Obstructive sleep apnoea (OSA)

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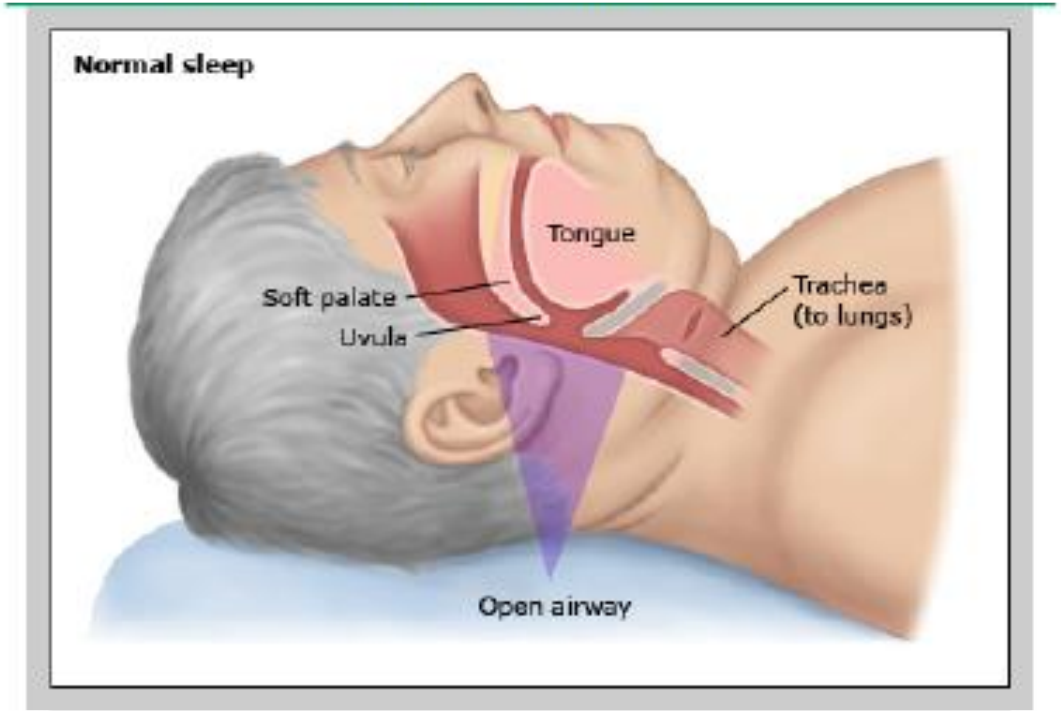
Obstructive sleep apnoea (OSA)

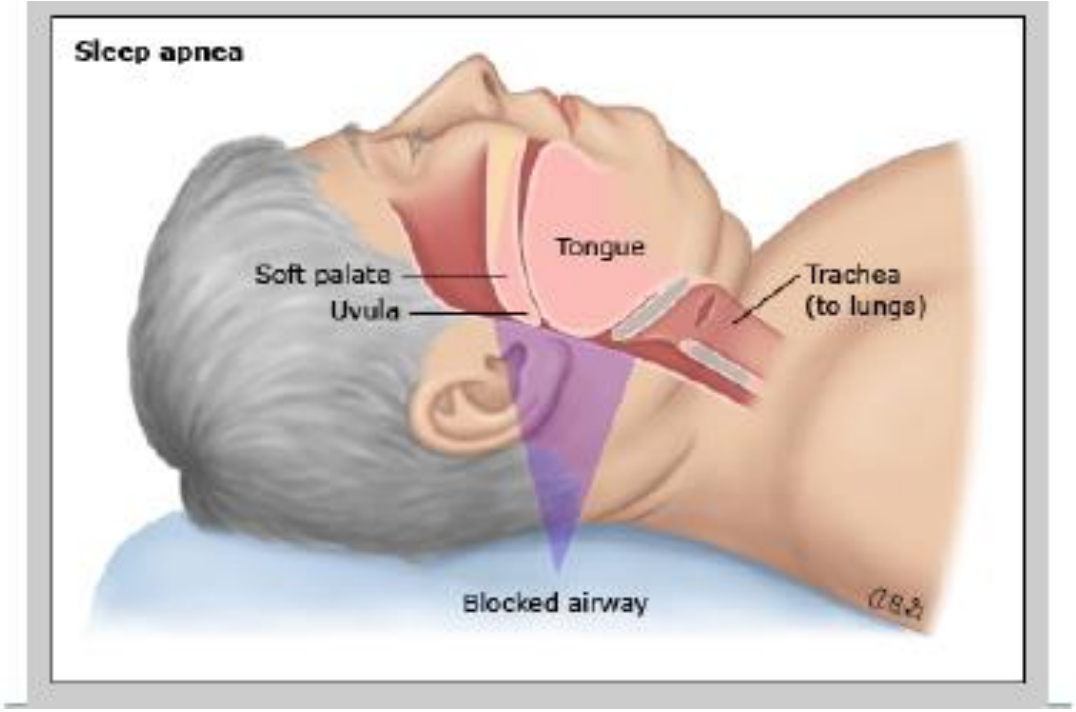
1. Pathophysiology of OSA.
2. Diagnosis and severity.
3. Treatment options and treatment efficacy.

How to refer to RHH Sleep Clinic.

What is OSA?

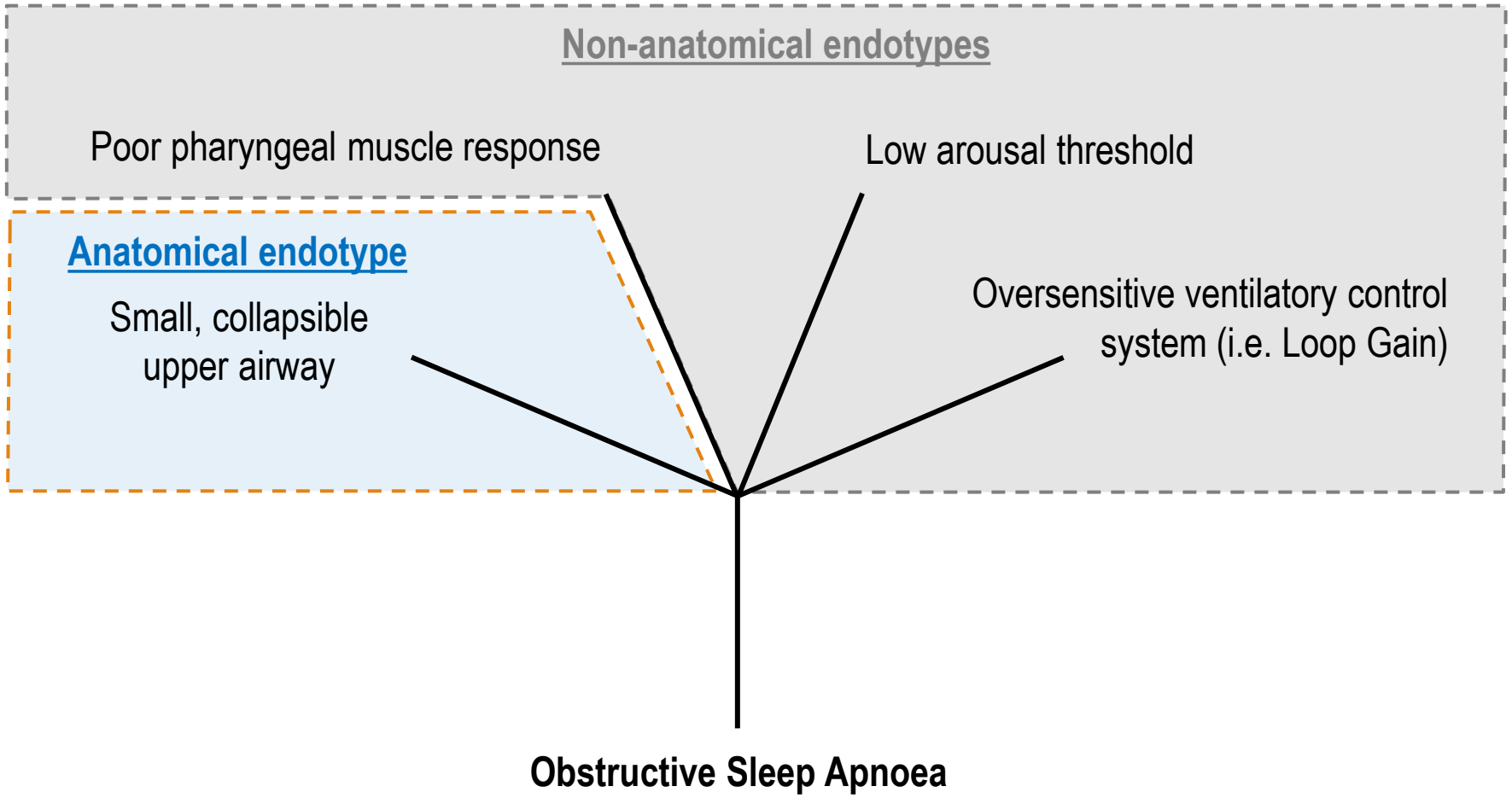
Affects 1 billion people (Benjafield 2019).





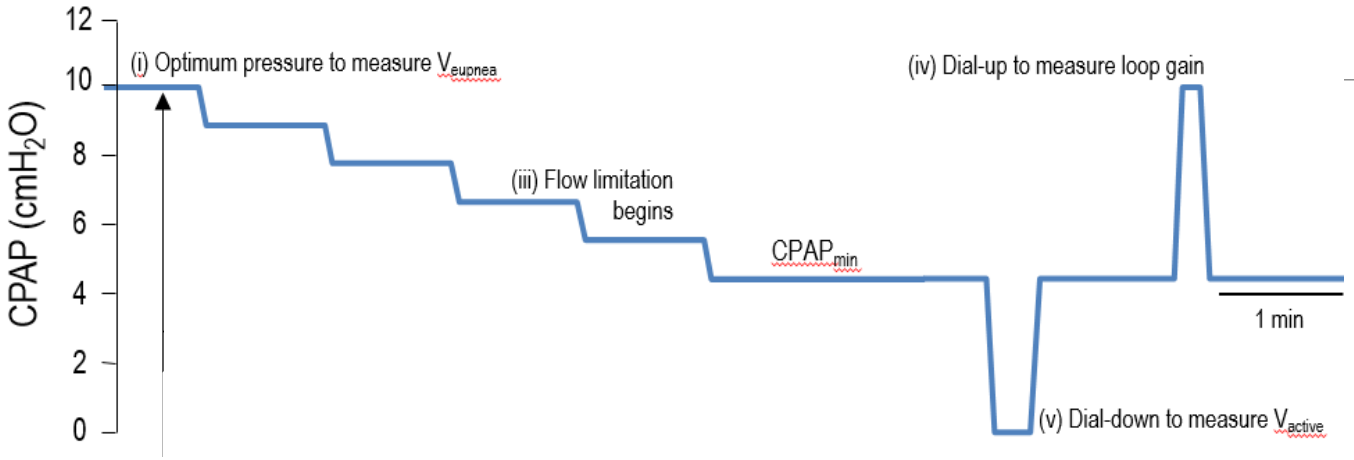
UpToDate – OSA – Patient information

OSA pathophysiology is complex



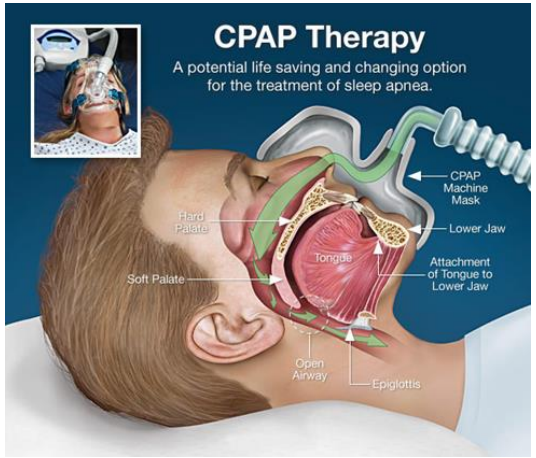
Gold-standard invasive endotyping (CPAP dial down)

a.



