
 - even 10% reduction
 - history of weight gain
- Stop Smoking
 - smokers have an increased risk
- ETOH reduction
 - arousal threshold
 - apneas are longer
- Positional Therapy
 - tennis ball

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Non CPAP Therapy:

-Oral Appliances

- mild to moderate OSA (FDA)
- especially good for positional OSA
- don't need to fail CPAP generally
- NEED FOLLOWUP!

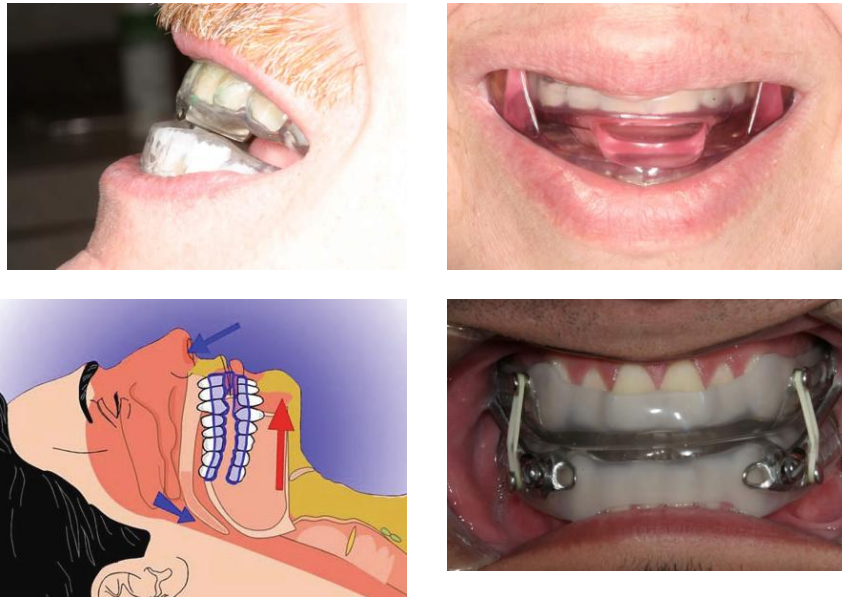
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Non CPAP Therapy:

-Oral Appliances

- 2 types
 - jaw advancers
 - over a period of time
 - tongue suckers

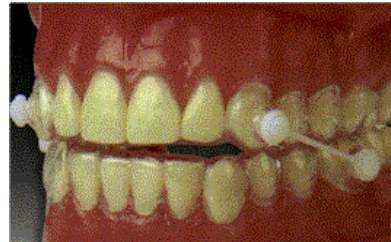
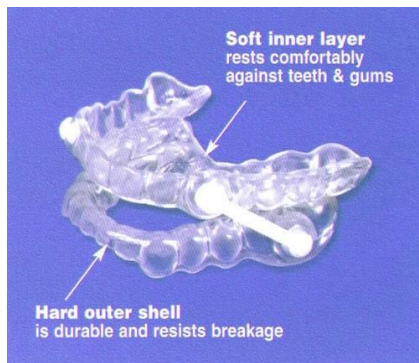
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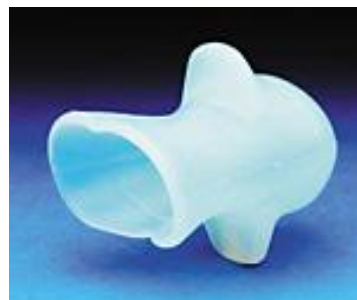
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Non CPAP Therapy:

-Oral Appliances

Consider oral appliance therapy **for adults with OSA who are intolerant of CPAP or prefer an alternative**, ideally **custom, titratable** with follow-up sleep testing.

-Evidence

- 52% were able to get AHI < 10

- 42% got AHI less than 5

- improved O₂ saturation, sleepiness, QOL,

-Compliance

- 77% stay with it after the first year

- jaw discomfort and lack of efficacy

- periodontal disease is contraindication

Ramar K, Dort LC, Katz SG, et al. Clinical practice guideline for the treatment of obstructive sleep apnea and snoring with oral appliance therapy: an update for 2015. J Clin Sleep Med. 2015;11(7):773-827. doi:10.5664/jcsm.4858.

