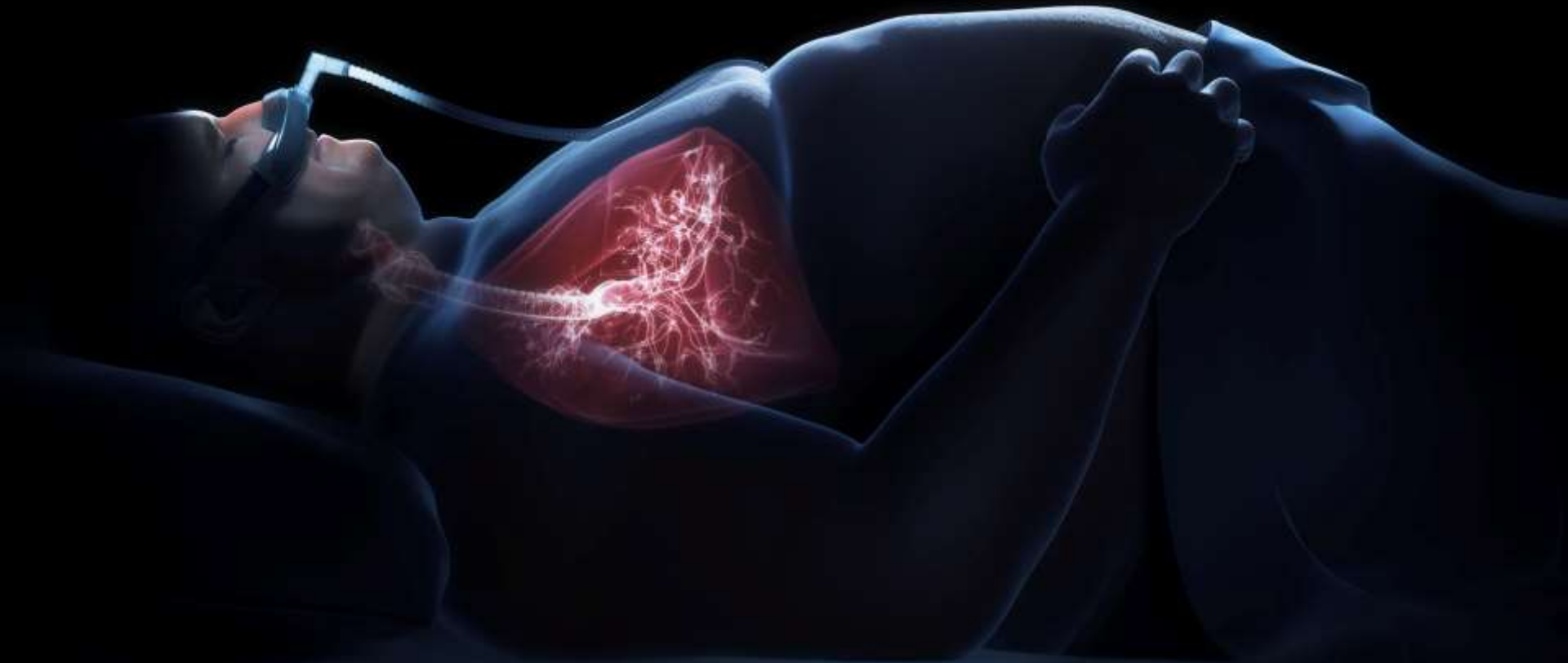


Obstructive sleep apnea Overview



Dr. Kaddaha
Tuesday, November 27th 2018

Disclaimer

Sleep study interpretation and consultant for
Biron
Vitalaire
SAS
Clinique de sommeil de Grand Montréal

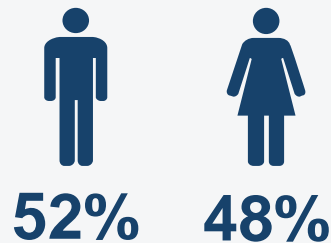
Learning objectives

You will understand

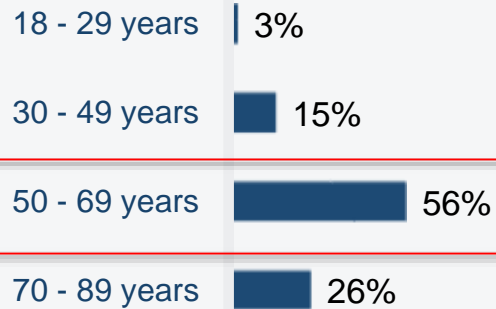
- Risk factors
- Screening process
- Underlying pathophysiology
- Diagnosis and work up
- Existing treatment modalities
- Difference between non-surgical and surgical treatment approaches

Profile of Respondents

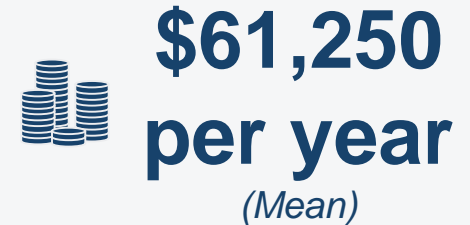
Gender



Age



Household Income



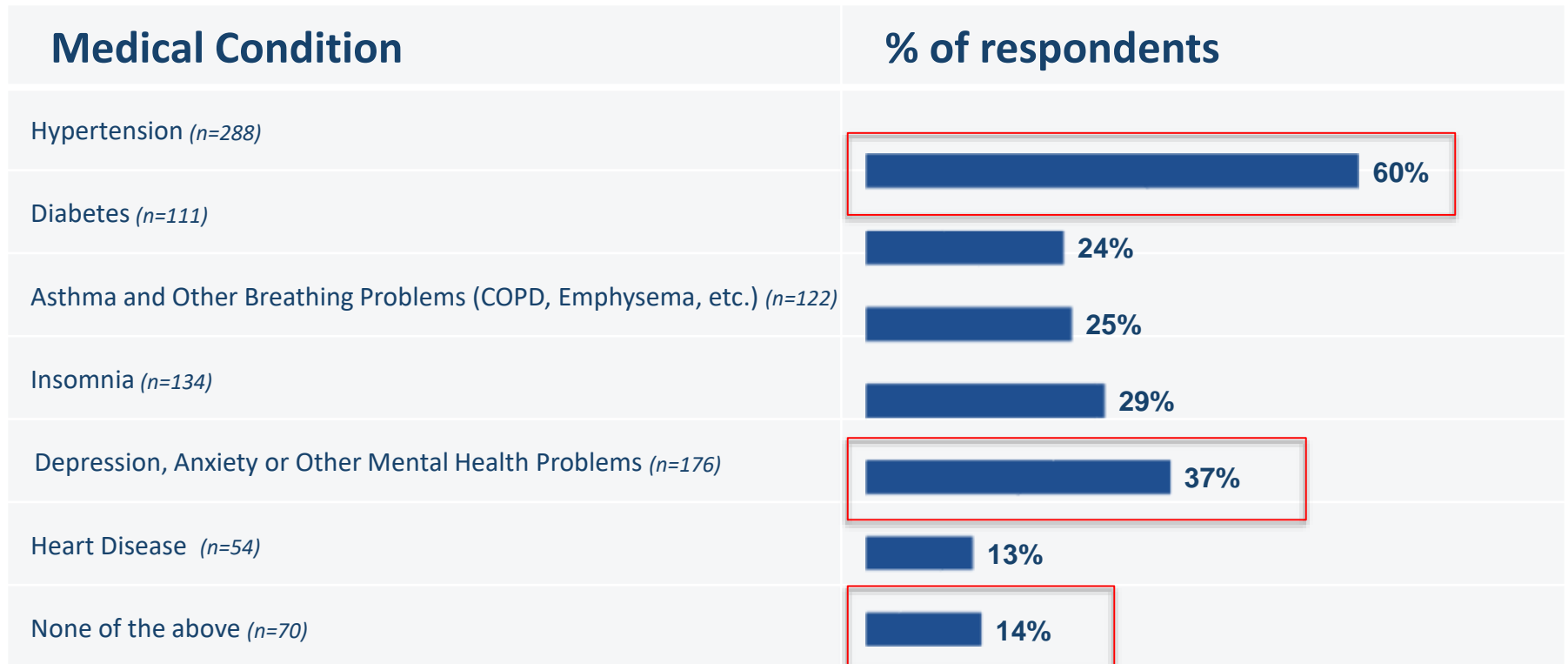
Age Diagnosed with Sleep Apnea

53
years old
(Mean)

Age Beginning Treatment for Sleep Apnea

53
years old
(Mean)

