

Sleep breathing disorders

Dr Tariq

Learning objectives

Introduction to Sleep

Overview of obstructive sleep apnoea and Ix

Sleep apnoea and medical conditions

Other sleep disorders

Sleep apnoea and driving

Management of OSA

Referral criteria

Sleep

6.5-8.5 hours/24 hours



Sleep

Function

regeneration, dreaming, rest, memory formation, immune system, allows for decreased metabolic activity, brain metabolic restoration and survival

Types

REM 20-25%
– reduced muscle tone, dreaming

Non-REM 75%-80% (1-4)
– limb movement, sleep walking

REM

REM sleep period

- occurs about every 90 min
- lasts 20-30 min
- and becomes successively longer

Muscle tone is markedly reduced - flaccidity

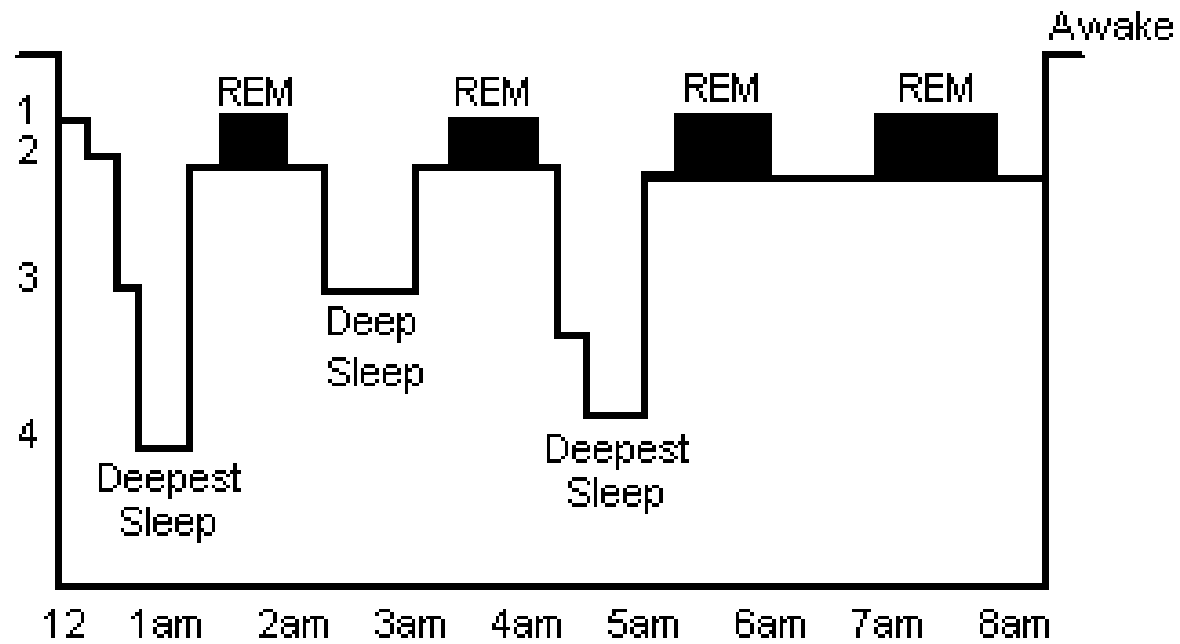
Non-REM

Sleep starts with non-REM

Stages 1-4

Muscle tone reduced

Ventilation, HR, CO, BP all falls



Effects of sleep on human physiology

- CNS
 - parasympathetic tone is increased
 - sympathetic tone is variable
- CVS
 - heart rate varies
 - BP falls
- Respiration
 - hypoventilation with reduced rate
 - upper airway narrows increasing airflow resistance
- GI
 - reduced acid production and emptying
- Endo
 - GH & prolactin increase
- Renal
 - reduced renal blood flow, GFR & UOP

Sleep disorders

It is estimated that 50% of the population suffers from some type of sleep disorder such as sleep apnoea, insomnia, narcolepsy, restless leg syndrome.

48 year old man

Presented with

Nocturnal cough, choking episodes

Waking up 2-3 times in night with dry mouth

Partner has seen him stopping breathing in sleep

Un-refreshed sleep

Excessive daytime sleepiness and tiredness

Partner finds it difficult to sleep because of the snoring

He slept at the wheel 18 months ago when he was driving from Newcastle

Non-smoker

Consumes 10u alcohol/week

PMH none

Medication none

BMI 34

Collar size 17

ENT examination normal

BP 148/92

ESS 13/24

TFT normal

Hb 14.7

Spirometry 3.12/3.93(98%/119%)

Normal flow volume loop

Does he have sleep related breathing problem? OSA or OSA syndrome?

Is it simple snoring?

Has his QoL/relationship been affected?

Should I refer him to sleep clinic?

Should I investigate him?

Should I treat him?

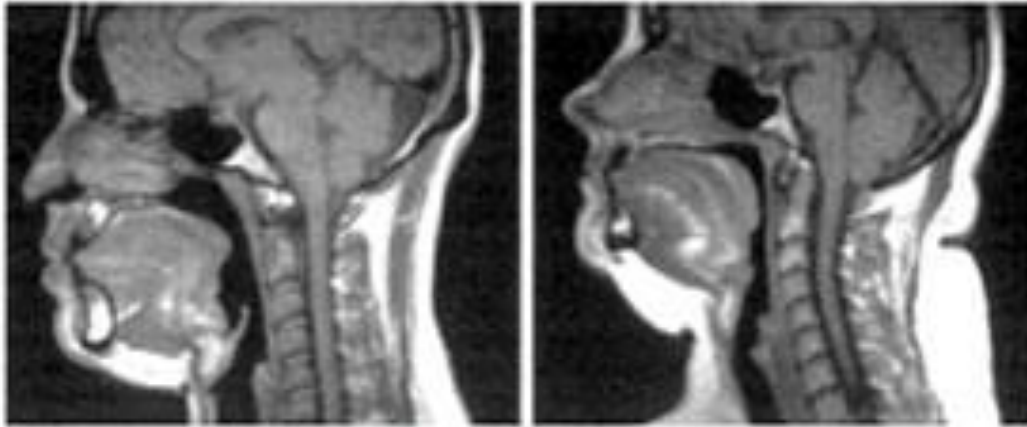
Should he stop driving?

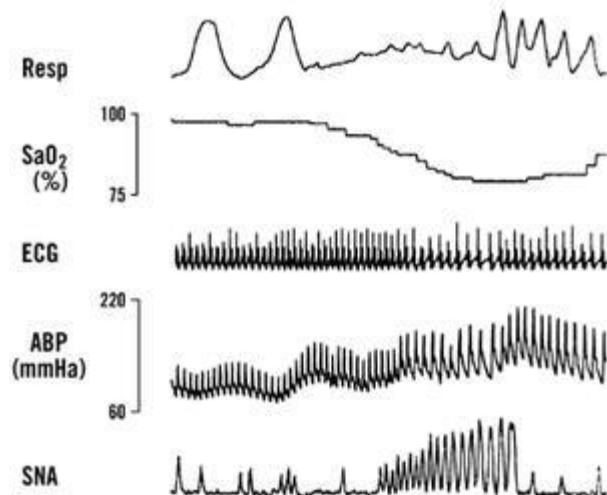
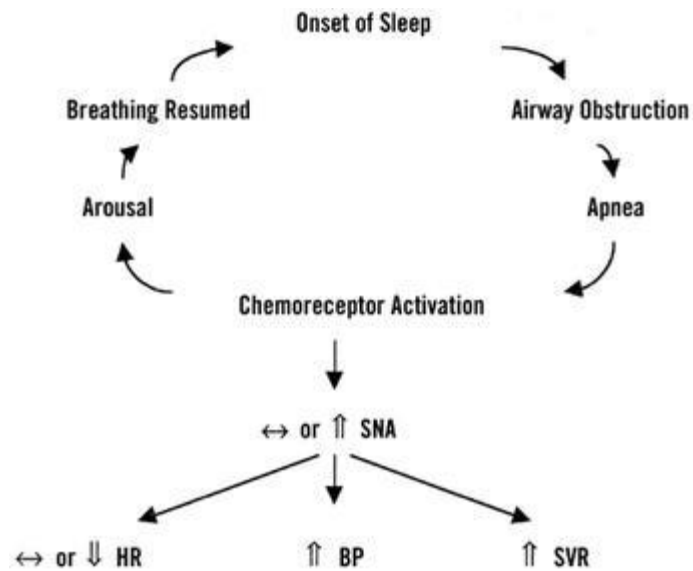
Sleep apnoea