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Non CPAP Therapy:

-Surgery

- Tracheostomy (gold standard)

- UPPP (**Uvulopalatopharyngoplasty**)

 - disappointing

- RFVTR (Radiofrequency Volumetric Tissue Reduction) - -disappointing

- Oromaxillofacial Surgery

 - good success (96%)

 - high risk of surgery

- Palatal Implants – no good studies

- Bariatric Surgery (laparoscopic)?

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Non CPAP Therapy: Medications

-intranasal steroids¹

-Medications orally (do not unobstruct)

Modafinil (Provigil; generics) — *Mechanism:* wake-promoting; binds dopamine transporter (DAT) and inhibits dopamine reuptake (overall mechanism “unknown”).

Dose (OSA-EDS): **200 mg PO qAM**; doses up to 400 mg/day tolerated but no consistent added benefit beyond 200 mg/day.

Armodafinil (Nuvigil; generics) — *Mechanism:* wake-promoting; binds DAT and inhibits dopamine reuptake (overall mechanism “unknown”; described as indirect dopamine receptor agonist).

Dose (OSA-EDS): **150–250 mg PO qAM**; doses up to 250 mg/day tolerated but no consistent added benefit beyond 150 mg/day in OSA.

Solriamfetol (Sunosi) — *Mechanism:* dopamine + norepinephrine reuptake inhibitor (DNRI) (MOA “unclear,” likely via DNRI activity).

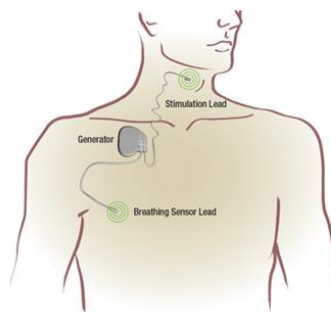
Dose (OSA-EDS): start **37.5 mg PO once daily** upon awakening; may double q ≥3 days to **max 150 mg once daily**; **avoid dosing within 9 hours of bedtime**.

1) [Am J Rhinol Allergy](#). 2016 May;30(3):215-21. doi: 10.2500/ajra.2016.30.4305. **Intranasal corticosteroid therapy in the treatment of obstructive sleep apnea: A meta-analysis of randomized controlled trials.**

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Take Comfort.

Help your body work the way it's supposed to.



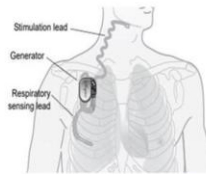
The Inspire system consists of three components: a small generator, a breathing sensor lead, and a stimulation lead—all controlled by the small handheld Inspire sleep remote. Simply turn the therapy on at night before bed, and off in the morning when you wake up.

Inspire therapy works *inside* your body, and with your natural breathing process, to treat sleep apnea. It continuously monitors your breathing patterns while you sleep. Based on your unique breathing patterns, the system delivers mild stimulation to key airway muscles, which keeps the airway open.



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Inspire Upper Airway Stimulation – P130008/S090



This is a brief overview of information related to FDA's approval to market this product. See the links below to the Summary of Safety and Effectiveness Data (SSED) and product labeling for more complete information on this product, its indications for use, and the basis for FDA's approval.

When is it used?

The Inspire UAS system is used to treat people with moderate to severe obstructive sleep apnea ($15 \leq \text{AHI} \leq 100$) who are age 22 and older and who:

- Are not able to use or tolerate [positive airway pressure](#) (PAP) or bi-level positive airway pressure (BiPAP) treatments according to clinical criteria that define the inability to eliminate obstructive sleep apnea or an intolerance for PAP.
- Do not have complete blockage of [concentric collapse of the back](#) muscular part of the roof of the mouth, called the soft palate.

BMI?

