





# ***OSA and Hypertension***

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# INTRODUCTION

*Hypertension and OSA frequently coexist. OSA has been reported among 30–50% of hypertensive patients. This rate can increase to 80% among cases with drug-resistant HT. There is a bidirectional and causal relationship between HT and OSA. Several studies have revealed a clear dose–response relationship with OSA severity and HT.*

*The meta-analyses on the relationship between OSA and HT are summarized in the following Table:*

Author (Reference)	Year	Number of Studies	Total Sample Size	OSA (OR (95% CI)) for HT
Meng [15]	2016	6	20,367	1.41 (1.29–1.89)
Hou [16]	2018	26	51,623	1.80 (1.54–2.06)
Han [17]	2020	10	13,274	1.80 (1.36–2.38)
Yuan [18]	2021	8	3484	6.44 (5.38–7.71)



# INTRODUCTION

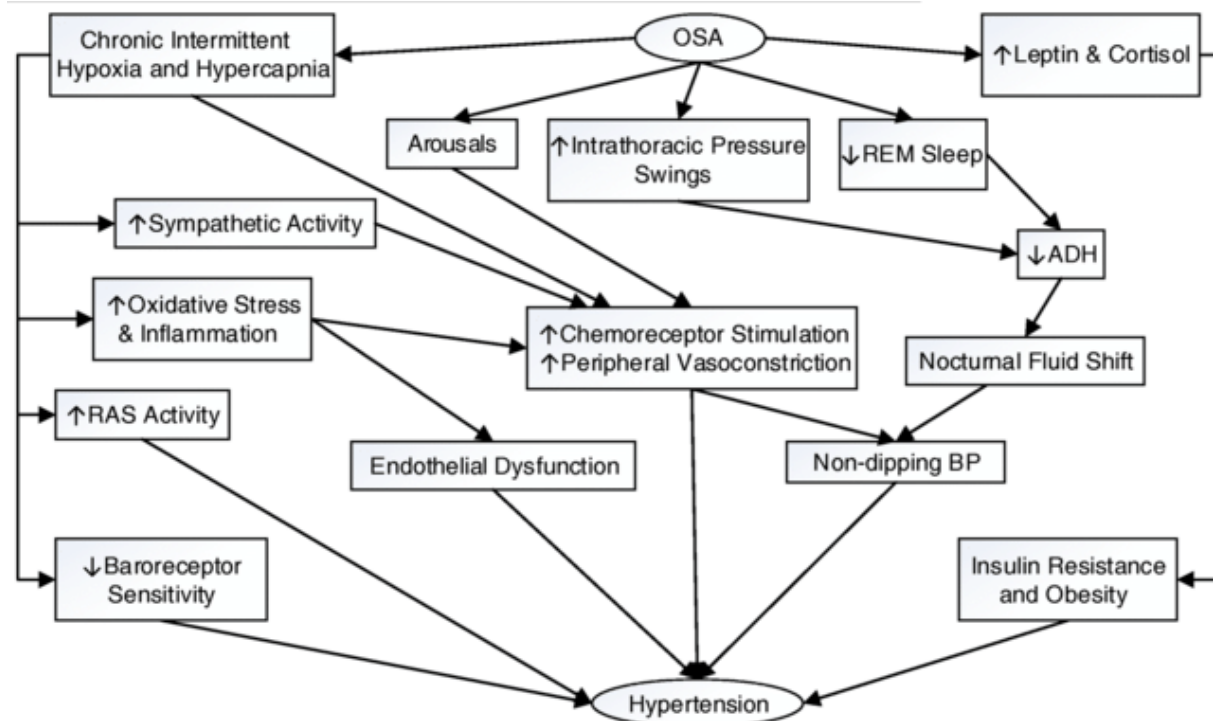
*It is now well known that obstructive sleep apnea (OSA) is one of the common secondary causes of blood pressure (BP) elevation. Moreover, hypertensive patients with OSA are at increased risk of developing resistant hypertension and experiencing alterations and events compared with their hypertensive counterparts without OSA.*