Existing Medical Conditions

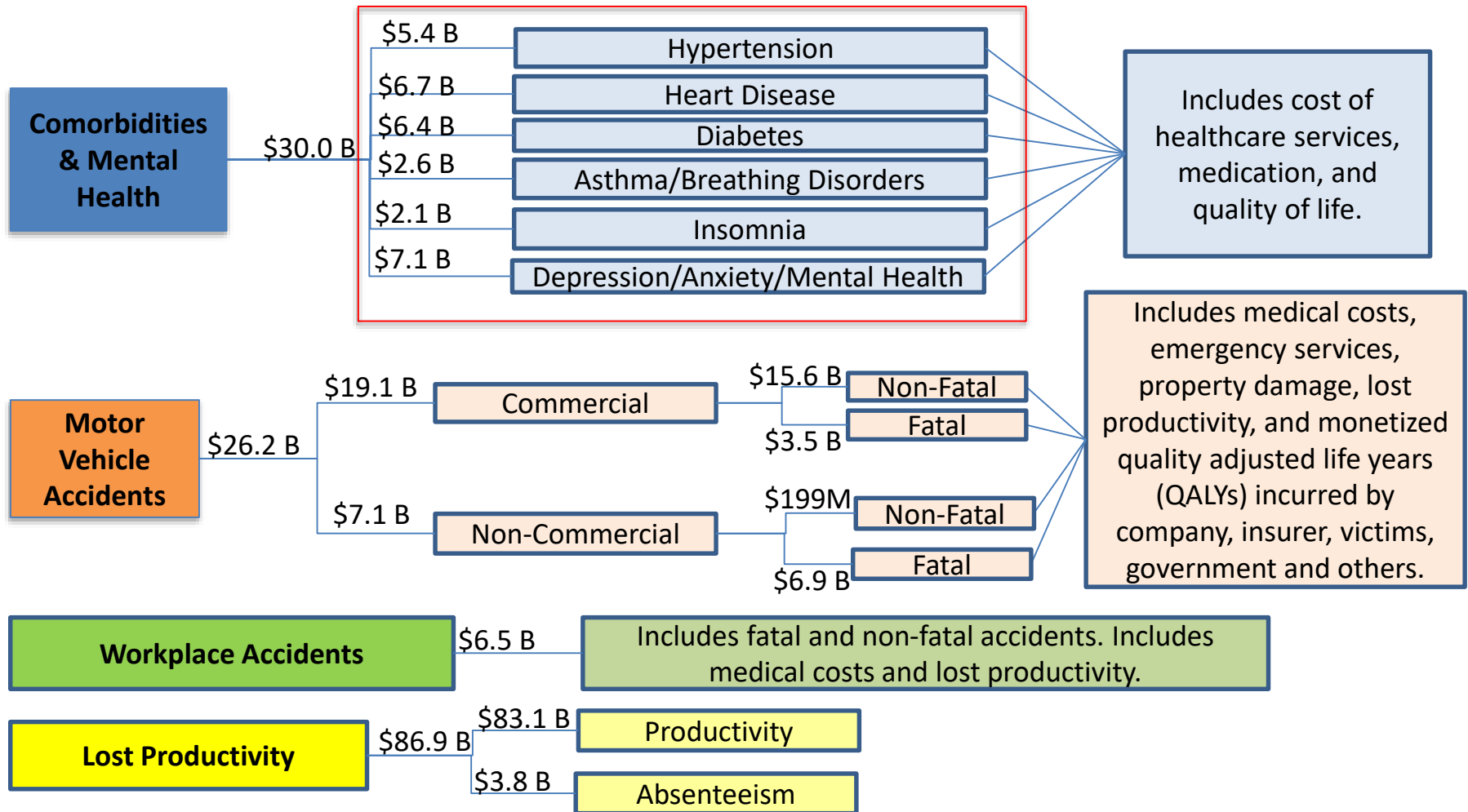


Barriers to Diagnosis & Treatment

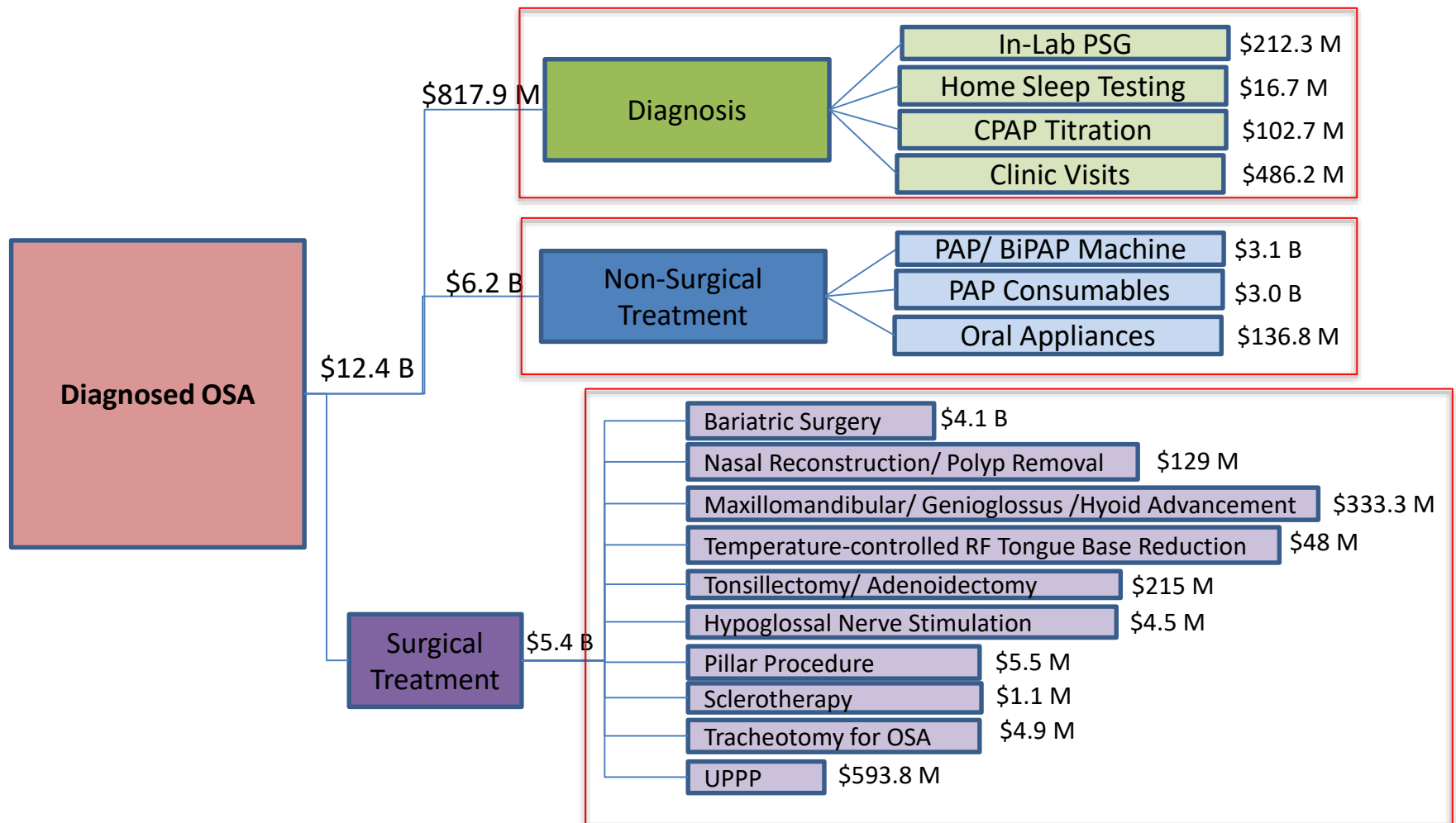
General Public Awareness	Many individuals do not recognize symptoms and severity of the condition.
Primary Care Physician Education	Front-line caregivers do not routinely ask about duration and quality of sleep or screen patients for OSA.
Diagnosis and Treatment Costs	While usually covered by payors for qualified patients, costs average \$2,105 per year for testing, appointments, treatment devices and surgery if necessary.
Employer and Payor Investment for Chronic Care Management	Economic stakeholders are still developing cost models that financially reward managing chronic conditions in order to lessen longer-term risk for acute events

Source: Primary and secondary research

Sources of Cost for Undiagnosed OSA

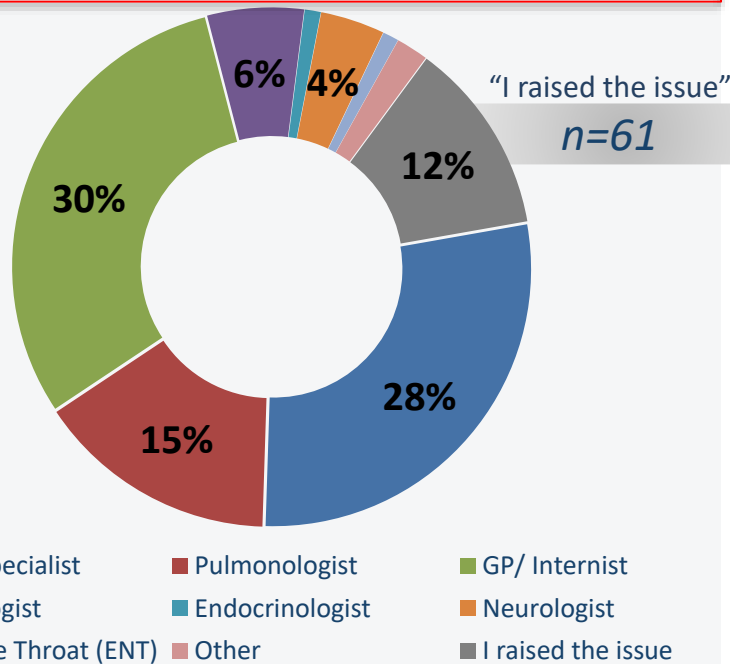


Cost for Diagnosed / Treated OSA

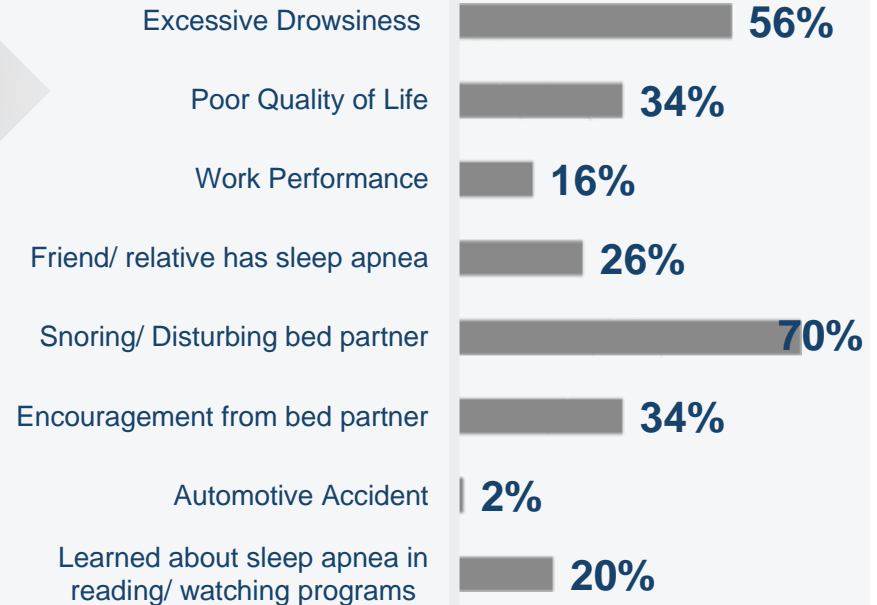


Who do they talk to...and about what?