Central

Obstructive

Mixed

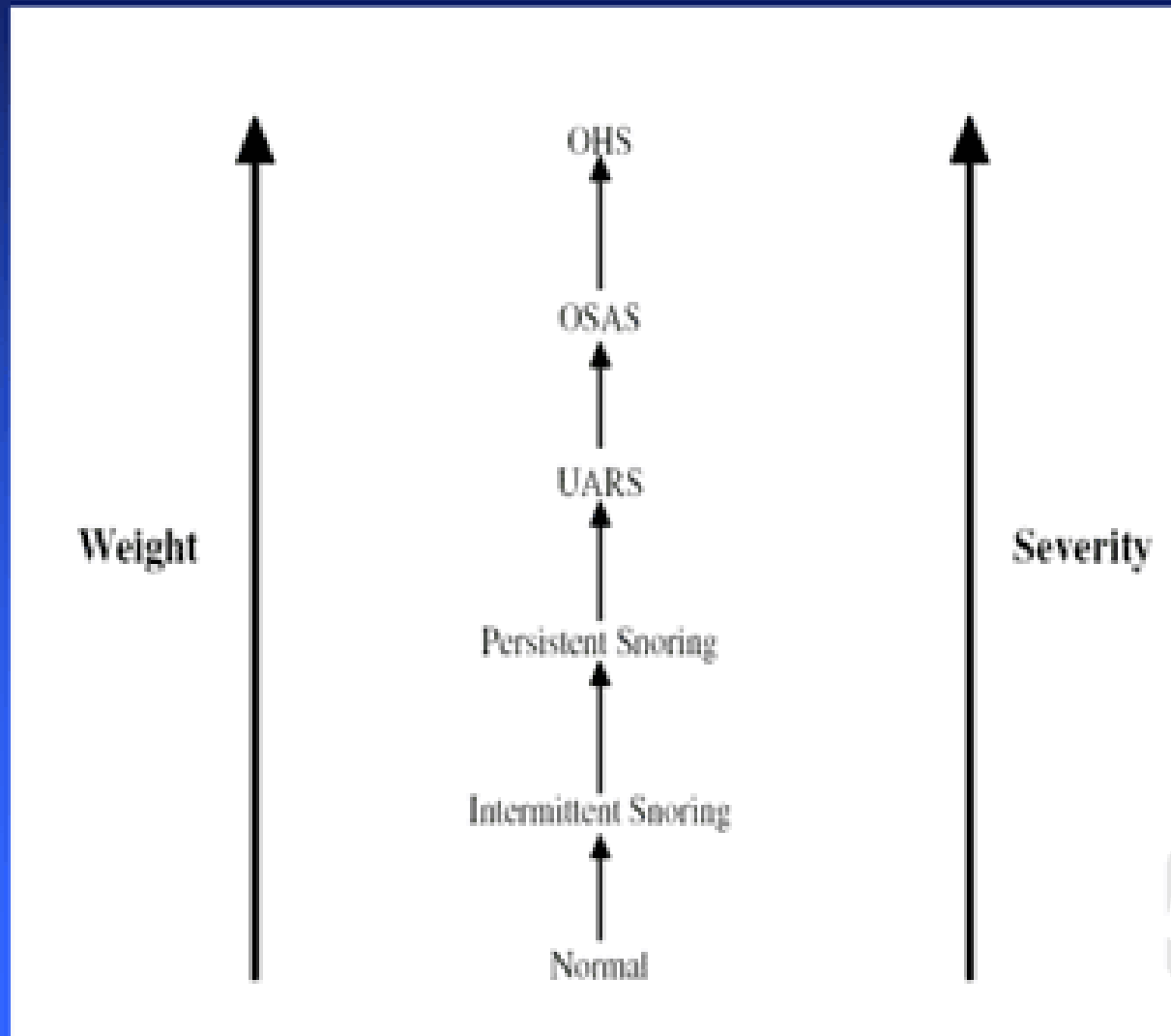




Medscape®

<http://www.medscape.com>

Sleep apnoea is part of the spectrum of sleep disordered breathing



Definitions

Apnoea: total obstruction with 10s breathing pause

Hypopnea: partial obstruction with breathing reduced by $\geq 50\%$ from baseline for $\geq 10s$

Central apnoea: no mechanical breathing effort and no airflow for $\geq 10s$

Sleep latency: time taken to go to sleep

OSA

4% of middle age men

2% of middle age women

1-2% children

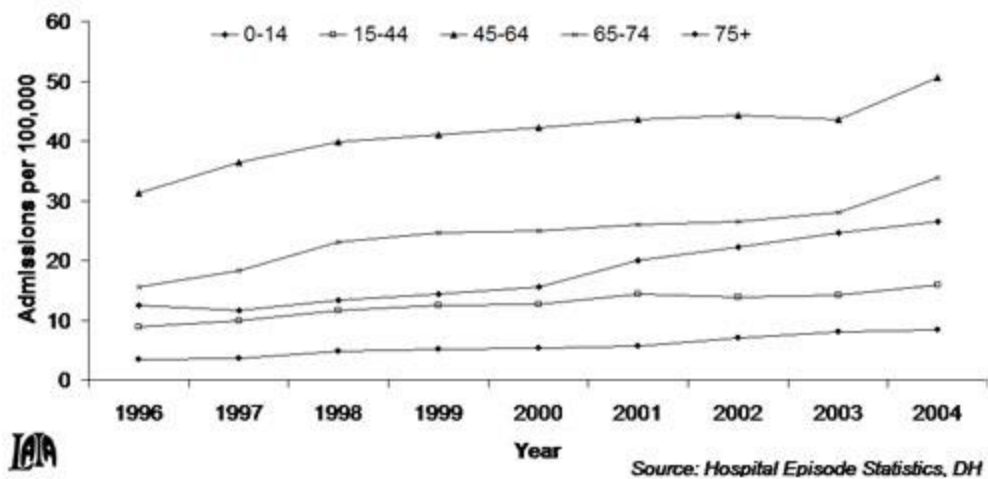
Peak age 55-60 years

AHI: 6-14 episodes/hr = borderline OSA

≥15 episodes/hr = definite OSA

ODI: number of O₂ desaturation episodes of
>3% from baseline/hr

Figure 1: Trends in hospital admission rates for sleep apnoea, England 1996-2004.



Snoring

Simple snoring

OSA without symptoms

OSA with symptoms (OSAS)

Simple snoring

1 in 3 men

1 in 10 women

Divorce

Separate beds

Being asked to leave hotels

Not being invited to stay overnight by friends



SYMPTOMS IN OBSTRUCTIVE SLEEP APNOEA

Common (>60%)

Loud snoring

Excessive daytime sleepiness

Feelings of choking or shortness of breath at night

Restless sleep

Un-refreshed sleep

Less common (10-60%)