FDA $\leq 40 \text{ kg/m}^2$

CMS $< 35 \text{ kg/m}^2$

Com: $\leq 32\text{--}35 \text{ kg/m}^2$

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Efficacy of Hypoglossal Nerve Stimulation

Baseline AHI = 32
12 Months = 15
P < 0.001

ESS = 11.6
12 Months = 7.0
P < 0.001

Most common device related non serious adverse event: Electrical stimulation 40%

Strollo PJ Jr, Soose RJ, Maurer JT, et al; STAR Trial Group. Upper-airway stimulation for obstructive sleep apnea. *N Engl J Med*. 2014;370(2):139-149. doi:10.1056/NEJMoa1308659

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ORIGINAL ARTICLE

f X in e

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**

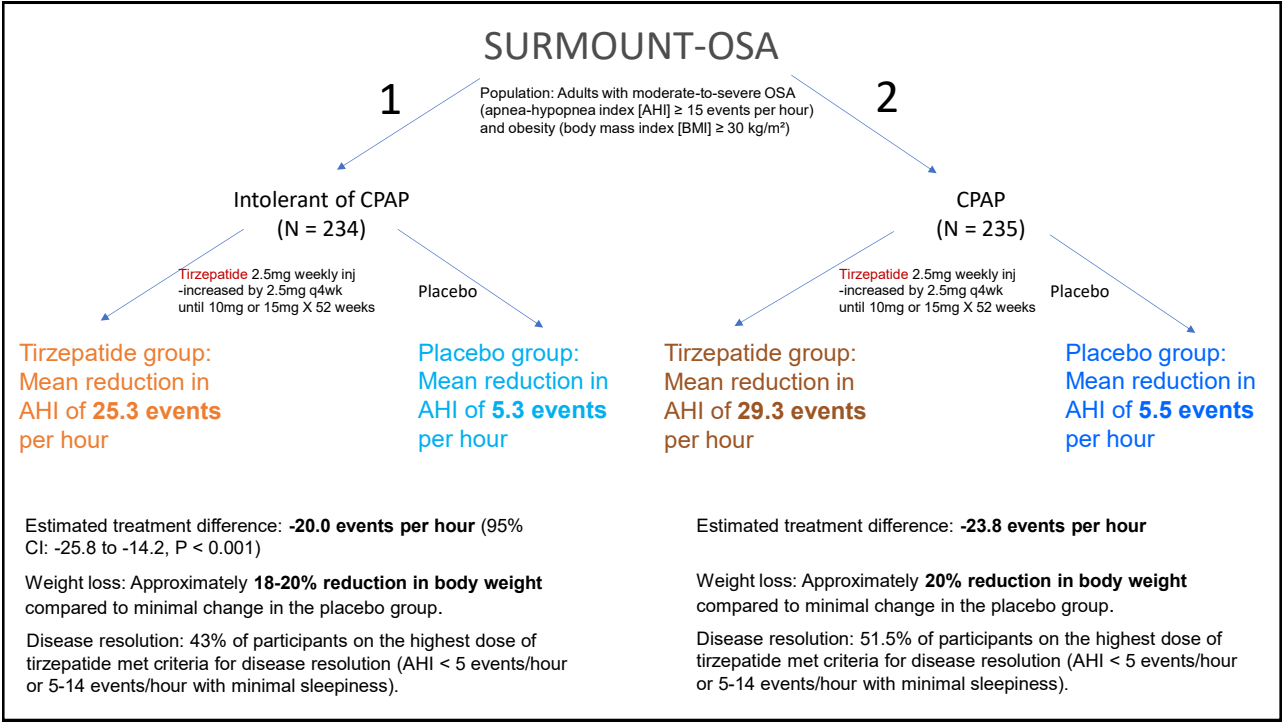
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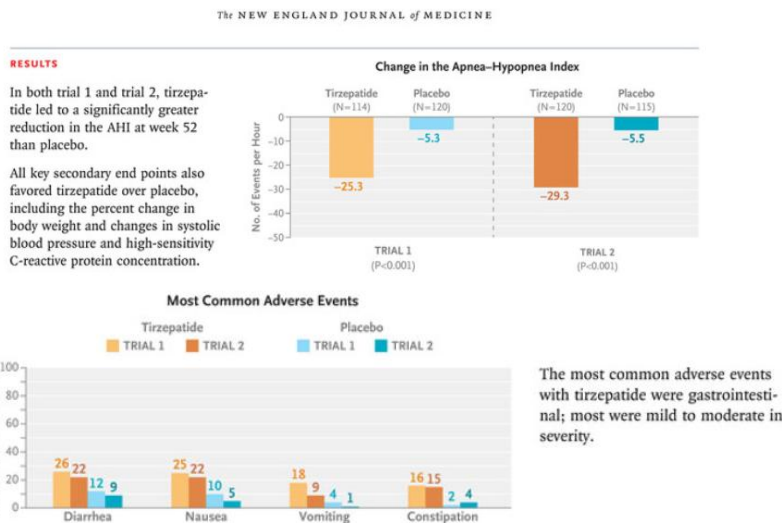
SURMOUNT-OSA

