

PACCM Fellow Teaching Series: OSA

Obstructive sleep apnea: An overview

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Main goal for this presentation

- Give an overview of OSA - diagnosis and treatment
- Review epidemiology, pathophysiology, and relationship to comorbidities
- Help you understand where sleep apnea fits into the overall health of your patients

Why is OSA important?

- Top 3 disorders pulmonary docs actually see in office practice
- Significant morbidity, some mortality
- Easily treatable
- Make a meaningful impact on patient lives
- 10% of pulmonary boards

Patient Presentation

- 55 year old woman
- Loud snoring, choking/gasping
- Witnessed apnea by spouse
- Htn x 5 year
- Borderline T2DM
- 30# weight inc x 5 yrs
- BMI 32kg/m²
- ESS 12
- **Diagnosis?**
- **Causation?**
- **Would you do next?**
- **Treatment?**
- **Prognosis?**

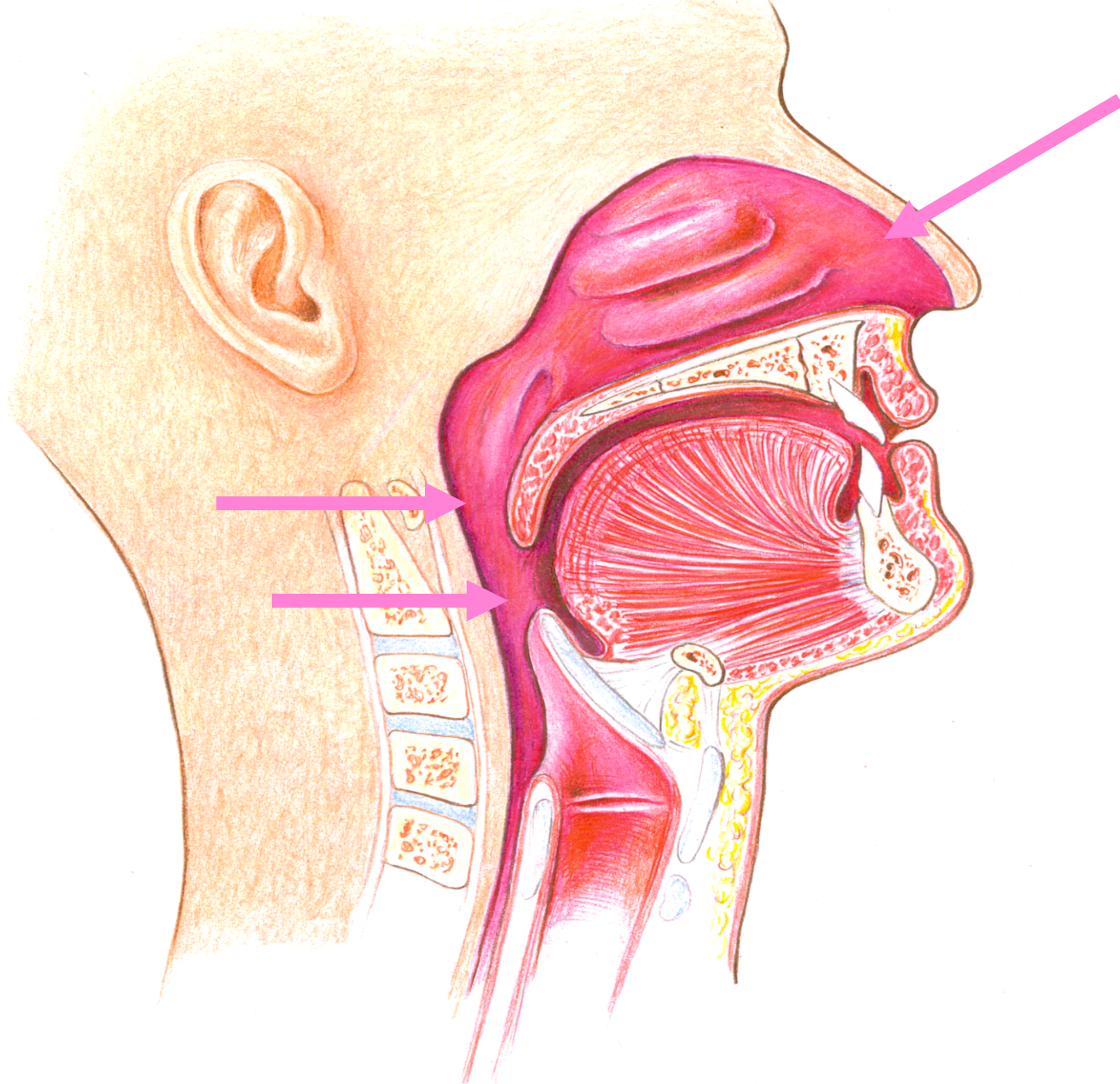
Sleep Apnea Pathophysiology

Pathophysiology Key Points

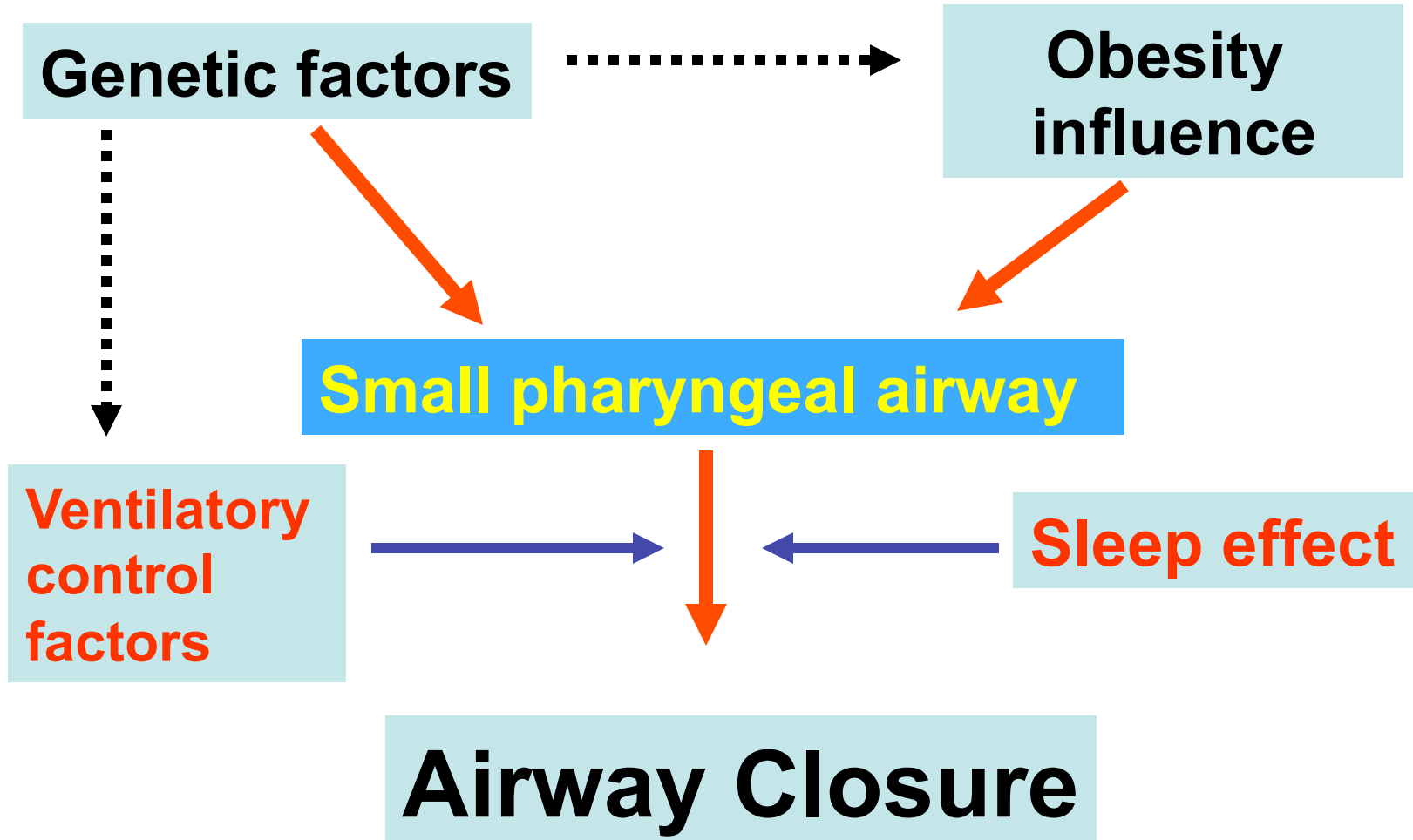
- UA is collapsible
 - Genetics
 - Weight
 - Intrinsic property
- Collapse occurs at all segments
 - Naso, velo, hypo
 - Nose, mouth, lower
- Promote collapse
 - Weight of neck
 - Small anatomy (oroP)
 - ?NM tone
- Promote patency
 - GG tone
 - Larger anatomy
 - Less soft tissue