Morning headaches

Reduced libido

Spouse worried by apnoeic pauses

Irritability

Depression

Loss of concentration

Lack of energy

Nocturnal confusion

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

2. Watching TV

3. Sitting inactive in a public place (e.g., theater or meeting)

4. As a passenger in a car for an hour without a break

5. Lying down to rest in the afternoon when able

6. Sitting and talking to someone

7. Sitting quietly after a lunch without alcohol

8. In a car while stopped for a few minutes in traffic

Excessive daytime sleepiness

No night sleep

Depression, anxiety, Parkinson, drug

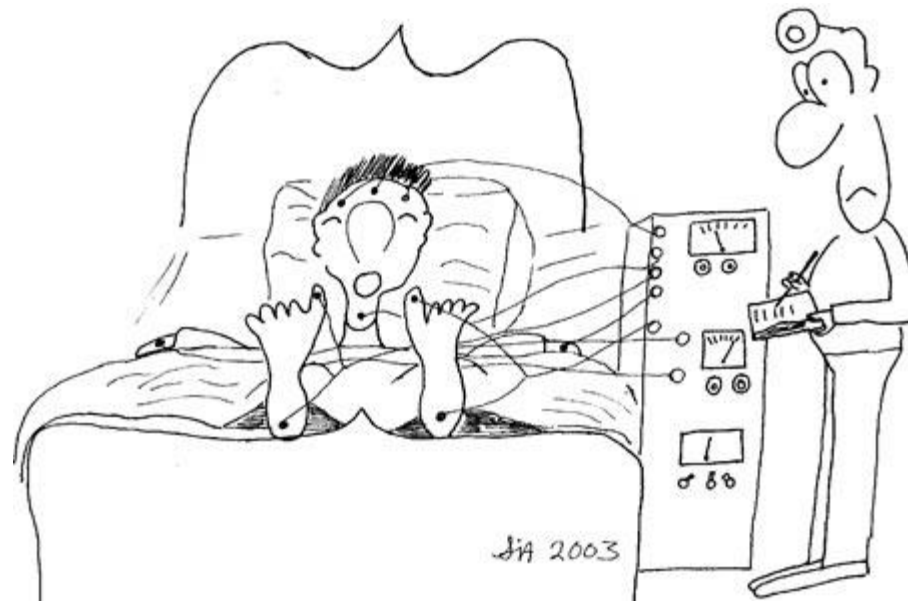
Shift work

OSA

Idiopathic hypersomnolence

Narcolepsy

Sleep study & overnight oximetry

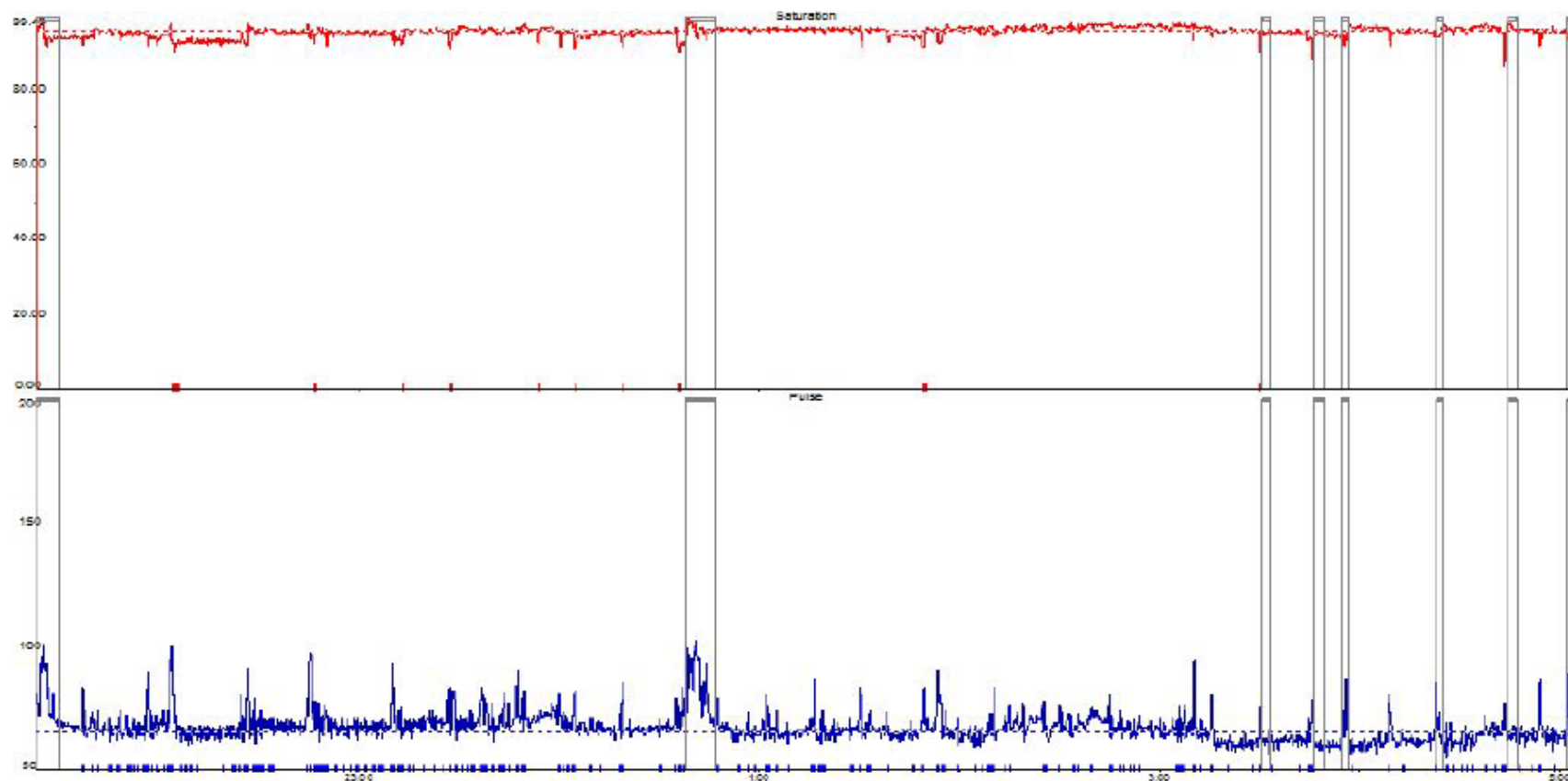


Date of Study: 22/04/2015

Start Time: 21:23:20

Duration: 07:41:40

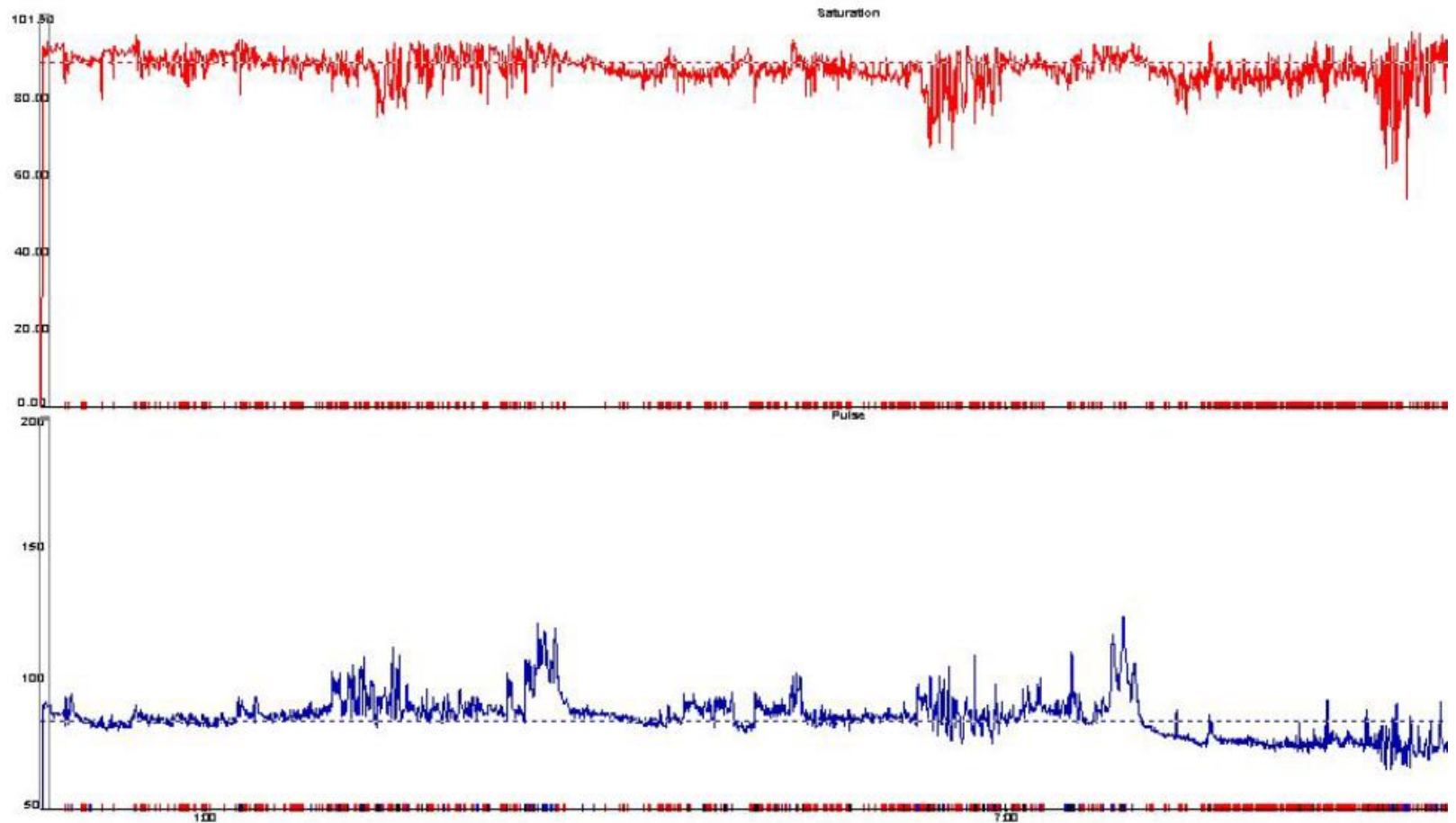
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Date of Study: 09/10/2014