Research PSG:

- To measure the OSA endotypes
- Additional sleep study
- Patient has to tolerate CPAP



Wellman et al. (2013) Journal of Applied Physiology
Edwards et al. (2016) AJRCCM

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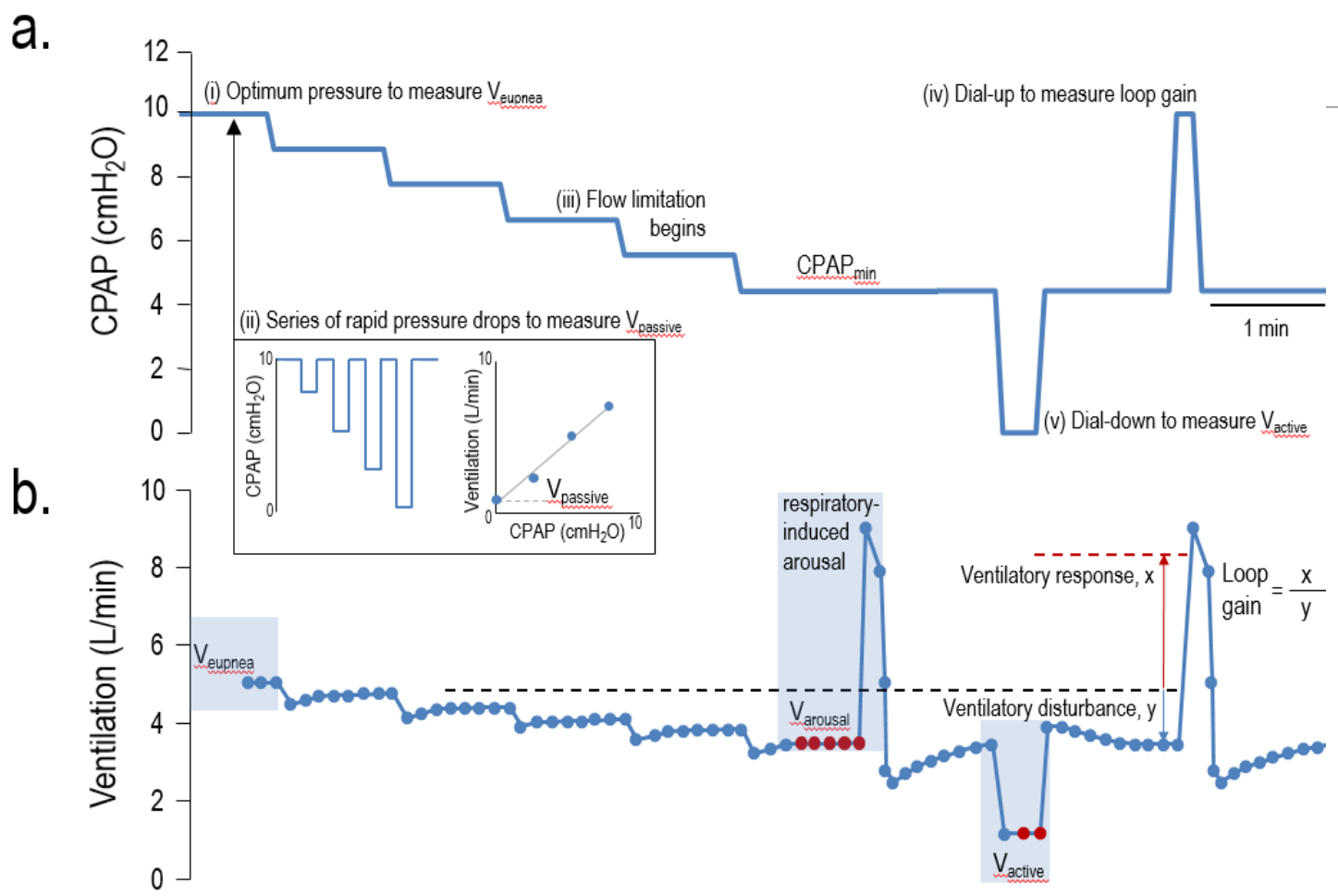

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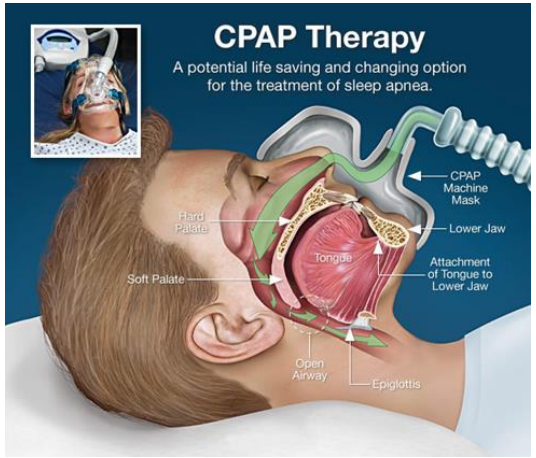

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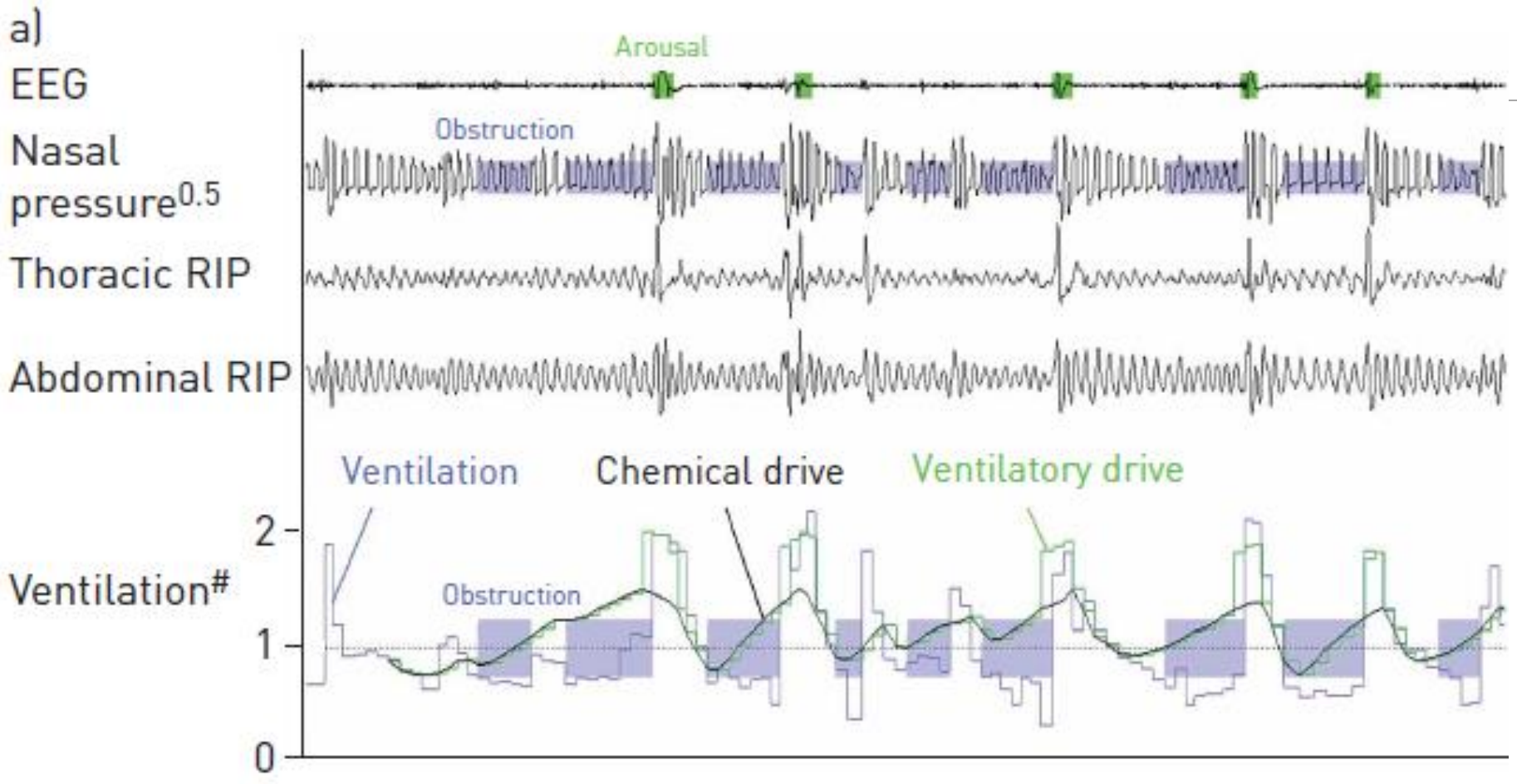
Non invasive endotyping (from clinical polysomnography)



Benefits:

- Simple (software-based)
- Obtain from routine clinical PSG

Issues:

- Requires validation
- Not readily available

Terrill et al. (2015) ERJ, Sands et al. (2018) SLEEP, Sands et al. (2018) AJRCCM

Why a patient seeks evaluation?

Snoring → social disruption or embarrassment

Symptoms of un-refreshing sleep, daytime fatigue and sleepiness & its social/professional consequence

Concerns that suspected sleep apnoea may contribute to adverse health outcomes

After a motor-vehicle accident

Pre-operative high risk screening

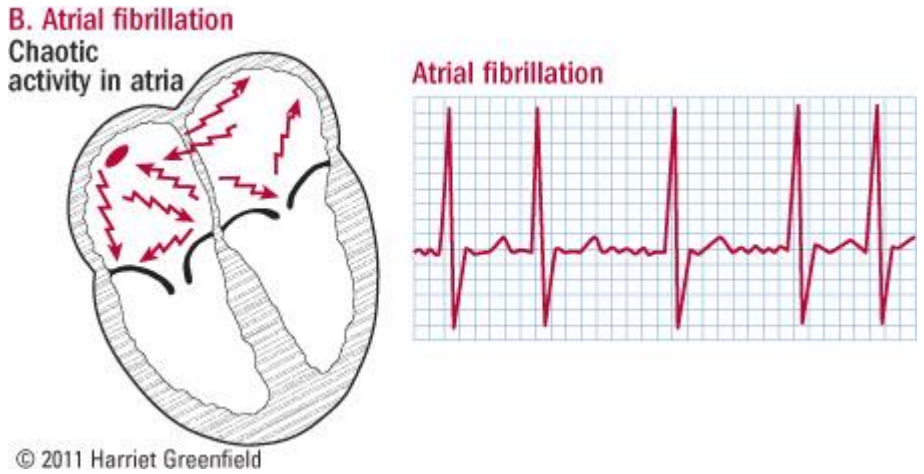
OSA Complications and Associations

Hypertension

Atrial fibrillation

Stroke – 2-3x

Diabetes mellitus



OSA can co-exist with other conditions

- Sleep (eg. Restless legs, insomnia)
- Pulmonary disease
- Depression, PTSD

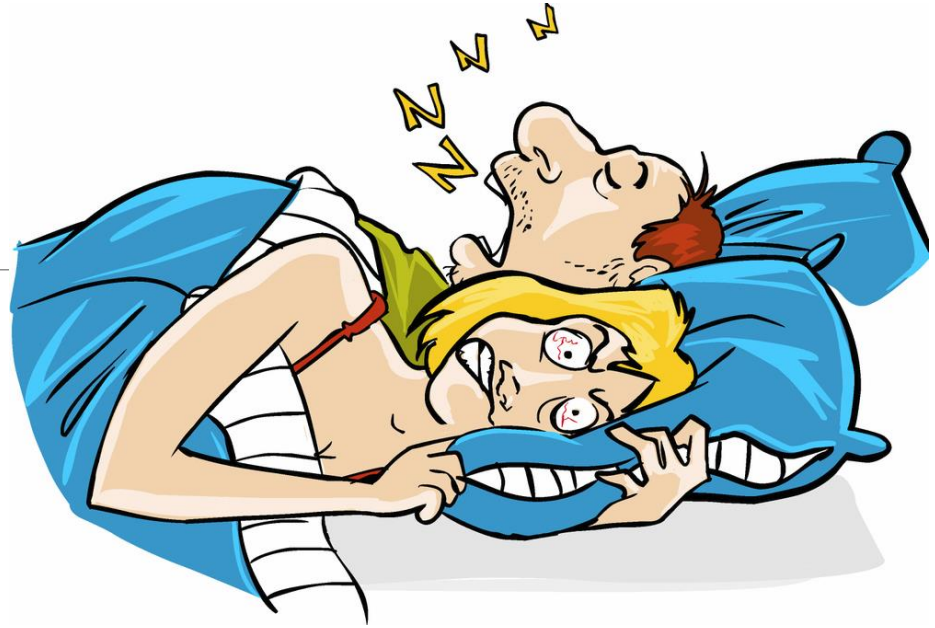
How is OSA diagnosed?

Clinical history and examination

Sleep questionnaires

Diagnostic sleep study

History



Partner/collateral history

Snoring

Dry mouth

Fatigue vs Sleepy

- Ask for total caffeine consumption ?mask sleepiness
- Ask specific questions: Do you fall asleep →
  - watching TV after dinner? Reading?
  - during work meetings?
  - whilst driving, stopped at a traffic light?

(Alcohol consumption); Sleeping position

Bedside examination

Body Mass Index (BMI)

Neck circumference (>40cm)

Clinical predictors (OSA in Sao Paulo Epidemiological Sleep Study 2010; n=1000 with AHI > 5 & symptoms OR AHI >15)

- Male gender (OR 4.1)
- Obese (OR 10.5)
- Age > 50 (OR >10+)

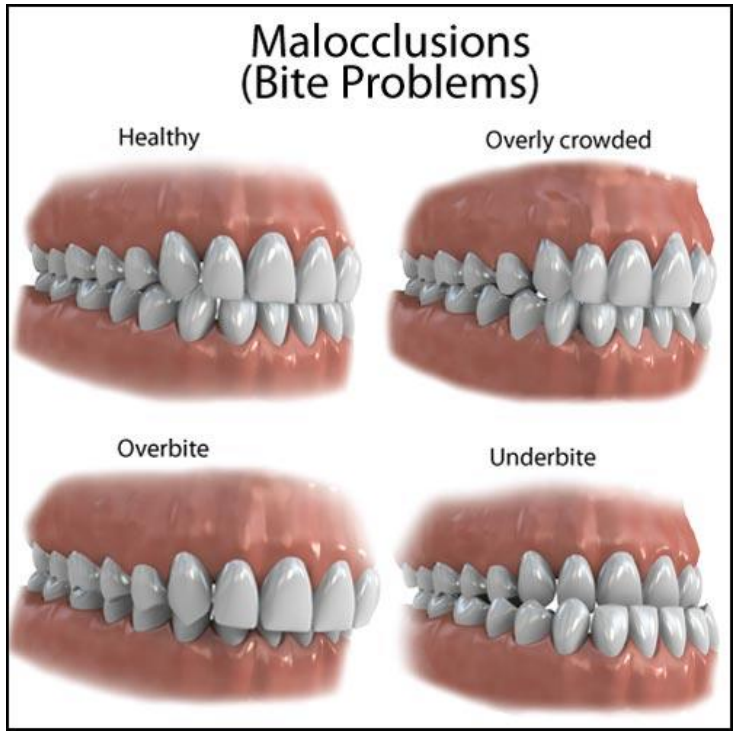
111. Kushida CA, Efron B, Guilleminault C. A predictive morphometric model for the obstructive sleep apnea syndrome. Ann Intern Med 1997;127:581-587.