What type of healthcare provider initially warned you about the risk of sleep apnea? (n=506)



What caused you to raise the issue of your risk of sleep apnea with your healthcare provider? (n=61)



(Percentages under 3% not shown for transparency).

Wisconsin Sleep study Cohort

1. **First** population study conducted using **in-lab studies of sleep and breathing**
2. Showed a **significant** prevalence of sleep apnea or **sleep-disordered breathing in a middle-aged, nonclinical** population
3. Findings signaled significant and largely **undiagnosed effect of sleep-disordered breathing on public health**

Prevalence & Incidence

TABLE 2

Incidence of OSA from population-based longitudinal studies

Study	N	Years of follow-up	Definition	Incidence
Wisconsin Sleep Cohort [31]	554	4	AHI<5 to AHI≥5	10.6%
Cleveland Family [30]	286	5	AHI<5 to AHI≥15	15% Men 8.2% Women
Sleep Heart Health [32]	2968	5	AHI<5 to AHI≥15	11.1% Men 4.9% Women

PREVALENCE OF OSA IN PATIENTS WITH ...

DRUG-RESISTANT HYPERTENSION

80%

Logan et al.
J. Hypertension 2001

CONGESTIVE HEART FAILURE

80%

Maisel et al.
HFSA 2007

TYPE 2 DIABETES

72%

Einhorn et al.
Endocrine Pract 2007

ATRIAL FIBRILLATION

~50%

Somers et al.
Circulation 2004

ALL HYPERTENSION

35%

Sjostrom et al.
Thorax 2002

CAD

30%

Schaler et al.
Cardiology 1999

ANGINA

30%

Sanner et al.
Clin Cardiology 2001



25

50

75

100

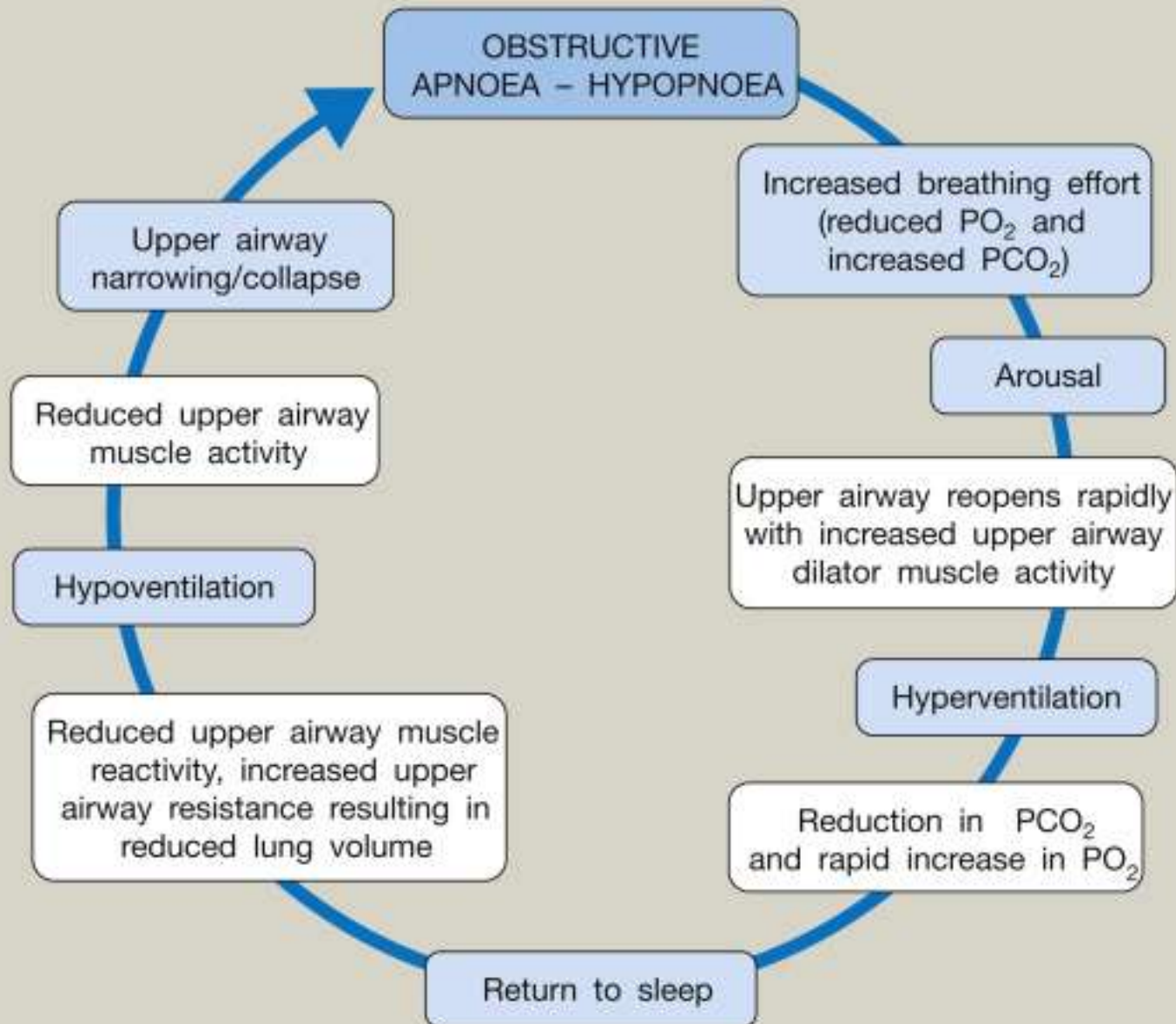
Apneas and Hypopneas

- Specific to the sleeping state
- Accompanied by
 - Completely closed, extra-thoracic upper airway
 - (“**Obstructive**” event)
 - Reduction or cessation of brain stem respiratory motor output
 - (“**Central**” event)
 - Combination of central and obstructive events
 - (“**Mix**” events)

Ventilatory inadequacies

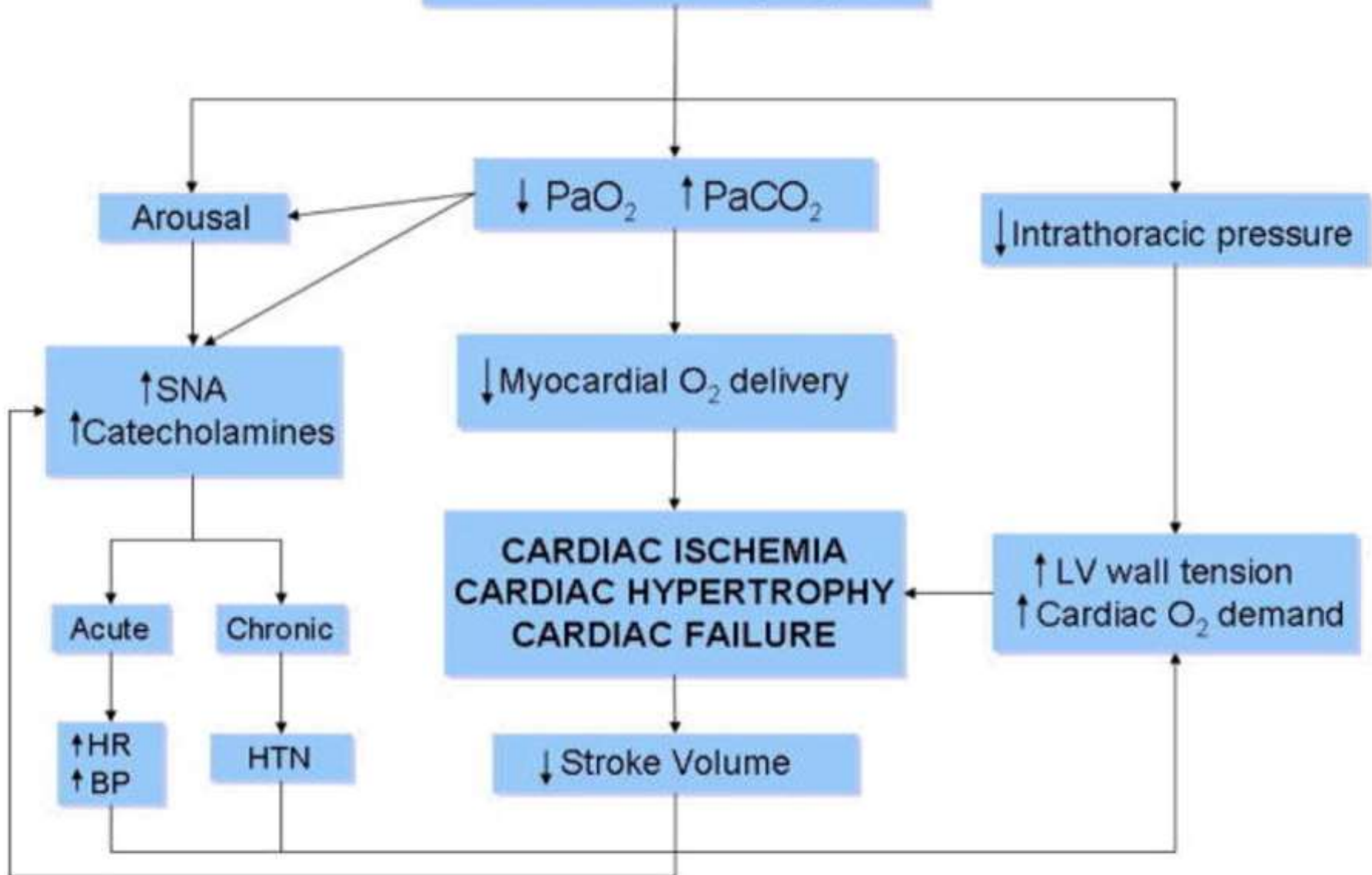
- Accompany intermittent hypoxemia
 - Transient arousals from sleep
 - Sleep state fragmentation throughout the night
 - Over compensatory responses of autonomic nervous system