Start Time: 23:46:01

Duration: 12:06:45



5 channel

Oxygen saturation

Heart rate

Snoring recording

Position

Thoraco-abdominal movement - belt

Airflow

Pulse & SpO2

Pulse

56

bpm

SpO2

96

%

Event Overview-Respiratory

Activity

Apnea

Hypopn

Oxygen

Position and Activity

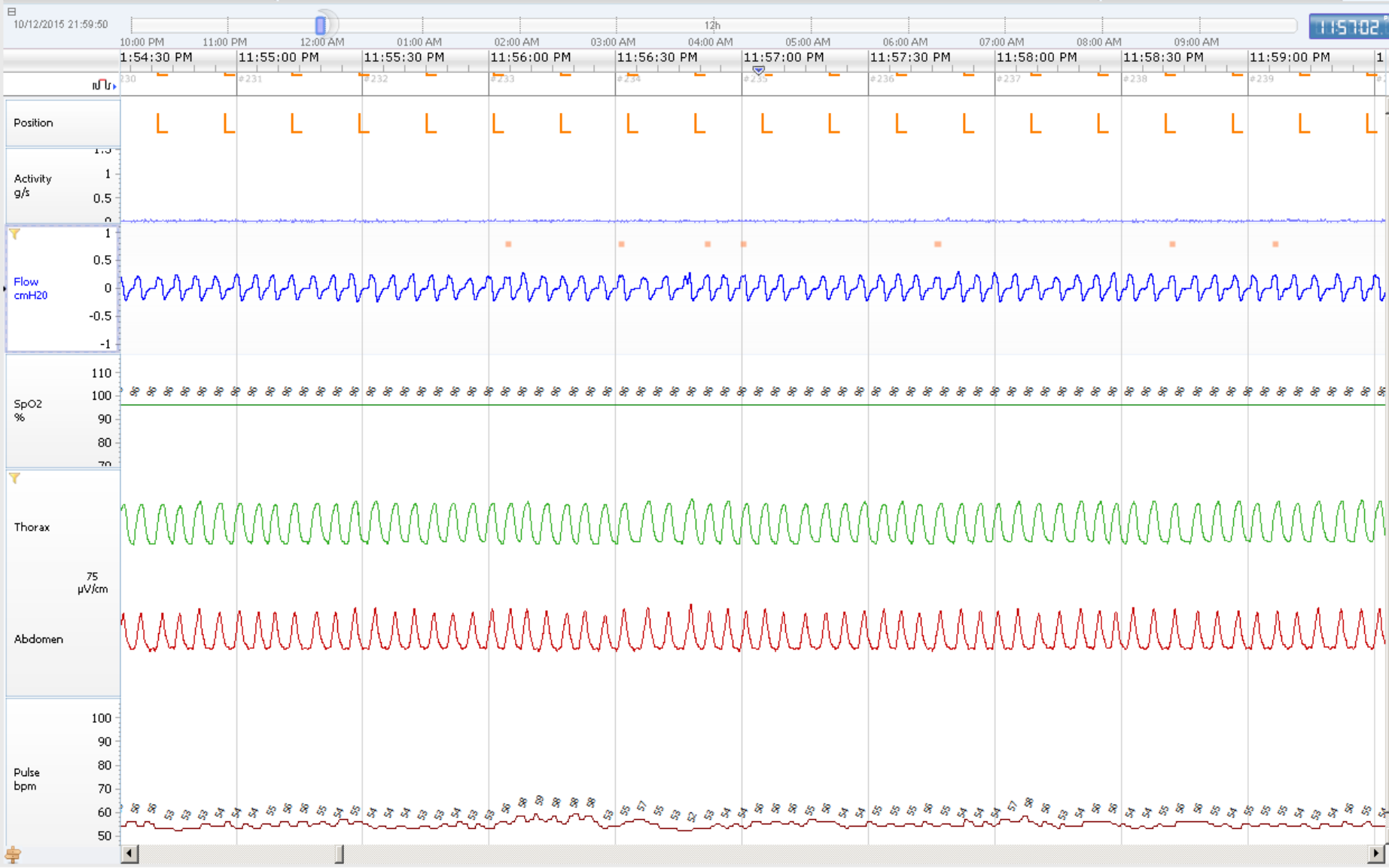
Position

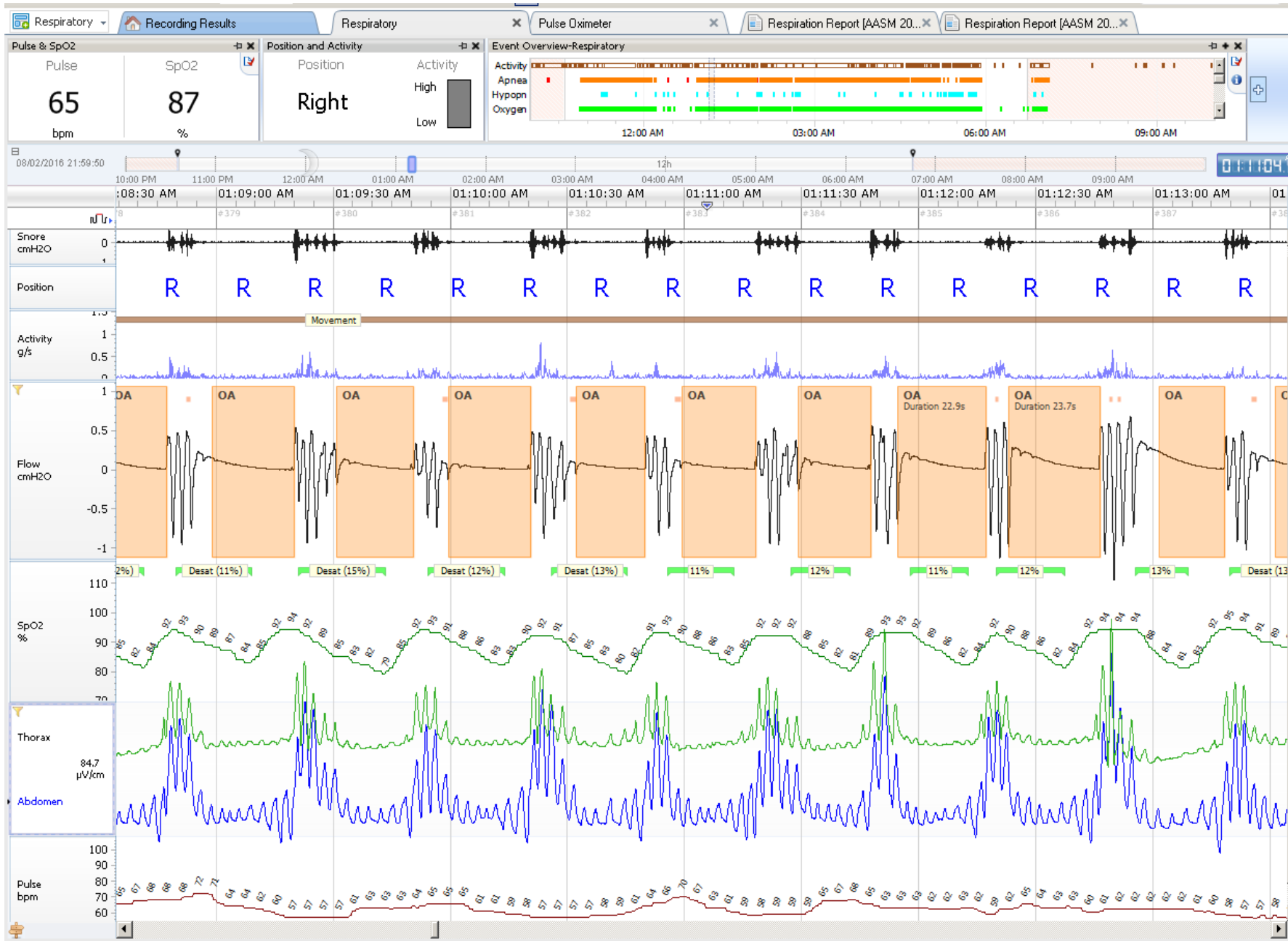
Left

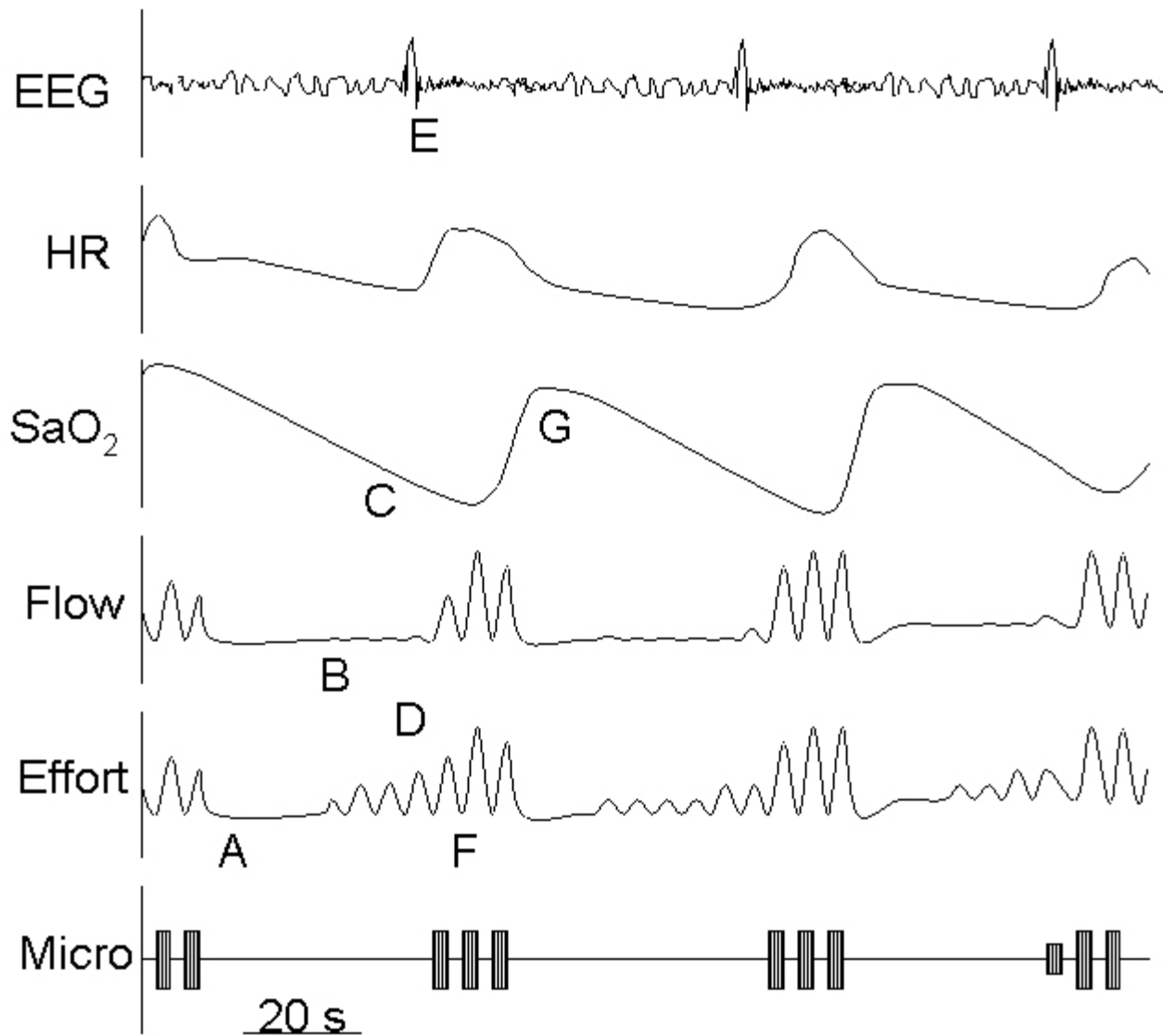
Activity

High

Low







Polysomnography

EEG

EMG

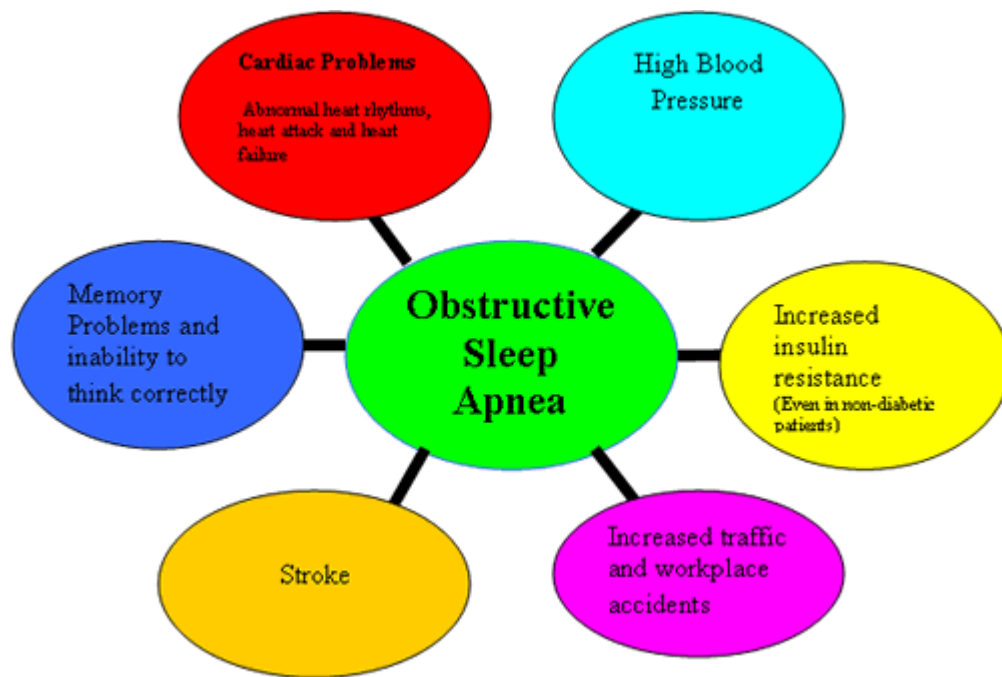
ECG

EOG

Video

Leg movement

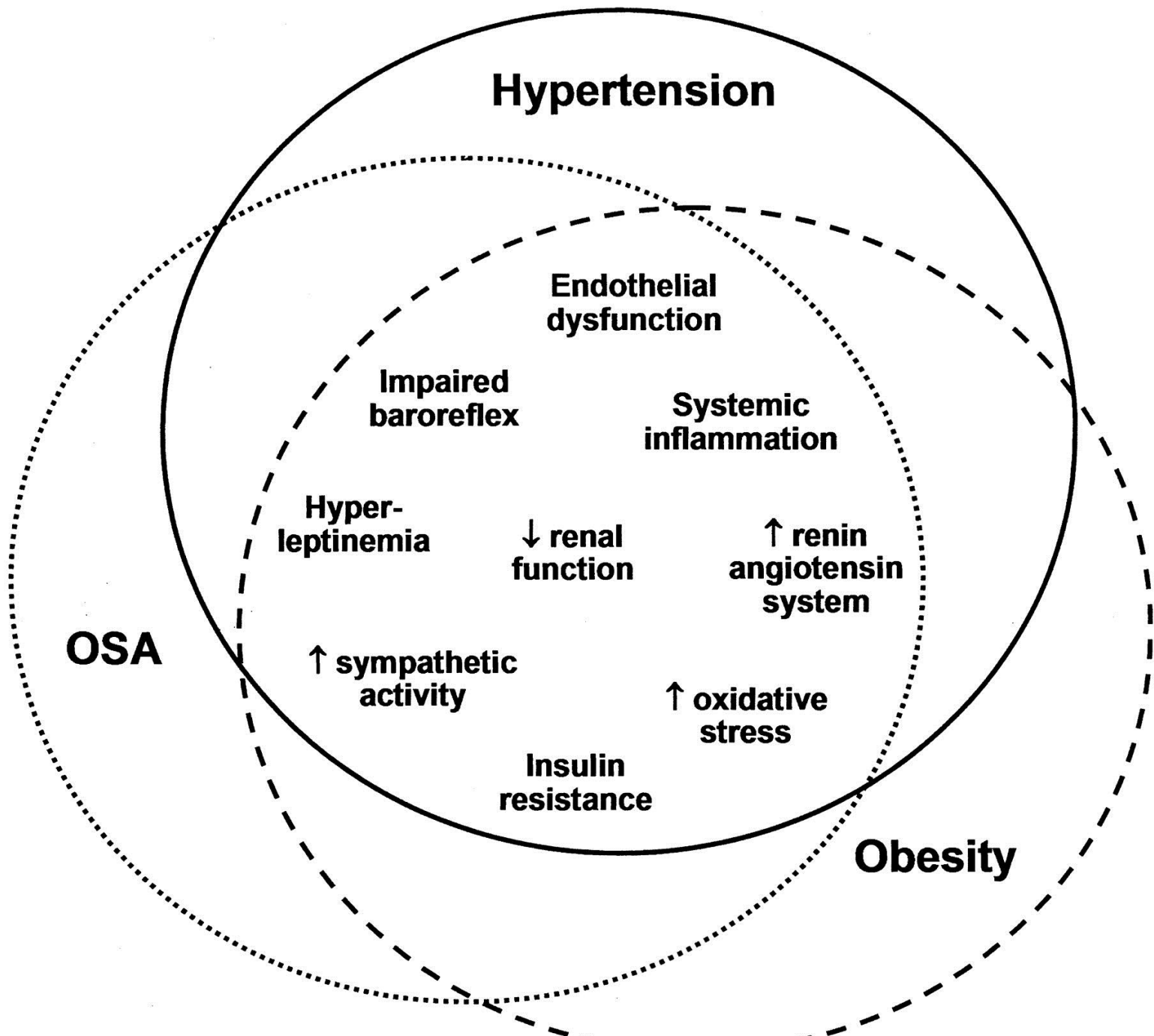
OSA and Medical Conditions



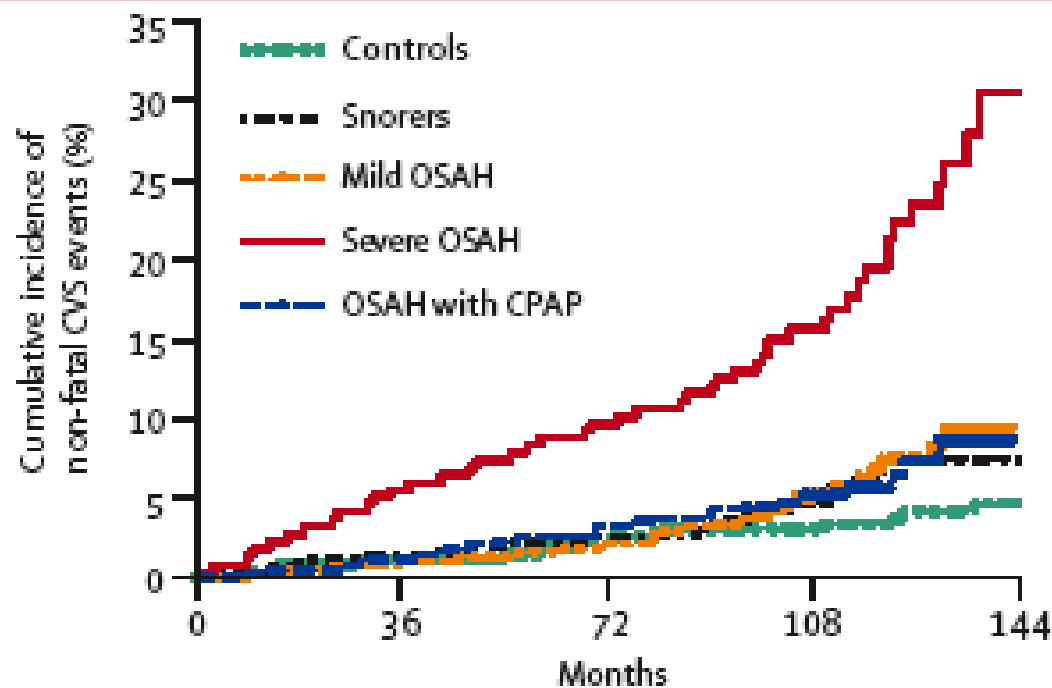
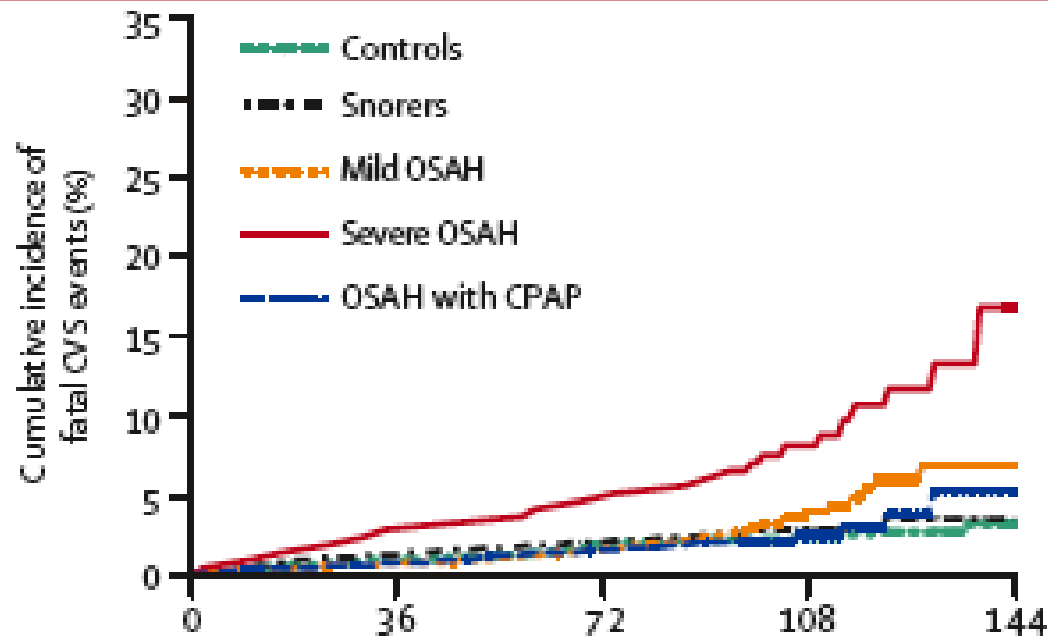
OSAHS and Hypertension

Patient with OSAHS have significantly higher blood pressure than control

- Worsnop et al Am J Respir Crit CareMed 1998;157:111-5