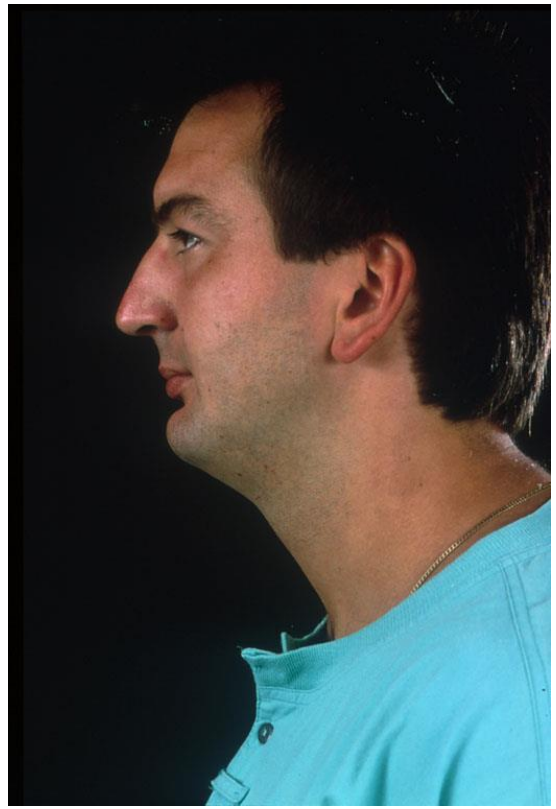
Bedside examination – Upper Airway and facial structure

Oropharyngeal/dental, including:

- Palate position and tonsil
- Malocclusion & overlapping teeth → ?small oral cavity
- ?Bruxism

Figure 105-4 Photograph of high arched palate.





Bedside examination – Upper Airway

Nasal

- Can contribute to increased airway resistance

Nasoendoscopy **(ENT surgeons)**

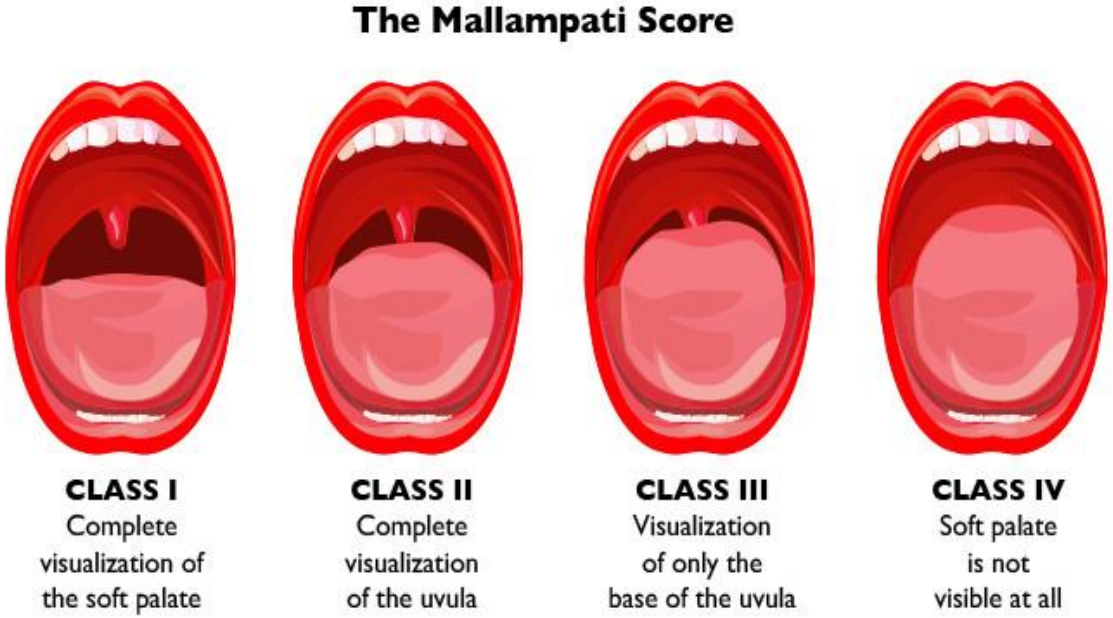
Figure 105-5 Abnormal nasal anatomy in a patient with upper airway resistance syndrome. Note the deviation of the septum, the asymmetrical size of the nares, and the collapse of the nasal external valves.

Kryger 2015, Chapter 105

Bedside examination

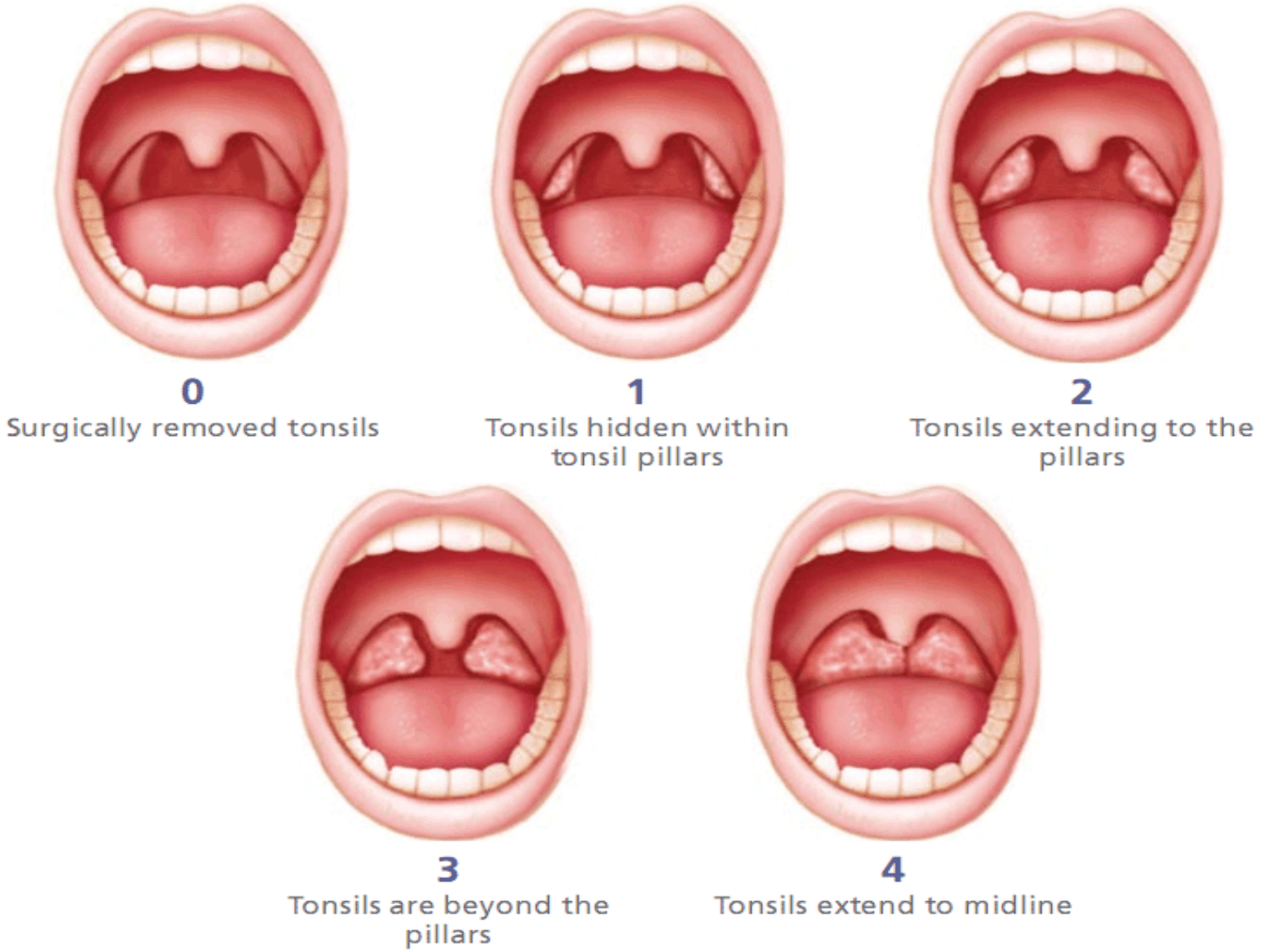
Modified Mallampati Score (MMP)

- Head in neutral position, tongue is NOT protruded, (NO) phonation
- Used to predict the ease of endotracheal intubation
- High score (3 or 4) is associated with more difficult intubation & higher incidence of OSA



Laryngoscope, 1999 Friedman et al.

Tonsil size



Friedman Tonsil Size

Epworth Sleepiness Scale (ESS)

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.

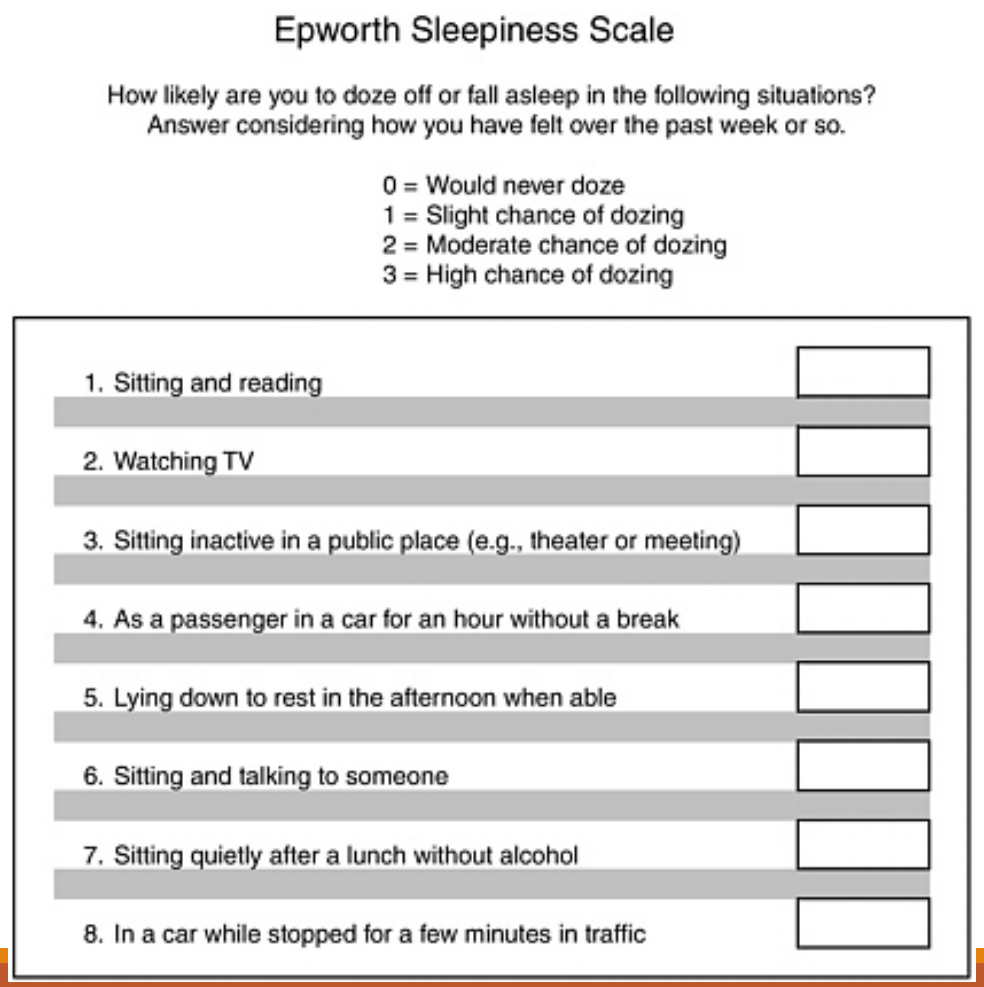
0 = Would never doze
1 = Slight chance of dozing
2 = Moderate chance of dozing
3 = High chance of dozing

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	

Murray Johns

MW Johns Sleep 1991

Epworth Sleepiness Scale (ESS)



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Difficulty maintaining the alert/awake state

ESS Score:

Normal	0-10
Mild	11-14
Mod	15-17 (?significant if 16+)
Severe	≥18

- Patient cooperation
- Weak correlation with OSA severity
- Not sensitive or specific for screening on its own
- Re-test reliability not well studied

MW Johns Sleep 1991

STOP-Bang Questionnaire

STOP-Bang Questionnaire

Please answer the following questions by checking "yes" or "no" for each one	*Yes*	*No*
Snoring (Do you snore loudly?)	☐	☐
Tiredness (Do you often feel tired, fatigued, or sleepy during the daytime?)	☐	☐
Observed Apnea (Has anyone observed that you stop breathing, or choke or grasp during your sleep?)	☐	☐
High Blood **P**ressure (Do you have or are you being treated for high blood pressure?)	☐	☐
BMI (Is your body mass index more than 35kg per m2?)	☐	☐
Age (Are you older than 50 years?)	☐	☐
Neck Circumference (Is your neck circumference greater than 40 cm [15.75 inches]?)	☐	☐
Gender (Are you male?)	☐	☐

Chung et al. (2008) Anesthesiology; Chung et al. (2012) BJA

Detecting sleep apnoea syndrome in primary care with screening questionnaires and the Epworth sleepiness scale

Chamara V Senaratna[1,2], Jennifer L Perret[3], Adrian Lowe[1], Gayan Bowatte[1], Michael J Abramson[4], Bruce Thompson[5], Caroline Lodge[1], Melissa Russell[1], Garun S Hamilton[4,6], and Shyamali C Dharmage[7]