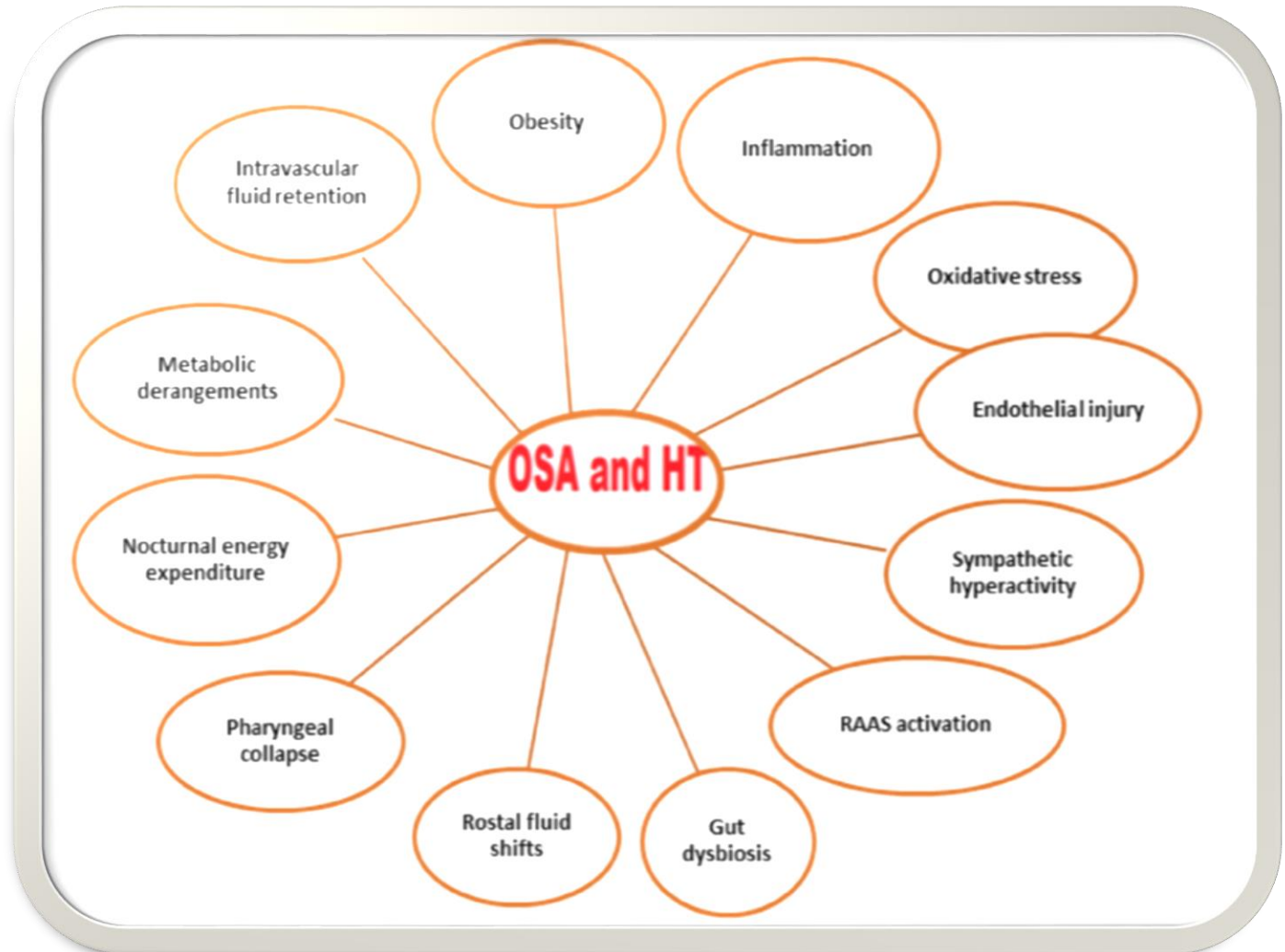
*Pathophysiological mechanisms of OSA on HTN*