Effect of State, medications, internal obstruction, ctrl of breathing

Upper Airway Sites Contributing to OSA



Pathogenesis of OSA



Balance of Pressures in Upper Airway Function

- Small airway size
- Upper airway resistance
- Neg inspiratory pressure
- Extra lumenal tissue pressure
- Greater collapsibility
- Smaller mandible

- Pharyngeal dilator muscles
- Larger airway size
- Larger mandible
- Less collapsibility
- Higher lung volume



Favors collapse

Favors patency

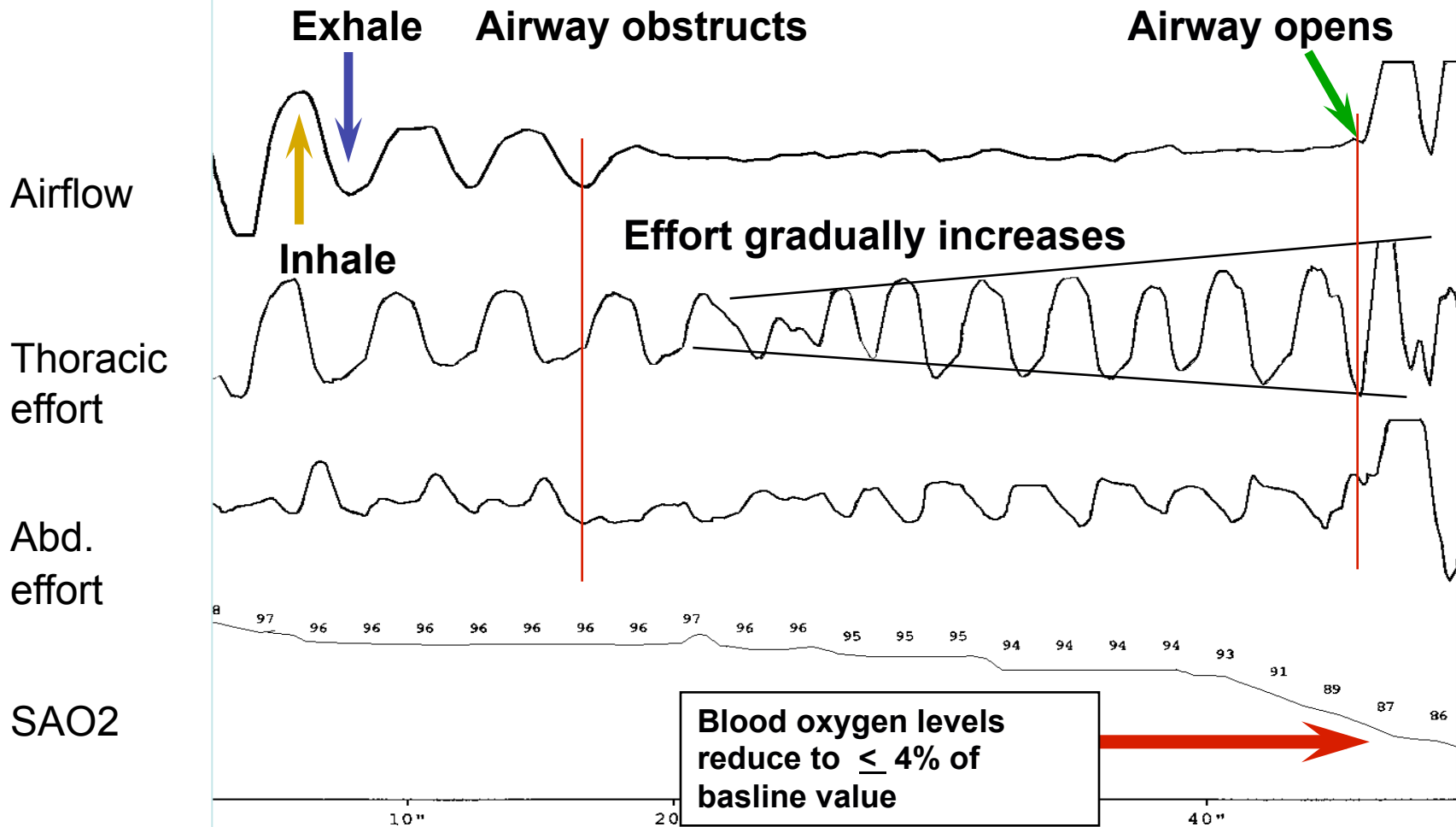
Sleep Apnea

Definitions and Examples

What is sleep apnea?

- **Apnea** is complete absence of airflow for ≥ 10 seconds.
- **Hypopnea** is a partial (50-70%) reduction in airflow and with $\geq 3\%$ O₂ desaturation and/or arousal
- **Obstructive sleep apnea**: complete collapse of the pharynx during sleep despite efforts to breath.
- **Central sleep apnea**: complete withdrawal of central respiratory drive to the muscles of respiration during sleep