Pathophysiology of obstructive sleep apnoea



Modified from Eckert DJ, Malhotra A. Pathophysiology of obstructive sleep apnoea. *Proc Am Thorac Soc.* 2008; 5(2): 144-53

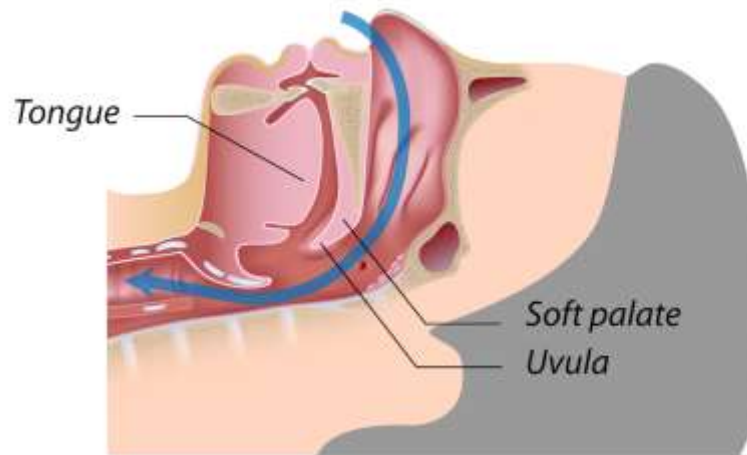
Obstructive Sleep Apnea



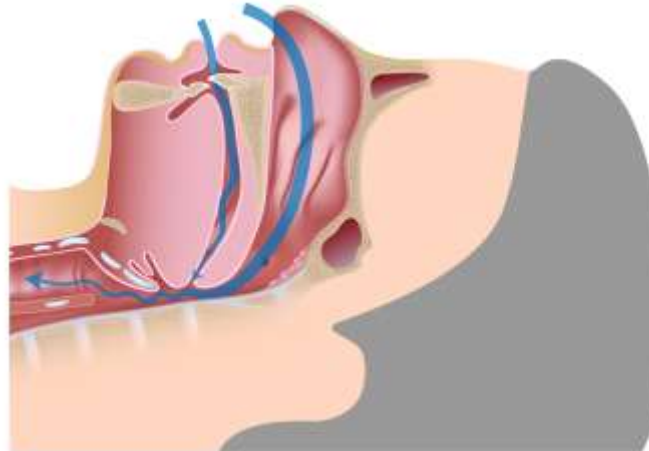
Pathophysiology

- OSA is caused by soft tissue collapse in the pharynx
- Transmural pressure
 - Difference between intraluminal pressure and the surrounding tissue pressure.
 - ① If transmural pressure decreases, the cross-sectional area of the pharynx decreases.
 - ② If pressure passes a critical point, pharyngeal closing pressure is reached.
 - ③ Exceeding pharyngeal critical pressure (P_{crit}) causes tissues collapsing inward.
 - ④ The airway is then obstructed.

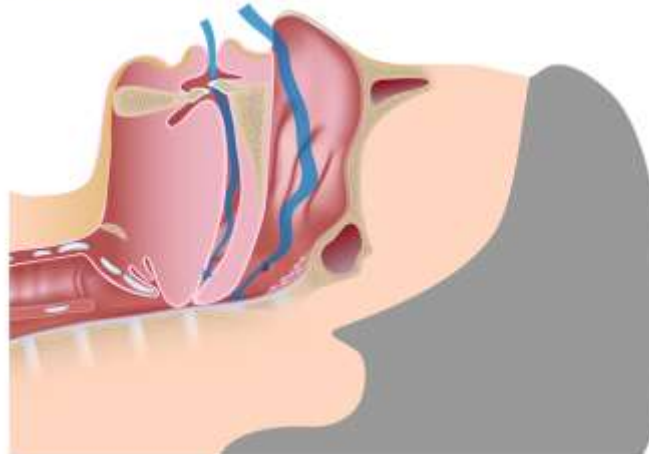
Normal
breathing



Snoring - Partial
obstruction
of the airway



OSA - Complete
obstruction
of the airway



Upper airway anatomy

- Composed of numerous muscles and soft tissue
 - Lacks rigid or bony support.
 - Contains a collapsible portion that extends from the hard palate to the larynx.
- Ability of the upper airway to change shape and momentarily close is essential for speech and swallowing during wakefulness
 - Opportunity for collapse at inopportune times such as during sleep

Upper airway anatomy

- Anatomic perspective
 - Narrow upper airway more prone to collapse than a larger one
 - Cross-sectional area of the upper airway during wakefulness is reduced in patients with OSA
 - Compared with subjects without OSA
- Arrangement of the surrounding soft tissues appears to be altered in patients with OSA
 - May place upper airway at risk for collapse

Mid-sagittal magnetic resonance image (MRI) N Normal subject (left) & patient with severe OSA (right).

A

Normal



Apneic



Soft palate

Tongue

Airway

Mandible

Nasopharynx

Retroplatal

Retroglossal

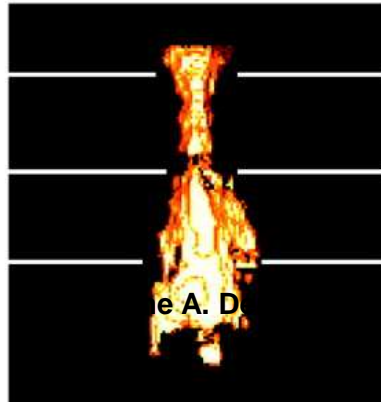
Hypopharynx

Subcutaneous
fat

B

Wakefulness

Sleep



RP

RG

RP

RG

le A. D.

a

Rev. 201

-112

Mallampati Classification



Class 1



Class 2



Class 3



Class 4

Class 1; soft palate, fauces, uvula, pillars

Class 2; soft palate, fauces, portion of uvula

Class 3; soft palate, base of uvula

Class 4; hard palate only

KISSING TONSILS

- It is unusual for tonsils to touch or meet in the midline without protrusion of the tongue. When tonsils meet in the midline or overlap, they are called "kissing tonsils".





**Prognathism
of lower jaw**



**Retrognathism
of lower jaw**

Macroglossia



Screening

- All adults who answer yes to either question:
 - Are they dissatisfied with their sleep?
 - Do they have daytime sleepiness?
- Patients with risk factors
 - Obesity, especially BMI >35 kg/m²
 - Family history of obstructive sleep apnea
 - Retrognathia
 - Treatment-resistant hypertension
 - CHF, atrial fibrillation, stroke
 - Type 2 diabetes
- Patients with high-risk driving occupations or daytime sleepiness + motor vehicle crash

Table 2—Patients at High Risk for OSA Who Should Be Evaluated for OSA Symptoms

Obesity (BMI > 35)

Congestive heart failure

Atrial fibrillation

Treatment refractory hypertension

Type 2 diabetes

Nocturnal dysrhythmias

Stroke

Pulmonary hypertension

High-risk driving populations

Preoperative for bariatric surgery

Screening tools

1. Epworth questionnaire

- Probability of falling asleep on a scale of increasing probability from 0 to 3 for eight different situations

2. Berlin questionnaire (primary care setting)

- 10 items
- Snoring severity, significance of daytime sleepiness, witnessed apnea, obesity, hypertension

3. STOP-BANG screening test (preoperative setting)

- 8 items
- STOP: Snoring, Tired, Observed apnea, high blood Pressure history
- BANG: elevated BMI, Age > 50, increased Neck circumference, Gender male

Table 3—Questions about OSA that Should Be Included in Routine Health Maintenance Evaluations

Is the patient obese?

Is the patient retrognathic?

Does the patient complain of daytime sleepiness?

Does the patient snore?

Does the patient have hypertension?

