

Slide 1

2025
AFOS/SECO
**EDUCATION
DESTINATION**
San Antonio

Course # 109

Sleep Apnea Crash Course

Meghan Elkins, OD

Please Silence All Mobile Devices.

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Slide 2

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Meghan Elkins, OD

Disclosure statements:
No financial relationships to disclose

All relevant relationships have been mitigated.

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Slide 3

Sleep Apnea Crash Course

Meghan Elkins, OD, FAAO

Slide 4

Sleep Apnea Crash Course

Meghan Elkins, OD, FAAO

No Disclosures

Slide 5

1. 40% of men, 20% of women
2. Back of throat closes off cutting oxygen to the brain
3. Nocturnal hypotension compounds problems
4. NAION & NTG most common ocular sequelae
5. Floppy Eyelid Syndrome = ~100%
6. CPAPs & BiPAPs

Slide 6

Agenda

Introductory Topics
Pathophysiology
Treatment Comparisons
Untreated Ramifications
Final Considerations

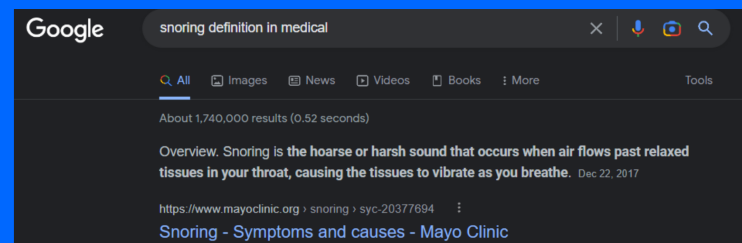
Slide 7

Sleep Apnea Basics

Snoring
Upper Airway Resistance Syndrome
Obstructive Sleep Apnea
Other Forms

Slide 8

Snoring



Snoring

- Pharyngeal soft tissue vibration
- Stats: 40% men, 20% women
- Audible snoring + AHI < 5 events / hour
 - Apnea: no breathing
 - Hypopnea: reduced breathing with reduced oxygen

AHI
=
Apnea-Hypopnea Index

Upper Airway Resistance Syndrome

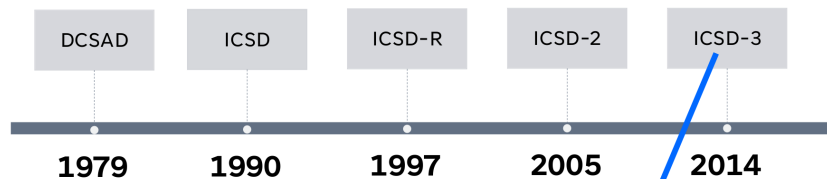
Currently described under OSA

- International Classification of Sleep Disorders 3
- “Not OSA” but has symptomology

Respiratory Effort-Related Arousals

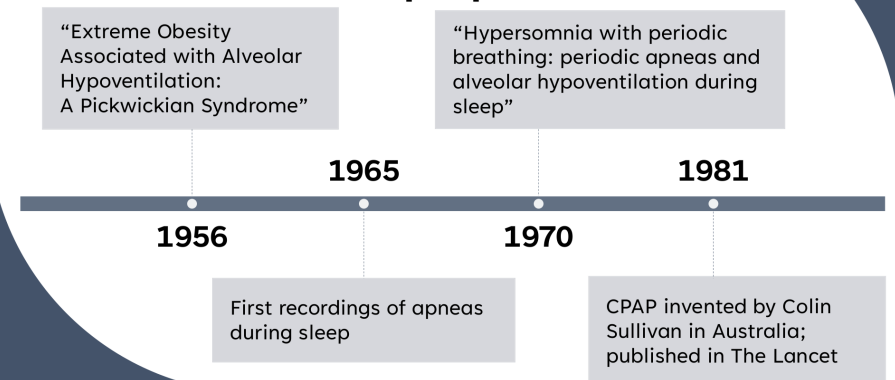
- >10 seconds
- Aroused from sleeping / sleep-state

