



# Obstructive Sleep Apnea Types, symptoms, diagnosis and treatment in Primary Care

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*250 years of EXCELLENCE  
in medical education,  
research & innovation  
and healthcare*

# Why do we sleep?

## Repair and Restoration Theory

- ↳ sleep enables the body and brain to repair after activity during the day – homeostatic balance
- ↳ to restore and rejuvenate, to grow muscle, repair tissue and synthesize hormones
- ↳ an opportunity for the brain to be cleared of waste chemicals
- ↳ consolidate a memory



Sleep deprivation leads to irritability, impaired concentration and hallucinations



# Contents

ICSD 3

Definition of OSAS

Clinical Features

Treatment

Case story

GP's knowledge of and attitude towards OSAS



# (International Classification of Sleep Disorders (ICSD 3)

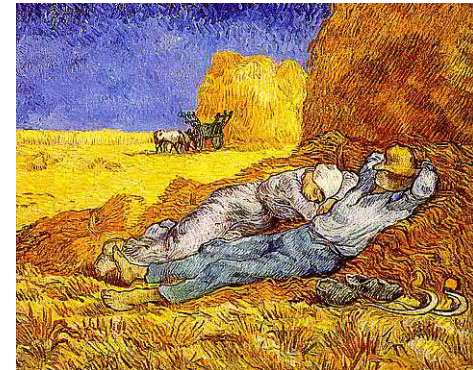
1. Insomnia
2. Sleep-related breathing disorders
3. Central disorders of hypersomnolence
4. Circadian rhythm sleep-wake disorders
5. Parasomnias
6. Sleep-related movement disorders
7. Other sleep disorders



# Sleep Breathing Disorders

The most common sleep breathing disorders:

- ↪ Central sleep apnea syndrome
- ↪ Obstructive sleep apnea syndrome (OSAS)
- ↪ Upper airway resistance syndrome



Vincent Van Gogh (1890) La Sieste

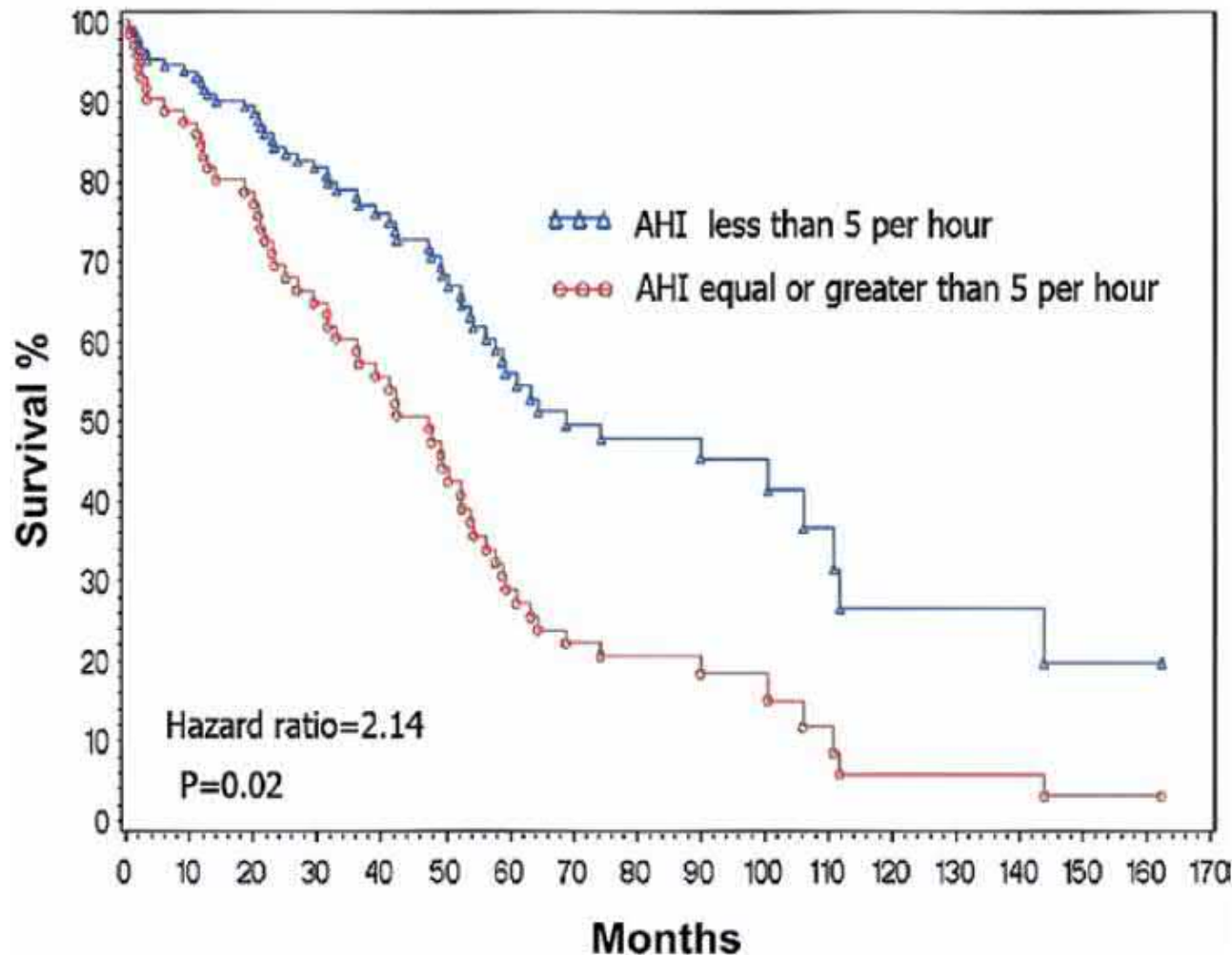
# Central sleep apnea syndrome (CSA)

- ↪ Central apnea occurs when both airflow and ventilatory effort are absent at least 10 seconds or more
- ↪ CSA is estimated to represent about 5% to 10% of patients with sleep-related breathing disorders
- ↪ It increases in middle-aged males and older adults.



Survival of heart failure (HF) patients with or without central sleep apnea (CSA) after accounting for all other confounders.

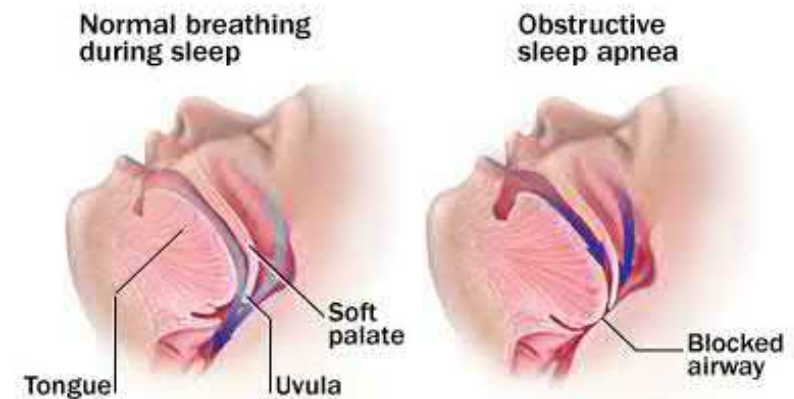
AHI (apnea-hypopnea index)





# Obstructive sleep apnea

- An obstructive apnea occurs when airflow is absent or nearly absent, but ventilatory effort persists. It is caused by complete, or near complete upper airway obstruction.
- Patients with OSA often have reduced upper airway size due to excess surrounding soft tissue, or a highly compliant airway.





# Subjective symptoms of OSAS

Daytime	Nighttime
Sleepiness	Snoring
Tiredness, fatigue	Observed apneas
Impaired memory	Frequent awakenings
Symptoms of gastroesophageal reflux	Gaspings
Morning headaches	Sweating
Depressive symptoms	Palpitations
Impotence or decreased libido	Nocturia

# EPIDEMIOLOGY

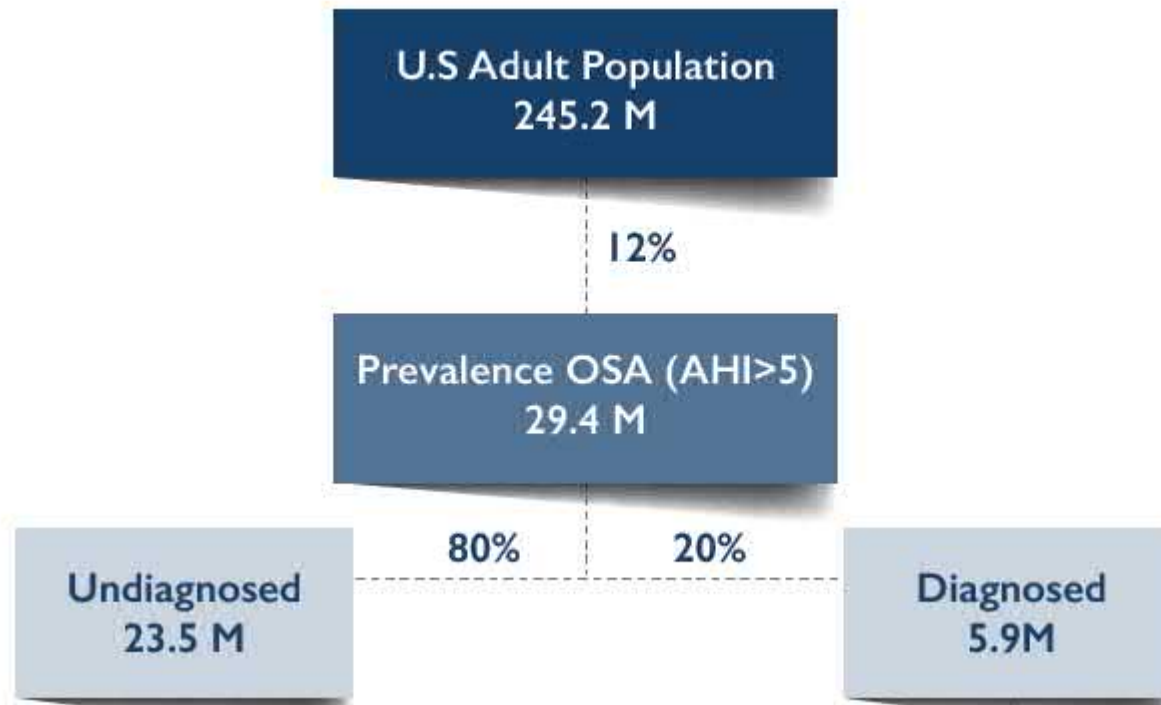
- ↪ 3-9% have OSAH if defined as an AHI greater than five events per hour accompanied by at least one symptom
- ↪ In Hungary the prevalence 2-4%
- ↪ The prevalence of OSAH increases with age. Among patients 65 years and older, there is a 2-3 fold higher prevalence compared to patients 30 to 64 years old.

<sup>1</sup>Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. (1993) The occurrence of sleep-disordered breathing among middle-aged adults. N Engl J Med, 328(17): 1230-1235.

<sup>2</sup> Banno K, Walld R, Kryger MH. (2005) Increasing obesity trends in patients with sleep-disordered breathing referred to a sleep disorders center. J Clin Sleep Med, 1(4): 364-366.



# Epidemiology



Source: Primary research with experts, U.S. Census (2014), Peppard "Increased Prevalence of Sleep-disordered Breathing in Adults." American Journal of Epidemiology (2013)



# Apnea

- ✚ Apnea is the cessation, or near cessation, of airflow. It exists when airflow is less than 20 percent of baseline for at least **ten seconds** in adults
- ✚ Apnea can produce arousals from sleep, increased arterial carbon dioxide, and decreased oxygen levels.