Table 4—OSA Symptoms that Should Be Evaluated during a Comprehensive Sleep Evaluation

Witnessed apneas

Snoring

Gasping/choking at night

Excessive sleepiness not explained by other factors

Nonrefreshing sleep

Total sleep amount

Sleep fragmentation/maintenance insomnia

Nocturia

Morning headaches

Decreased concentration

Memory loss

Decreased libido

Irritability

Table 5—Components of Patient Education Programs

Findings of study, severity of disease

Pathophysiology of OSA

Explanation of natural course of disease and associated disorders

Risk factor identification, explanation of exacerbating factors, and risk factor modification,

Genetic counseling when indicated

Treatment options

What to expect from treatment

Outline the patient's role in treatment, address their concerns, and set goals

Consequences of untreated disease

Drowsy driving/sleepiness counseling

Patient quality assessment and other feedback regarding evaluation

A top-down view of a crowd of umbrellas. One bright yellow umbrella is the central focus, standing out prominently against a sea of dark grey umbrellas. The perspective is from directly above, showing the circular canopy of the yellow umbrella and the surrounding dark grey canopies.

Diagnosis

The Goldstandard

- Overnight in-laboratory polysomnographic evaluation (PSG)
 - Gold standard diagnostic method for OSA at any age
- Polysomnography in the sleep laboratory
 - Standard method for diagnosis and determining severity of Dx
 - Assesses other sleep disorders

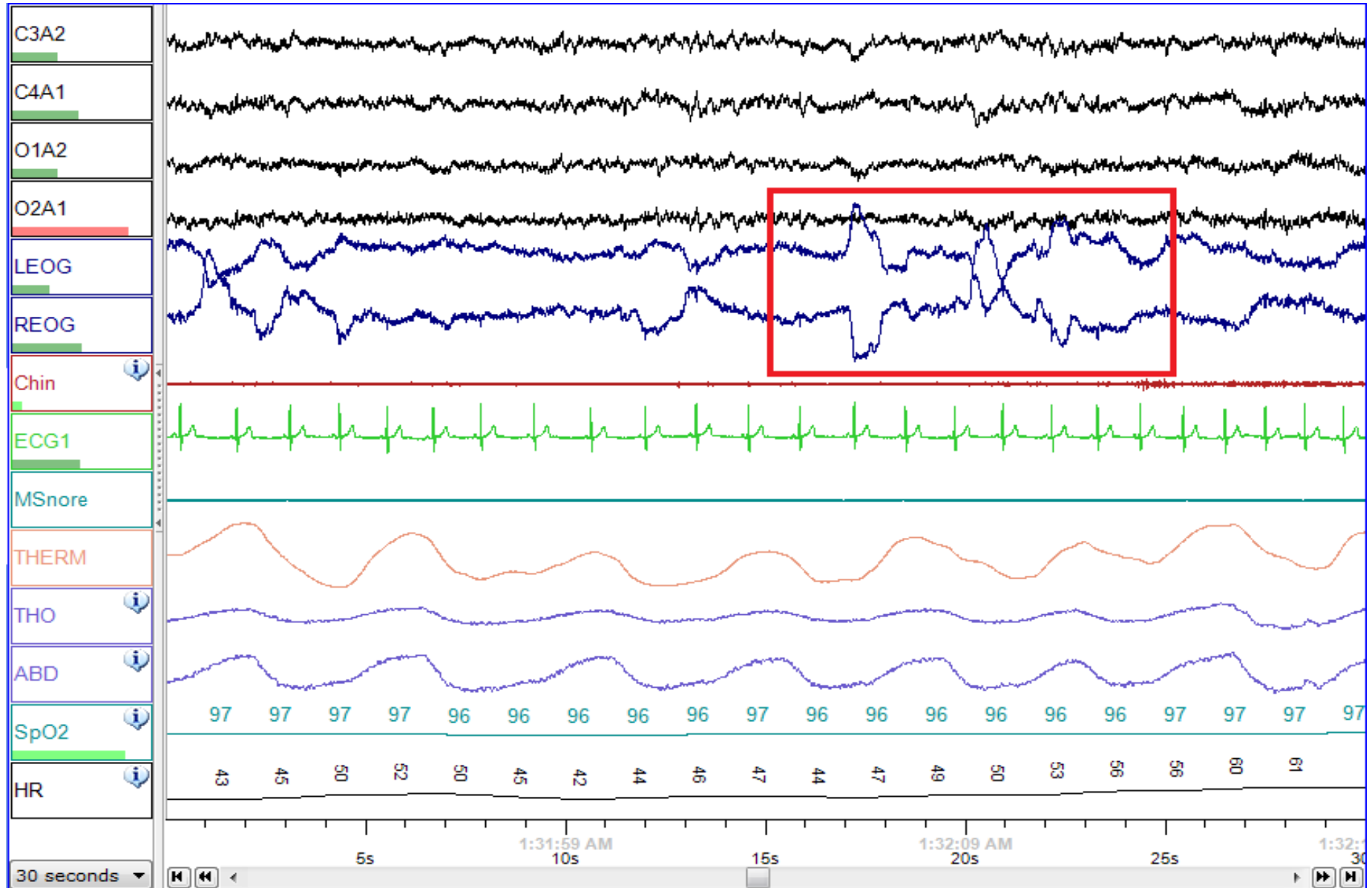
PSG report: **Important** variables

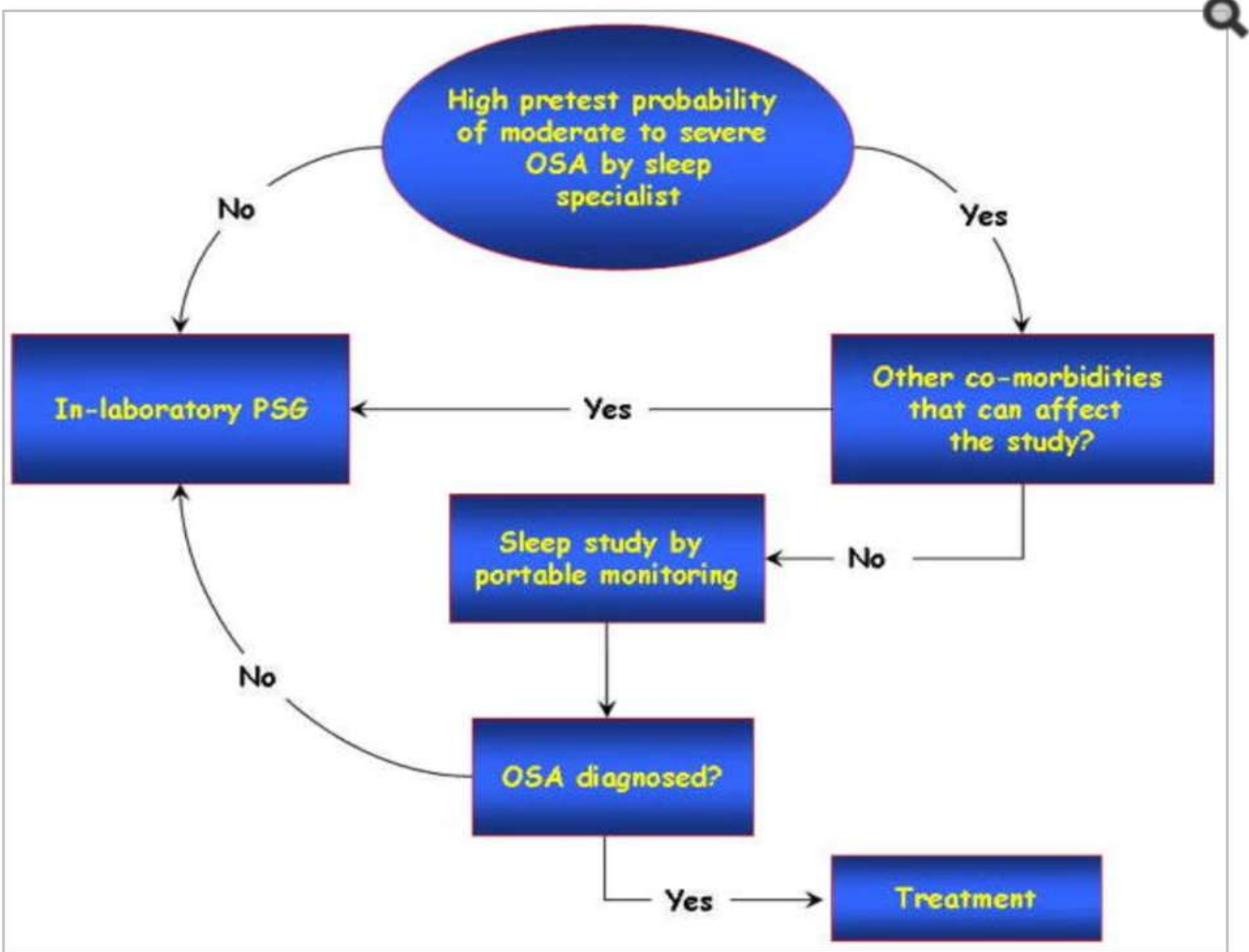
- Apnea-hypopnea index (AHI)
 - Episodes of apnea and hypopnea per hour of sleep
 - Mild OSA: AHI ≥ 5 and $< 15/h$
 - Moderate OSA: AHI ≥ 15 and < 30
 - Severe OSA: AHI ≥ 30
 - Apnea: airflow reduction by $\geq 90\%$ from baseline for ≥ 10 sec
 - Hypopnea: airflow reduction by $\geq 30\%$ for ≥ 10 sec plus 3% OxyHb desaturation or arousal from sleep
 - total sleep time
- EEG, EMG chin and limbs, EOG, HR, SpO₂, thoracic and abdominal bands, oral thermistor and nasal pressure.