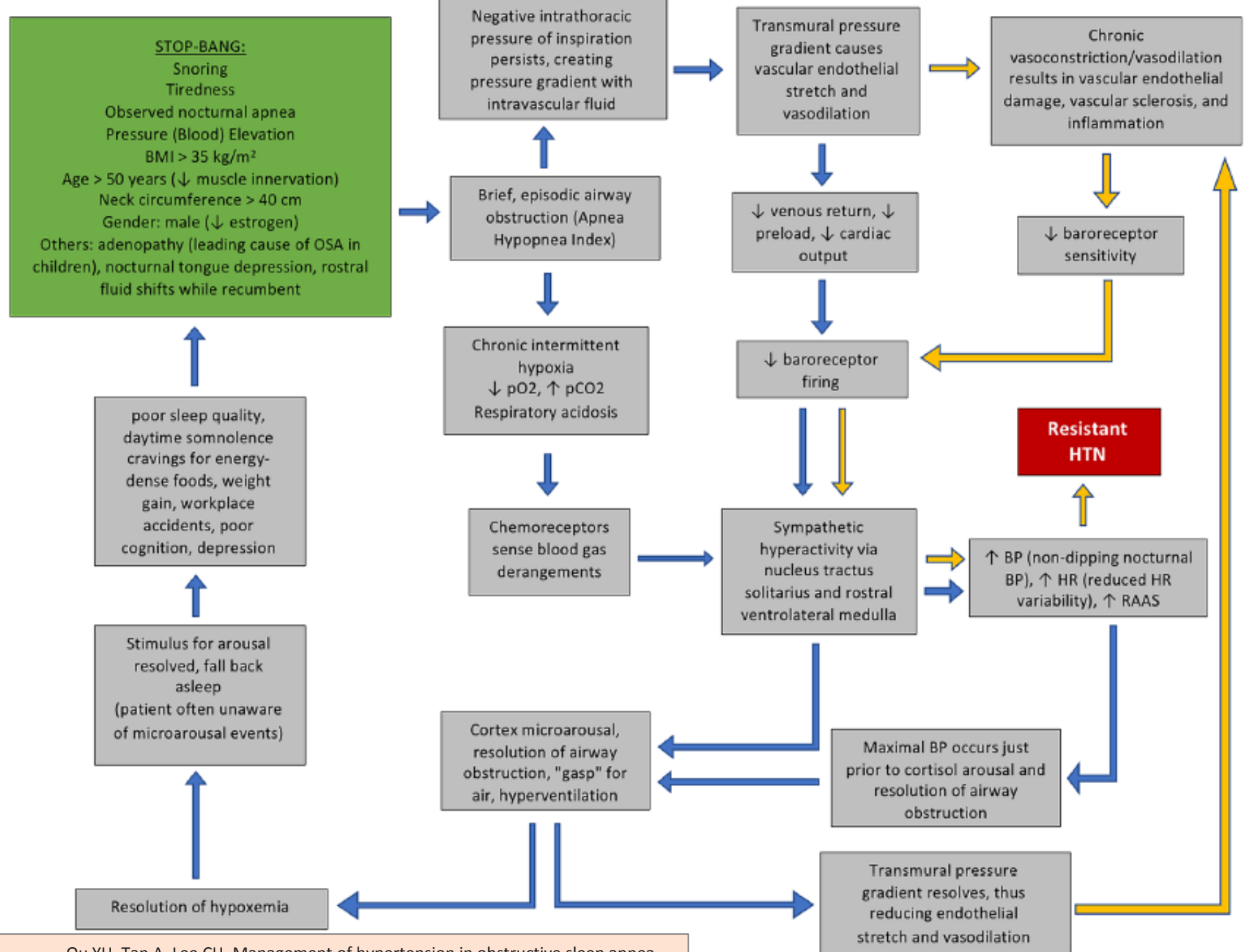


## Pathophysiological mechanisms of OSA on HTN



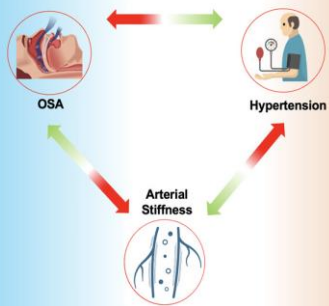
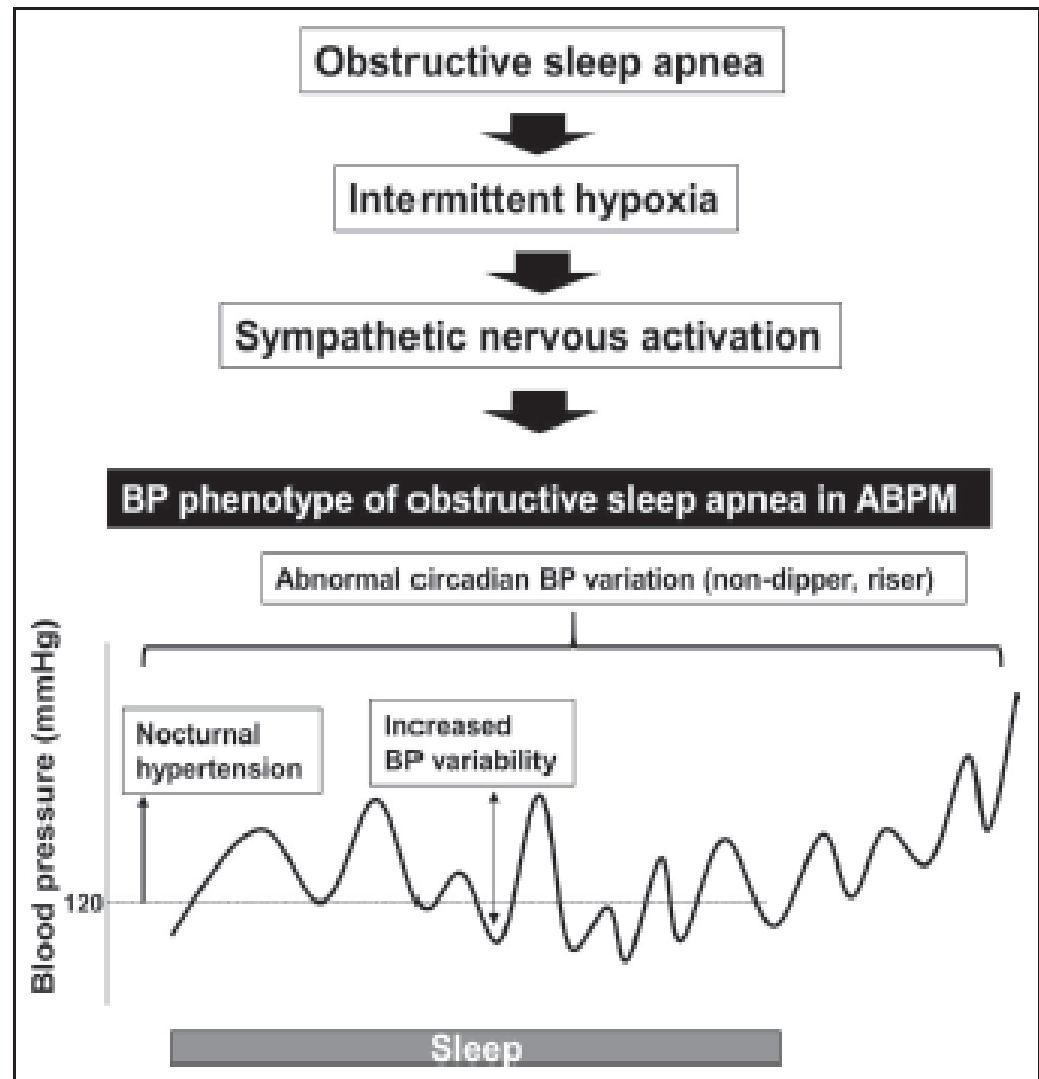
## *Pathogenesis of Hypertension in OSA*







## ***BP phenotype of OSA in ABPM***





## *Screening For OSA*

***Who ?***



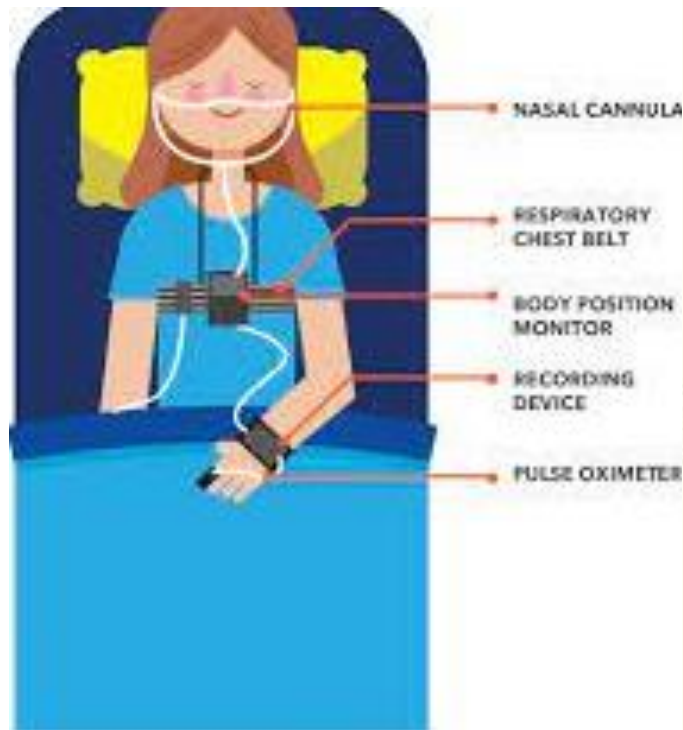
## ***Screening Surveys For OSA***

*Patient surveys used to screen for OSA include the Epworth Sleep Scale, the Berlin questionnaire, and the STOP-BANG questionnaire. The latter has derivatives unique for Arabic and Asian populations .Popular among them is the STOPBANG questionnaire, which uses eight questions .*