- Davies CW et al Thorax 2000;55:726-8



Long-term cardiovascular outcomes in OSAS



Marin et al. Lancet 2005;
365: 1046-1053

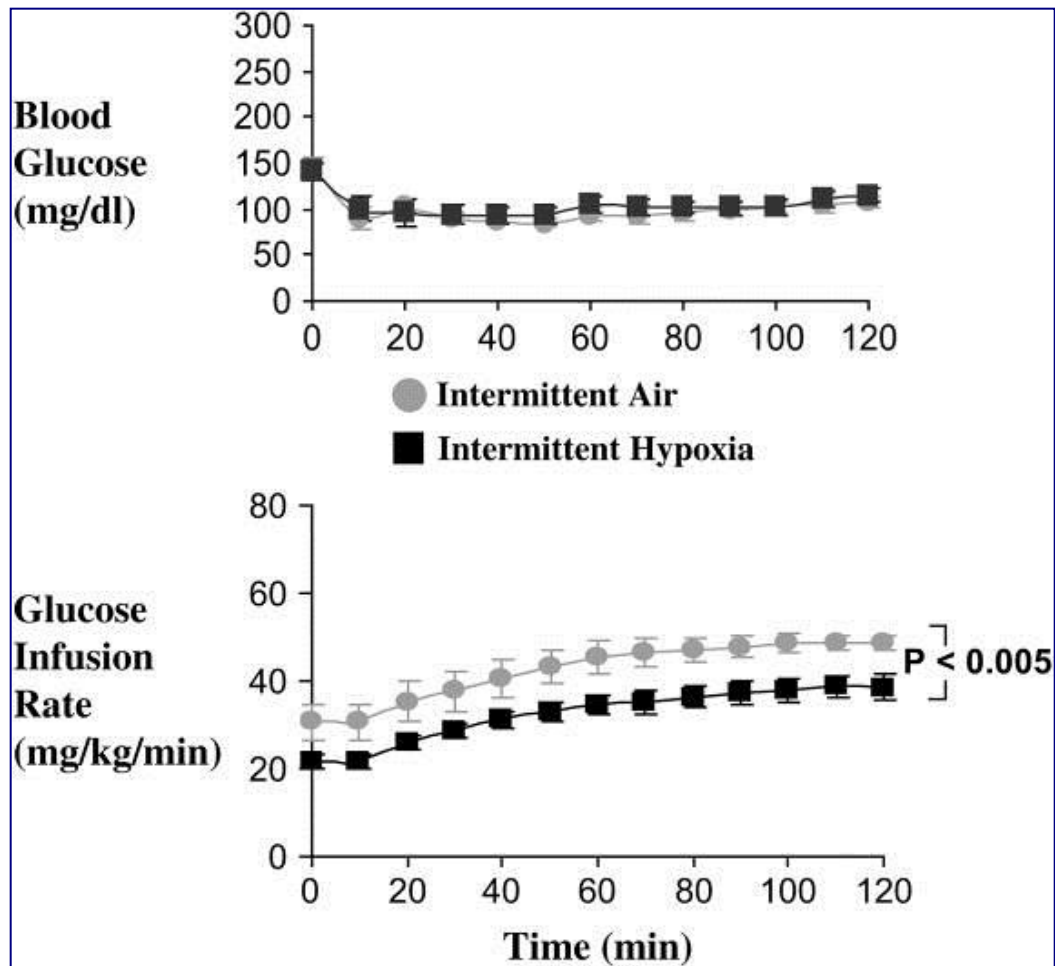
Obstructive sleep apnea is independently associated with insulin resistance

Ip et al. Am J Respir Crit Care Med 2002; 165: 670-676

	AHI Stratum				p Value
	Group I < 5	Group II ≥ 5 to < 15	Group III ≥ 15 to < 30	Group IV ≥ 30	
No., %	85 (31.5)	59 (21.9)	48 (17.8)	78 (28.9)	
Male, no. (%) [†]	47 (55.3)	42 (71.2)	38 (79.0)	70 (89.7)	< 0.001
Smokers, no. (%) [†]	5 (5.9)	3 (5.1)	7 (14.6)	12 (15.4)	0.010
Drinkers, no. (%) [†]	5 (5.9)	1 (1.7)	3 (6.3)	8 (10.3)	0.236
AHI, no. of events/h [‡]	2.3 (1.6)	9.3 (2.8)	20.6 (4.4)	50.2 (13.7)	< 0.001
Min O ₂ , % [‡]	88.3 (10.7)	82.1 (5.9)	75.7 (8.9)	63.6 (15.1)	< 0.001
SaO ₂ < 90%, min [‡]	3.4 (14.8)	16.5 (55.1)	27.7 (38.3)	121.4 (90.1)	< 0.001