4 Diagnostic utility of obstructive sleep apnoea screening questionnaires, alone and in combination with an Epworth sleepiness scale score of at least 8 for identifying participants with clinically relevant obstructive sleep apnoea* in people with at least one trigger symptom†

Screening tests	Area under ROC curve (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	Positive likelihood ratio§ (95% CI)	Negative likelihood ratio§ (95% CI)	Diagnostic odds ratio§ (95% CI)
Obstructive sleep apnoea screening questionnaires‡								
Berlin	62% (56–68%)	65% (56–73%)	59% (50–67%)	61% (53–69%)	63% (54–71%)	1.6 (1.2–2.1)	0.6 (0.4–0.8)	2.7 (1.6–4.3)
STOP-Bang	58% (53–63%)	81% (73–87%)	36% (28–44%)	55% (48–62%)	65% (53–76%)	1.2 (1.1–1.4)	0.5 (0.4–0.8)	2.3 (1.3–4.0)
OSA-50	54% (49–58%)	86% (80–92%)	21% (15–29%)	52% (46–59%)	61% (46–75%)	1.1 (1.0–1.2)	0.6 (0.4–1.1)	1.7 (0.9–3.2)
Obstructive sleep apnoea screening questionnaires‡ and Epworth sleepiness scale score ≥ 8								
Berlin	66% (61–70%)	36% (28–45%)	95% (90–98%)	88% (76–95%)	60% (54–67%)	7.3 (3.4–16)	0.7 (0.6–0.8)	10.9 (4.8–25)
STOP-Bang	71% (66–76%)	50% (41–59%)	92% (86–96%)	86% (77–93%)	65% (58–72%)	6.4 (3.5–12)	0.5 (0.4–0.6)	11.7 (5.9–23)
OSA-50	72% (67–76%)	51% (43–60%)	92% (86–96%)	87% (77–93%)	66% (59–72%)	6.6 (3.6–12)	0.5 (0.4–0.6)	12.4 (6.2–25)

CI = confidence interval; ROC = receiver operator characteristic. * Defined as moderate to severe obstructive sleep apnoea (oxygen desaturation index ≥ 15) or mild obstructive sleep apnoea (oxygen desaturation index, 5–14) with excessive day time sleepiness (Epworth sleepiness scale score ≥ 8). † Troublesome snoring, witnessed apnoeas, or sleepiness or fatigue/tiredness (online Supporting Information, table 1). ‡ Standard questionnaire cut-off scores were applied. § The positive likelihood ratio — sensitivity/(1 – specificity) — compares the probability of a positive test result for someone with the disorder with that for someone without the disorder; the negative likelihood ratio — (1 – sensitivity)/specificity — compares the probabilities of a negative result for people with and without the disorder. The ratio of the positive and negative likelihood ratios is the diagnostic odds ratio, a measure of the overall accuracy of the test.

Senaratna et al. (2019) MJA

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6 A decision support tool for primary care: utility of using different STOP-Bang scores, alone or in combination with Epworth sleepiness scale (ESS) scores for detecting clinically relevant obstructive sleep apnoea*

STOP-Bang and ESS cut-off scores	Patients with clinically relevant OSA excluded if criteria used to rule out clinically relevant disease	Healthy persons included for further assessment if criteria used to rule in clinically relevant disease
STOP-Bang score and ESS ≥ 8		
≥ 2	39%	11%
≥ 3	50%	8%
≥ 4	70%	6%
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Senaratna et al. (2019) MJA

Can I have a sleep study please?

Types of sleep studies

Types of Sleep Studies	Other "name"	Key points
Type 1	In-laboratory polysomnography	- Benefits of video monitoring - Other sleep disorders apart from OSA is suspected
Type 2	Ambulatory polysomnography	- Home environment - "Rule-in" or "rule-out" OSA - 'Signal' issues can occur
Type 3	Limited channel - ≥ 4 variables	- No EEG (i.e. no sleep staging) - Screening for OSA (at least moderate probability)
Type 4	Limited channel – one or two variables only e.g. oximetry, heart rate, airflow	

Types of sleep studies

Type 2 Ambulatory Polysomnography

Sleep in own bed

Lack of video monitoring
Signal issues

Types of sleep studies

Type 3 sleep study

Limited channel, at least four variables are measured

Which sleep study should I get?

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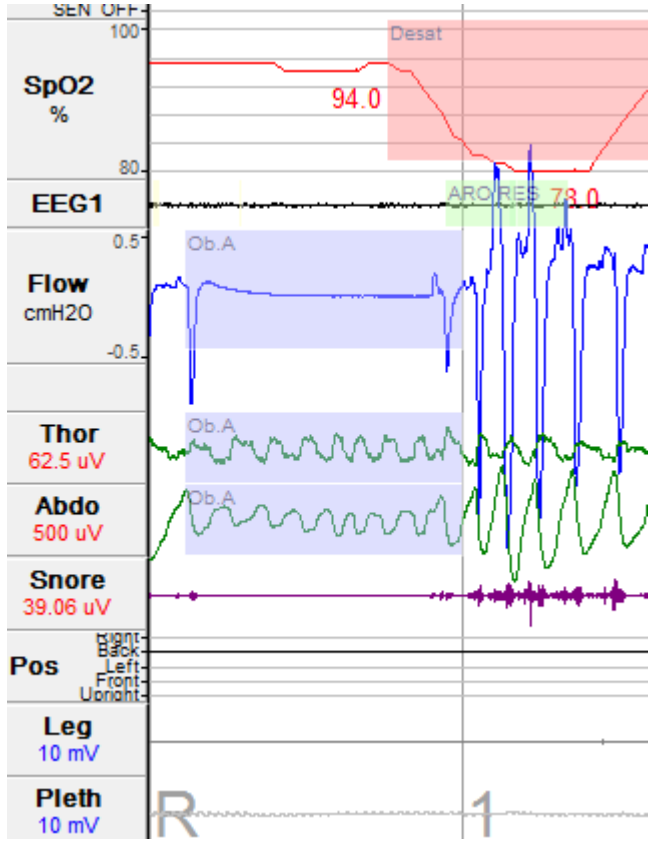
What is the AHI?

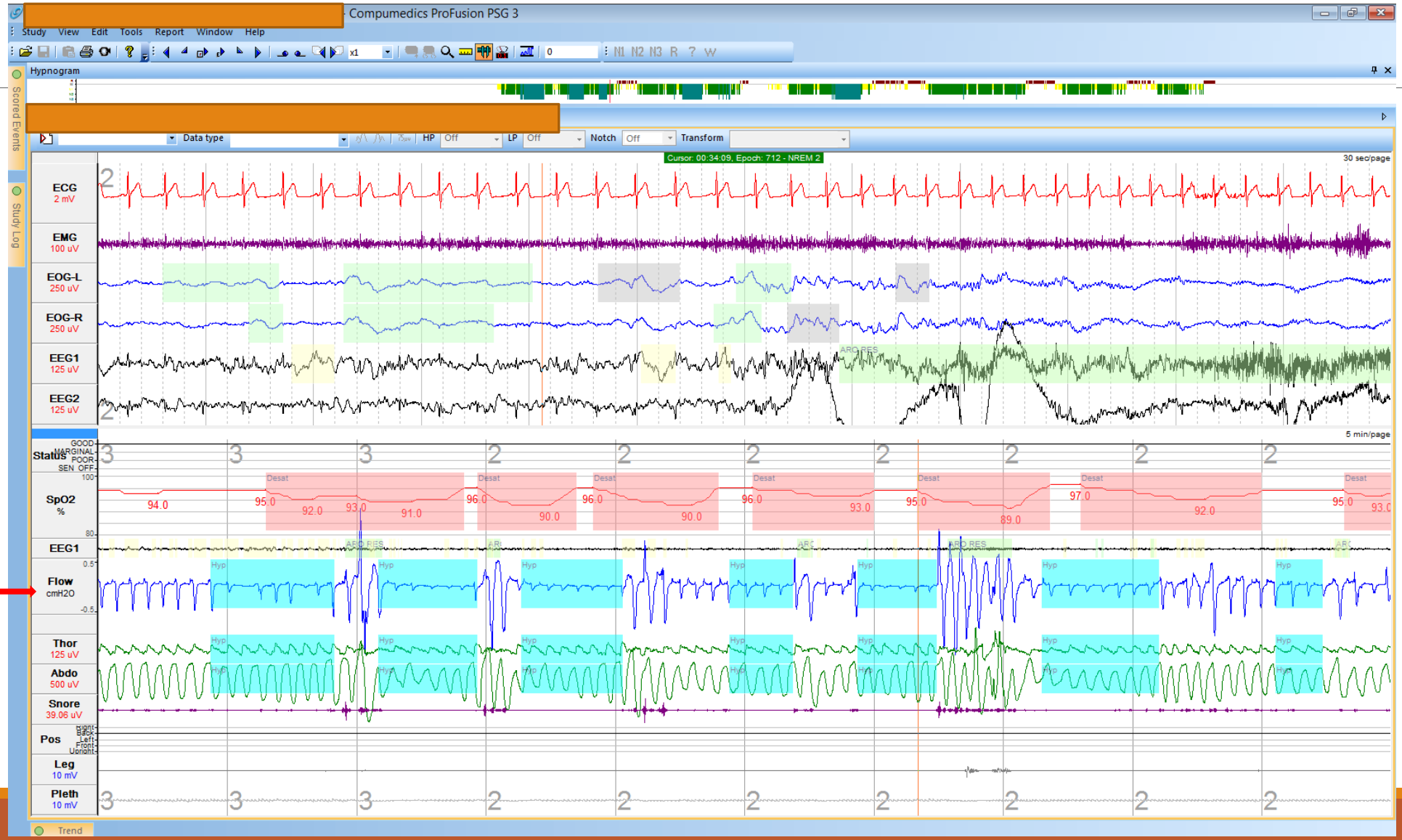
Apnoea



Hypopnoea

Apnoeas in REM

Hypopnoeas in NREM



Apnoea-Hypopnoea Index (AHI)

Denotes OSA severity

AHI (events/hr)	Severity
< 5	Normal
5 - <15	Mild
15 - <30	Moderate
≥ 30	Severe

Apnoea-Hypopnoea Index (AHI)

Other ways this may feature on the sleep study report:

RDI = Respiratory disturbance index

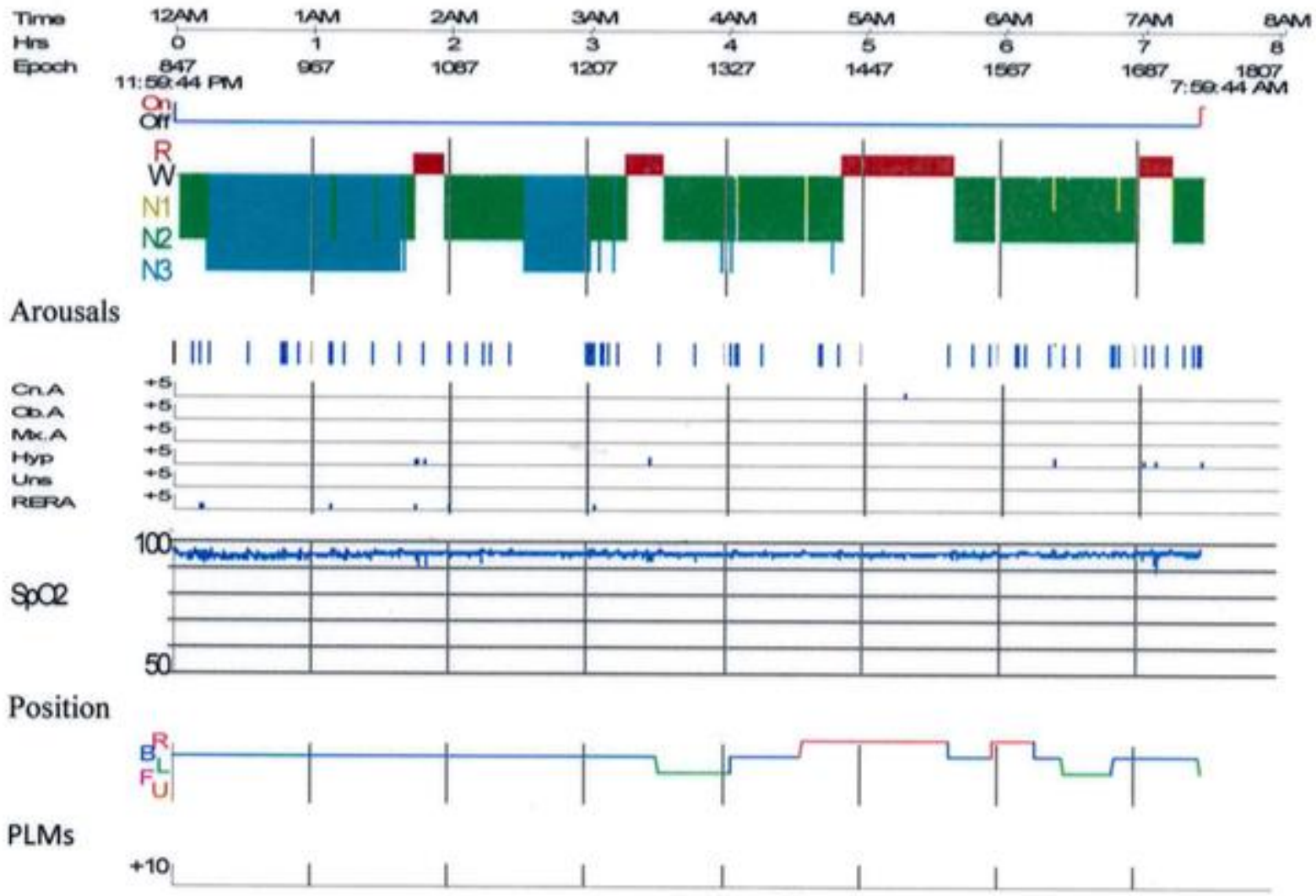
** old method of scoring; now – it includes "apnoea + hypopnoea + RERA"*

ODI = Oxygen desaturation index

** oximetry, and using either 3% or 4% oxygen desaturation to score a 'respiratory event'*

RERA = respiratory effort-related arousal

Polysomnography signals (Sleep study) – Type 1 and 2



What about the Apnea-Link Air (type III sleep study)?