CME

<https://www.nejm.org/doi/full/10.1056/NEJMoa2404881>

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FDA approved **Zepbound (tirzepatide)** on Dec 20, 2024
for **moderate-to-severe OSA** in adults with obesity
Works primarily through weight loss.

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Oropharyngeal Myofunctional Therapy (OMT)

• Sleep. 2015 May 1;38(5):669–675. doi: [10.5665/sleep.4652](https://doi.org/10.5665/sleep.4652)

Myofunctional Therapy to Treat Obstructive Sleep Apnea: A Systematic Review and Meta-analysis

[Macario Camacho](#)^{1,✉}, [Victor Certal](#)², [Jose Abdullatif](#)³, [Soroush Zaghi](#)⁴, [Chad M Ruoff](#)¹, [Robson Capasso](#)⁵, [Clete A Kushida](#)¹

• Author information • Article notes • Copyright and License information

PMCID: PMC4402674 PMID: [25348130](https://pubmed.ncbi.nlm.nih.gov/25348130/)

Conclusion:

Current literature demonstrates that myofunctional therapy decreases apnea-hypopnea index by approximately 50% in adults and 62% in children. Lowest oxygen saturations, snoring, and sleepiness outcomes improve in adults. Myofunctional therapy could serve as an adjunct to other obstructive sleep apnea treatments.



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Effect of sleep apnoea interventions on multiple health outcomes: an umbrella review of meta-analyses of randomised controlled trials



Camille Figard^{a,d}, Raoua Ben Messaoud^{b,d}, Sébastien Baillieu^{a,b}, Marie Joyeux-Faure^{a,b}, Marie Destors^b, Renaud Tamisier^{a,b}, Charles Khouri^{b,c,e,f,g} and Jean-Louis Pépin^{a,b,c,e}



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^cRegional Pharmacovigilance Center & Clinical Pharmacology Unit, Grenoble Alpes University Hospital, University Grenoble Alpes, Grenoble, France

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AHI

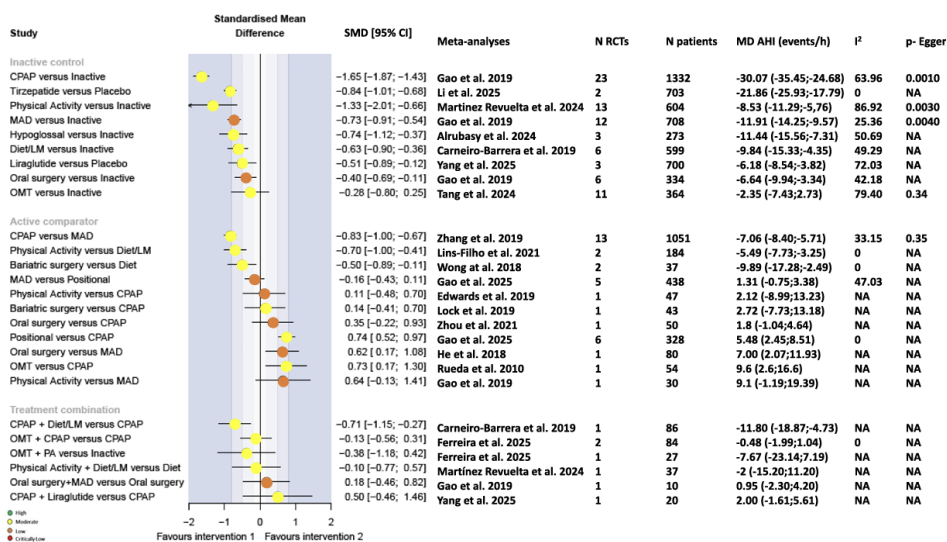


Fig. 2: Forest plots for the apnoea-hypopnoea index endpoint. CI, confidence interval; CPAP, continuous positive airway pressure; e, exponential; I², evaluation of heterogeneity; LM, lifestyle measures; MAD, mandibular advancement device; MD, mean difference; NA, not applicable; SMD, standardised mean difference.