Type 1



PSG Report





Type 3

- Ambulatory home sleep study: portable home study
 - Should be used for patients with high pretest probability of OSA
 - No comorbid sleep conditions
 - No major comorbid diseases such as COPD, CHF
 - Uses oximetry, respiratory monitoring of effort, airflow, snoring, cardiac monitoring, and body position

Type 3



Sleep Summary

Apnea/Hypopnea

Analyzed Time:	585.2	minutes	
Apnea (A) + Hypopnea w/ 3% <u>desat</u> (H3) + Hypopnea w/ Arousal (HA):	383		48.9 / h
Supine A+H3+HA:	232		65.5 / h
Non-Supine A+H3+HA:	151		35.2 / h
Apnea + Hypopnea w/ 4% <u>desat</u> (A+H4):	282		36.0 / h
<u>Supine</u> A+H4:	205		57.9 / h
<u>Non-Supine</u> A+H4:	77		17.9 / h

Position

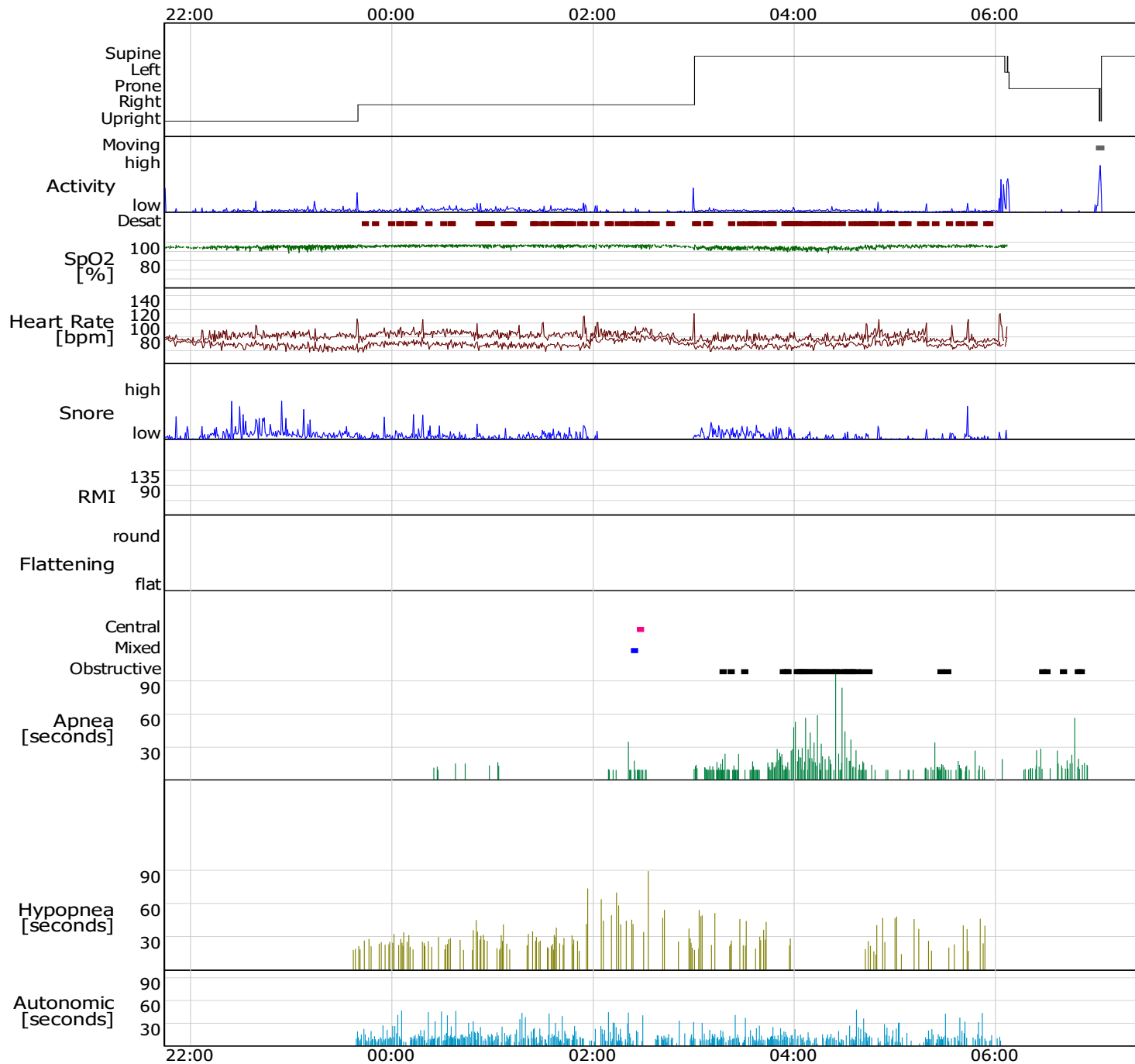
Supine Time:	212.4	minutes	36.3 %
Non-Supine Time:	257.6	minutes	44.0 %
Upright Time:	115.2	minutes	19.7 %
Movement Time:	-	minutes	- %

Oxygen Saturation

Average Oxygen Saturation:	95.9	%	
Oxygen Desaturation Events:	235		30.2 /h
OD >= 3%:	235		30.2 /h
OD >= 4%:	87		11.2 /h

Snoring

Snore Time:	10.5	minutes	2.3 %
Number of Snoring Episodes:	234		



SpO2 Report ---OxiMetry Report

User Information **Name :**
Age : **Sex :** Female **Height / cm :**
Recording Date(mm/dd/yy) : 05/28/15 **time :** 10:00:00 **Duration :** 09:08:27 **Weight / kg :**
Analysed : 09:08:27

Comments

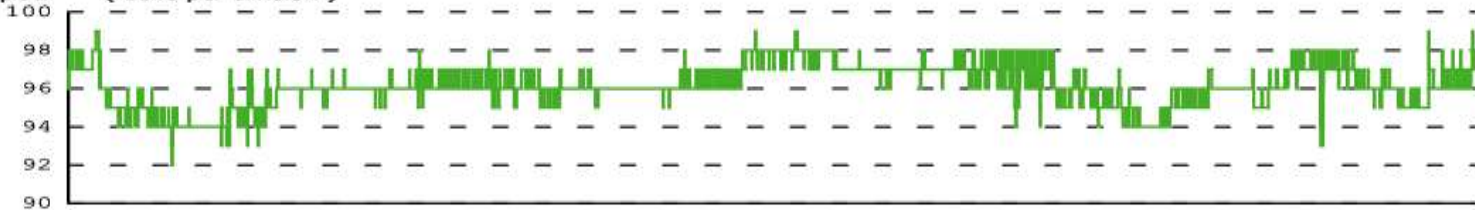
Event Data	SpO2	Pulse	%SpO2 Level	Events	Below(%)	Time(%)
Total Events	5	147	99 - 95	0	100	100.0
Time In Events(min)	4.5	90.1	94 - 90	5	95	8.8
Avg. Event Dur.(sec)	54.6	36.8	89 - 85	0	90	0.0
Index (1/hr)	0.5	16.1	84 - 80	0	85	0.0
% Artifact	0.1	0.1	79 - 75	0	80	0.0
Adjusted Index (1/hr)	0.5	16.1	74 - 70	0	75	0.0
%SpO2 Data			69 - 65	0	70	0.0
Basal SpO2(%)	96.2		64 - 60	0	65	0.0
Time(min) < 88%	0.0		59 - 55	0	60	0.0
Events < 88%	0		54 - 50	0	55	0.0
Minimum SpO2(%)	92		49 - 45	0	50	0.0
Avg. Low SpO2(%)	93.4		44 - 40	0	45	0.0
Avg. Low SpO2 < 88%	----		39 - 35	0	40	0.0
Pulse Data			34 - 30	0	35	0.0
Avg Pulse Rate(bpm)	58.9					
Low Pulse Rate(bpm)	45					

Analysis Parameters

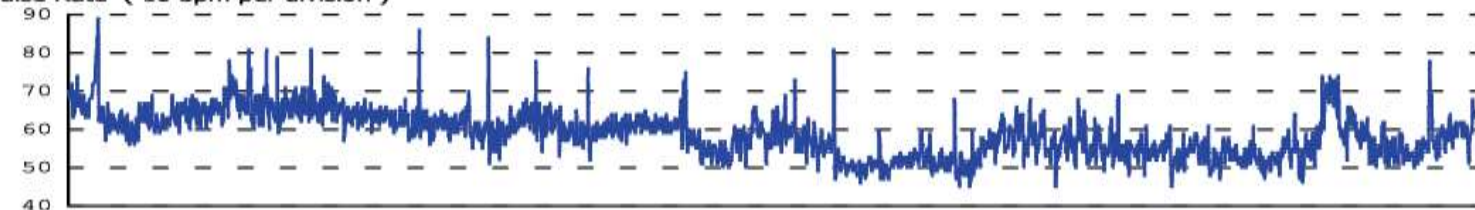
Desaturation Event: drop in SpO2 by at least 4% for a minimum duration of 10 seconds.
Pulse Event: Change in rate by at least 6 bpm for a minimum duration of 8 seconds.

Graphic Summary

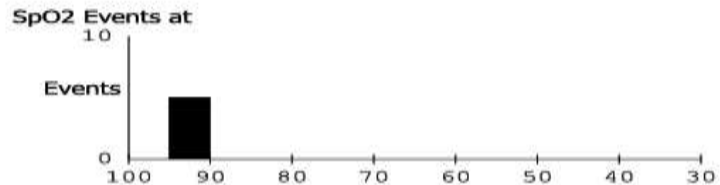
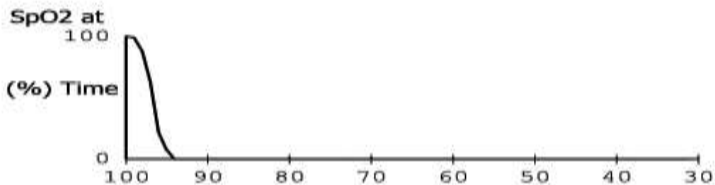
SpO2 (10% per division)



Pulse Rate (10 bpm per division)



Time 10 11 12 13 14 15 16 17 18 19



Specialist or Sleep study

Which one first?