# Hypopnea

- Hypopnea is a reduction of airflow to a degree that is insufficient to meet the criteria for an apnea.
- It exists when airflow is less than 70 percent of baseline
- There is diminished airflow lasting at least ten seconds.
- Decreased airflow is accompanied by at least 4 percent oxyhemoglobin desaturation.

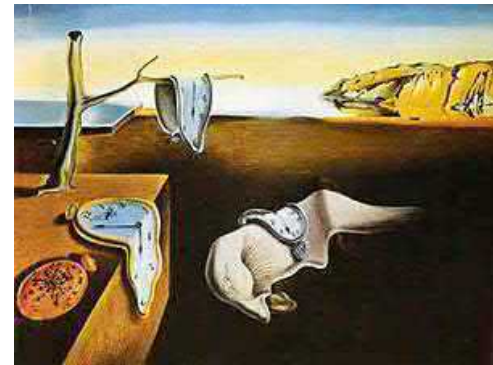


# Diagnostic criteria of OSA

➤ More than **15** apneas, hypopneas per hour of sleep (ie, an AHI > 15 events/hr) in an asymptomatic patient

OR

➤ AHI > 5 events per hour in a patient with symptoms (eg. sleepiness, fatigue and inattention) or signs of disturbed sleep (eg. snoring, restless sleep, and respiratory pauses).



Salvatore Dali (1931)  
Persistence of Memory



# Severity of OSA

- **None or minimal:** <5 events/hour
- **Mild:** 5 -15 events/hour
- **Moderate:** 15 -30 events/hour
- **Severe:** >30 AHI

# OSA can affect anyone, but is more common in some people....

- ↪ snoring loudly
- ↪ intermittently stop breathing when sleeping
- ↪ male and middle aged (2 fold)
- ↪ woman after menopause



# Gender differences in characteristics of clinical presentations inpatients with obstructive sleep apnea syndrome

More common in females	More common in males
Depression	Witnessed apneas
Hypothyroid disease	Caffeine consumption
Insomnia	Alcohol consumption



# OSA can affect anyone, but is more common in some people....

- ↪ snoring loudly
- ↪ intermittently stop breathing when sleeping
- ↪ male and middle aged (2 fold)
- ↪ woman after menopause
- ↪ overweight or obese
- ↪ large neck size (17 inches for men , 15 inches for women )
- ↪ resistant hypertension (!)
- ↪ small airway
- ↪ small lower jaw
- ↪ large tonsils, large tongue
- ↪ abnormal face shape, or nasal blockage

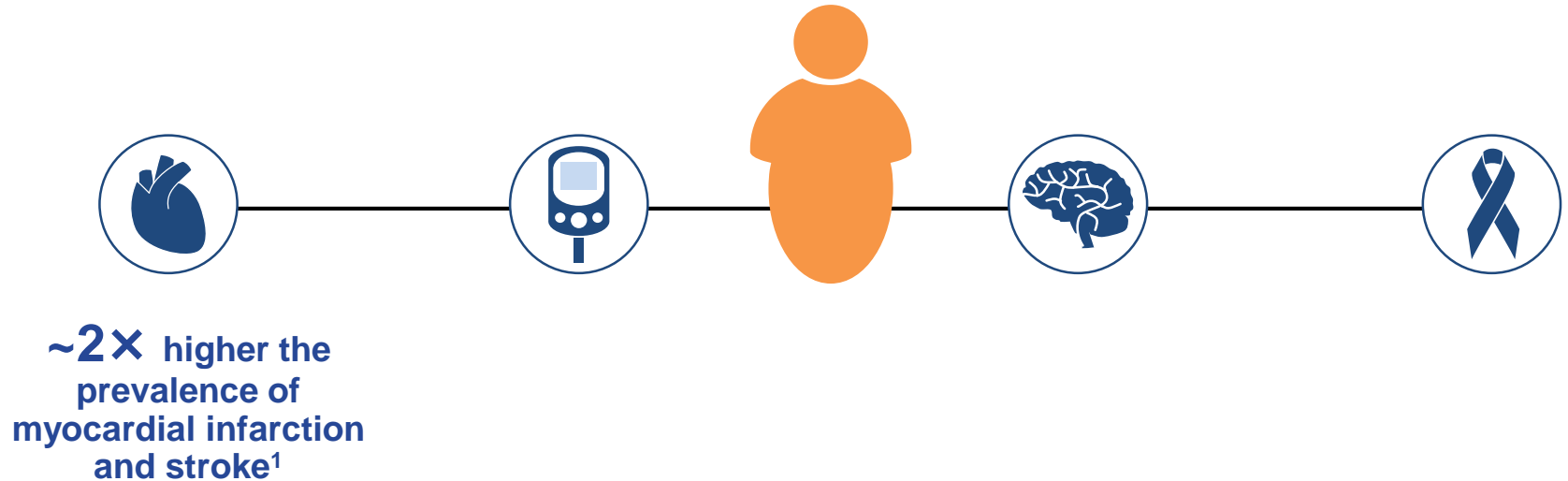


# Associated clinical manifestations in non-sleep medical fields

Field	Associated disorders and conditions
Cardiology	Hypertension, left ventricular hypertrophy, angina pectoris, myocardial infarction, arrhythmia, heart failure, pulmonary hypertension, cor pulmonale, peripheral edema, sudden death
Respirology	Respiratory failure, nocturnal shortness of breath, postpolio syndrome
Endocrinology	Diabetes mellitus, insulin resistance, metabolic syndrome, hypothyroidism, acromegaly
Neurology	Stroke, epilepsy, impaired memory, cognitive dysfunction
Gastroenterology	Gastroesophageal reflux disease (GERD)
Hematology	Polythemia
Psychiatry	Depression, anxiety disorder, Schizophrenia
Urology	Nocturia, impotence, erectile dysfunction, reduced libido
Gynecology and obstetrics	Pregnancy, menopause, polycystic ovary syndrome (PCOS)
Otorhinolaryngology	Enlarged tonsils, adenoids, nasal obstruction
Ophthalmology	Glaucoma, non-arteritic ischemic optic neuropathy
Anesthesiology	Difficulty of intubation, prolonged apneic episodes after operation
Dentistry and Orthodontics	Retrognathia, micrognathia