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Epworth Sleepiness Score

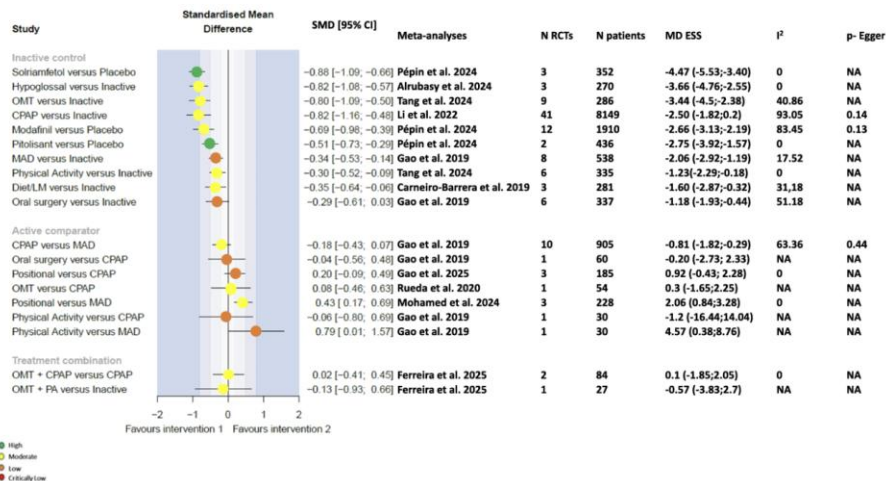


Fig. 3: Forest plots for the Epworth Sleepiness Scale score endpoint. CI, confidence interval; CPAP, continuous positive airway pressure; e, exponential; I², evaluation of heterogeneity; MAD, mandibular advancement device; MD, mean difference; NA, not applicable; SMD, standardised mean difference.

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Quality of Life

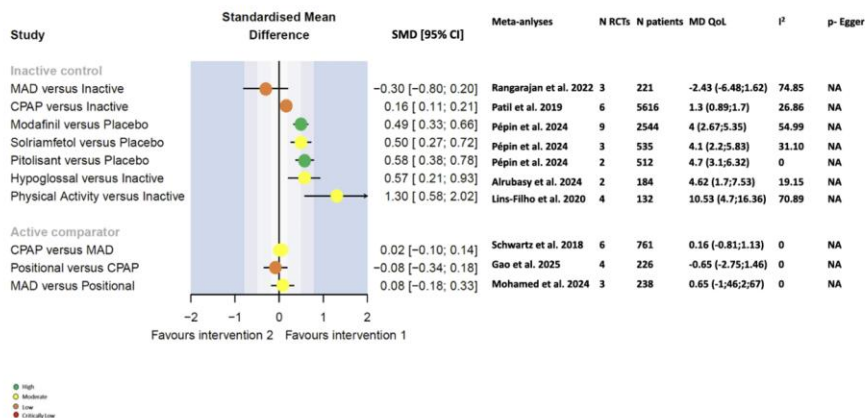


Fig. 4: Forest plots for quality-of-life measure endpoints (including the Functional Outcomes of Sleep Questionnaire, Sleep Apnoea Quality of Life Index, Short Form-36, Clinical Global Impression scale, and Patient Global Impression scale). CI, confidence interval; CPAP, continuous positive airway pressure; e, exponential; I², evaluation of heterogeneity; MAD, mandibular advancement device; MD, mean difference; NA, not applicable; SMD, standardised mean difference.

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Summary:

- OSA is a danger lurking in each primary care office
- diagnosis rests on **PSG or HSAT** (in appropriate patients); treatment initiation via **PAP titration** (lab) or **auto-PAP** (home) depending on patient factors
- CPAP is the first line choice
- behavioral change, the use of oral appliances, surgery in carefully selected (and well informed) patients, and perhaps judicious use of medications, may benefit some patients.
- oral appliances have emerged as an effective and safe second-line treatment for OSA

Education is key!