- Sleep specialist evaluation recommended
 - Complex sleep-disordered breathing processes suspected
 - Other sleep disorder suspected
 - To ensure proper diagnostic tests ordered
- Prior evaluation not needed in other cases
 - But clinician should discuss options with patient first
 - Explain OSA therapy and why it may be initiated

TREATMENT

TREATMENT STRATEGY ONLINE IMPORTANT PERFORMANCE MARKETING SALES SOCIAL RESEARCH PRODUCT PROMOTION CUSTOMER ASSESSMENT STRATEGY ORGANIZATION PRODUCT

ONLINE TREATMENT STRATEGY STRATEGY SOLUTION RISK ANALYSIS PROJECT PLAN TARGET

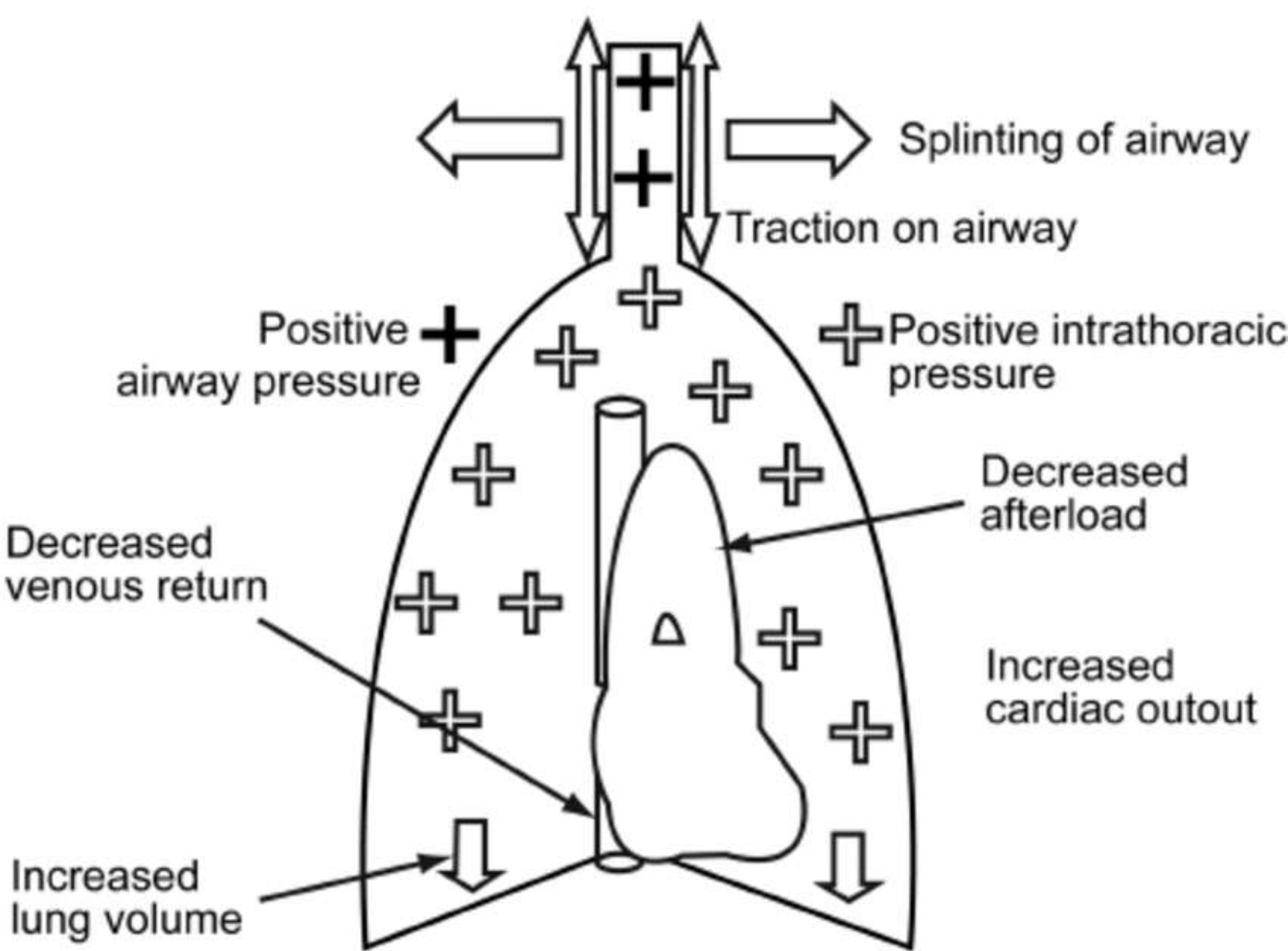


Lifestyle changes

- For milder cases of obstructive sleep apnea, your doctor may recommend lifestyle changes:
- Lose weight if you're overweight.
- Exercise regularly.
- Drink alcohol moderately, if at all, and don't drink several hours before bedtime.
- Quit smoking.
- Use a nasal decongestant or allergy medications.
- Don't sleep on your back.



Positive Airway Pressure Therapy (PAP)



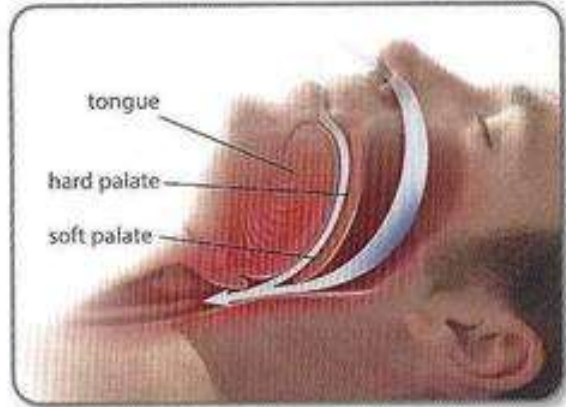
Alternative treatments

Recommendations

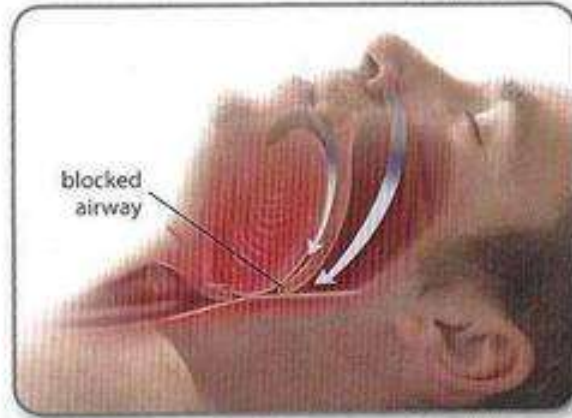
Recommendation Statement	Strength of Recommendation	Quality of Evidence	Benefits versus Harms/ Burdens Assessment
The Use of Oral Appliances for Treatment of Primary Snoring in Adults			
We recommend that sleep physicians prescribe oral appliances, rather than no therapy, for adult patients who request treatment of primary snoring (without obstructive sleep apnea).	STANDARD	High	Benefits clearly outweigh harms
The Use of Oral Appliances for Treatment of Obstructive Sleep Apnea in Adults			
When oral appliance therapy is prescribed by a sleep physician for an adult patient with obstructive sleep apnea, we suggest that a qualified dentist use a custom, titratable appliance over non-custom oral devices.	GUIDELINE	Low	Benefits clearly outweigh harms
We recommend that sleep physicians consider prescription of oral appliances, rather than no treatment, for adult patients with obstructive sleep apnea who are intolerant of CPAP therapy or prefer alternate therapy.	STANDARD	Moderate	Benefits clearly outweigh harms
We suggest that qualified dentists provide oversight—rather than no follow-up—of oral appliance therapy in adult patients with obstructive sleep apnea, to survey for dental-related side effects or occlusal changes and reduce their incidence.	GUIDELINE	Low	Benefits clearly outweigh harms
We suggest that sleep physicians conduct follow-up sleep testing to improve or confirm treatment efficacy, rather than conduct follow-up without sleep testing, for patients fitted with oral appliances.	GUIDELINE	Low	Benefits clearly outweigh harms
We suggest that sleep physicians and qualified dentists instruct adult patients treated with oral appliances for obstructive sleep apnea to return for periodic office visits—as opposed to no follow-up—with a qualified dentist and a sleep physician.	GUIDELINE	Low	Benefits clearly outweigh harms



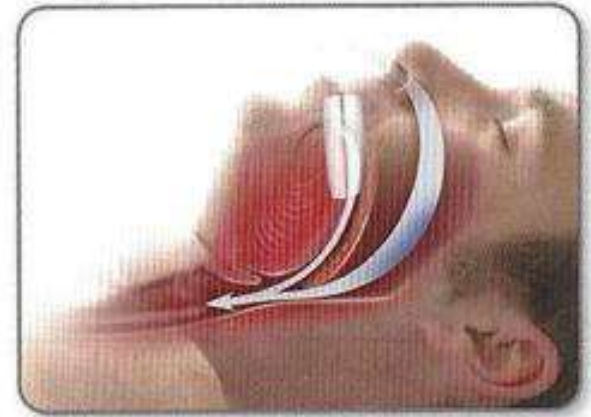
Normal breathing during sleep



Obstructive Sleep Apnea



Oral Device on Teeth



CLINICAL REVIEW

Meta-analysis of randomised controlled trials of oral mandibular advancement devices and continuous positive airway pressure for obstructive sleep apnoea-hypopnoea