# Complications of OSA

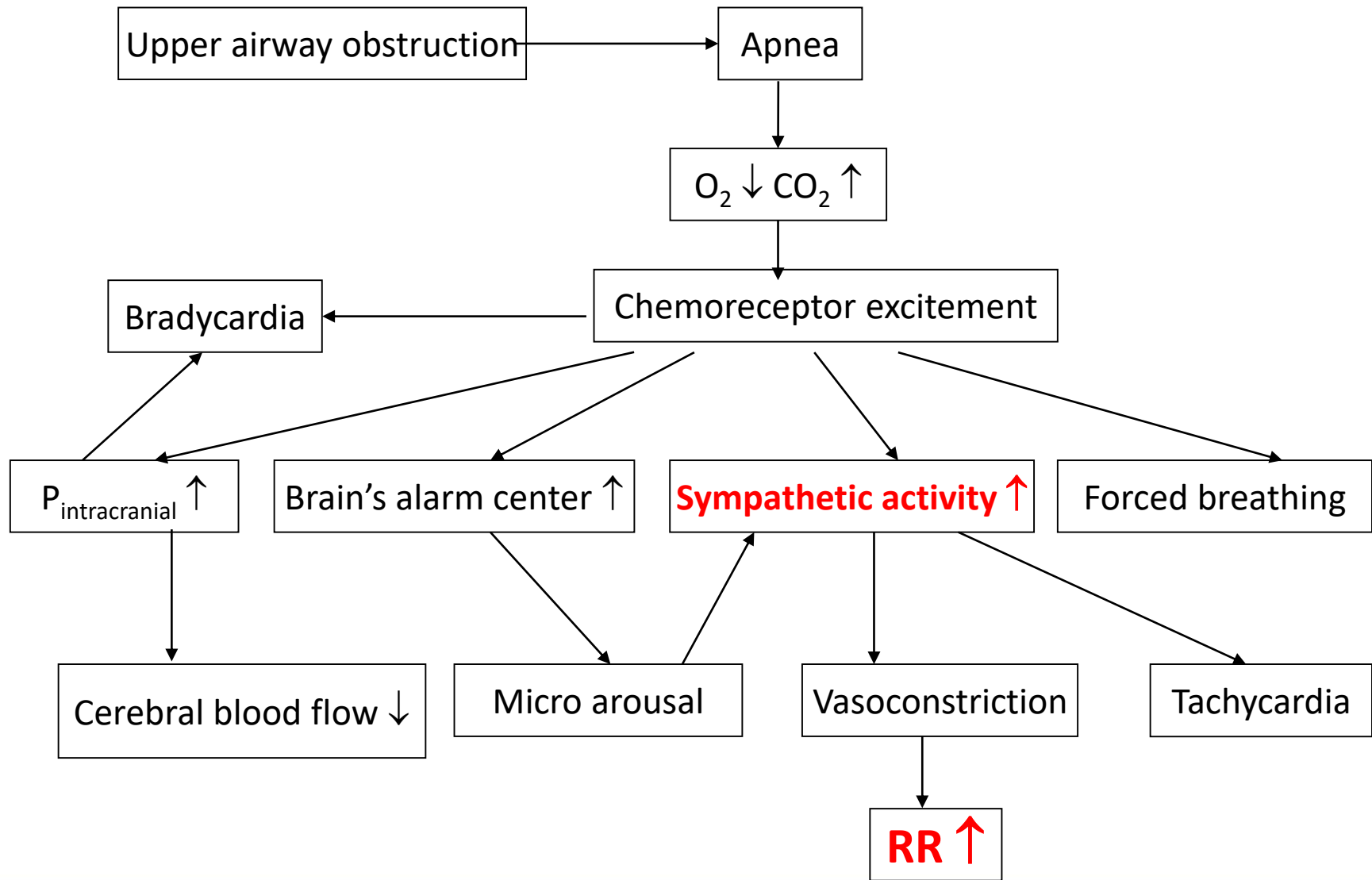


1. Mathew B, és mtsai. *J Am Board Fam Med.* 2008; 21: 562-8.





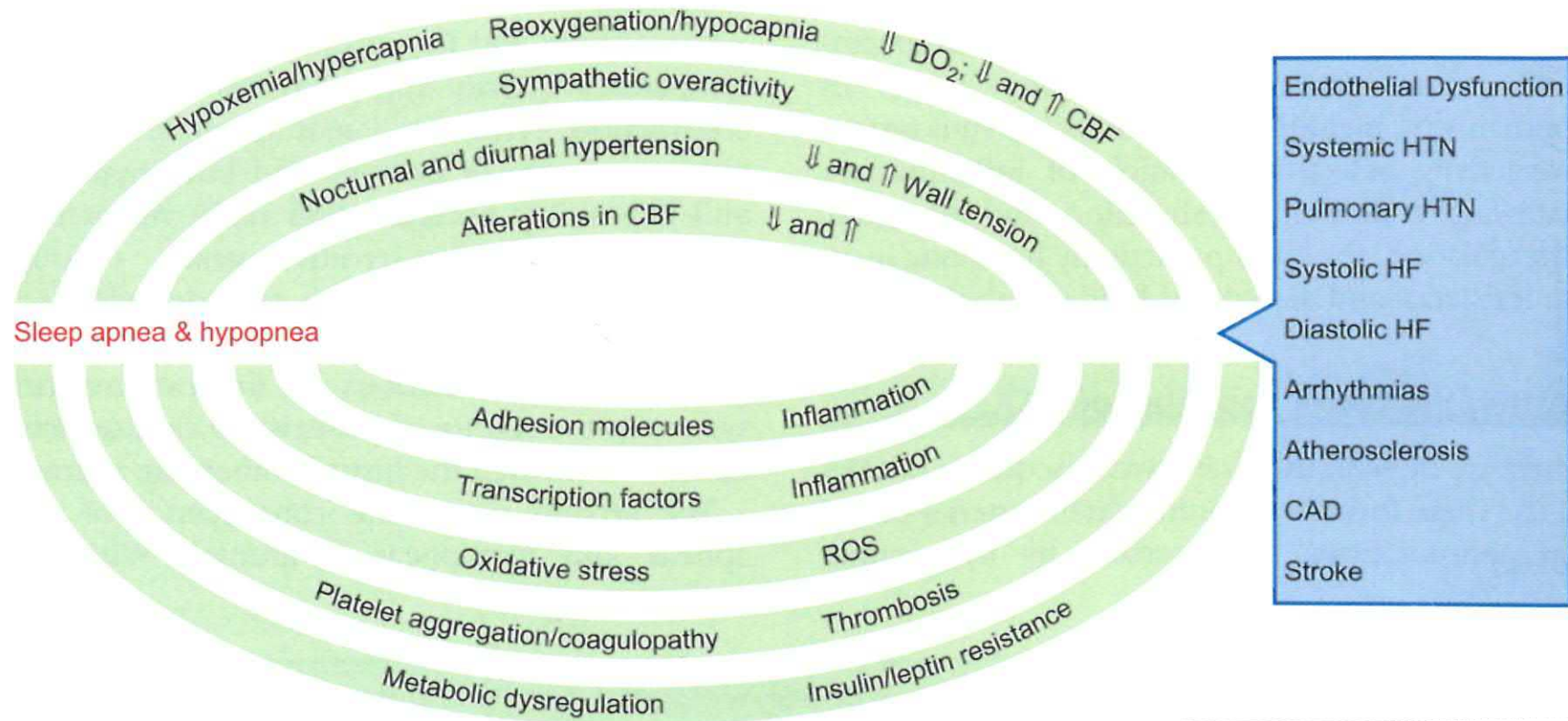
# Patomechanism



## Primary Events

## Intermediary Mechanisms

## Consequences



Javaheri 2007 Sleep Medicine Clinics

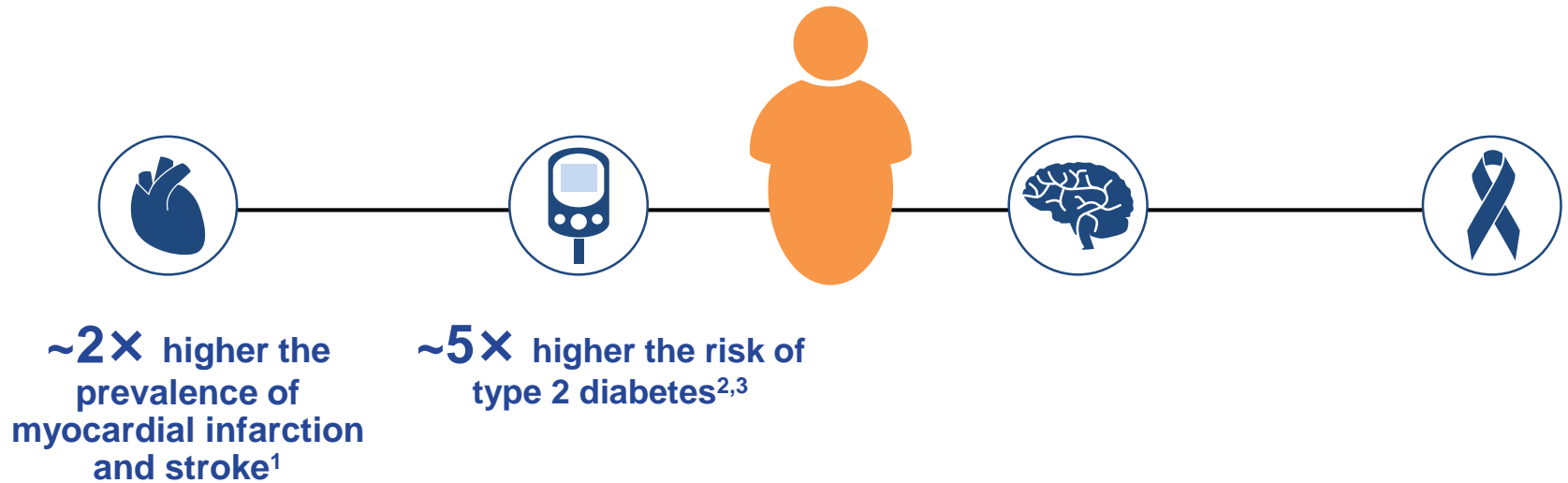


# Possible C-V Complications of OSA

- ↪ Endothelial dysfunction
- ↪ Hypertension
- ↪ Pulmonary hypertension
- ↪ Systolic or diastolic heart failure
- ↪ Arrhythmias
- ↪ Coronary artery disease
- ↪ TIA and stroke
- ↪ Dementia
- ↪ Death



# Complications of OSA



1. Mathew B, *et al. J Am Board Fam Med.* 2008; 21: 562-8.
2. Mokdad AH, *et al. JAMA.* 2003; 289: 76-9.
3. A.L. Borel *et al. Diabetes & Metabolism* 45 (2019) 91–101

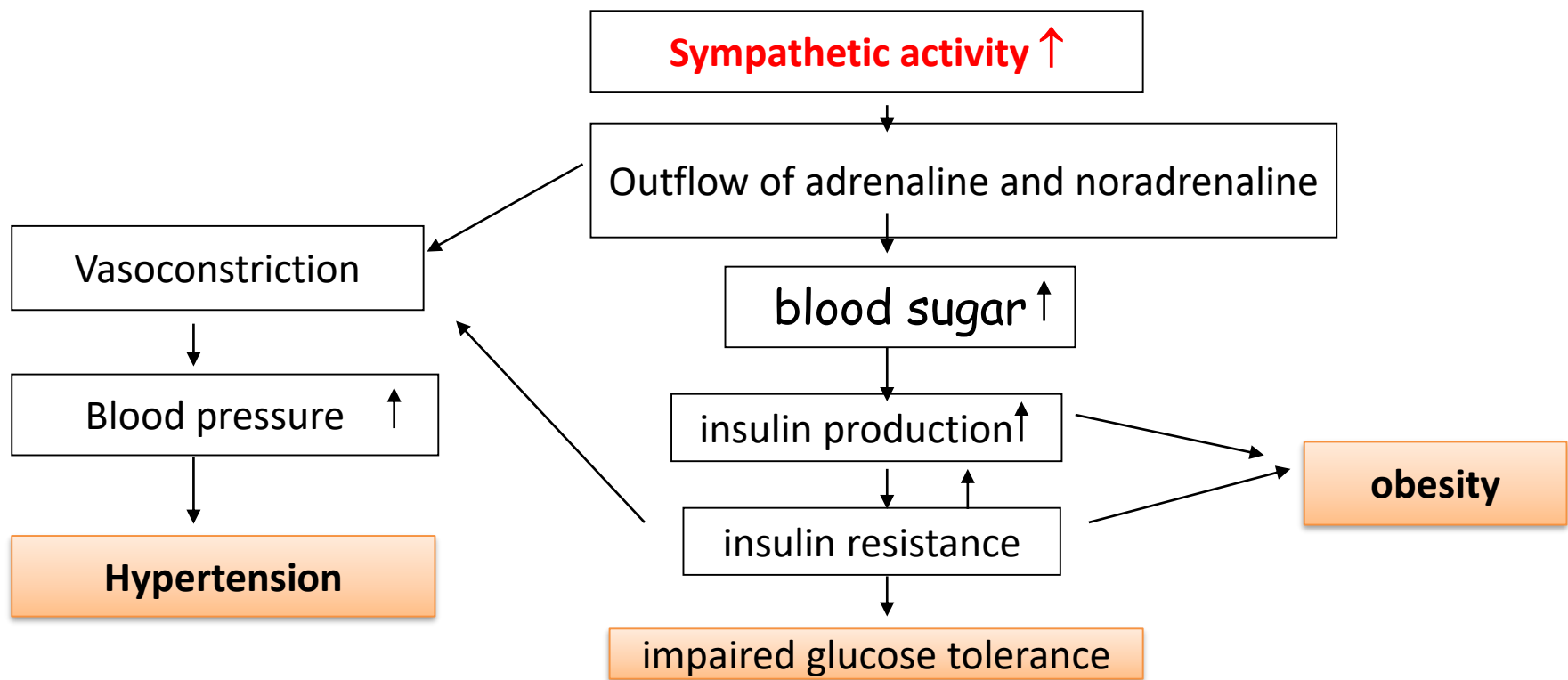
# Diabetes

- ↪ OSA is an independent risk factor for diabetes
- ↪ Percentage of people living with diabetes who also have OSA is between 17-48%.
- ↪ 86% of obese type 2 diabetes patients have OSA.

A.L. Borel et al. Obstructive sleep apnoea syndrome in patients living with diabetes:  
Which patients should be screened? *Diabetes & Metabolism* 45 (2019) 91–101