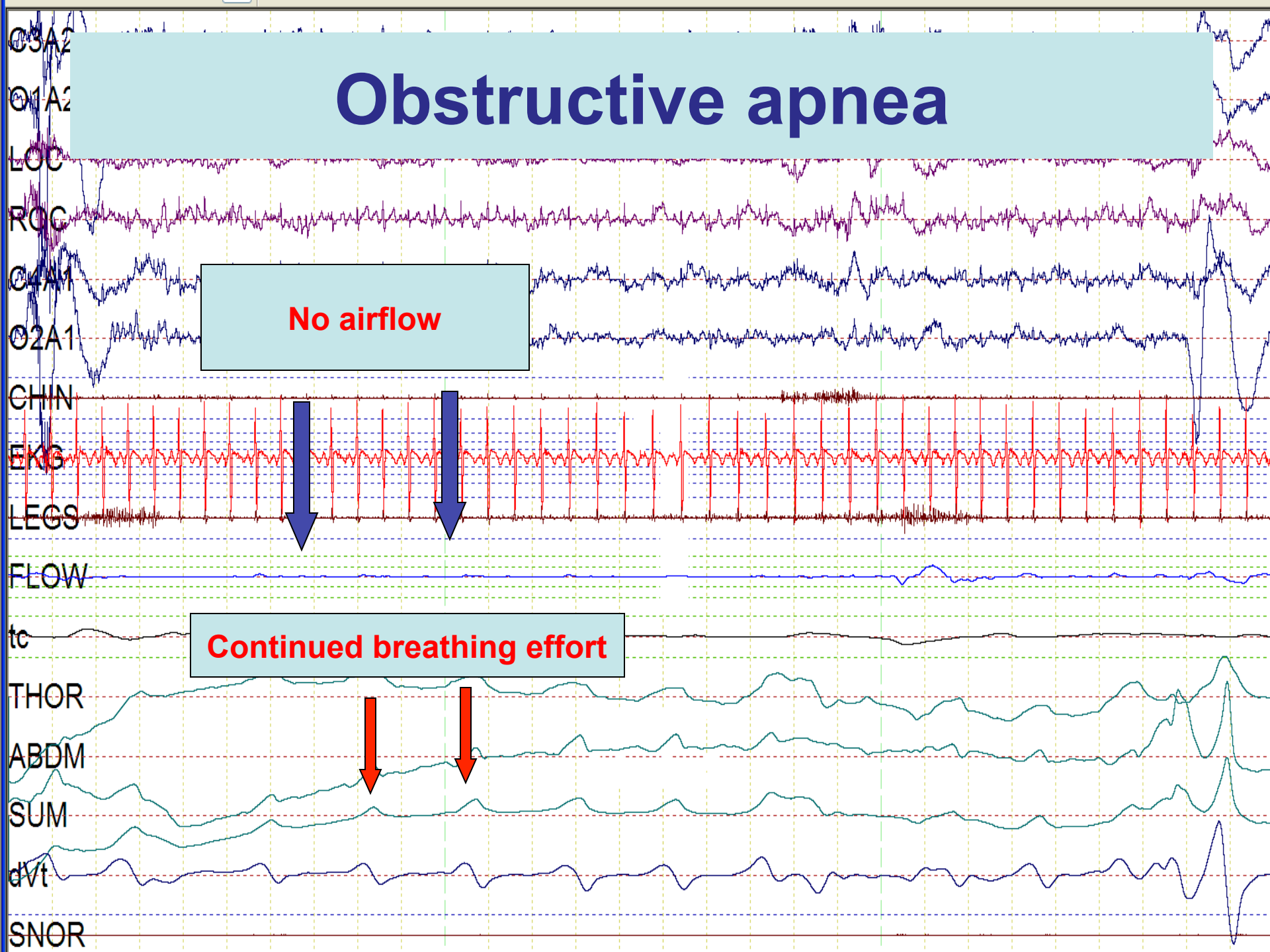
EKG



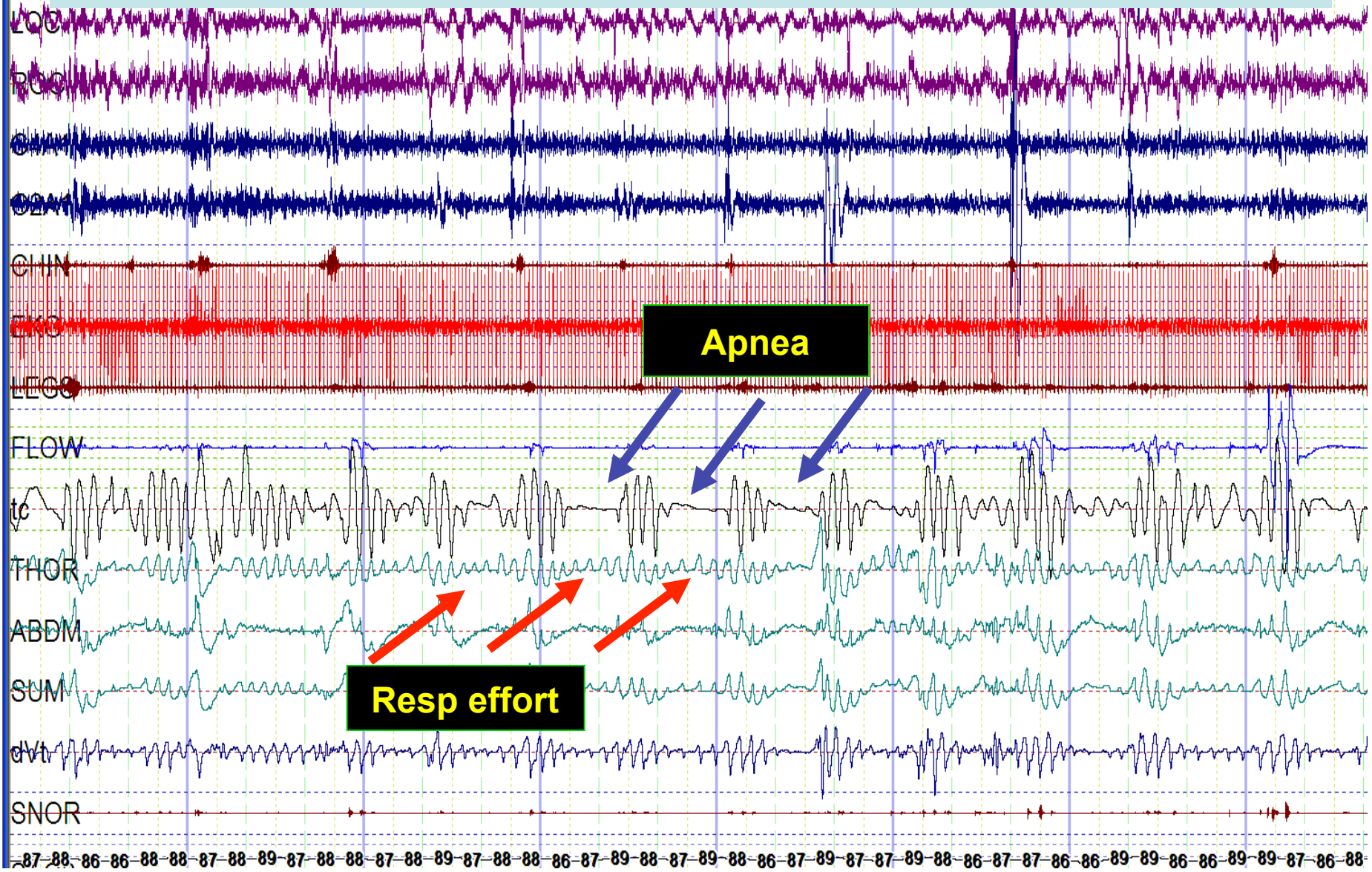
Obstructive Apnea

A complete blockage of the airway despite efforts to breath.