Obstructive Sleep Apnea



2023: ICSD-3-TR
Removes comorbidities
from adult OSA dx

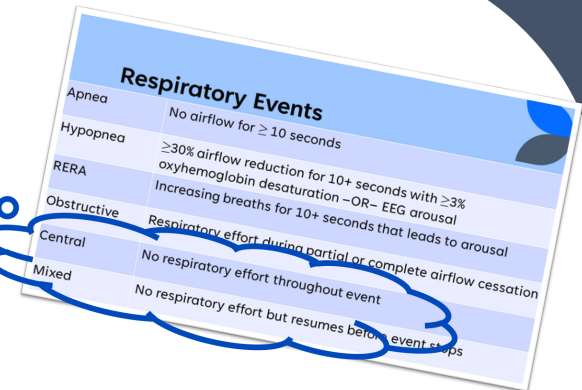
Obstructive Sleep Apnea



Obstructive Sleep Apnea

- Diagnosis requires:
 - Polysomnography
 - Home Sleep Apnea Test (HSAT)
- Respiratory or obstructive respiratory events:
 - 10+ seconds
 - 3-4% ↓ O₂ saturation
 - “Brief, unconscious arousal” *(usually)*

Other Forms



Apnea	No airflow for ≥ 10 seconds
Hypopnea	≥30% airflow reduction for 10+ seconds with ≥3% oxyhemoglobin desaturation –OR– EEG arousal
RERA	Increasing breaths for 10+ seconds that leads to arousal
Obstructive	Respiratory effort during partial or complete airflow cessation
Central	No respiratory effort throughout event
Mixed	No respiratory effort but resumes before event stops

Screening

Epworth Sleepiness Scale
 STOP-BANG Questionnaire
 Partner Reports

Epworth Sleepiness Scale

- 1990, Dr. Murray Johns
- Revised in 1997
- Second scale for children (not covered in this lecture)
- Cannot be used in people with physical or cognitive deficiencies
- Subject to copyright laws

Epworth Sleepiness Scale

Scale: 0 to 24
Self-reported

No chance of dozing	0
Slight chance of dozing	1
Moderate chance of dozing	2
High chance of dozing	3

As a passenger in a car for an hour or more without stopping for a break	☐	☐	☐	☐
Lying down to rest when circumstances permit	☐	☐	☐	☐
Sitting and talking to someone	☐	☐	☐	☐
Sitting quietly after a meal without alcohol	☐	☐	☐	☐
In a car, while stopped for a few minutes in traffic or at a light	☐	☐	☐	☐

Add up the numbers you selected for the eight situations to get your total score. A score of 10 or greater raises concern: you may need to get more sleep, improve your sleep practices, or seek

ESS Interpretation

How much daytime sleepiness does one have?

0-7	Unlikely to have abnormal sleepiness
8-9	Average amount of daytime sleepiness
10-15	Possible excessive sleepiness
16-24	Excessive sleepiness

Research

- Almost 10,000 articles on PubMed
- Gold standard?
- Limitations
- Does it capture OSA specifically?

Epworth Sleepiness Scale

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STOP-BANG QUESTIONNAIRE

- Perioperative adverse events ↑ with OSA
- Compared questionnaire score with AHI
- Moderate sensitivity in OSA identification with STOP score only
- Significantly increased sensitivity when BANG added to scoring

AHI
=
Apnea-Hypopnea Index



- Snoring
- Snoring



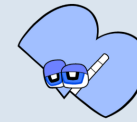
- Tiredness
- Tiredness During Daytime



- Observed
- Observed Apnea



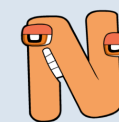
- Pressure
- High Blood Pressure



- BMI



- Age



- Neck Size



- Gender

Partner Reports

Different **patient**-reported and **partner**-reported answers on questionnaires!

1990 study: snoring may misclassify disorders in men d/t **bias by gender**

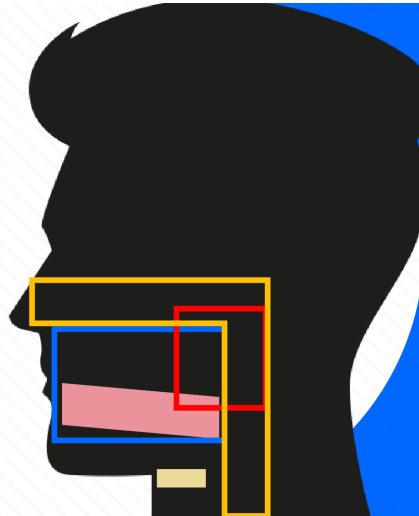
- *Men under-reporting self?*
- *Wives over-reporting husbands?*

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Pathophysiology

- Anatomy Review!
 - Mouth
 - Soft palate
 - Hyoid
 - Posterior airspace
 - Throat
- So what happens during obstructive events?