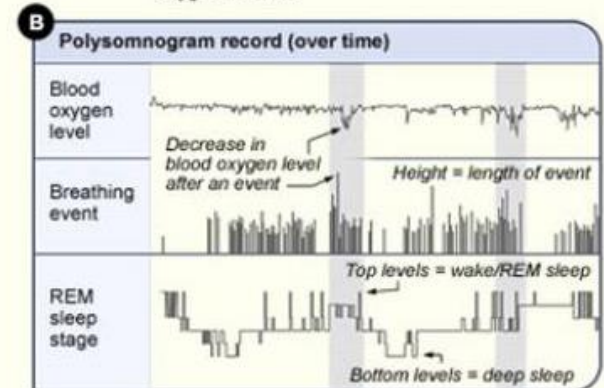
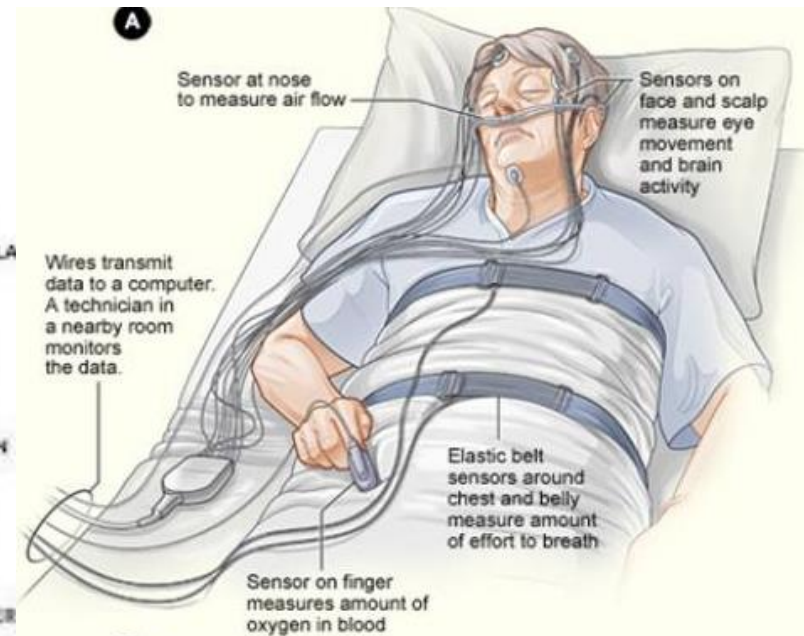
## ***STOP-BANG Score***

<b>S</b>	Snoring
<b>T</b>	Tiredness
<b>O</b>	Observed apnea
<b>P</b>	High blood pressure
<b>B</b>	Body mass index $>35 \text{ kg/m}^2$
<b>a</b>	Age $>50$ years
<b>n</b>	Neck circumference $>40 \text{ cm}$
<b>g</b>	Gender, male

# Polysomnography



*Home-based sleep tests(HBST)*







## ***Polysomnography***

*The diagnosis and severity of OSA are based on the apnea–hypopnea index (AHI), which reports the number of apneic and/or hypopneic events during one hour of sleep. Apneic events obstruct > 90% of intrathoracic airflow, whereas hypopneic events obstruct > 30–90% of intrathoracic Airflow.*

*Both types of events last at least 10 s and result in oxygen desaturation of 3% or greater .*

*Mild OSA causes an AHI of 5–14 events/h; moderate OSA causes 15–29 events/h; and severe OSA causes > 30 events/h.*

## Screening Surveys For OSA

*The survey's diagnostic sensitivities in patients with an AHI > 5 events/h, > 15 events/h, and > 30 events/h are 83.6%, 92.9%, and 100%, respectively. Affirmative answers to each of the eight questions receive one point, and a score > 3 merits a formal sleep study. In all patients with OSA, concomitant HTN and adequacy of HTN treatment should be frequently investigated. This is particularly important if STOPBANG scoring is  $\geq 5-8$ , which is highly correlated with moderate to severe OSA and resistant HTN.*