Reasonable choice if clinical question and mod-high probability of OSA

5 signals:

Nasal flow

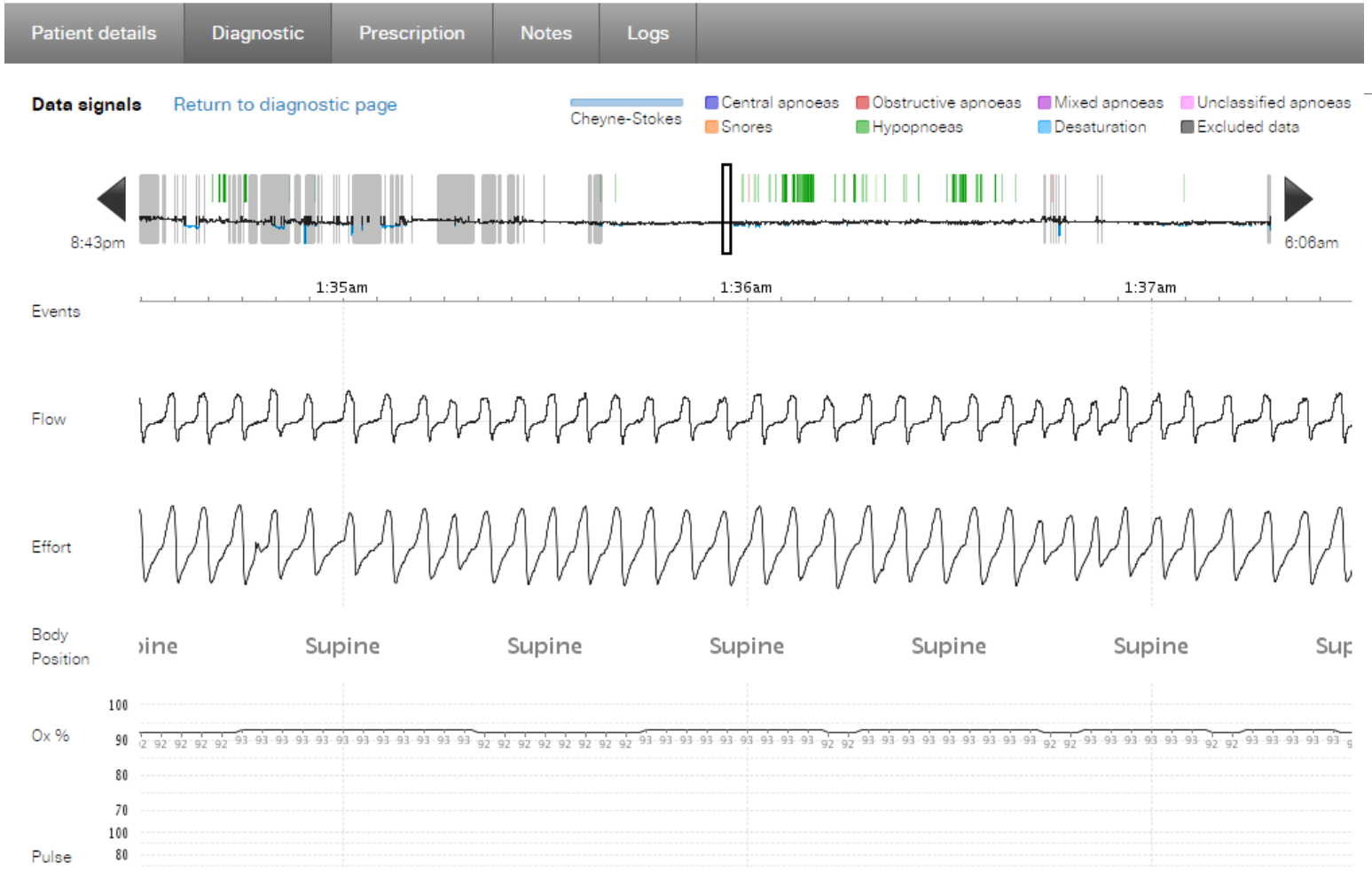
Thoracic bands (Effort)

Oximetry

Pulse

Snoring

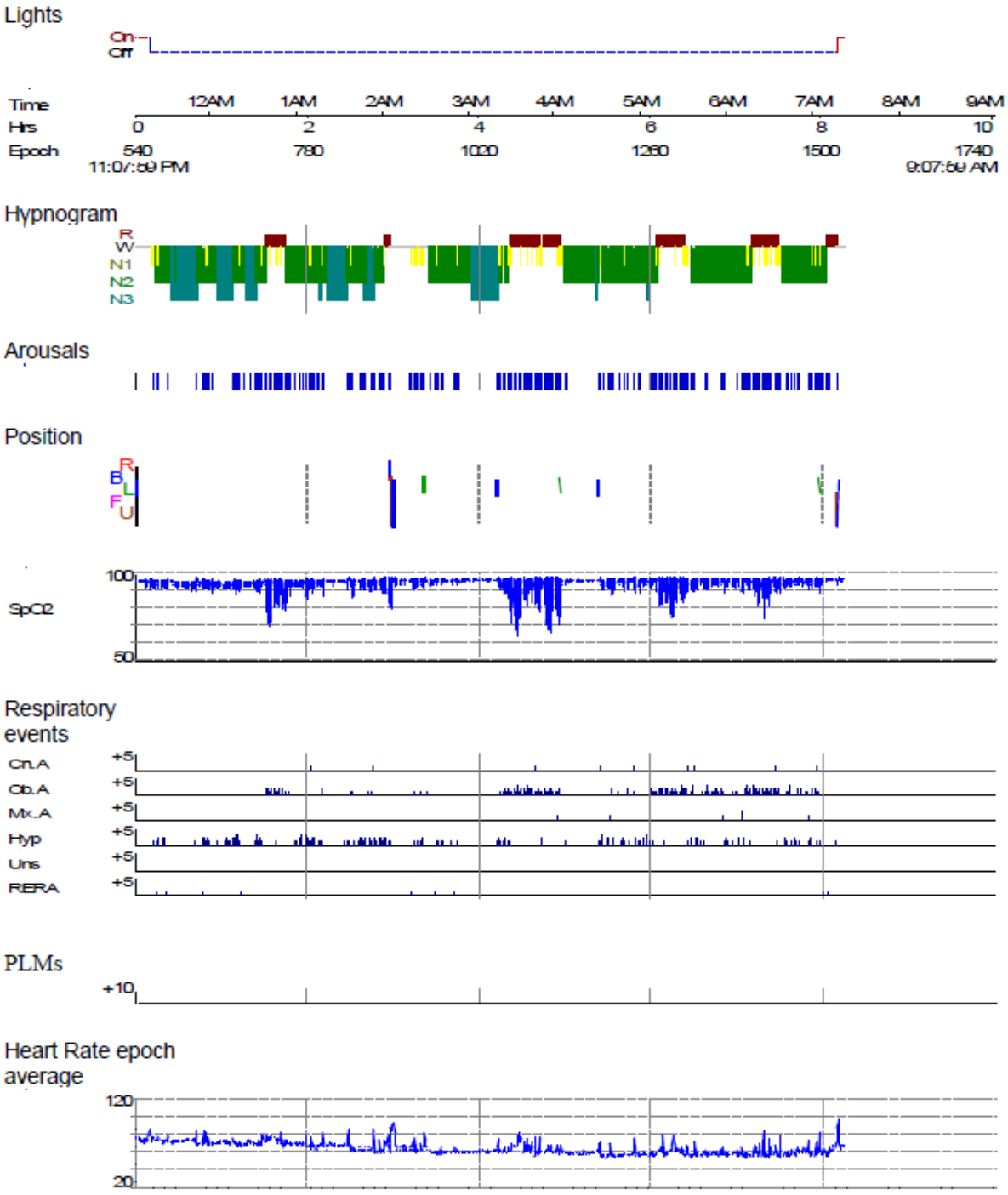
What about the Apnea-Link Air (type III sleep study)?