Arousal index [‡]	15.0 (9.2)	18.3 (12.4)	18.1 (9.9)	31.5 (19.6)	< 0.001
Age, yr [‡]	42.2 (7.9)	46.3 (9.2)	47.2 (11.2)	46.6 (12.0)	0.004
Body mass index, kg/m ²	24.4 (3.5)	26.9 (4.1)	28.4 (4.6)	29.5 (4.8)	< 0.001
Neck circumference, cm	35.7 (3.4)	37.6 (3.8)	39.3 (3.1)	40.7 (3.7)	< 0.001
Waist circumference, cm	83.3 (10.1)	89.6 (10.1)	95.2 (9.6)	99.5 (11.9)	< 0.001
Hip circumference, cm [‡]	96.5 (7.0)	99.8 (8.1)	101.6 (7.9)	105.6 (9.4)	< 0.001
Waist/hip ratio	0.86 (0.07)	0.90 (0.06)	0.94 (0.06)	0.94 (0.07)	< 0.001
Glucose, mmol/L	5.3 (1.4)	5.3 (0.8)	5.4 (0.7)	5.6 (0.7)	0.166
Insulin, μU/ml [‡]	6.8 (4.2)	9.0 (12.7)	9.1 (6.7)	15.6 (34.3)	< 0.001
HOMA-IR [‡]	1.6 (1.1)	2.2 (3.1)	2.3 (2.0)	4.0 (8.4)	< 0.001
Systolic BP, mm Hg	123.1 (13.9)	127.4 (17.5)	127.3 (13.5)	130.8 (14.0)	0.023
Diastolic BP, mm Hg	70.6 (10.8)	74.8 (14.3)	78.8 (13.3)	78.8 (12.1)	< 0.001