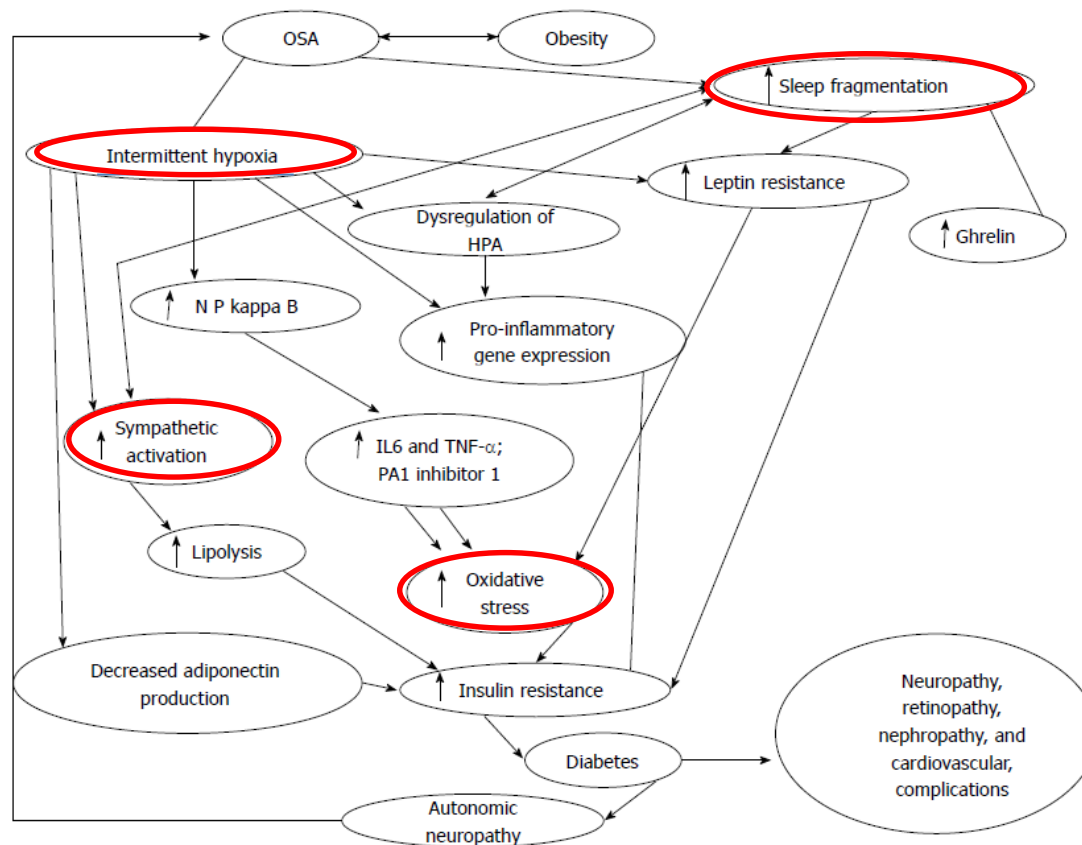


# Patomechanism





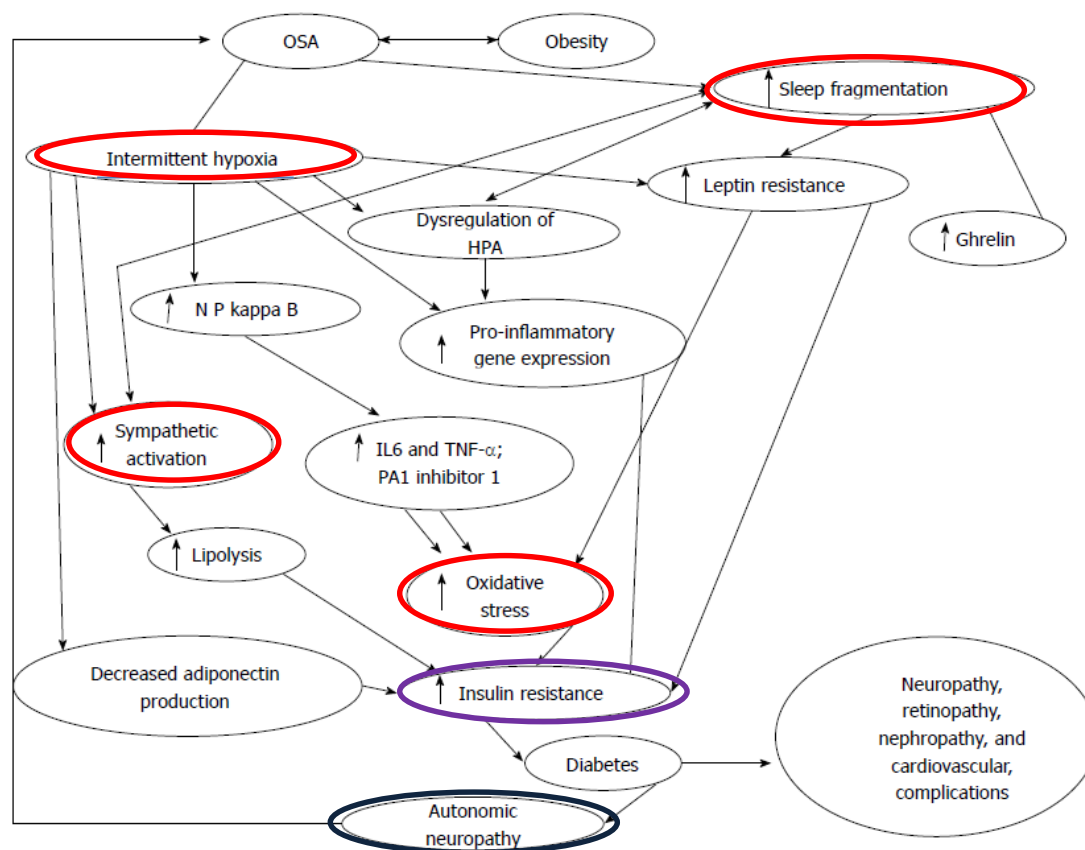
# OSAS and diabetes



**Figure 1** Flow diagram demonstrating interplay between obstructive sleep apnea, intermittent hypoxia, sleep fragmentation and diabetes. OSA: Obstructive sleep apnea; NF- $\kappa$ B: Nuclear factor kappa B; PAI: Plasminogen activator inhibitor 1; HPA: Hypothalamic-pituitary axis; IL: Interleukin; TNF- $\alpha$ : Tumor necrosis factor- $\alpha$ . Modified from Ref [58].

Nannapaneni S, Ramar K, Surani S.: Effect of obstructive sleep apnea on type 2 diabetes mellitus: A comprehensive literature review. World J Diabetes. 2013 Dec 15;4(6):238-44.

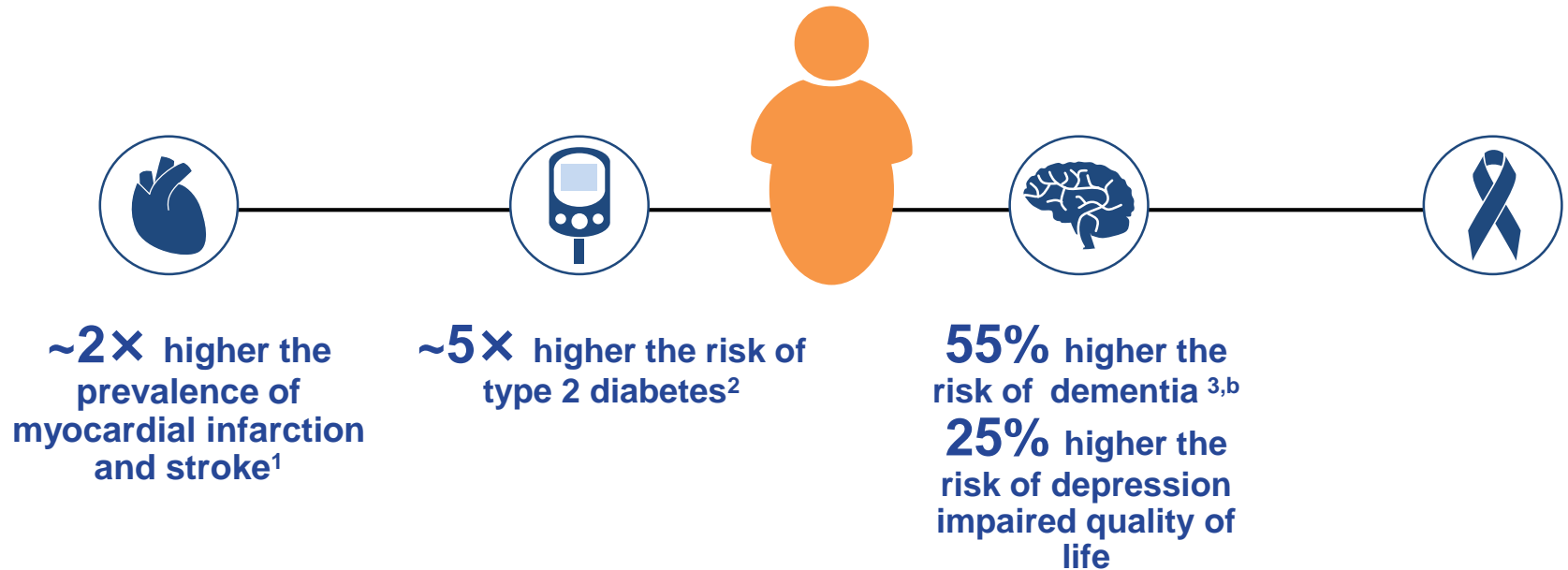
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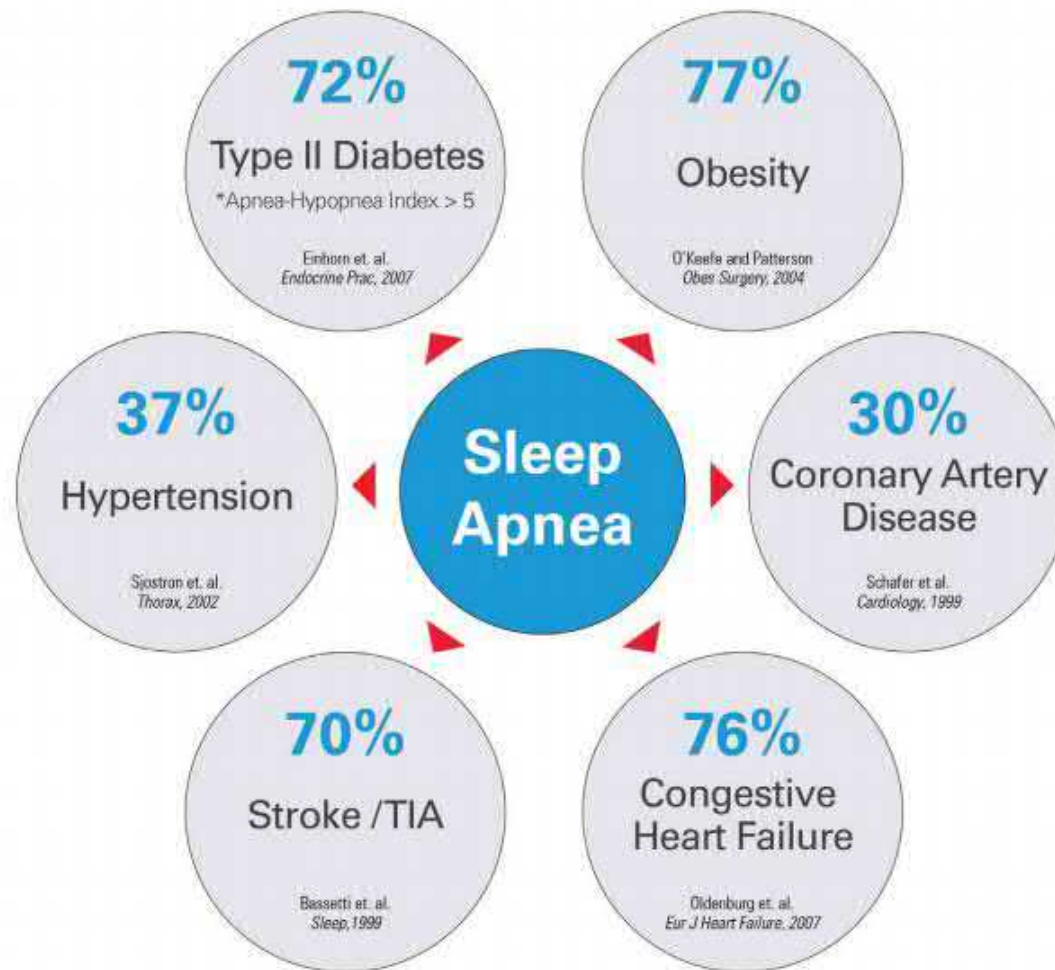
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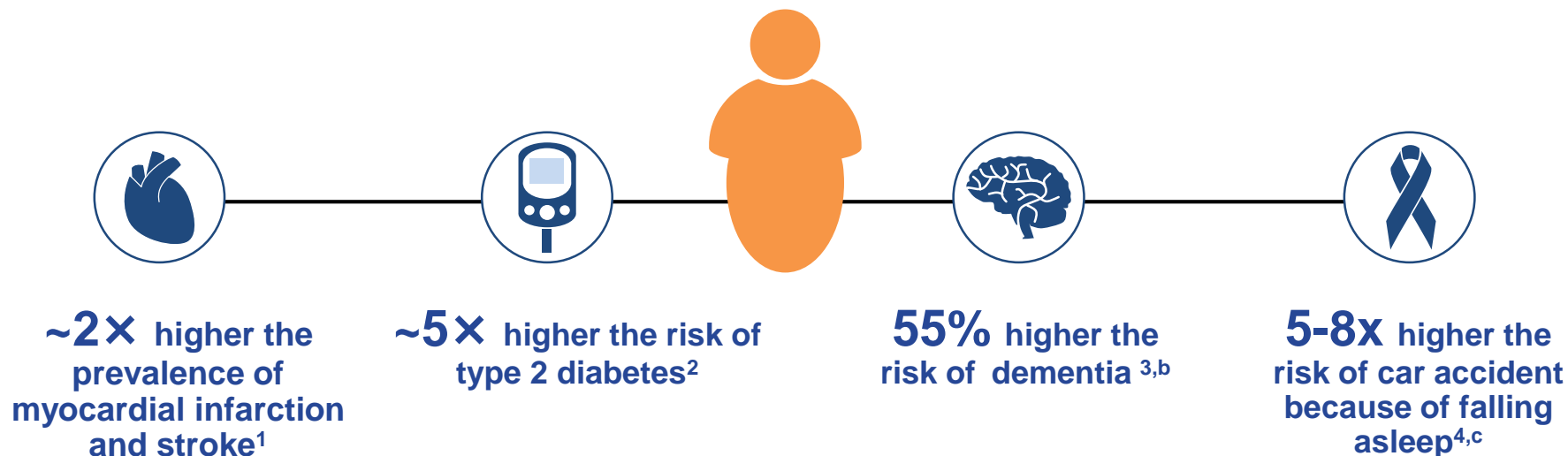
1. Mathew B, és mtsai. *J Am Board Fam Med*. 2008; 21: 562-8.
2. Mokdad AH, és mtsai. *JAMA*. 2003; 289: 76-9.
3. Luppino FS, és mtsai. *Arch Gen Psychiatry*. 2010; 67: 220-9.
4. Parkin DM, és mtsai. *Br J Cancer*. 2011; 105(suppl 2): S77-S81.