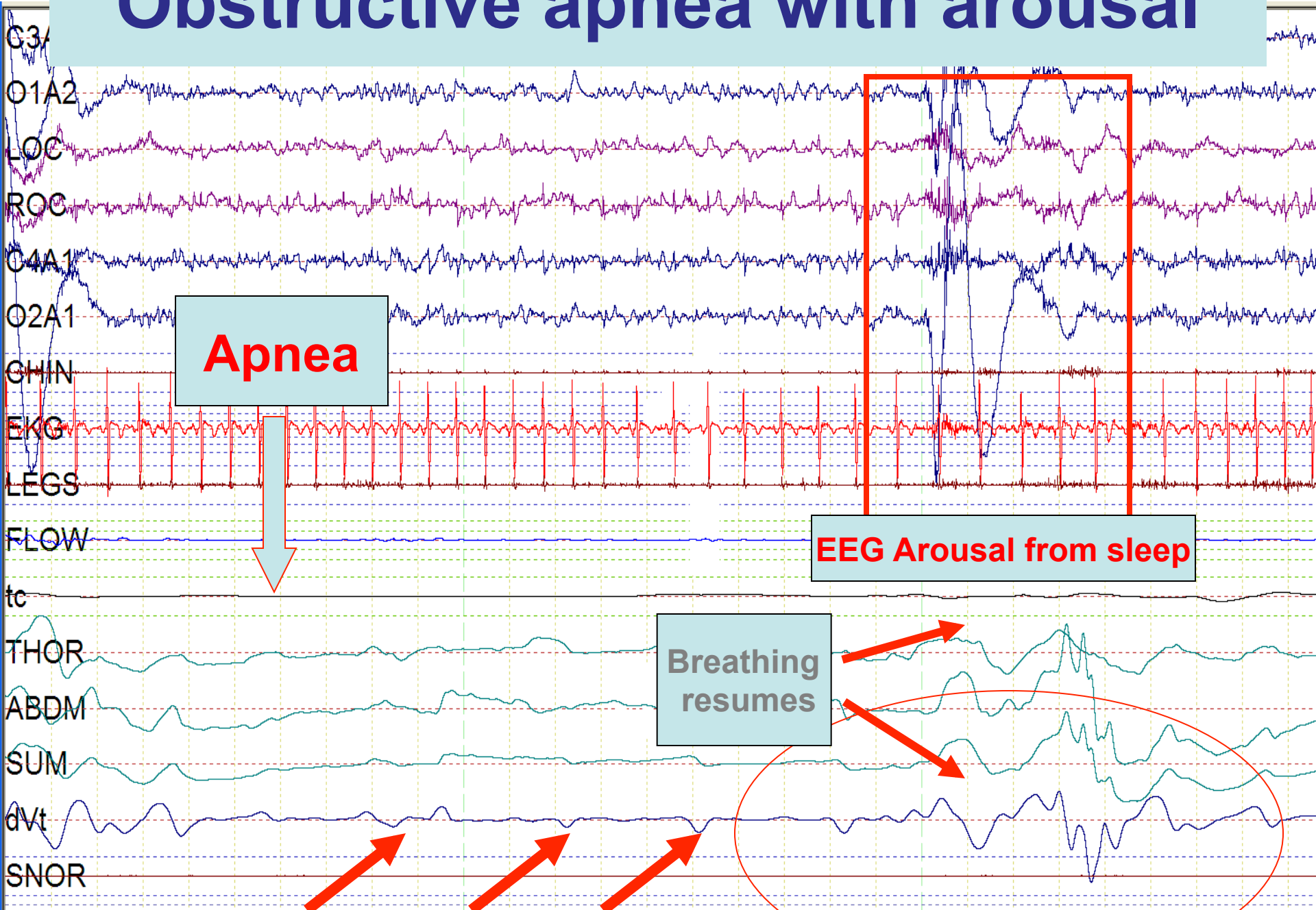
Obstructive apnea



Obstructive sleep apnea



Obstructive apnea with arousal



Hypopneas

- >70% airflow reduction
 - >4% decrease in saturation
 - At least 10 sec
- >50% airflow reduction
 - >3% decrease in saturation OR EEG arousal
 - At least 10 sec

Sleep Apnea Epidemiology

Epidemiology

- **1990s**

- Men 25% at risk; 4% affected
- Women 9% at risk; 2% affected

- **2010s**

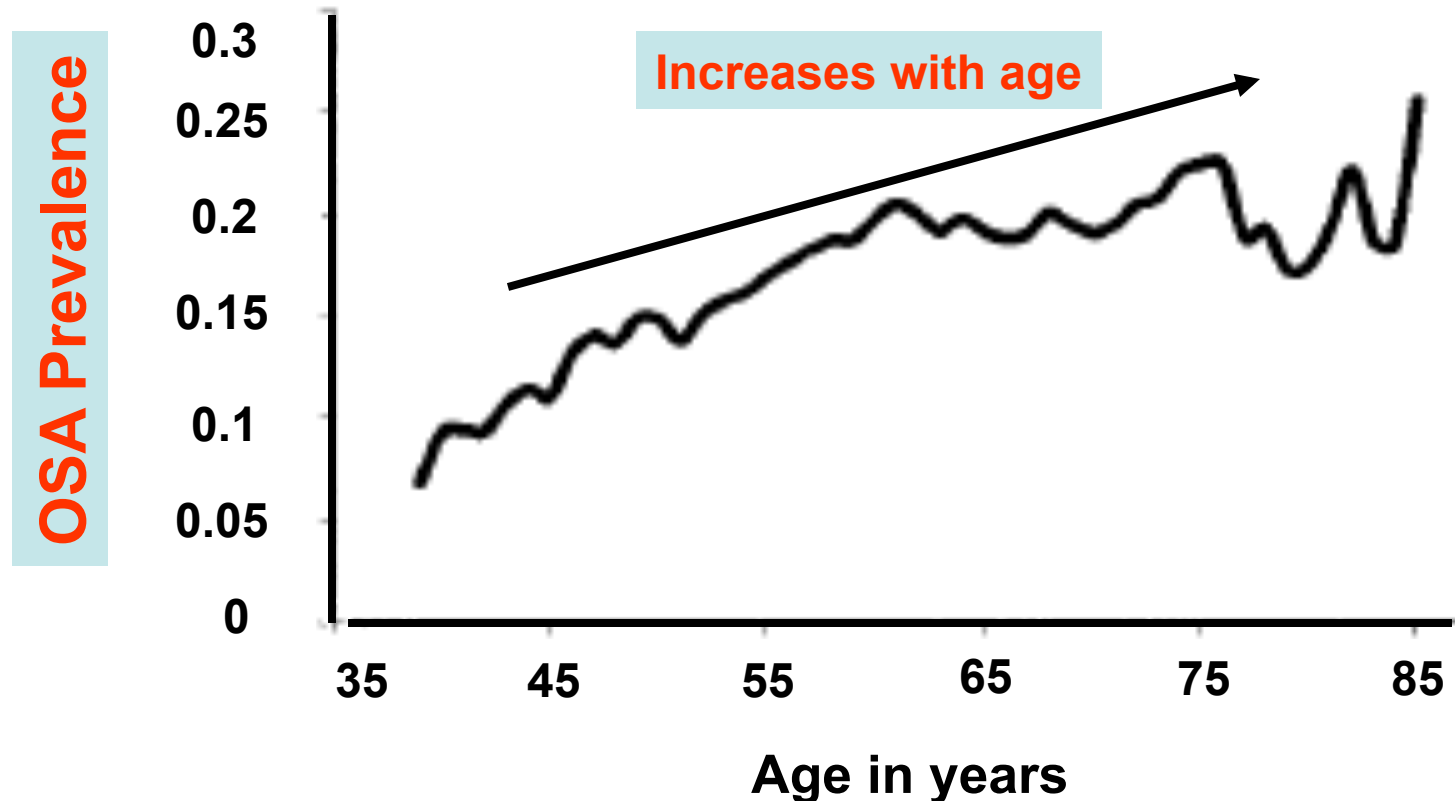
- Men 35% at risk; 15% affected
- Women 15% at risk; 8% affected



Epidemiology of OSA

- 2 major US prevalence studies
 - Wisconsin sleep cohort study
 - Penn State study
- Both have found similar results
 - About 15% of men have clinical OSA
 - About 7% of women have clinical OSA

Prevalence of Sleep Apnea



What Has Epidemiology Taught Us About Clinical Presentation?

- Large difference between OSA and OSA Syndrome
 - Men: 25% vs. 4%
 - Women: 9% vs. 2%
- Implications/Questions:
 - Large number of people without symptoms vs. subclinical disease- may develop symptoms later?
 - Are we asking the right questions about clinical presentation?
- Relationship between clinical presentation and objective testing?

Clinical Presentation

Clinical Presentation: Most Common Features

- Loud snoring
 - Very common complaint
 - 40% of men, 20% of women report habitual snoring
 - Minimal to no health hazard known
 - Associated with considerable social and marital hazard
 - 70-90% of OSA patients snore; in one study only 6% of OSA *did not* snore*

*Viner et al, Ann Int Med, 1991

Clinical Presentation: Most Common Features

- Excessive Daytime sleepiness (EDS)
 - Extremely common complaint
 - Neither specific nor sensitive in OSA
 - Sleepiness does not distinguish OSA from non-OSA
 - Cause of EDS is not completely known
 - Arousals?
 - Hypoxia?
 - Primary brain injury?