## *Diagnostic criteria for OSA*

Index	Calculation
Apnea-hypopnea index (AHI)	Apneas + hypopneas Total sleep time (hours)
Respiratory disturbance index (RDI)	AHI + respiratory event-related arousal Total sleep time (hours)
<b>Severity</b>	
OSA is present when AHI > 5 and at least 1 of the following:	
Daytime sleepiness, nonrestorative sleep, fatigue, insomnia	
Waking with breath holding, gasping or choking	
Observed loud snoring, breathing interruption, or both	
Hypertension, mood disorder, cognitive dysfunction, ischemic heart disease, stroke, congestive heart failure, atrial fibrillation, type 2 diabetes	
Mild	AHI 5–14.9 events per hour
Moderate	AHI 15–29.9 events per hour
Severe	AHI ≥ 30 events per hour



## ***Oxygen desaturation rate(ODR)***

*Oxygen desaturation rate (ODR) identifies patients with OSA who are at greatest risk for HTN, and it is a relatively novel datapoint acquired during PSG or HBST.*

*ODR is defined as the change in the percentage of pulse oxyhemoglobin saturation (SpO<sub>2</sub>) per second after anapneic/hypopneic event.*

# *Treatment of Hypertension and OSA*



- **Non pharmacological approach**

*Control of the co-morbidities and life style*

*CPAP*

*MAD*

*Sleep surgery*

*Renal Denervation for resistant hypertension*

- **Pharmacological approach**

*an individualized approach would be needed for the treatment of HTN with OSA*



# CPAP

*CPAP is an efficacious treatment for OSA and there is robust evidence for its effectiveness in reducing BP (especially in resistant hypertension), OSA severity ,and self-reported daytime sleepiness, and increasing quality of life .*

*However, the effects of CPAP on BP are generally modest, as most systemic reviews and meta-analyses have shown that it results in a mean BP reduction of only 2–3 mmHg.*



## CPAP

*A number of studies have shown that CPAP therapy results in a modest reduction of 2–3 mmHg in SBP and of 1.5–2 mmHg in DBP in OSA patients. On the other hand, this reduction is higher in adults with treatment-resistant HT. Although a 1–2 mmHg decrease in blood pressure may not be considered much, even such a slight decrease in blood pressure was shown to be associated with significant decreases in cardiovascular mortality and stroke risk.*



## **CPAP**

*given that CPAP therapy does not correct all factors that increase blood pressure (e.g., volume overload, high salt production, etc.), CPAP alone cannot produce a significant improvement in blood pressure.*

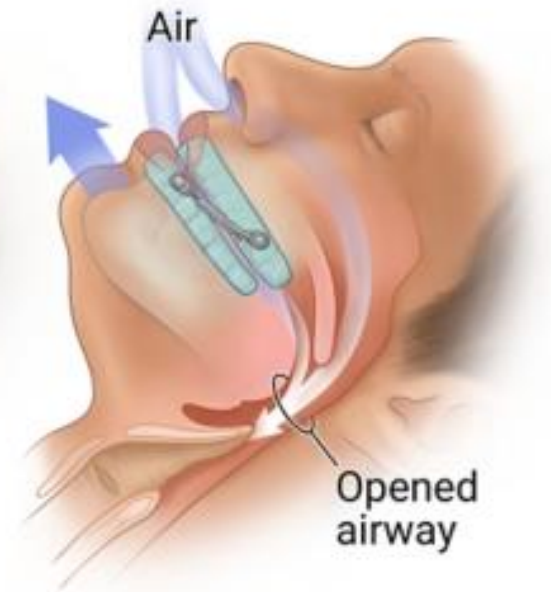


# ***MAD(Mandibular Advanced Device)***

Obstructive sleep apnea



MRD moves jaw forward



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## ***Antihypertensive Therapy in OSA***

*The best available evidence so far did not support any specific preference for the pharmacological antihypertensive treatment. To reduce BP in patients with OSA, all major classes of antihypertensive drugs can be used. BP reduction has been reported also with the use of MRAs.*






## *Antihypertensive Therapy in OSA*

*Regarding the medications, calcium channel blockers, ACEIs or ARBs, and thiazide-type diuretics are recommended as first-line therapy in patients with OSA and HT, and spironolactone should be added to the first line treatment in the presence of resistant hypertension in OSA patients. Moreover, beta-blocker therapy should be preferred in hypertensive OSA patients in the presence of CAD, arrhythmia, or heart failure.*



## ***Antihypertensive Therapy in OSA***

*SGLT-2 inhibitors and renal denervation therapy may be considered as an option in patients refractory to standard therapy.*

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**THANKS FOR YOUR ATTENTION**