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Who Do I Suspect OSA in:

- Overweight male patients
- patients on more than 2 blood pressure medications
- Patients with history of
 - CHF –SDB (49%) –CSA (37%) –OSA (12%)
 - HTN (38%)
 - resistant HTN (3+ medications) (83%)
 - stroke (72%)
 - Atrial Fibrillation (49%)
 - Patients seeing a Cardiologist (32%)

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Who Do I Suspect OSA in:

- snoring at night
- witnessed apneas
- morning headaches
- falling asleep while watching TV or reading a book
- decreased energy
- can't concentrate
- poor memory
- fibromyalgia

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Introduction

Snoring

OSA

- Epidemiology and Pathogenesis
- Diagnosis and Consequences
- CPAP Treatment
- non CPAP Treatment
- Cost

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Sleep. 1999 Sep 15;22(6):749-55.

The medical cost of undiagnosed sleep apnea.

[Kapur V](#), [Blough DK](#), [Sandblom RE](#), [Hert R](#), [de Maine JB](#), [Sullivan SD](#), [Psaty BM](#).

Department of Medicine, University of Washington, Seattle 98195, USA.

-consecutive 238 cases of OSA

-looked at cost and utilization with the past 12 months

-\$2,720 versus \$1,348 matched controls in age and gender ($p < 0.01$)

~ \$3.4 billion

-Cost increased with AHI ($p < 0.05$)

Crash risk soars among truck drivers who fail to adhere to sleep apnea treatment

Transportation safety is threatened when obstructive sleep apnea remains untreated

Date: March 21, 2016

Source: American Academy of Sleep Medicine

Summary: The largest study of obstructive sleep apnea and crash risk among CMV drivers involved 1,613 truck drivers with sleep apnea and an equal number of controls. The rate of preventable crashes was 5 times higher among truck drivers with sleep apnea who failed to adhere to PAP therapy, compared with matched controls. In contrast, the crash rate of drivers with sleep apnea who were fully or partially adherent with treatment was statistically similar to controls.

87

Sleep. 2006 Oct 1;29(10):1307-11.

Healthcare utilization in women with obstructive sleep apnea syndrome 2 years after diagnosis and treatment.

[Banno K](#), [Manfreda J](#), [Walld R](#), [Delaive K](#), [Kryger MH](#).

Sleep Disorders Center, St. Boniface General Hospital, Section of Respiratory Diseases, Winnipeg, Manitoba, Canada.

-414 Women with OSA

-1404 Women without OSA (controls)

	Cost		Clinic Visits	
	Prior 2 years	Post 2 years	Prior 2 years	Post 2 years
OSA	+\$123.43	-\$37.96	+2.32	-1.48
	+/- \$25.01	+/- \$21.35	+/- 0.43	+/- 0.42

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ARS Question #1

Generally, What Is the Circumstance that Most Predisposes for Obstructive Sleep Apnea?

- A. Non-REM sleep, lateral position
- B. REM sleep, lateral position
- C. REM sleep, supine
- D. Non-REM sleep, supine
- E. Non-REM sleep, prone



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ARS Question #2

Which of the Following Is NOT a Risk Factor for OSA?

- A. Hypothyroidism
- B. Race
- C. Age
- D. Gender
- E. Weight



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ARS Question #3**What Is the Most Ideal Patient for a MAD (Mandibular Advancement Device)?**

- A. A patient with mild OSA, worse in the supine position
- B. A patient with severe OSA, worse in REM sleep
- C. A patient with moderate OSA, non positional
- D. A patient with severe OSA, non positional
- E. A patient with moderate OSA, worse in REM sleep



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ARS Question #4**Which of the Following Does NOT Require a Full PSG to Diagnosis OSA?**

- A. 50-year-old overweight male that snores and has excessive daytime sleepiness.
- B. 65-year-old male with COPD and requires 3L/min oxygen with excessive daytime sleepiness
- C. 40-year-old female with excessive daytimes sleepiness but a HST negative for OSA
- D. 75-year-old male with CHF (EF = 35%) and episodes of witnessed apneas at night.



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ARS Question #5

**Which of the Following Interventions
Reduces the AHI the Most on Average?**

- A. CPAP
- B. MAD
- C. Tirzepatide
- D. Hypoglossal Nerve Stimulator