Clinical Presentation: Most Common Features

- Nocturnal choking/gasping
 - Bed partners may recognize this more commonly than the patient
 - Differential diagnosis includes:
 - Nocturnal panic disorder
 - Paroxysmal nocturnal dyspnea
 - GERD/Reflux

Other Presenting Symptoms

- Restless sleep
 - Multiple causes of this; many not apnea related
- Headache
 - Common side-effect of OSA; mechanism unknown
- Dry mouth
 - Related to mouth breathing
- Nocturia
 - Think OSA when seen in younger men or pre-menopausal women

How OSA May “Present” to Other Physicians

- Cardiologist
 - Hypertension, CHF, Arrhythmias, Nocturnal angina
- Psychiatrist
 - Depression
- Neurologist
 - Stroke, refractory epilepsy, headache in AM
- Urologist
 - Nocturia, erectile dysfunction

Notable physical exam features

Mallampatti Airway Classification



Class I



Class II

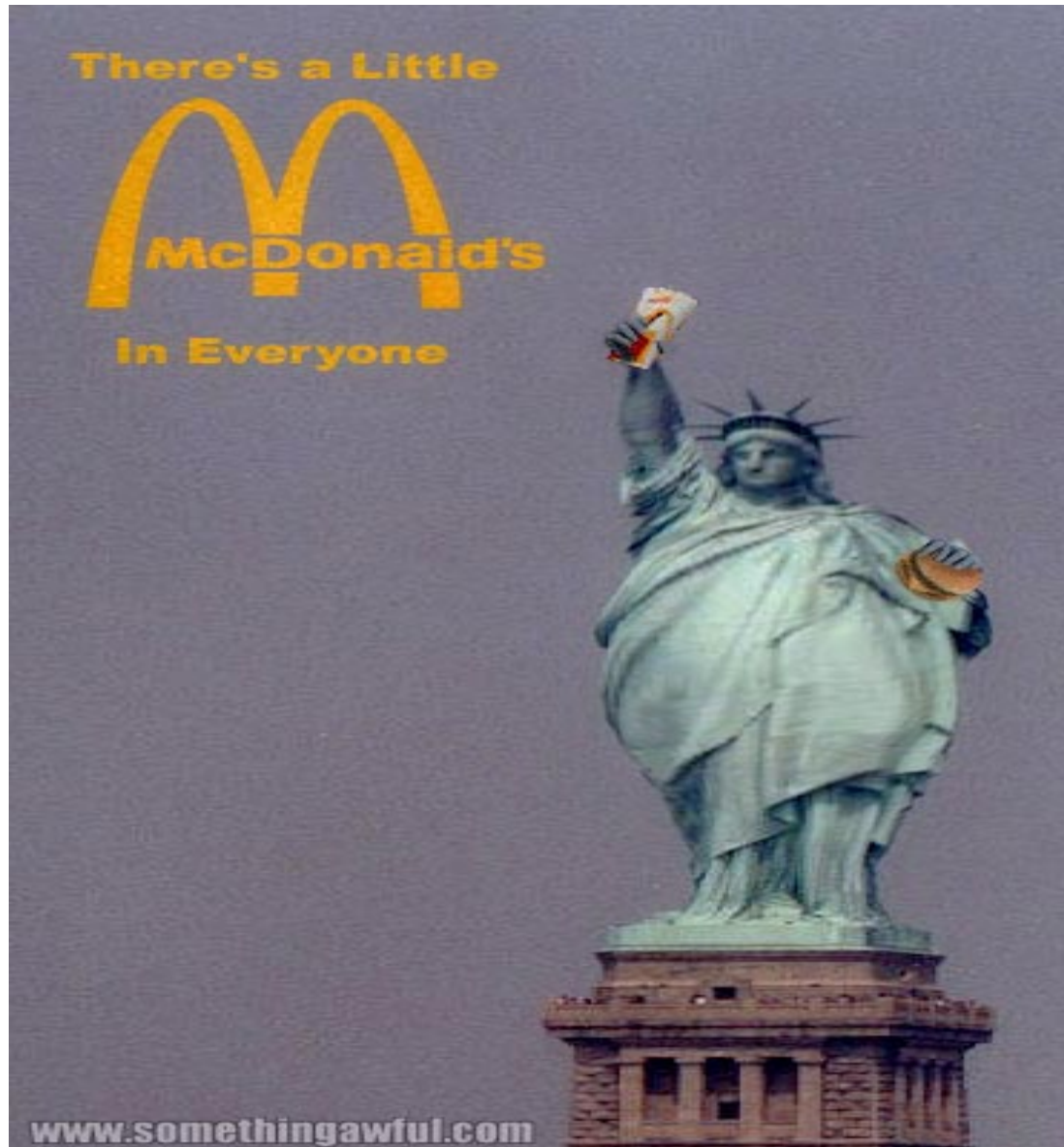


Class III



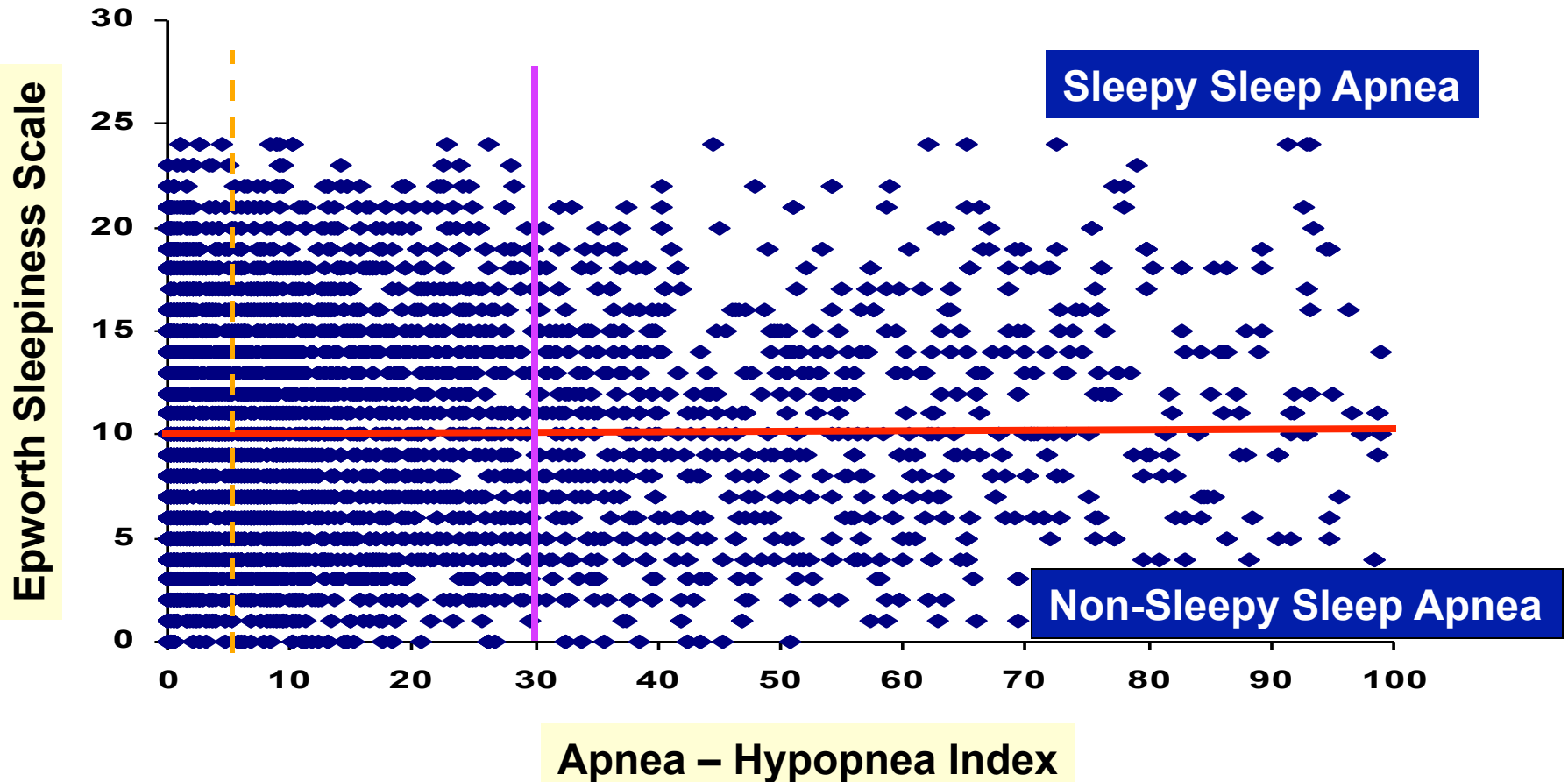
Class IV

Why Sleep Apnea Isn't Going Away.....