# Prevalence of Sleep Apnea



# Complications of OSA



1. Mathew B, és mtsai. *J Am Board Fam Med*. 2008; 21: 562-8.
2. Mokdad AH, és mtsai. *JAMA*. 2003; 289: 76-9.
3. Luppino FS, és mtsai. *Arch Gen Psychiatry*. 2010; 67: 220-9.
4. Parkin DM, és mtsai. *Br J Cancer*. 2011; 105(suppl 2): S77-S81.





# Verona, January 2017





# Car Crashes and OSA

- Patients with  $AHI > 15$  ( $n = 102$ ) have 8.1-fold increased risk of motor vehicle crash compared to matched controls ( $n = 152$ )<sup>2</sup>
- Patients with  $AHI > 34$  ( $n = 78$ ) have 15-fold increased risk of motor vehicle crash than matched controls ( $n = 160$ )<sup>3</sup>

1. George CF. *Thorax* 2001;56:508-512.
2. Teran-Santos J, et al. *N Engl J Med* 1999;340:847-851.
3. Horstmann S, et al. *Sleep* 2000;23:383-389.





# **New Standards and Guidelines for Drivers with Obstructive Sleep Apnoea syndrome**

**Report of the Obstructive Sleep Apnoea Working Group**

**Brussels, 2013**



# 16/2015. (III.30.) Regulation

OSAS screening must be part of the general medical checkup for drivers in Hungary



**Proposed questionnaire to screen for OSAS**

- 1. Gender
- 2. Age
- 3. Weight
- 4. Height
- 5. Did it already happen to you to doze off while driving?      YES    NO    DON'T KNOW
- 6. Did you have a serious accident (with personal injuries or property damage) due to sleepiness in the last 3 years?      YES    NO    DON'T KNOW
- 7. Do you usually snore loudly almost every night?      YES    NO    DON'T KNOW
- 8. Have you been told your breathing stops during your sleep?      YES    NO    DON'T KNOW
- 9. Do you usually wake up refreshed after a full night sleep? YES    NO    DON'T KNOW
- 10. Do you suffer from, or are you being treated for, Arterial Hypertension? YES    NO    DON'T KNOW
- 11. Please complete the questionnaire on usual daytime sleepiness, called the Epworth Sleepiness Scale, on the next page

**Epworth Sleepiness Scale**

How likely are you to doze off or fall asleep in the following situations?  
Answer considering how you have felt over the past week or so.

- 0 = Would never doze
- 1 = Slight chance of dozing
- 2 = Moderate chance of dozing
- 3 = High chance of dozing

1. Sitting and reading	<input type="text"/>
2. Watching TV	<input type="text"/>
3. Sitting inactive in a public place (e.g., theater or meeting)	<input type="text"/>
4. As a passenger in a car for an hour without a break	<input type="text"/>
5. Lying down to rest in the afternoon when able	<input type="text"/>
6. Sitting and talking to someone	<input type="text"/>
7. Sitting quietly after a lunch without alcohol	<input type="text"/>
8. In a car while stopped for a few minutes in traffic	<input type="text"/>







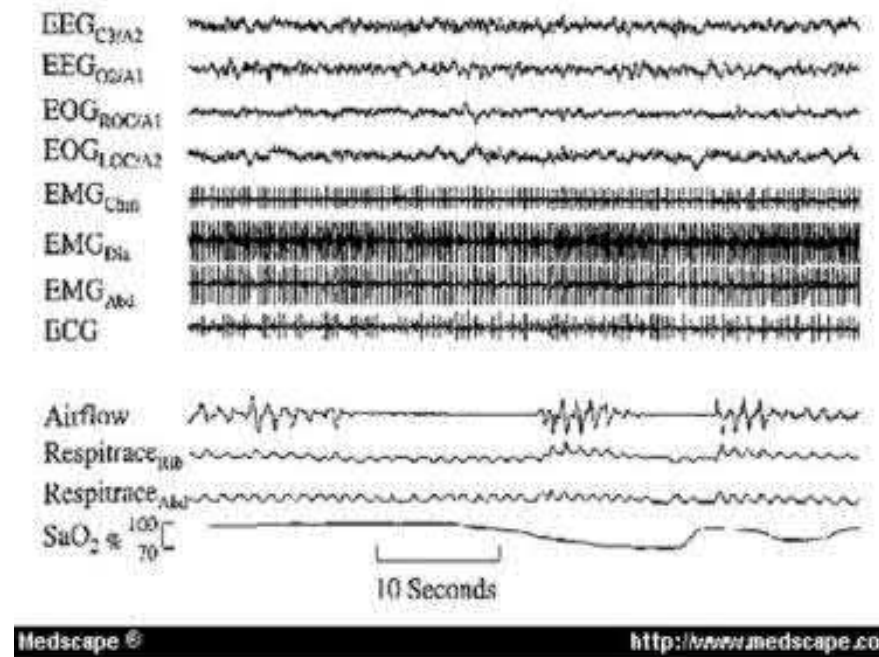
"OK, Mrs. Tully. We want you to relax, get a good night's sleep, and we'll evaluate any sleep issues that you have."

# Sleep laboratory

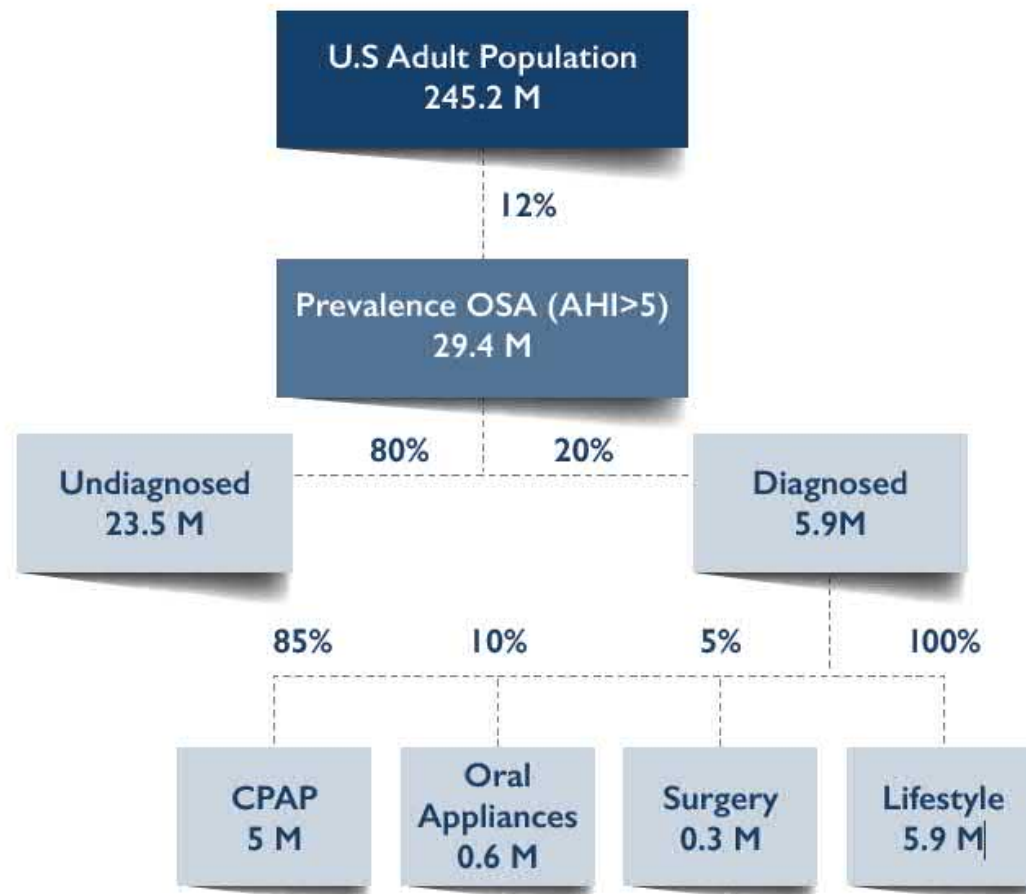


# Polysomnography

- ⇒ ECG
- ⇒ neurophysiologic variables– sleep stages
- ⇒ Measurement of resp. effort
- ⇒ Art. O<sub>2</sub> sat., pCO<sub>2</sub> – transdermal pulsoxymetry
- ⇒ Limb movements



# Epidemiology



Source: Primary research with experts, U.S. Census (2014), Peppard "Increased Prevalence of Sleep-disordered Breathing in Adults." American Journal of Epidemiology (2013)



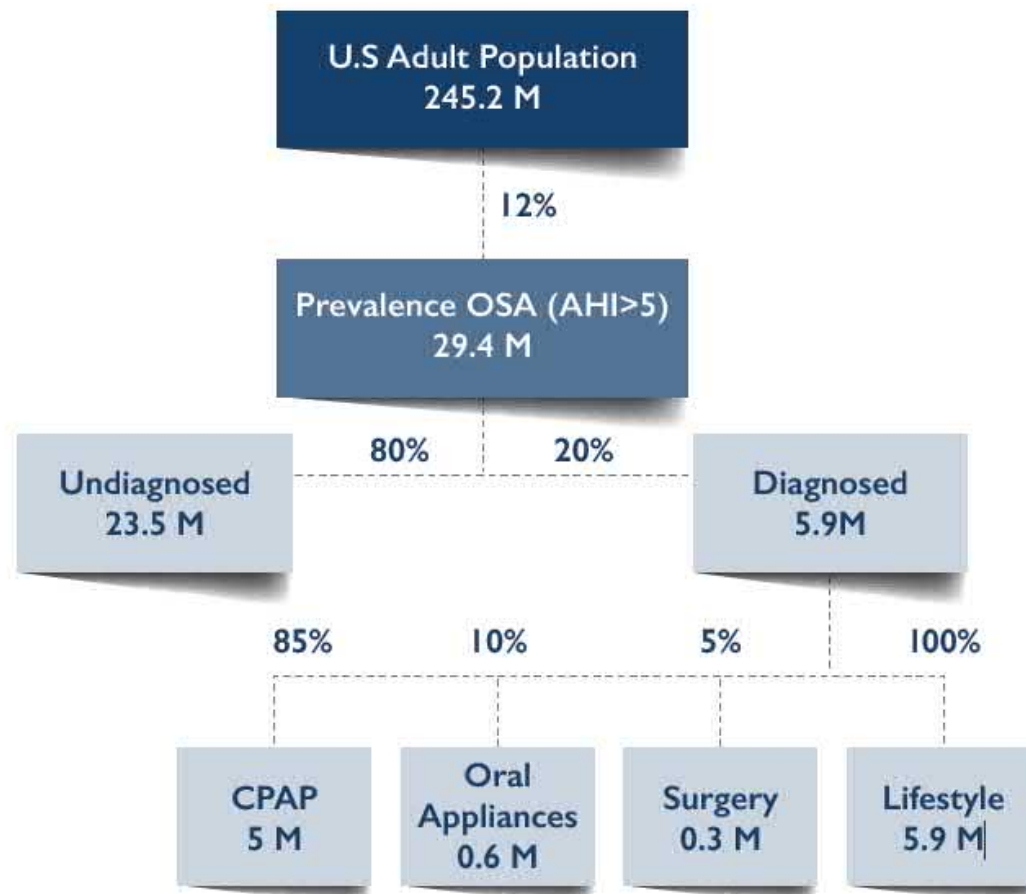
# TREATMENT

- ↪ weight control
- ↪ voiding the supine posture during sleep for patients with mild OSA
- ↪ avoidance of alcohol, sedative medication
- ↪ stop smoking