Intermittent hypoxia causes insulin resistance in lean mice

Iyori et al. Am J Respir Crit Care Med 2007; 175:851-857



Does CPAP treatment affect insulin resistance?

Negative studies Follow-up

Davies et al, 1994	4 mo
Saarelainen et al, 1997	3 mo
Coughlin et al, 2007*	6 wk
West et al, 2007*	3 mo
Trenell et al, 2007	12 wk
Teramoto et al, 2008	6 wk
Comondore et al, 2008*	4 wk
Vgontzas et al, 2008	3 mo

Positive studies Follow-up

Brooks et al, 1994	4 mo
Harsch et al, 2004	3 mo
Babu et al, 2005	3 mo
Dorkova et al, 2008	8 wk (compliant pts)
Barceló et al, 2008	3 mo (pts with EDS)
Schahin et al, 2008	2.9 yr

* Randomized controlled trial

Stroke

OSA significantly increases the risk of stroke and the increase is independent of other risk factors, including hypertension

— H Klar Yaggi et al NEJM 2005;353:2034-2041

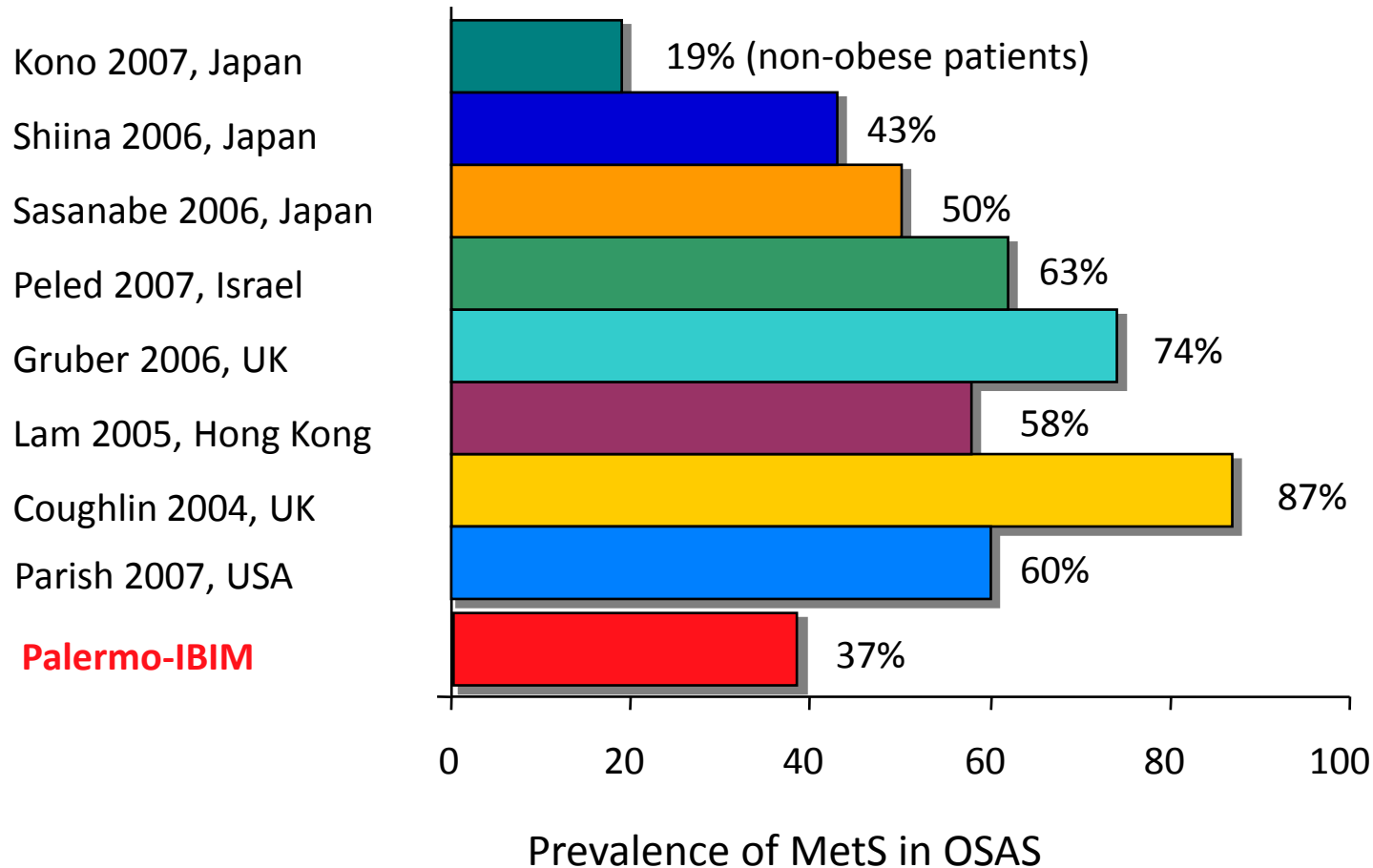
Metabolic Syndrome: Diagnostic Criteria (NCEP, 3rd Report)

Grundey et al. Circulation 2005; 112: e285-e290

Diagnosis based on any 3 of the following 5 criteria:

- **↑ waist circumference** (≥ 102 cm in men, ≥ 88 cm in women)
- **↑ Triglycerides** (≥ 150 mg/dL or drug treatment)
- **↓ HDL-C** (< 40 mg/dL in men, < 50 mg/dL in women, or drug treatment)
- **↑ BP** (systolic BP ≥ 130 mmHg, or diastolic BP ≥ 85 mmHg, or drug treatment for hypertension)
- **↑ Fasting glucose** (≥ 100 mg/dL or drug treatment)

Prevalence of Metabolic Syndrome in OSAS patients from different countries



Driving with OSA



In USA 13% of deaths from RTA are caused by the driver falling asleep

In UK 20-25% of the RTA on motorways are due to this

Screen all commercial drivers for
obstructive sleep apnoea

Call for lorry drivers to have sleep disorder tests

BBC 2011

Driving

Need to know the difference between OSA and OSAS

Does the driver have symptoms during driving?

DVLA

- Group 1 licence holders (car/motorcycle) diagnosed with sleep apnoea must stop driving until the symptoms have been controlled and confirmed by medical opinion.
- Group 2 licence holders (LGV) diagnosed with sleep apnoea must stop driving until the symptoms have been controlled, and must have ongoing treatment. Licensing reviews will be carried out regularly, usually annually.

Driver

It is the driver's responsibility to ensure their fitness to drive

Driver is legally obliged to tell the DVLA and stop driving

Doctor

When assessing and making decisions

Think about the impact on patient's life- Job, financial and social aspects.

Think about the impact of accident- fatalities, lifelong disability and emotional distress to patient, family and public.

Doctor should clearly document in the notes the discussion with patient.

If the specialist becomes aware that patient is driving, DVLA can be informed after informing the patient in writing.

GMC recognises you are not legally obliged to do this.