Wide range of disease severity – symptom severity relationships

n = 4653



Diagnosing OSA

Lab

- Comprehensive
- Expensive
- Guidelines:
comorbidities – CHF,
COPD, NMDz

Home

- Simpler
- Less expensive
- Guidelines: high risk
patients
- Insurers push for this
in most patients

Polysomnogram Interpretation

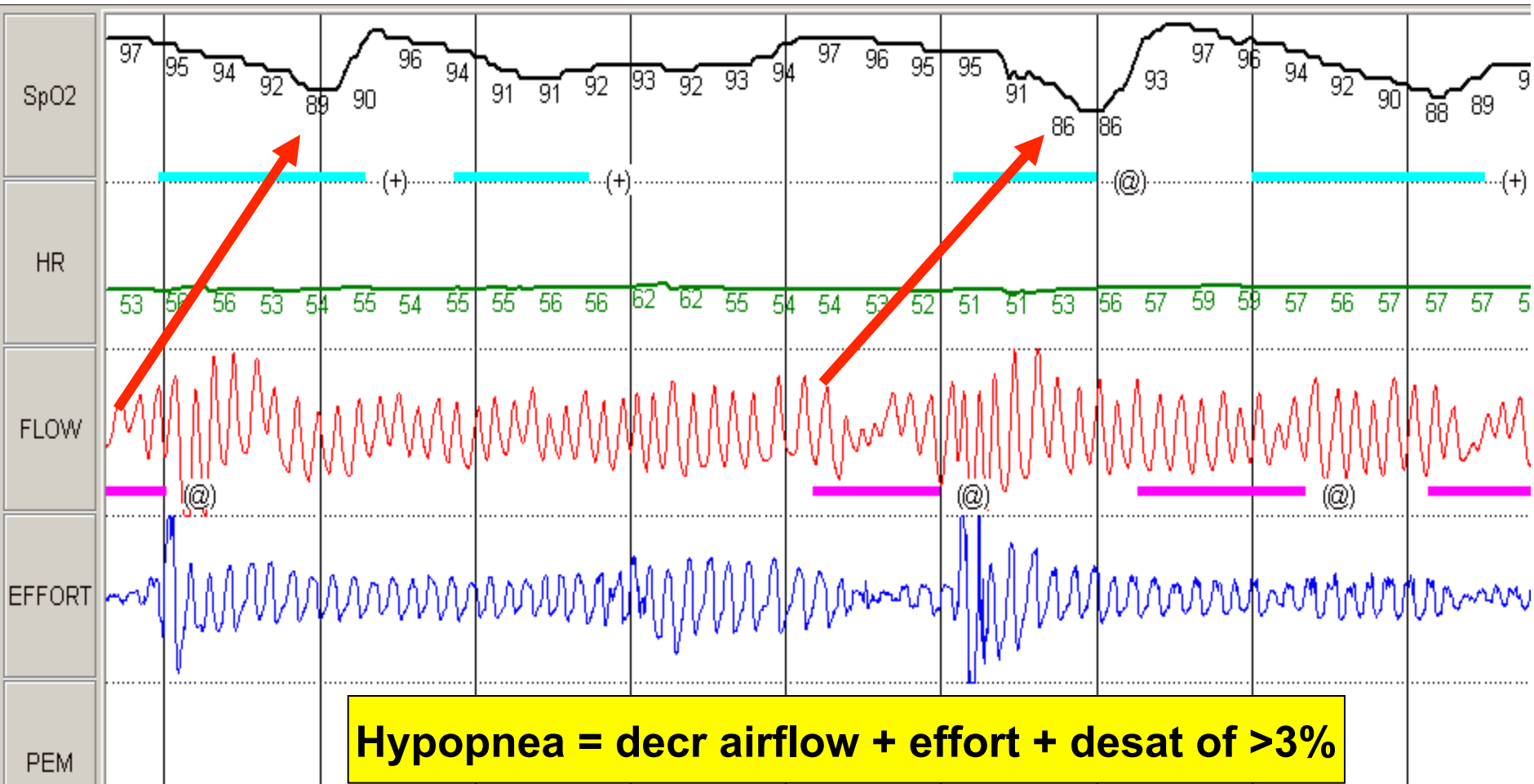
Diagnosis

AHI <5	Normal
AHI 5-15	Mild OSA
AHI 15-30	Moderate OSA
AHI >30	Severe OSA

Home sleep apnea test

- Uses fewer channels of recording
- Focuses on respiratory signals
- Well-validated compared to PSG
- Lower costs, lower reimbursement
- Increased tech failure rate, ~ 10%
- Controversial at present but is the future of sleep apnea diagnosis

Home Sleep Apnea Test



Outcomes of home OSA testing

- At least 5 RCT's in past 7 years
- Have shown equivalent outcomes in terms of CPAP usage and QOL/functional outcomes

Management of OSA

Management of OSA

- Weight loss
- CPAP
- Oral appliance
- Head/neck surgery
- Positional therapy

Effect of weight loss on OSA

- A prospective cohort study (n=690) reported 10% weight loss predicted a 26% decrease in AHI
(Peppard, JAMA 2000)
- A RCT of 31 pts comparing cognitive behavioral weight reduction with/without CPAP reported improvement in ODI mostly seen in the first 6 months
(Kajaste 2004)

Potential problems

- often short term as most patients regain the weight

Continuous Positive Airway Pressure (CPAP) Overview

- First description of CPAP – 1981
- Rapidly became therapy of choice
- Very effective
- Side effects tend to be mild, manageable
- Limited by need for nightly volitional decision to use it