Linda D. Sharples ^{a, b, *}, Abigail L. Clutterbuck-James ^c, Matthew J. Glover ^d,
Maxine S. Bennett ^b, Rebecca Chadwick ^e, Marcus A. Pittman ^c, Timothy G. Quinnell ^c

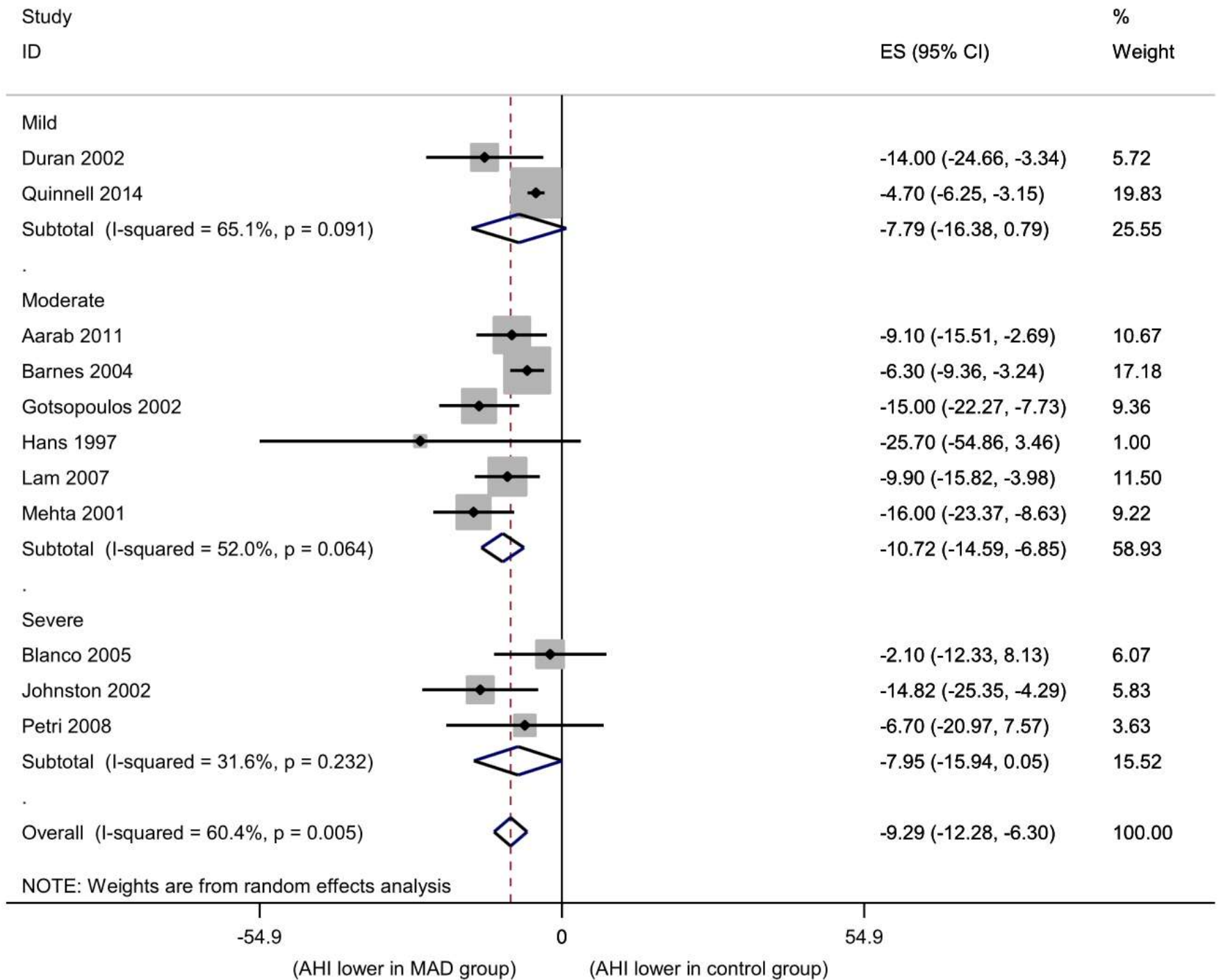


Summary of studies (n = 71 studies with 77 comparisons)

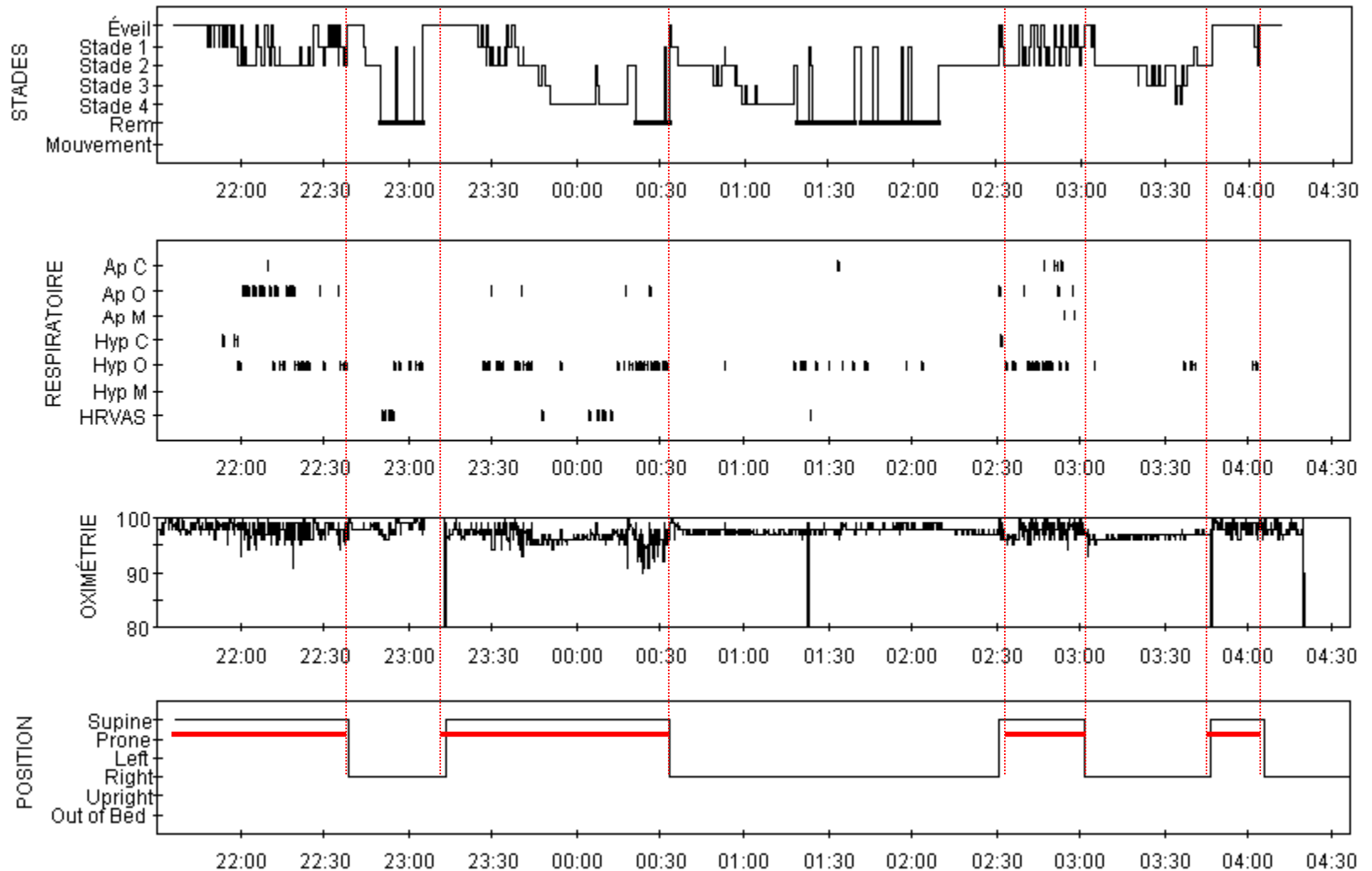
CPAP vs. Control n = 52

MAD vs. Control n = 12

CPAP vs. MAD n = 13



Événements associés à position





Surgical treatment

- Tracheostomy
- UPPP +/- tonsillectomy
- MMA
- LAUP
- RAUP



Table 6—General OSA Outcomes Assessment

Resolution of sleepiness

OSA specific quality of life measures

Patient and spousal satisfaction

Adherence to therapy

Avoidance of factors worsening disease

Obtaining an adequate amount of sleep

Practicing proper sleep hygiene

Weight loss for overweight/obese patients

Take Home Messages



Who to suspect

- Fat boy Joe or Jane
- Ask the partner
- Look into habits
- Co-morbidities
- Family
- Remember high-risk occupations

How to diagnose them

- Different levels
- At home or in lab
- Specialist or sleep study

What treatment to choose

- Behavioral
- Positive pressure
- Oral appliances
- Oral Surgery
- Bariatric surgery
- Positional
- Pharmacological
- ...

When you hesitate...

Get in touch with us !

- Complicated case
- Type 1 or Type 3 inconclusive
- Choosing between best types of investigation
- Suggestion for treatment

Contact Information

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- Work
 - Charles Moyne Hospital
 - Phone : 450-466-5000



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