1. Is this wake or sleep?
2. Flow limited breathing or hypopnoea?
3. Position sensor accuracy?

AHI 6.2 events/hr

How do I interpret a sleep study?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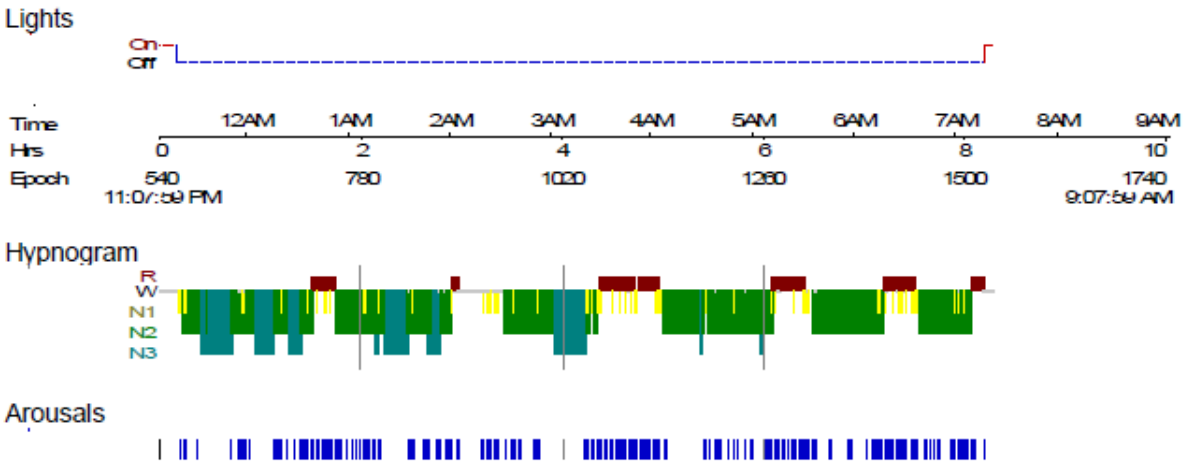
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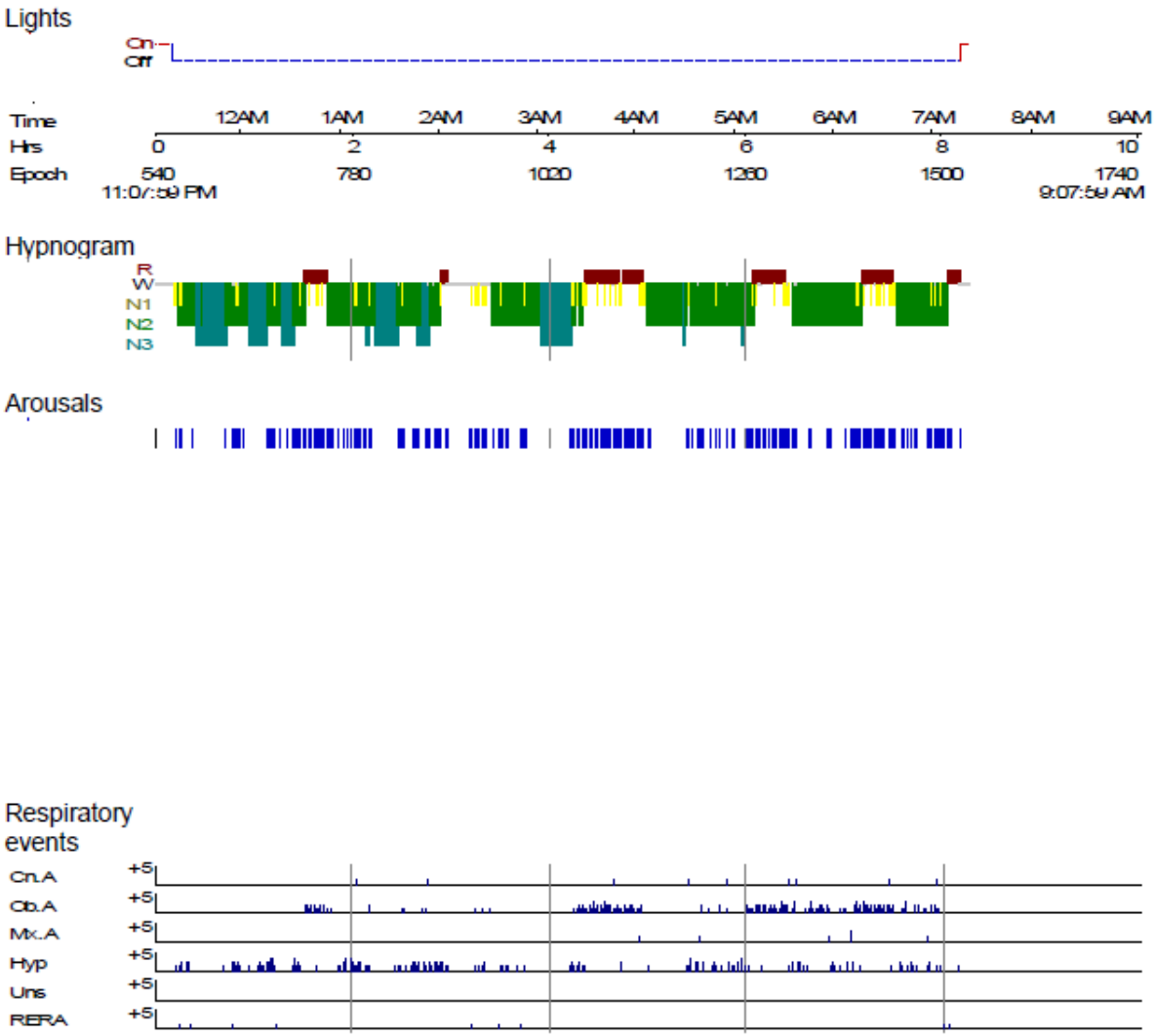
N3
Arousals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Arousals
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Cn.A
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RERA
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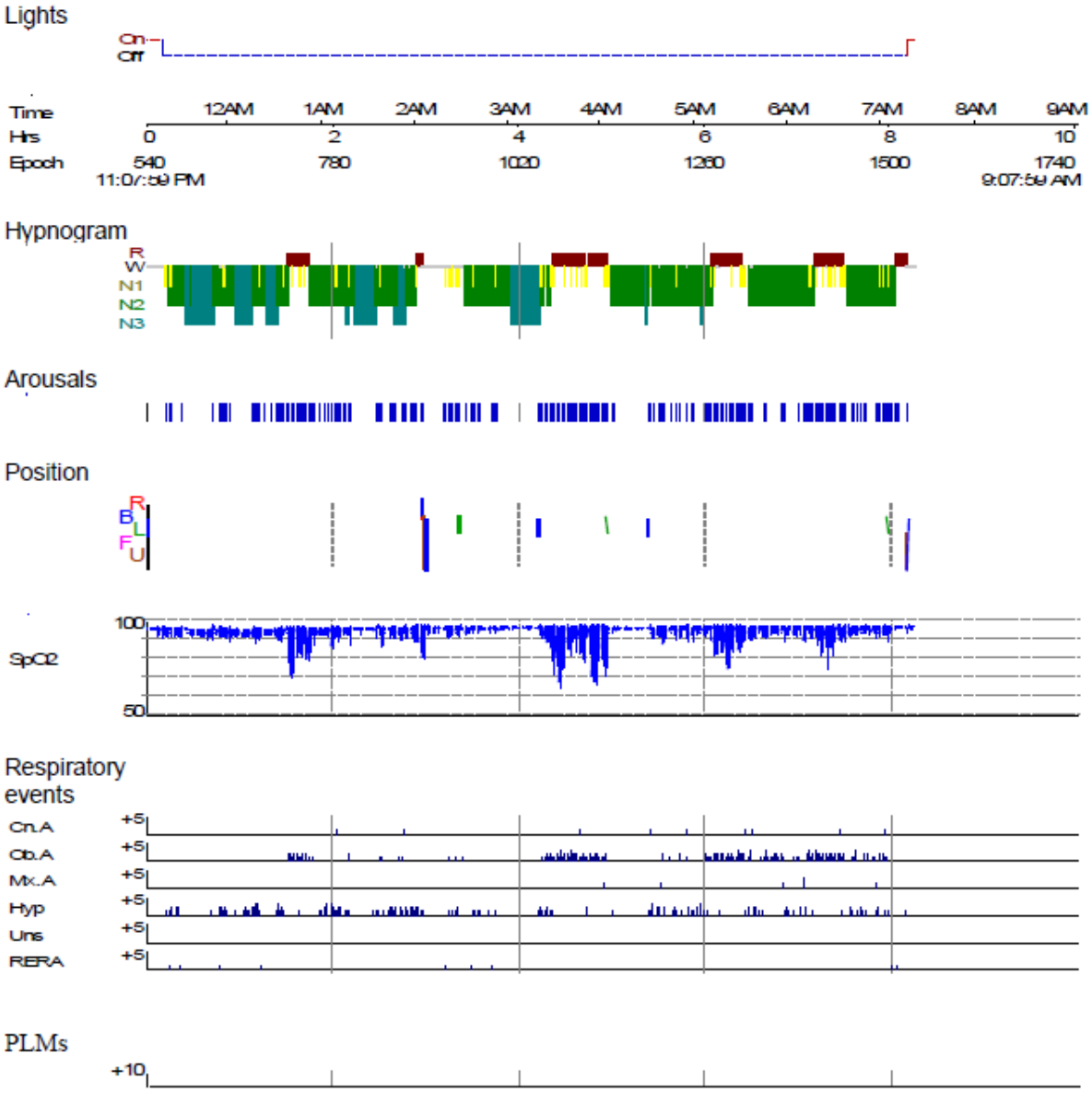
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Hypnogram
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N1
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N3
Arousals
Position
R
L
F
U
SpO2
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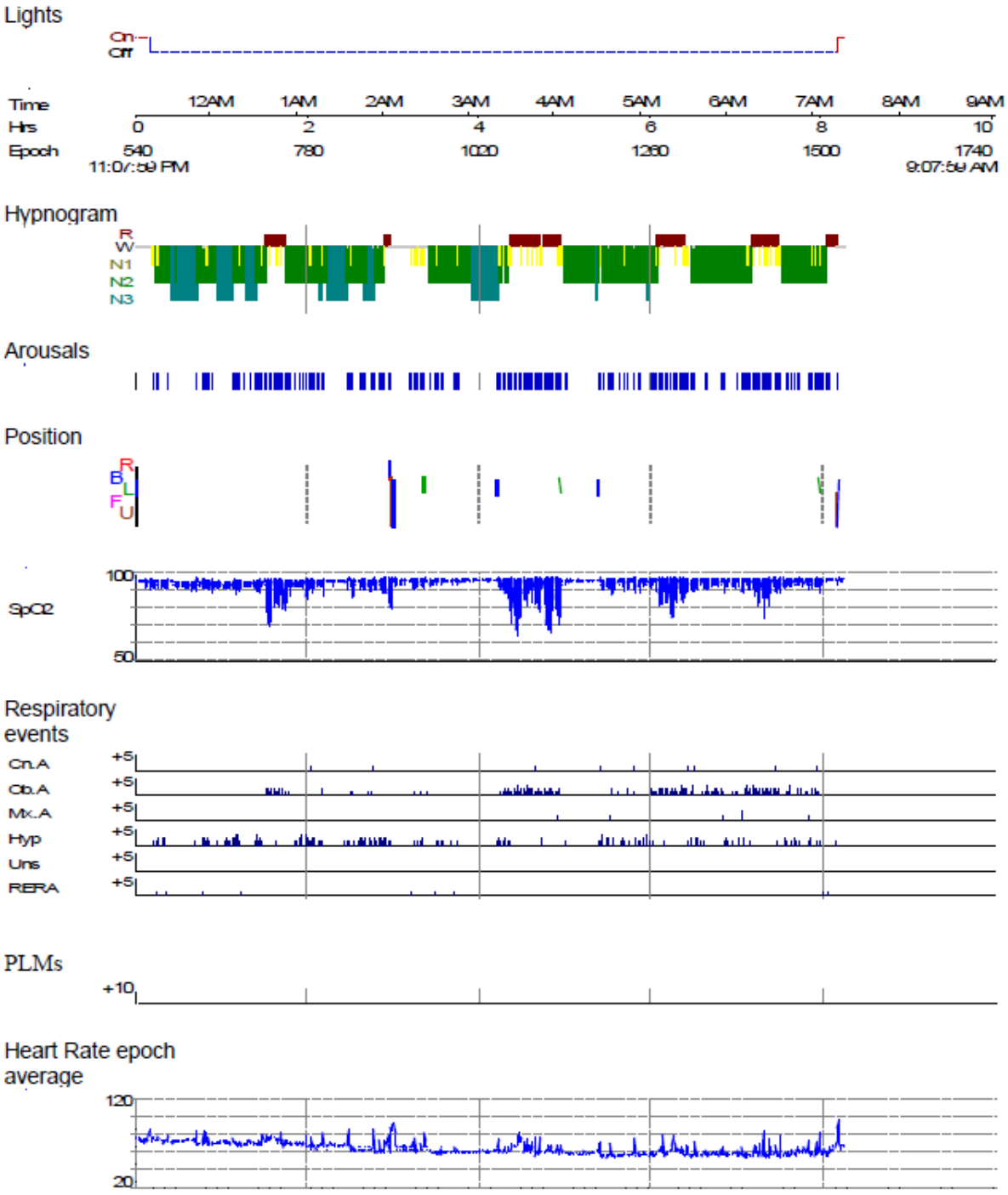
Respiratory events
Cn.A
Ob.A
Mx.A
Hyp
Uns
RERA
+5
PLMs
+10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N1
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N3
Arousals
Position
R
L
U
SpO2
100
50
Respiratory events
Cn.A
Ob.A
Mx.A
Hyp
Uns
RERA
+5
PLMs
+10
Heart Rate epoch average
120
20

Sleep Statistics

Height:	171cm	Sex:	Male
Weight:	85kg	BMI:	29.1 kg/m^2
Lights out clock time:	23:17:58	Lights on clock time:	07:17:29
Report time from 23:07:59-07:23:28:	495.5 min	Sleep latency:	1.0 min
Time available for sleep (lights out):	479.5 min	REM latency:	79.5 min
Sleep period from 23:18:59-07:17:28:	478.5 min	Total Sleep:	443.5 min
Total time awake during sleep period:	35.0 min	**Sleep Efficiency:**	**92.5%**
NREM Sleep = 367.0 min:	**82.8%**	**REM Sleep:**	**76.5 min: 17.2%**
Stage N1 = 82.0 min	18.5%	Movement time:	0.0 min
Stage N2 = 218.0 min	49.2%	Unsure time:	0.0 min
Stage N3 = 67.0 min	15.1%		

Respiratory Statistics

	NREM			REM		
	Back	**Other**	**All**	**Back**	**Other**	**All**
Time during sleep	**288.0**	**79.0**	**367.0**	**69.0**	**7.5**	**76.5**
SpO_2% min average	93	95	93	84	95	85
SpO_2% lowest	**70**	**75**	**70**	**64**	**81**	**64**
Events/hr						
Central Apnoea	0.8	0.0	0.7	0.0	0.0	0.0
Obstructive Apnoea	21.0	0.0	16.5	72.2	0.0	65.1
Mixed Apnoea	1.3	0.0	1.0	0.0	0.0	0.0
Hypopnoea	32.3	7.6	27.0	6.1	8.0	6.3
AHI	55.4	7.6	**45.1**	78.3	8.0	**71.4**
RERA	1.0	2.3	1.3	0.0	8.0	0.8
RDI	56.5	9.9	**46.4**	78.3	16.0	**72.2**

PLM Statistics

Number of PLMs / hr of NREM	0.0
Number of PLMs / hr of REM	0.0
Total PLMI	**0.0**

Arousal Statistics

Per hour	REM	NREM	Total
ARO RES	50.2	26.6	30.7
ARO Limb	0.0	0.0	0.0
ARO SPONT	2.4	2.9	2.8
Total			**33.6**

Summary of Respiratory Events

SpO2 awake average:	94%
Average SpO2 desaturation:	7%
% Sleep with SpO_2 < 89%	6 %
ODI (3%)	46.8/hr
ODI (4%)	34.6/hr
Mean Apnoea/Hypopnoea duration:	24 sec
Longest Hypopnoea	84 sec
Longest Apnoea	54 sec
Total AHI:	**49.7/hr**
Total RDI	**50.9/hr**

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	NREM			REM		
	Back	**Other**	**All**	**Back**	**Other**	**All**
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Total AHI:	**49.7/hr**
Total RDI	**50.9/hr**

When do we treat OSA?

Patient's concern

Disruptive snoring/affecting partner

Unrefreshing sleep/Sleepiness

Perceived health risk

Effect on driving

Clinician's concern

Patient's symptoms

Links with cardiovascular morbidity and effects on mental health

Safety (patient and society)

Continuous Positive Airway Pressure (CPAP)

Can “try before you buy”
“100%” effective

Long term adherence with CPAP is ~ 30-60%

Colin Sullivan – Aus CPAP inventor

Weaver et al. (2008) Proc Am Thorac Soc.

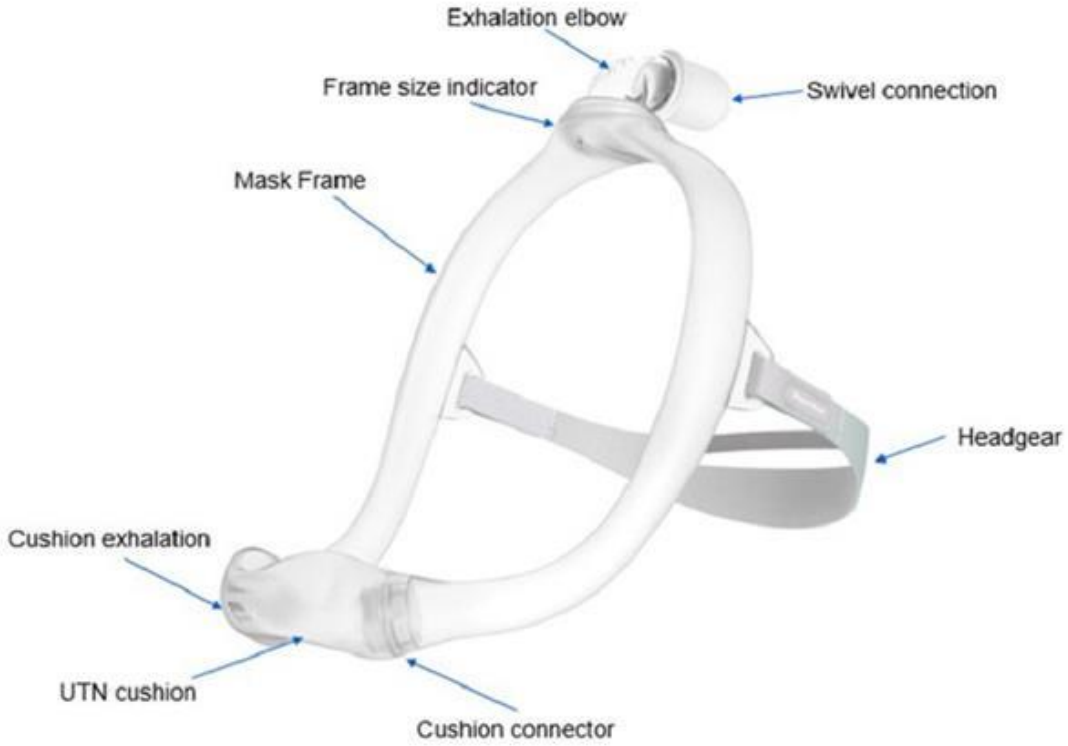
1980 Experiment

“Nasal” mask used

Sullivan, C. (2018) AJRCCM

Nasal CPAP masks have evolved

Nasal pillow



Nasal “cradle”

How do I know my patient is adherent and CPAP is working?