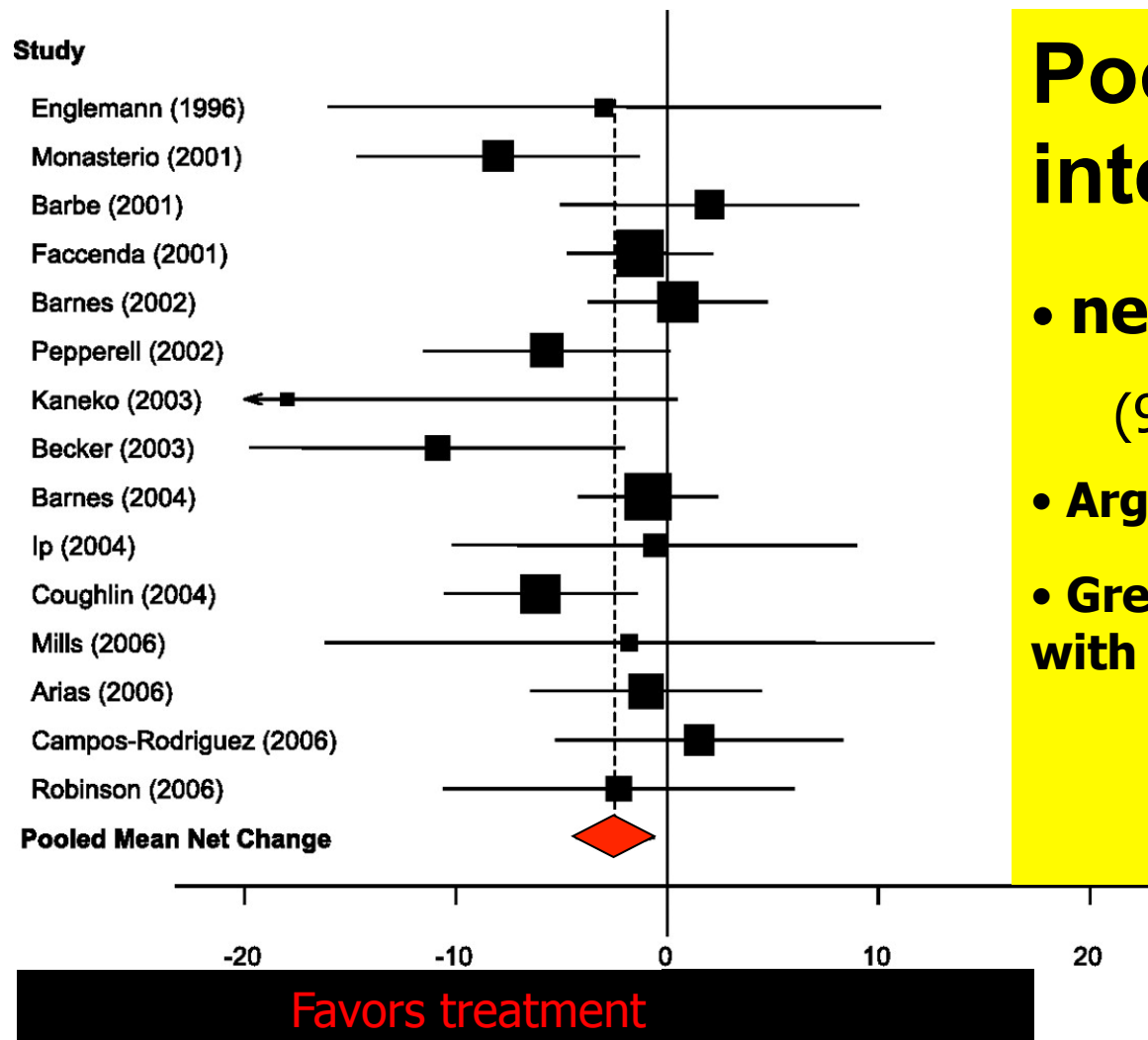
Mechanism of CPAP in OSA

- Pneumatic splinting is the most important
- Reflex dilatation also occurs – as lung volume increases, so does pharyngeal vol.

Effects of CPAP

- On HTN
- On cardiovascular outcomes and mortality
- On sleepiness

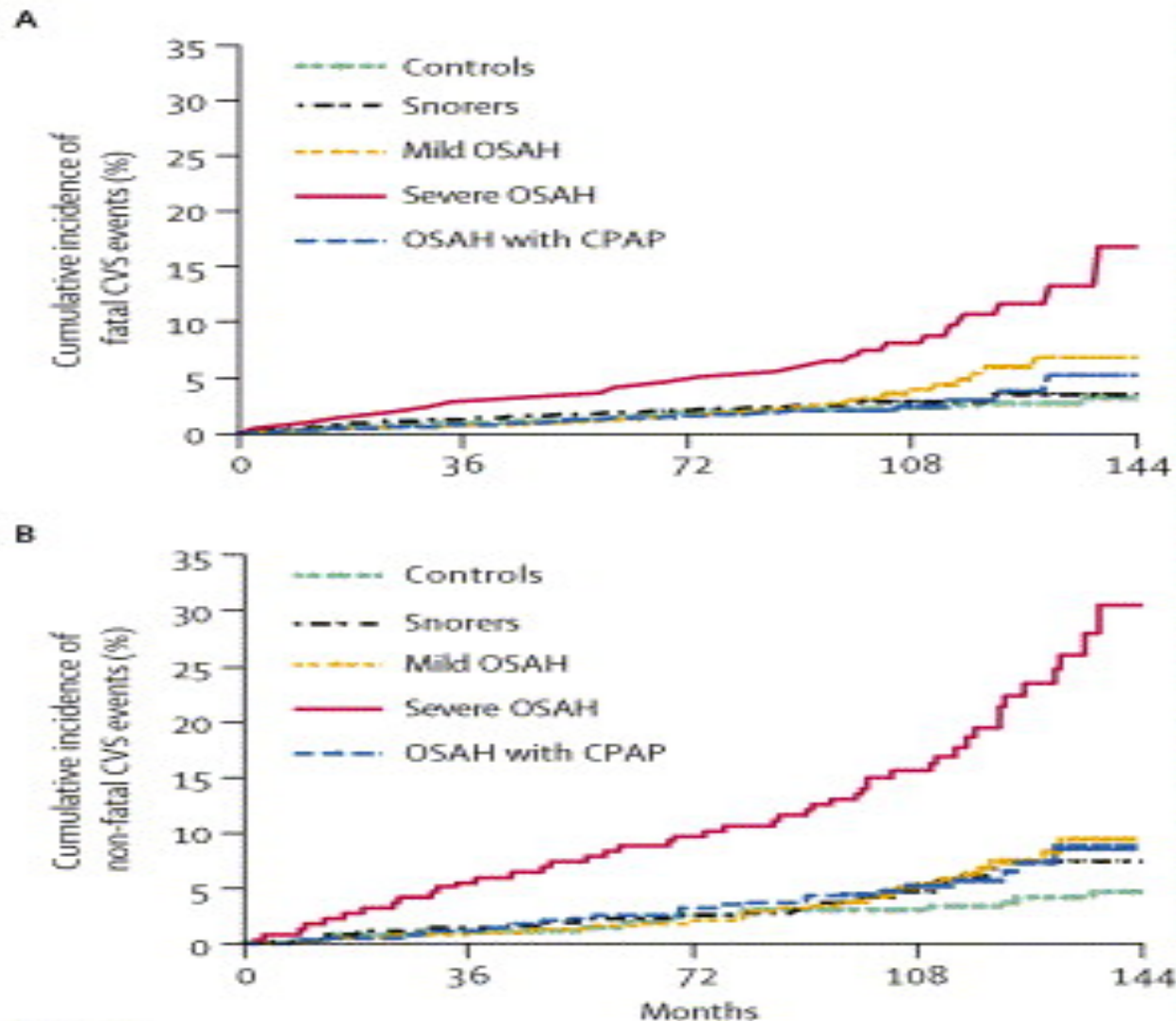
Mean net change in systolic BP by trial



Pooled estimate of intervention effect:

- **net SBP ↓ 2.46 mmHg**
(95% CI -4.31 to -0.62)
- **Arguably clinically significant**
- **Greater effect in worse studies with worse hypertension**

OSA and Risk of CV Complications: A prospective cohort trial



Numbers at risk

Controls	264	262	259	258
Snorers	377	372	361	232
Mild OSAH	403	401	392	264
Severe OSAH	235	229	221	167
OSAHS with CPAP	372	364	361	229