# Epidemiology

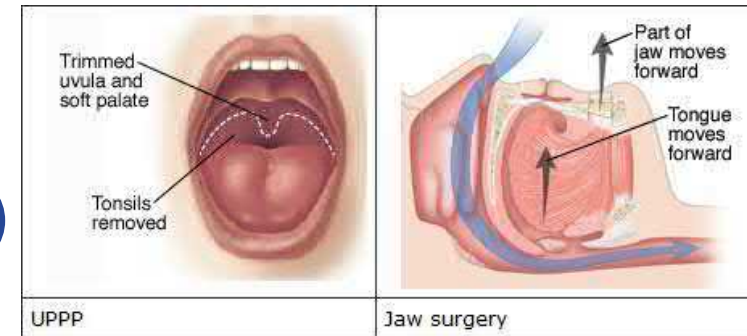


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# Surgery treatment

- Nasal surgery
- UPPP  
(Uvulopalatopharyngoplasty)
- Lower jaw advancement



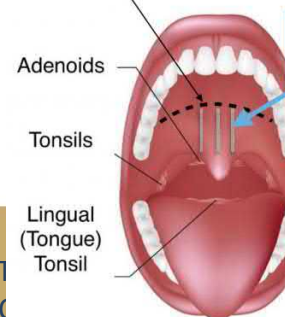
# Surgery treatment

- Nasal surgery
- UPPP  
(Uvulopalatopharyngoplasty)
- Lower jaw advancement
- Soft palate implants (the Pillar Procedure)
- Hyoid advancement
- Tongue advancement
- Tongue base reduction

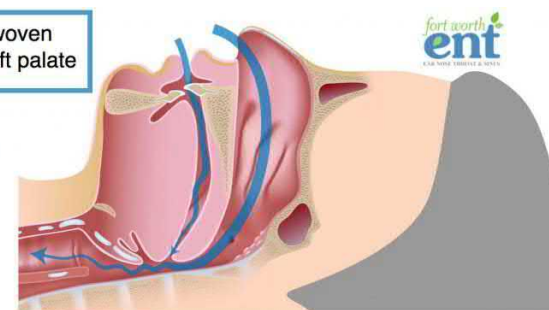
**Pillar Procedure** - small woven implants are placed in the soft palate



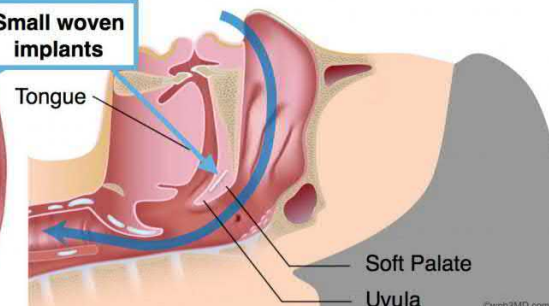
Hard Palate and Soft Palate Junction



**Small woven implants**



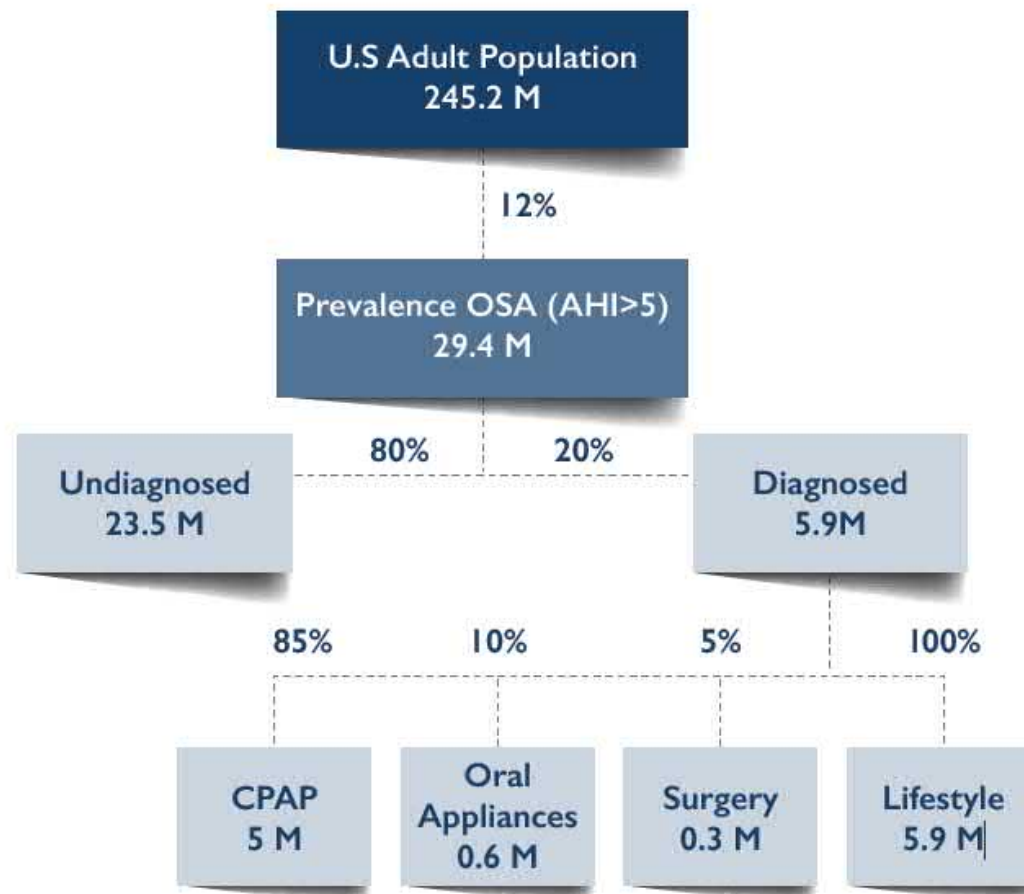
Snoring caused by partial obstruction of the airway



Pillar Implant relieves partial obstruction of the airway



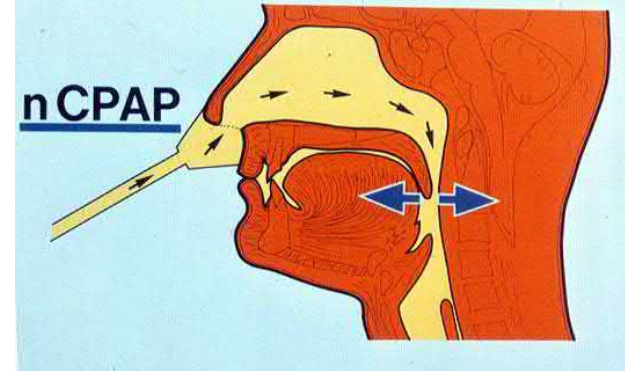
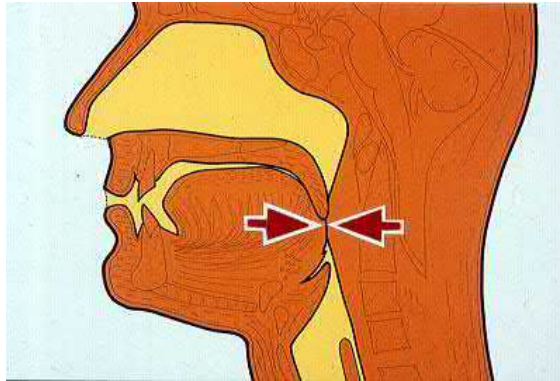
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Source: Primary research with experts, U.S. Census (2014), Peppard "Increased Prevalence of Sleep-disordered Breathing in Adults." American Journal of Epidemiology (2013)

# CPAP (Continuous Positive Airway Pressure)

## APAP (Automatic Positive Airway Pressure)





# BIPAP (Bilevel Positive Airway Pressure)

- ↪ BiPAP machines have two pressure settings:
  - ↪ higher pressure for inhalation (**Ipap**)
  - ↪ lower pressure for exhalation (**Epap**)



## *Who Would Benefit from BiPAP Therapy?*

- 1) sleep apnea patients with **high pressure settings** or with low oxygen levels
- 2) OSA patients with **cardiopulmonary disorders** such as congestive heart failure
- 3) OSA patients with **lung disorders** or certain **neuromuscular disorders**.

# OSA Treatment Has a Major Impact on Comorbidities

After one year, patients surveyed state OSA treatment delivers...



## Hypertension

- 41% report blood pressure improvement
- 17% report decrease in medication usage



## Diabetes

- 31% report improved HbA1c
- 14x increase in “good quality” sleep



## Asthma & Breathing Conditions

- 54% report improved respiratory function
- 70% increase in patients reporting symptoms as mild
- 8x increase in “good quality” sleep

# OSA treatment has a major impact on comorbidities

After one year, patients surveyed state OSA treatment delivers...