CPAP Aims:

1. Use ≥ 4 hours/day *[Better: any time patient is asleep]*
2. Residual AHI < 5 events/hour *[may be tailored to the patient]*
3. Any factors hindering patient adherence?

e.g. mask leak, claustrophobia, partner

How to start CPAP?

1) Automatic Positive Airway Pressure (APAP)

4 week trial

Range CPAP: 4 to 20 cm H2O

What is the 95th percentile CPAP?

- can use this information to determine “optimal”/ “fixed” CPAP pressure

2) CPAP titration sleep study

- in-laboratory polysomnography, to determine optimal CPAP pressure and CPAP mask

How to read a CPAP download?

Statistics

08/12/2020 - 13/05/2021 **Device: AirSense 10 Elite (S/N: 22201496091)**

Device Settings

Therapy Mode: **CPAP**	Set Pressure: **10.8 cmH2O**	EPR: **RAMP_ONLY**
EPR Level: **2.0 cmH2O**	EPR Enable: **ON**	EPR Patient Enable: **ON**
Ramp Enable: **AUTO**	Ramp Time: **20.0 minutes**	Essentials: **PLUS**

Leak - L/min

Median: **1.2**	95th Percentile: **49.2**	Maximum: **62.4**

Respiratory Indices - events/hr

Apnea index: **2.5**	Hypopnea index: **1.5**	AHI: **4.0**
Obstructive: **0.0**	Central: **1.7**	Unknown: **0.7**
% Time in CSR: **0.0**		

Total Usage

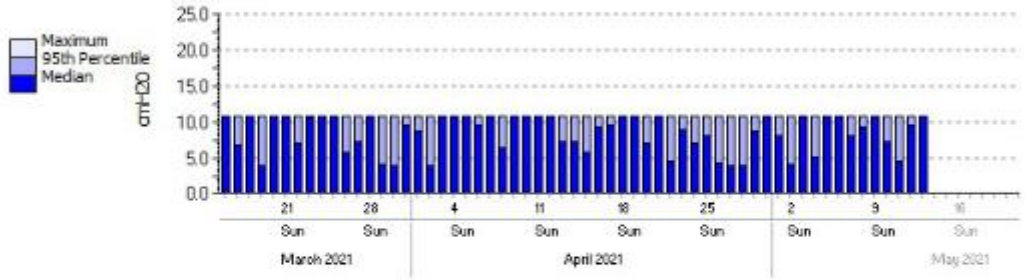
Used Days >= 4 hrs : **96**	Used Days < 4 hrs : **25**	% Used Days >= 4 hrs : **61**
Days not used: **36**	Total days: **157**	Total hours used: **729:52**
Median daily usage: **6:51**	Average daily usage: **4:38**	

Summary Graphs

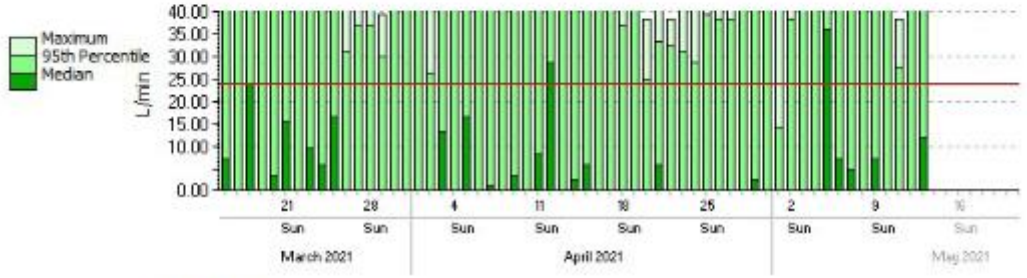
08/12/2020 - 13/05/2021

Device: AirSense 10 Elite (S/N: 22201496091)

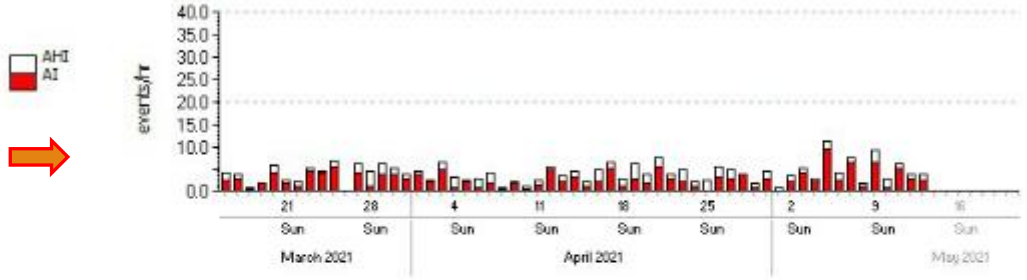
Pressure



Leak



AHI & AI



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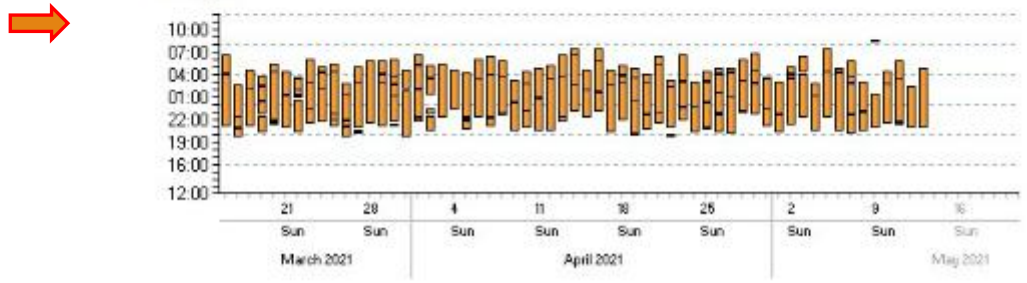


OSA pathophysiology – Why is it important?

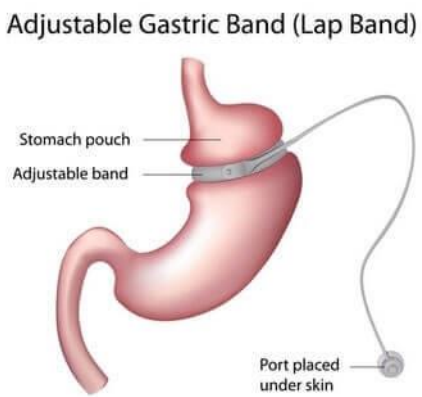
Continuous positive airway pressure (CPAP)

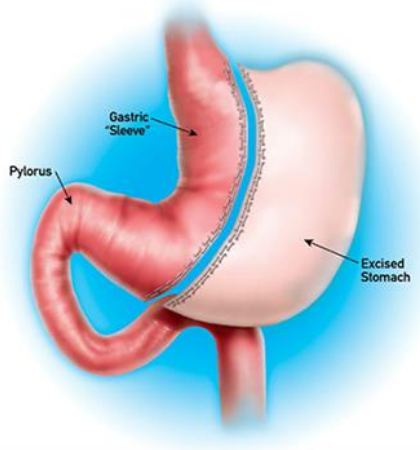
- Gold standard treatment

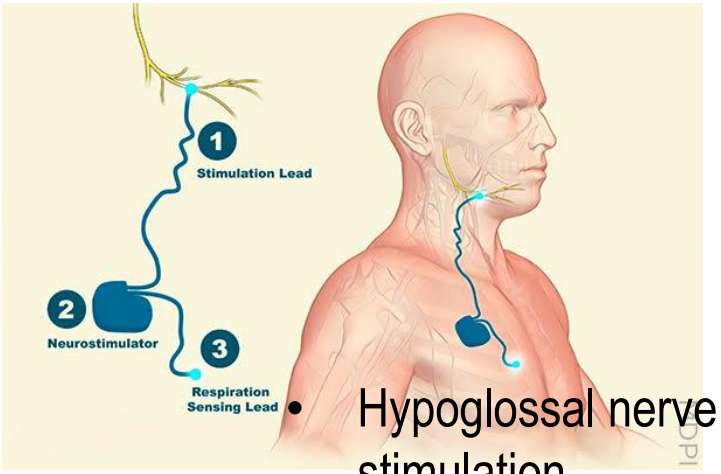
- 50% discontinue therapy beyond 3 months (Kribbs 1993)

We need other treatments!

Alternative OSA treatments

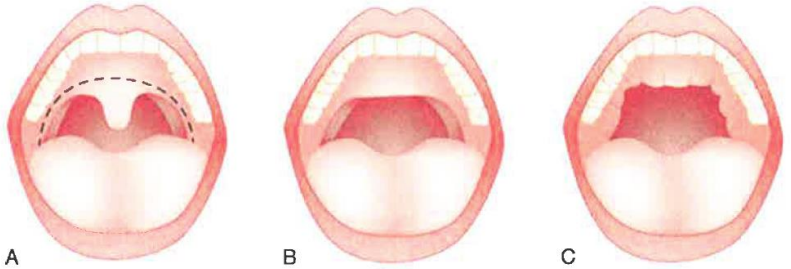






- Hypoglossal nerve stimulation

- Upper airway surgery



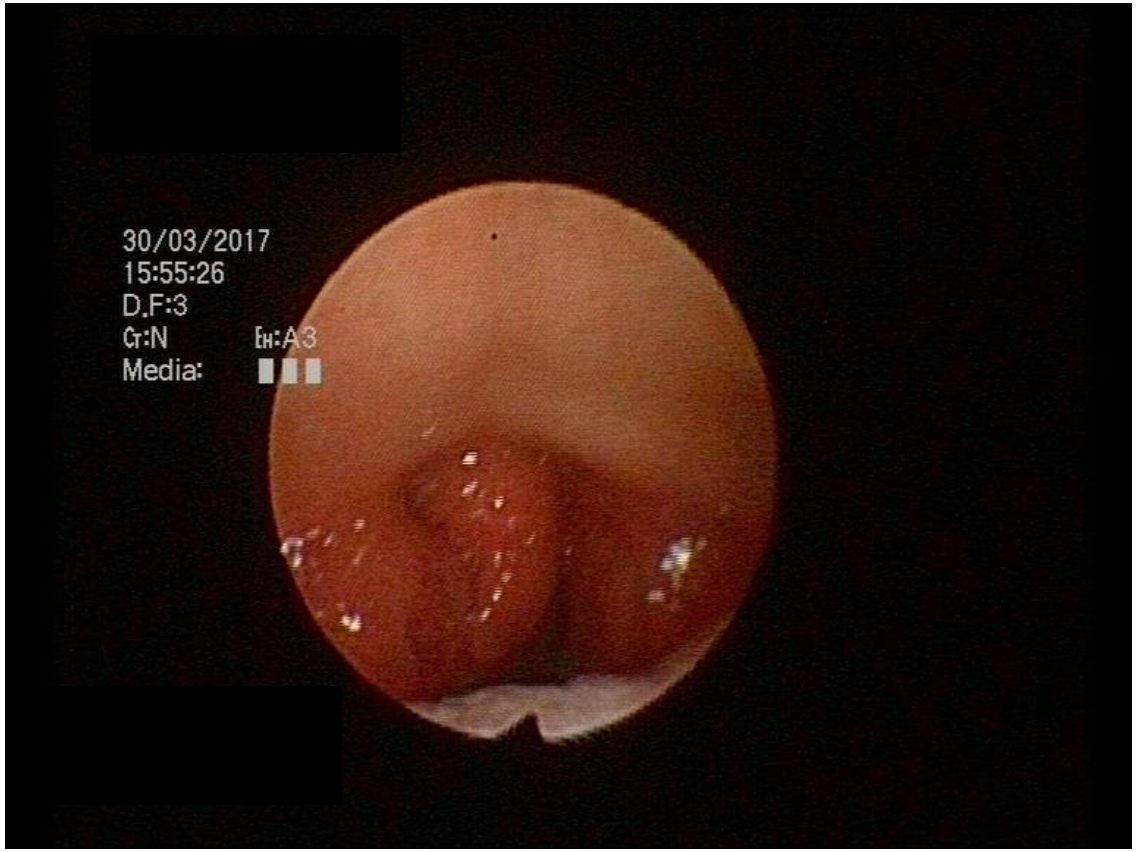
- "Drugs"*
  - Oxygen therapy and acetazolamide (to lower loop gain)
  - Sedatives (to raise the arousal threshold)
  - NRI and anticholinergics (to improve genioglossus muscle responsiveness)

* Edwards (2014); Wellman (2008); Carberry (2017); Taranto-Montemurro (2016, 2019)

Mandibular Advancement Device (MAD)

Mild to Moderate sleep apnoea
Recent report of success in severe OSA
Efficacy less certain than CPAP
Can cause teeth/jaw pain and teeth shift
No trial before buy

Tonsillectomy



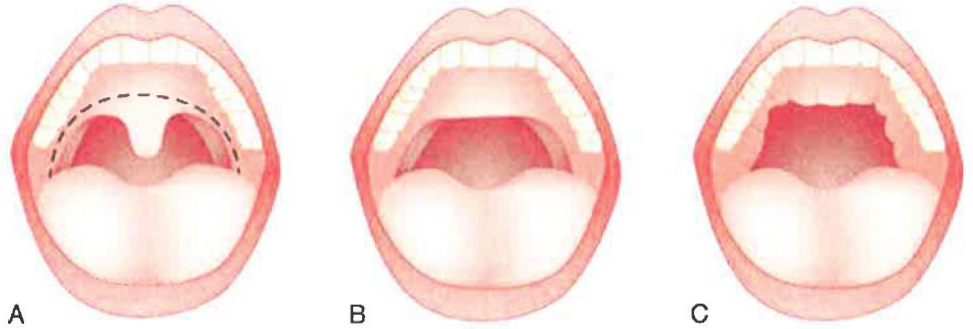


Figure 149-3 Classical uvulopalatopharyngoplasty technique. **A,** Redundant soft palate and pharyngeal pillar mucosa are outlined. **B,** Tonsils, pharyngeal pillar mucosa, uvula, and soft palate have been excised. The extent of soft palate excision is determined by placing traction on the uvula and noting the position of the mucosal crease. **C,** Mucosal flaps of the lateral pharyngeal wall and palatal muscle are advanced and closed with absorbable suture. (From Troell RJ, Strom CG. Surgical therapy for snoring. *Fed Pract* 1997;14:29–52.)