Marin, Lancet, 2005

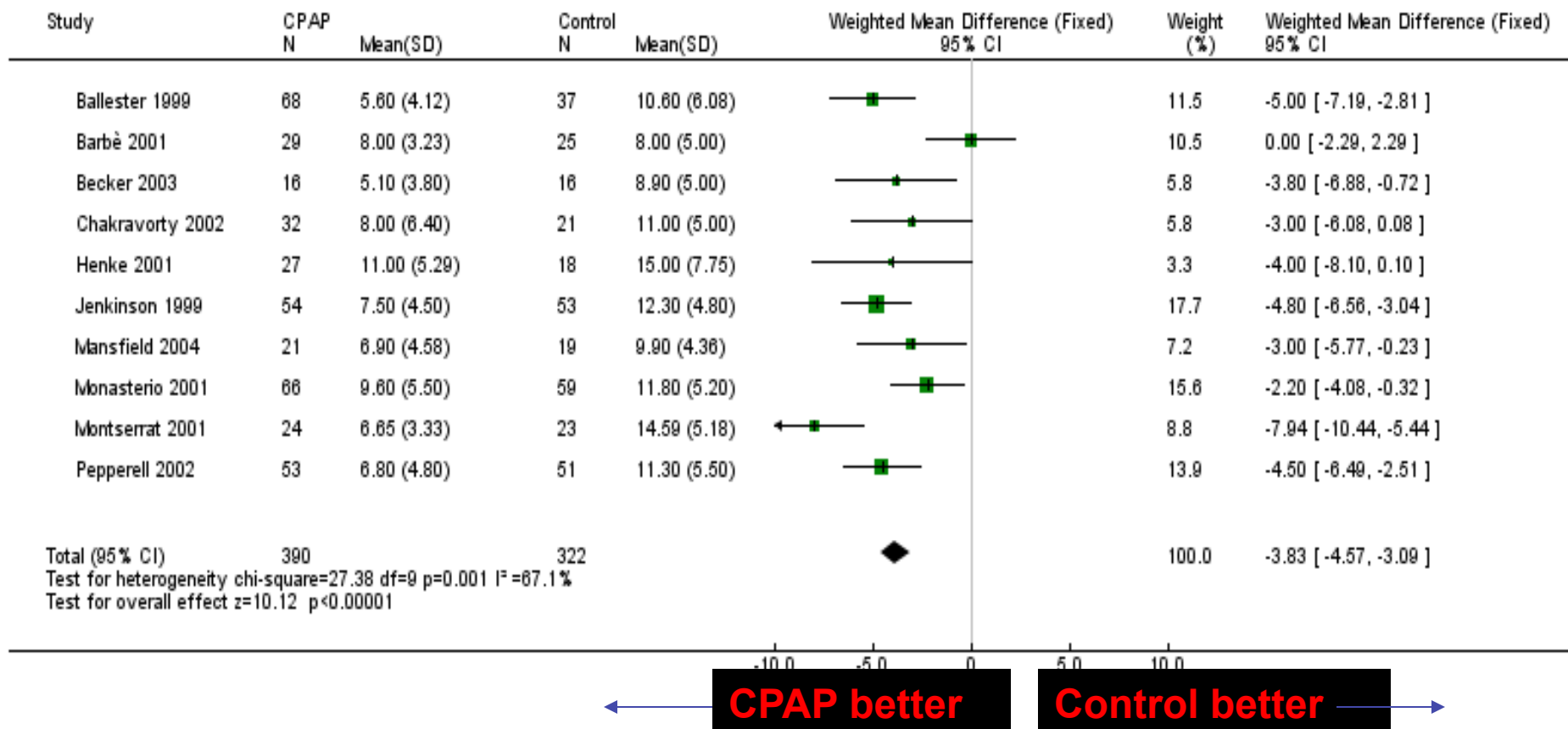
Long-term cardiovascular outcomes in men with obstructive sleep apnoea-hypopnoea with or without treatment with CPAP

Conclusion:

- In men, severe OSAH significantly increases the risk of fatal and non-fatal cardiovascular events.
- CPAP treatment reduces this risk.

CPAP improves sleepiness

Review: Continuous positive airways pressure for obstructive sleep apnoea in adults
 Comparison: 01 CPAP versus control - Parallel studies/first arm crossover
 Outcome: 01 Epworth Sleepiness Scale



Benefits of CPAP

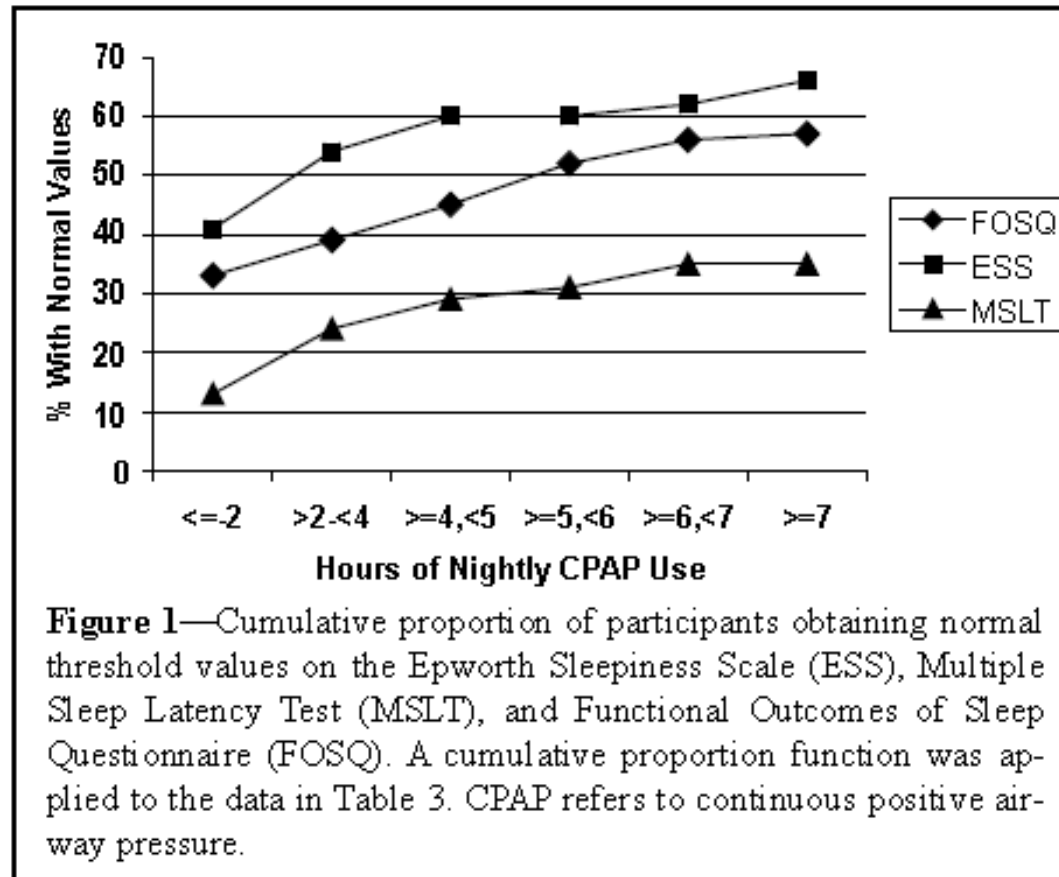
- **Immediate impact**

- Reduce hypoxia,
- improves quality of sleep
- Improves quality of life

- **Long term impact**

- Attenuates sympathetic nerve activity
- improves LVEF
- reduces afterload,
- decreases daytime blood pressure
- decreases arrhythmia,
- improves insulin resistance
- decreases stroke

CPAP: the more you use it, the better you do...



Compliance

- Short term compliance is 50-80%
- ave 3.5-4.5 hr/night
- Tolerability is frequently an issue but can be solved in many patients

Summary

- OSA is common, but under-recognized → under-diagnosed → under-treated.
- Confirmed by overnight sleep study
- Big impact – quality of life, cardiovascular complications, and socio-economical cost
- Readily available treatment – CPAP
- Main obstacle – compliance

Summary

- Sleep apnea is easy to diagnose
 - Sleep labs
 - Home OSA testing

Summary

- Very treatable
 - Adherence is no worse than taking pills
 - Programs to help patients with adherence are available.
 - Expect about 1/3 of your OSA patients will need another therapy

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Thanks

Questions?