## Insomnia

- 7x increase in good quality sleep
- Decline from 54% to 1% reporting “very bad” quality sleep



## Depression, Anxiety and Mental Health

- 4x reduction in reported life threatening mental health condition
- 49% report improved mental health



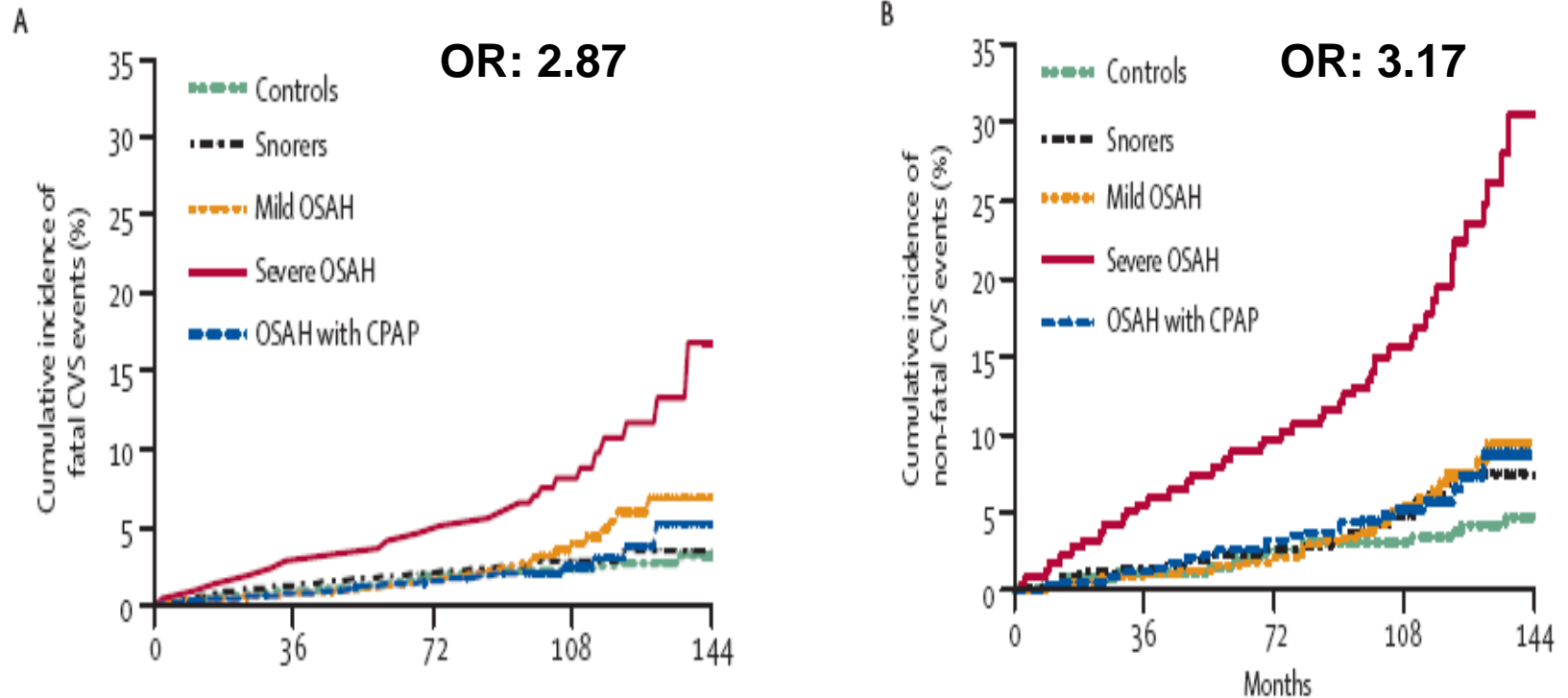
## Heart Disease

- 56% report reduced heart disease risk
- 5x decrease in self-reported life-threatening heart disease



# Long-term cardiovascular outcomes in men with obstructive sleep apnea

## 1001 OSAS vs. control



Marin JM et al.: Long-term cardiovascular outcomes in men with obstructive sleep apnea-hypopnoea with or without treatment with continuous positive airway pressure: an observational study. Lancet 2005 Mar 19-25;365(9464):1046-53.

# Case story

2016.02.17.

- 66 year old male patient
- BMI: 42.6 kg/m<sup>2</sup>, abdominal circumference 133 cm, neck circumference 46 cm (18 inch)
- According to the patient, he does not have any chronic diseases, no complaints
- No alcohol consumption and smoking
- ECG: Occasional ventricular extrasystoles
- Blood pressure 190/100 mmHg, heart rate 80/min
- OSA questionnaire: 16 points



1. Gender
2. Age
3. Weight
4. Height
5. Did it already happen to you to doze off while driving?      YES    NO    DON'T KNOW
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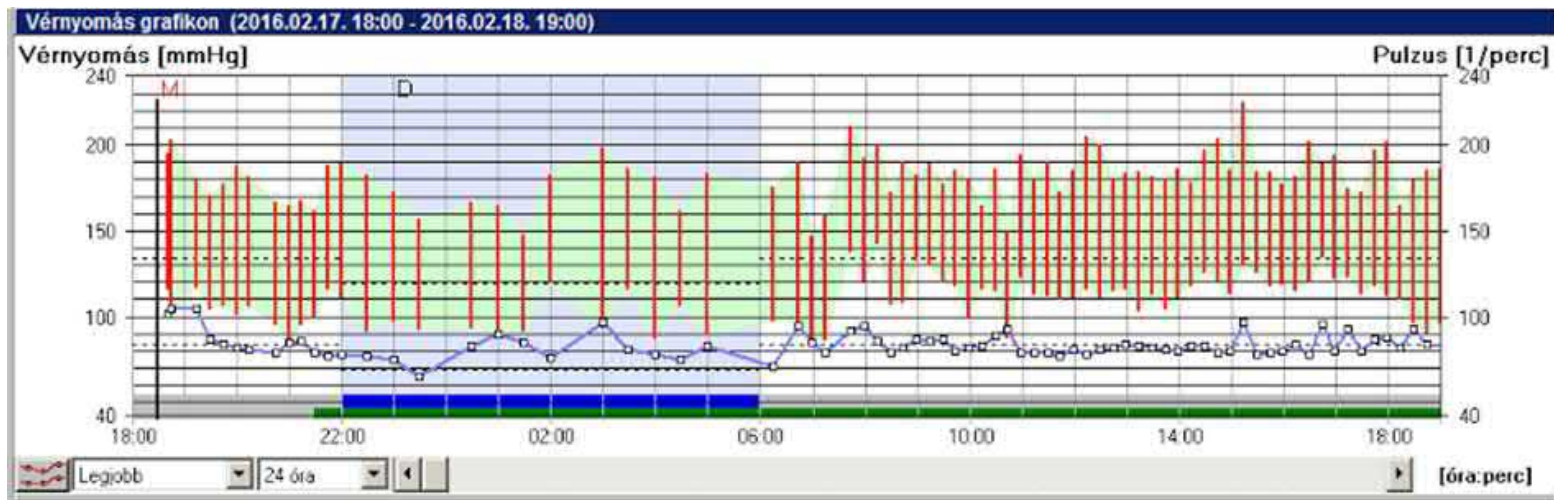
6. Sitting and talking to someone

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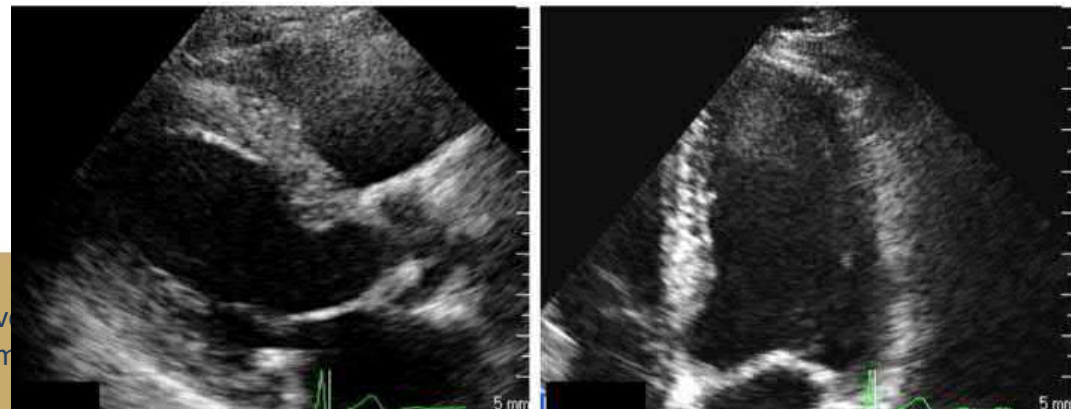
# ABPM results



- Average blood pressure 179/108 mmHg
- Average daytime blood pressure 182/112 mmHg
- Average night-time blood pressure 174/100 mmHg, pulse rate 82/min. Diurnal index 4/11%
- Therapy: Telmisartan 1x40 mg

## Cardiac ECHO:

- ↪ Left ventricular (LV) posterior wall thickness and interventricular septal thickness were found
- ↪ Mild mitral insufficiency, tricuspidal insufficiency
- ↪ Uric acid level (540  $\mu\text{mol/l}$ ) and total cholesterol value (6.8 mmol/l)





2016.03.01.

- Respiratory pulse oximetry
- AHI: 79.9/hour
- The oxygen desaturation index is 69.4 /hour. The mean blood oxygen saturation was 87%.
- Periodic Desaturation Typical of Sleep Apnea Syndrome
- Somnologist's opinion: severe OSA, oxygen deficiency in 48% of sleep



03/10/2016

## Polysomnography

Minimum oxygen saturation 51%

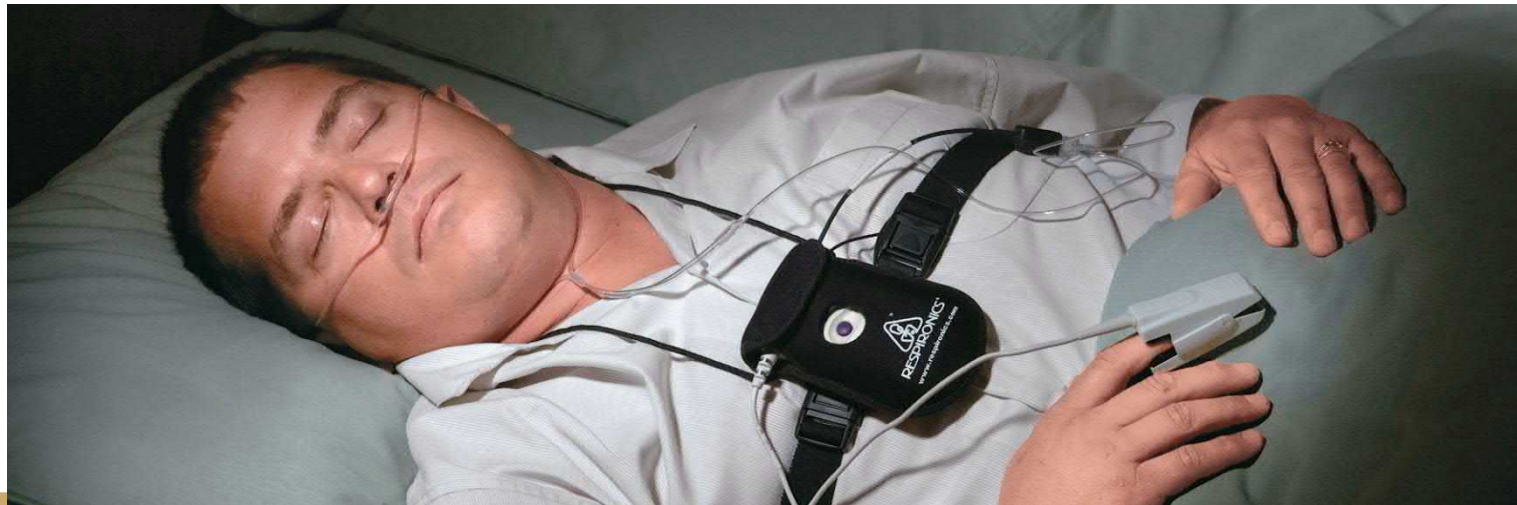
Average oxygen saturation 90%

The desaturation index was 82.9 /hour

AHI:57/hour.

Diagnosis: Severe sleep apnea

The patient was enrolled for CPAP titration



# 16/2015. (III.30.) Regulation

- ↪ Normal car driver with OSA  
↪ every 3 year
- ↪ Professional car drivers with OSA  
↪ every year
- ↪ Certificate from somnologist





# Barriers to Diagnosis & Treatment

General Public Awareness	Many individuals do not recognize symptoms and severity of the condition.
--------------------------	---



# Leaflet for patients



# 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.



# 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.



# The aim of our study

- To assess the knowledge and attitude of family physicians related to sleep apnoea
- Do the GPs have any problem with doing OSAS screening in their practice?