Patient with OSA on CPAP, but still sleepy!

1. Is CPAP working?

- Residual AHI

2. Is the patient compliant?

- Average daily use?

3. Sleep hygiene

- Is sleep restricted? Regular sleep and wake times?

4. Other contributors – e.g. Anxiety/depression; sedatives; metabolic disturbance; restless legs

May perform CPAP review sleep study +/- Multiple sleep latency test (MSLT)

- ?alternative diagnosis e.g. Narcolepsy or Idiopathic hypersomnia

- ?addition of Dexamfetamine and/or Armodafinil/Modafinil

Patient with severe OSA, but not compliant with OSA treatment, can they drive?

1. Confirm diagnosis and severity of OSA with polysomnography.

2. Assess why patient is unable to comply with OSA treatment.

- CPAP, MAD, weight loss

3. **Consider need for Maintenance Wakefulness Test (MWT).**

- assess level of alertness over 4-5 “40 minute” periods

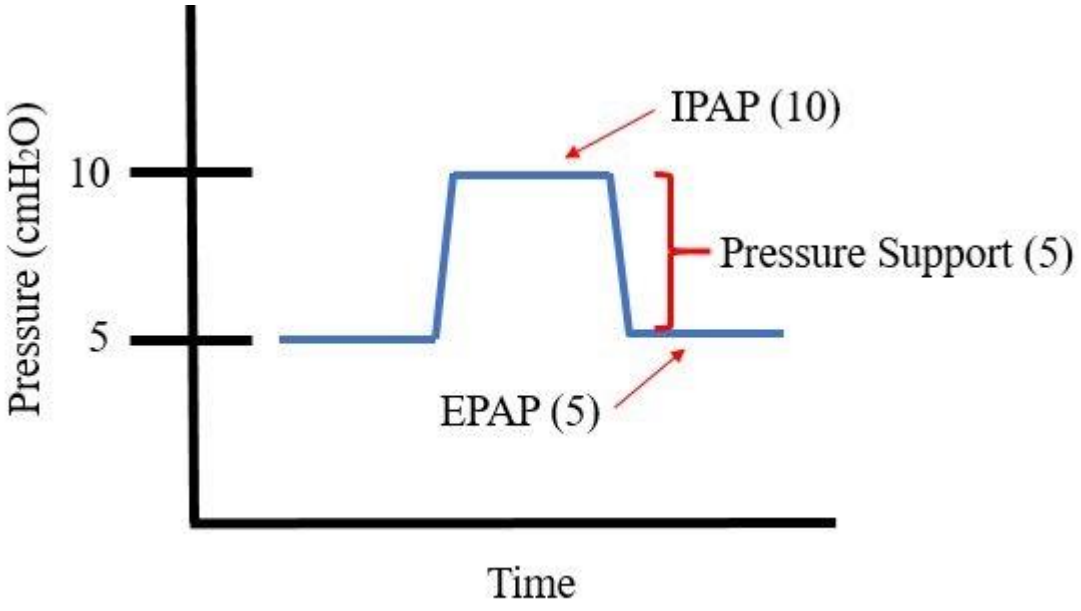
- this test may also be performed in patients with severe OSA on CPAP and wanting some objective measure of their ability to stay awake whilst stationary

- not currently available in Tasmania

CPAP? APAP? VPAP? BPAP? NIV?iVAPS?AVAPS?

	Continuous positive airway pressure (CPAP)	Bilevel positive airway pressure (BPAP) or non-invasive ventilation (NIV)
Auto-settings	APAP	iVAPS – target alveolar ventilation AVAPS – tidal volume
Conditions (e.g.)	OSA Obesity hypoventilation syndrome (mild-mod)	Conditions associated with type 2 respiratory failure (hypercapnia) /hypoventilation e.g. Neuromuscular conditions; COPD/emphysema; Obesity hypoventilation syndrome.

CPAP? APAP? VPAP? BPAP? NIV?iVAPS?AVAPS?



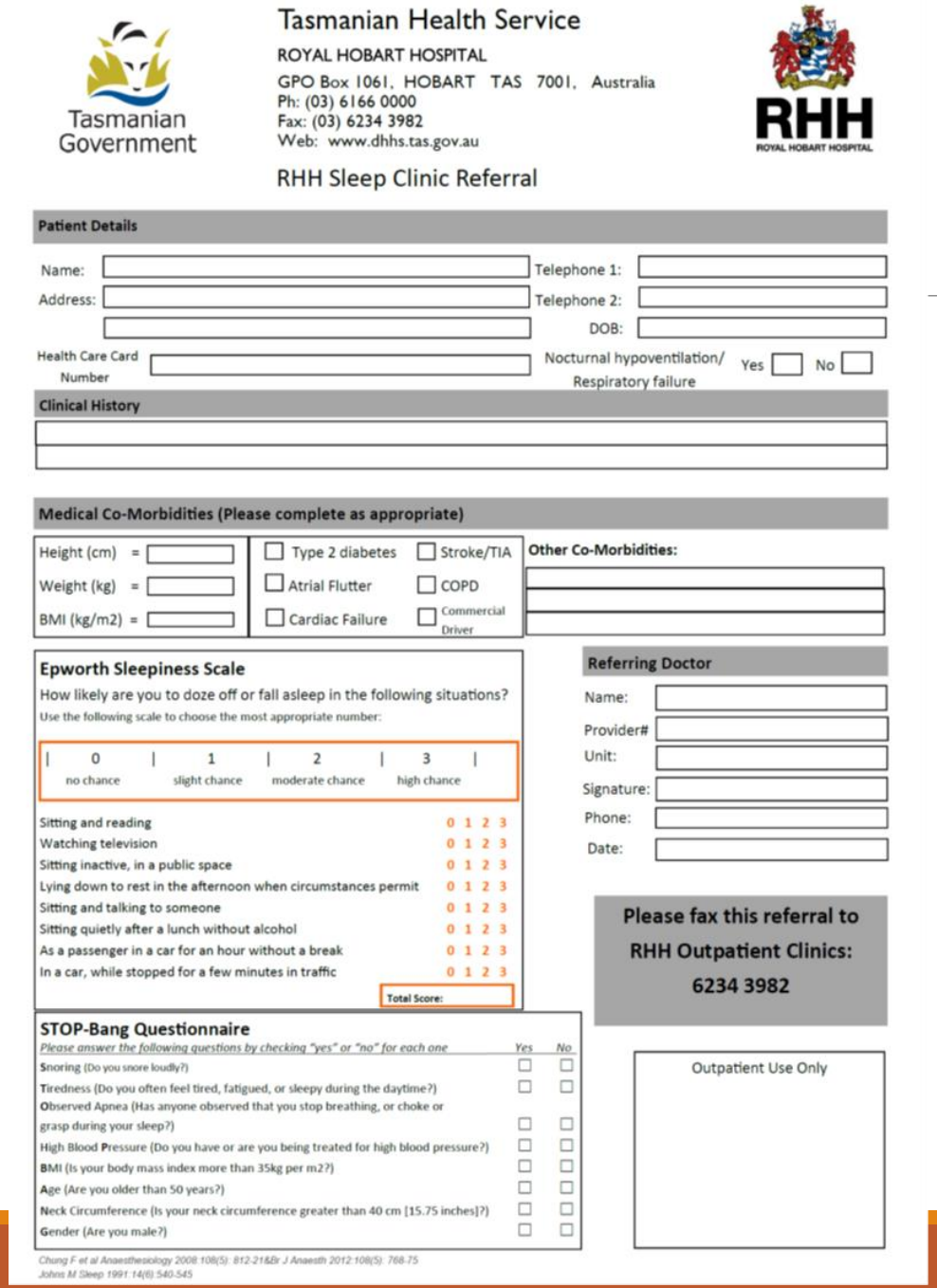
BPAP/NIV

EPAP + Pressure Support (PS) = IPAP

If you suspect respiratory failure:

- Arterial blood gas (ABG) [$PaCO_2$]

- is serum HCO3 elevated? (≥28 mmol/L)



Tasmanian Government

Tasmanian Health Service
ROYAL HOBART HOSPITAL
GPO Box 1061, HOBART TAS 7001, Australia
Ph: (03) 6166 0000
Fax: (03) 6234 3982
Web: www.dhhs.tas.gov.au

RHH
ROYAL HOBART HOSPITAL

RHH Sleep Clinic Referral

Patient Details

Name: | Telephone 1:
Address: | Telephone 2:
DOB:
Health Care Card Number | Nocturnal hypoventilation/ Respiratory failure: Yes ☐ No ☐

Clinical History

Medical Co-Morbidities (Please complete as appropriate)

Height (cm) =
Weight (kg) =
BMI (kg/m2) =

☐ Type 2 diabetes ☐ Stroke/TIA
☐ Atrial Flutter ☐ COPD
☐ Cardiac Failure ☐ Commercial Driver

Other Co-Morbidities:

Epworth Sleepiness Scale

How likely are you to doze off or fall asleep in the following situations?
Use the following scale to choose the most appropriate number:

0	1	2	3
no chance	slight chance	moderate chance	high chance

Sitting and reading	0 1 2 3
Watching television	0 1 2 3
Sitting inactive, in a public space	0 1 2 3
Lying down to rest in the afternoon when circumstances permit	0 1 2 3
Sitting and talking to someone	0 1 2 3
Sitting quietly after a lunch without alcohol	0 1 2 3
As a passenger in a car for an hour without a break	0 1 2 3
In a car, while stopped for a few minutes in traffic	0 1 2 3
Total Score:	

Referring Doctor

Name:
Provider#
Unit:
Signature:
Phone:
Date:

Please fax this referral to RHH Outpatient Clinics: 6234 3982

STOP-Bang Questionnaire

Please answer the following questions by checking "yes" or "no" for each one	Yes	No
Snoring (Do you snore loudly?)	☐	☐
Tiredness (Do you often feel tired, fatigued, or sleepy during the daytime?)	☐	☐
Observed Apnea (Has anyone observed that you stop breathing, or choke or grasp during your sleep?)	☐	☐
High **B**lood **P**ressure (Do you have or are you being treated for high blood pressure?)	☐	☐
BMI (Is your body mass index more than 35kg per m2?)	☐	☐
Age (Are you older than 50 years?)	☐	☐
Neck Circumference (Is your neck circumference greater than 40 cm [15.75 inches]?)	☐	☐
Gender (Are you male?)	☐	☐

Outpatient Use Only

Chung F et al Anaesthesiology 2008 108(5): 812-21&Br J Anaesth 2012 108(5): 768-75
Johns M Sleep 1991 14(6) 540-545

How to refer to RHH Sleep Clinic?

https://www.health.tas.gov.au/intranet/stho/medicine/respiratory_medicine

RHH Sleep Clinics

Monday afternoons

VPAP/CPAP supplier (current)

Health Dynamics [equipment]

Take home messages

1. What you give is what you get.

- Different sleep studies (pros and cons), how the AHI is measured and influenced.

2. CPAP works, if the patient can use it.

*positional therapy; *weight loss; ?mandibular advancement device (“buy before you try”).

3. Future directions: OSA pathophysiology, new non-CPAP therapies (?in combination) and prediction of OSA response to non-CPAP therapies.

Thank you and Questions

Ronald Grunstein

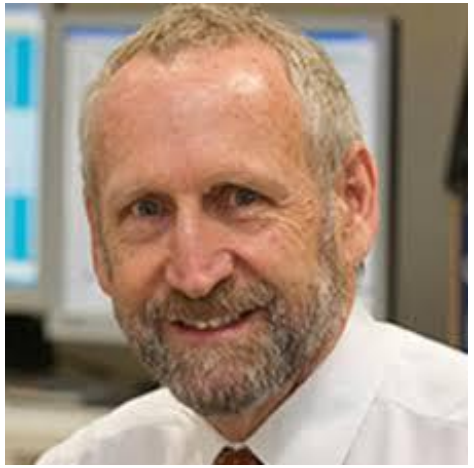
Sleep neurobiology,
Weight loss and OSA

David Hillman

Anaesthetist/Resp/Sleep
Perioperative OSA

Peter Cistulli

Oral appliance
therapy



Doug McEvoy

SAVE trial
NEJM 2016

Clare Anderson

Drowsy driving - biomarkers

Other key Australian researchers in Sleep Medicine – too many to list!