Treatment

Snoring



Anti-Snore pillow



Oral appliance

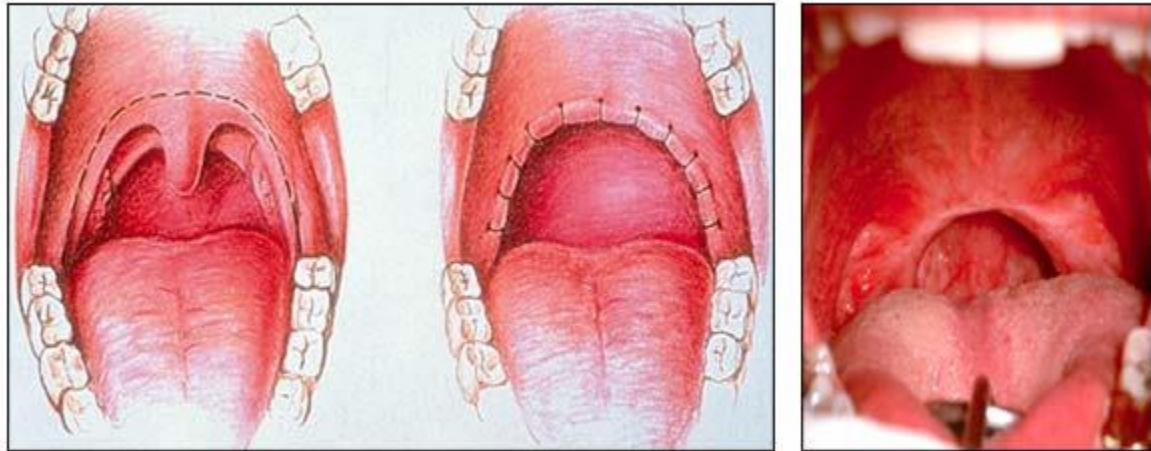
Mandibular advancement therapy

Tongue stabilising device





Uvulopalatopharyngoplasty(UPPP)





Continuous positive airway pressure (CPAP) is recommended as a treatment option for adults with moderate or severe symptomatic obstructive sleep apnoea/hypopnoea syndrome (OSAHS).

NICE March 2008

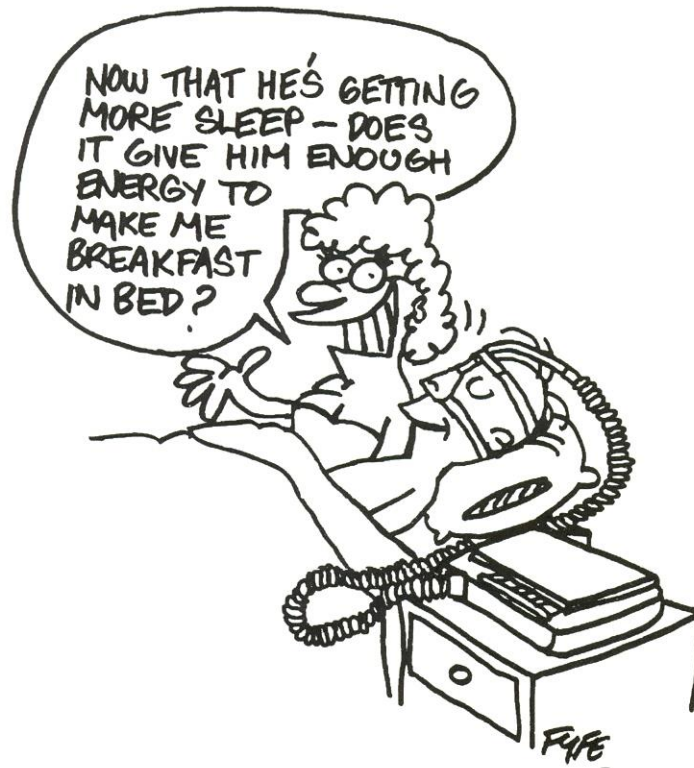
Continuous
Positive
Airway
Pressure

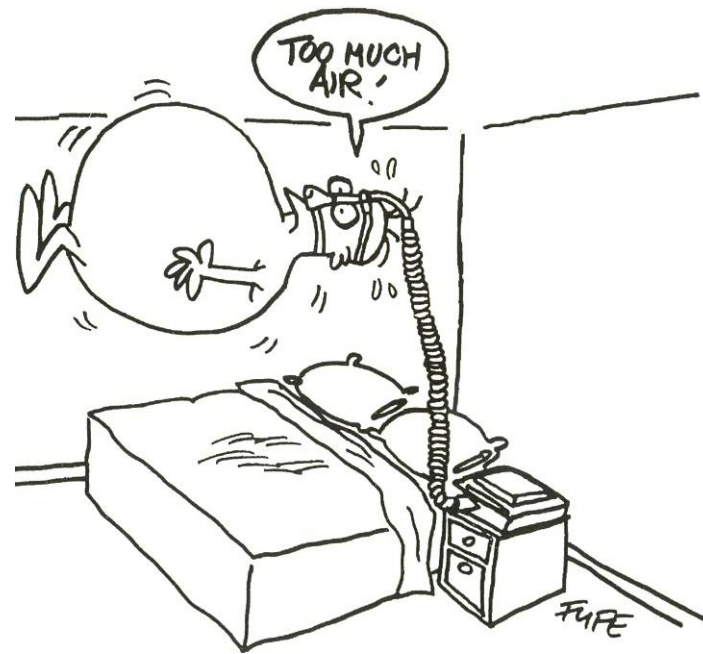


CPAP









Patient referral to sleep service

Sources of referral

GPs

ENT department

Neurologist

Cardiologist

Anaesthetist

Diabetologist

Psychiatrist

Need to reduce consultant to
consultant referrals

Who should be referred to L&D Sleep Clinic?

Anyone with a good history and significant day time symptoms

ESS >9

But consider other causes of sleepiness

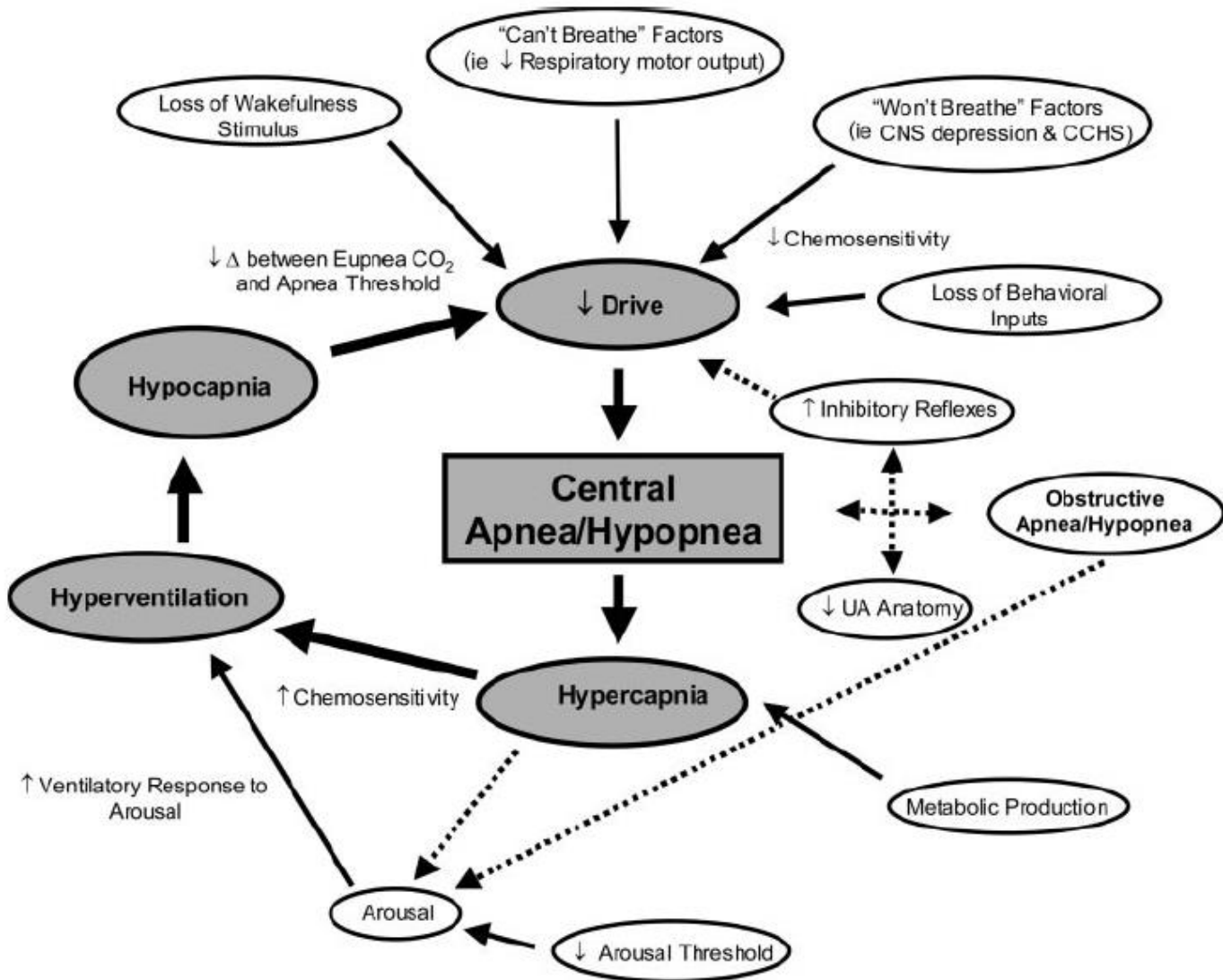
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search ID: cwin193

**"I never get a good night's sleep.
Thank God for these office meetings!"**

Pathophysiology of CSR/CSA



Untreated Cheyne-Stokes-Respiration (CSR)