Csatlós D., Ferenci T., Kalabay L., László A., Hargittay Cs., Márkus B., Szakács Z., Torzsa P. : Hungarian family physicians' and residents' knowledge of and attitude towards OSAS (obstructive sleep apnoea syndrome).

Do they screen sleep apnoea during the general medical checkup for the driving licence? Ideggyógyászati Szemle 70:105-115. (2017)



# Methods

- In the cross-sectional study we used a validated OSAKA questionnaire in mandatory continuous medical education courses, supplemented with four additional questions
- The respondent rate was 74%
- Statistical analysis was carried out using the SPSS 21 software.

\*Helena M. Schotland, Donna B. Jeffe: Development of the obstructive sleep apnea knowledge and attitudes (OSAKA) questionnaire  
Sleep Medicine 4 (2003) 443–450



# RESULTS

116 General practitioners

females n:74 (63%)      males n:42 (37%)

Age:55±11 years

103 trainees

females n:63 (60%)      males n:40 (40%)

Age:30±6 years





# Results

Gender (n)	OSAS knowledge	<i>p</i>
Females (74)	13.4±1.8	0.0004
Males (42)	11.7±2.6	
Age (n)		
<40 (16)	13.1±2.2	0.11 *
40-60 (60)	12.9±2.5	
>60 (40)	12.6±2.0	
Number of specializations (n)		
0-1 (52)	12.5±2.3	0.05
2 (42)	12.7±2.2	
3-4 (13)	14.0±2.1	



- 39% of the GPs screen always the OSAS
- 46% of GPs only screen the patients with risk factors
- 15% GPs do not screen the drivers for OSAS



„How many patients have OSAS in your practice?"

n:116

Median: 5 patients

40% of practices → <5 OSAS patients

10 % of practices → no OSAS patient



# Why GPs do not screen regularly the OSAS?

- ↪ They do not know any OSAS screening questionnaires (55%)
- ↪ It is difficult to screen the OSAS(47%)
- ↪ Lack of time (45%)
- ↪ They do not think that OSAS screening is important in primary care (33%)



# What did we do?





SPRINGMED HÁZIORVOS KÖNYVTÁR

# Obstruktív alvási apnoe szindróma a háziorvosi gyakorlatban

Szerkesztette:

Szakács Zoltán – Torzsa Péter

Szerzők:

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Csatlós Dalma  
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Dr. Peter Torzsa  
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# GPs' Sleep Medicine Workgroup



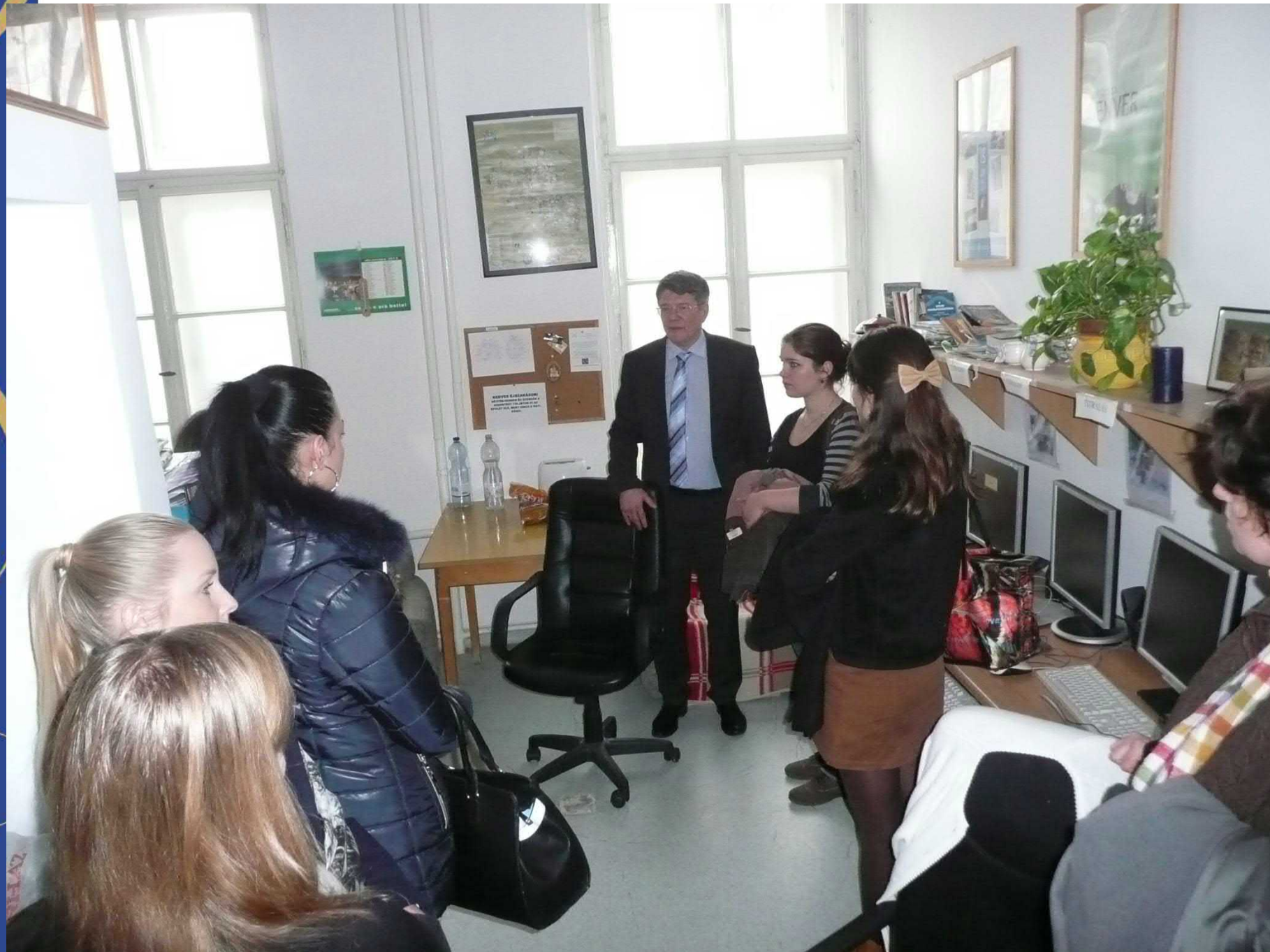
# Vocational training program

## Sleep Medicine Course

n=105







# The attitude changing of the GP trainees n=105

Attitude	Before the course	After 3 months	p
Importance of OSA as clinical disorder	3.7 $\pm$ 0.8	4.2 $\pm$ 0.8	0.0001
Important to identify patients with OSA	3.8 $\pm$ 0.8	4.3 $\pm$ 0.8	0.0001
Confident identifying at-risk patient	2.9 $\pm$ 0.8	3.7 $\pm$ 0.7	<0.0001
Confident managing patients on CPAP	2.4 $\pm$ 0.7	3.1 $\pm$ 0.7	<0.0001
All attitude	3.0 $\pm$ 0.5	3.7 $\pm$ 0.6	0.017

# Conclusions

Despite the high prevalence and clinical importance of OSAS, GPs often do not recognize sleep apnoea and they have difficulty in treating their patients for this problem.

**Education of physicians is important in order to diagnose patients with OSAS earlier and to treat them in accordance with the proper recommendations.**

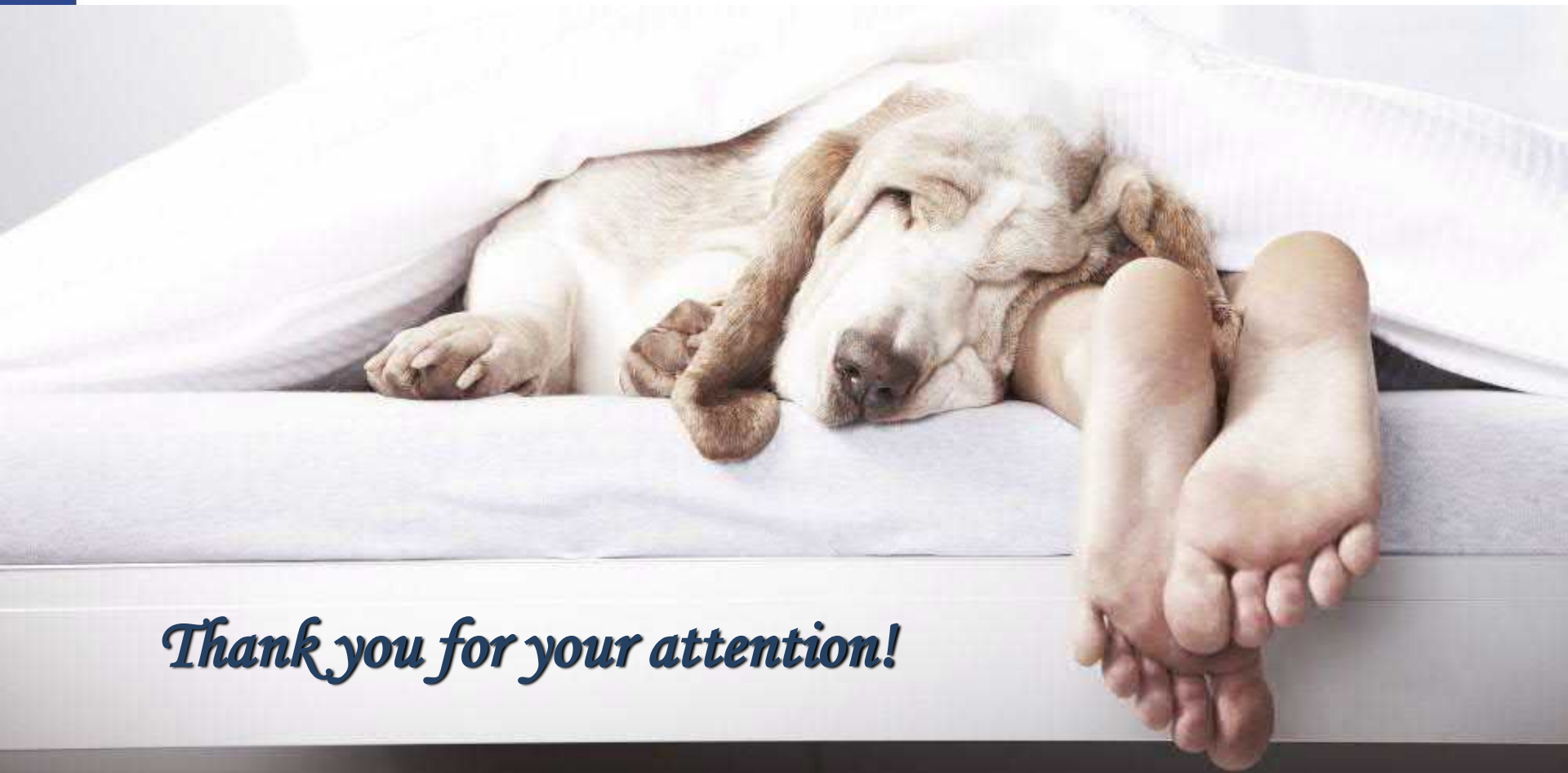


# Take home message

- Obstructive sleep apnea is a frequent disease (3-9%)
- 3 common symptoms: loud snoring, breathing pause, daytime sleepiness
- Without treatment it can cause serious cardiovascular, endocrine, neurological and other complications
- Screening questionnaires can help to identify the disease
- Polysomnography (PSG) is the gold-standard method for diagnosing the disease
- CPAP is the gold standard treatment of the mild/severe OSAS.







*Thank you for your attention!*



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Obstructive Sleep Apnea. Types, symptoms, diagnosis  
and treatment in Primary Care

Dr. Peter Torzsa  
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