1. Narrow or collapsible upper airway
2. Low respiratory arousal threshold
3. Upper airway dilator muscles poorly responsive
4. Variable respiratory control

OSA Symptoms

- Excessive Daytime Somnolence (EDS) *Drowsiness!*
- “Waking yourself up” (usually while snoring)
- Others reporting:
 - Loud snoring
 - Stopping breathing
 - Both
- **Morning Headaches******

OSA Comorbidities

- | | |
|--------|-----------------------------|
| • HTN! | • Obesity |
| • CAD | • Neck configuration |
| • CVA | • Lung anatomical variation |
| • CHF | • Mood Disorder |
| • Afib | • Cognitive Dysfunction |
| • DM | |

3x ↑ fatal & nonfatal CVEs in men
without OSA & with CPAP-tx OSA

OSA Diagnosis

Symptoms + Comorbidities

≥5

obstructive respiratory events
per hour

Regardless of S + C

≥15

respiratory events
per hour

AHI

- Apnea: no breathing
- Hypopnea: reduced breathing with reduced oxygen

- Audible snoring + AHI < 5 events / hour

Everybody likes a
good table...

Respiratory Events

Apnea	No airflow for ≥ 10 seconds
Hypopnea	$\geq 30\%$ airflow reduction for 10+ seconds with $\geq 3\%$ oxyhemoglobin desaturation –OR– EEG arousal
RERA	Increasing breaths for 10+ seconds that leads to arousal
Obstructive	Respiratory effort during partial or complete airflow cessation
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Sleep Disorder Indices

Apnea Index	# per hour of total sleep time
Hypopnea Index	
Apnea-hypopnea Index	
Central Apnea Index	
Mixed Apnea Index	

Case Study:

- 39 yowf
- Snores *a lot*
- Tired *all the time*
- Often wakes with headache

Event	#
Apneas	11
Obstructive	10
Central/Mixed	1
Average Duration	18 sec
Hypopneas	52
Hypopneas 4%	8
Average Duration	37 sec

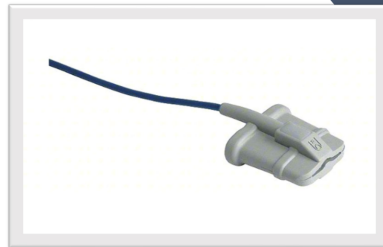
Index	#
Total Apnea	2.2
Total Hypopnea	10.4
Hypopnea 4%	1.6
REI 4%	3.2
AHI 4%	3.8
AHI 3% (RDI)	12.6

300
Total
Minutes

Events	#
Desaturations	8
Lowest Desaturation	81%
Time $\leq$ 88%	3 min

Case Study Results?

- Evidence of mild sleep apnea based on 3% criterion for hypopneas
- Suggest retest at facility
- Recommendation of PAP or device titrations
- ...but the patient didn't do the test correctly.



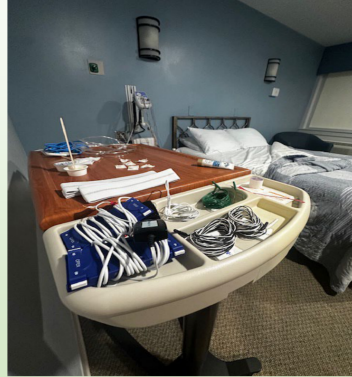
What are all those electrodes?

1. EEG
2. ECG
3. EOG
4. Submental EMG
5. Anterior Tibial EMG
6. Body Position Monitors
7. Chest Respiratory Effort
8. Thoracoabdominal Effort
9. Pulse Oximetry
10. Tracheal Microphone

Which ones are not measured at home?

How do these measurements directly relate to the pathophysiology of sleep apnea?

Update!



Update!



Other Dx Methods

- Nasopharyngoscopy & laryngoscopy
- Drug Induced Sleep Endoscopy (DISE)
- Cephalometric Radiograph (X-ray)
 - Inferior displacement of hyaloid
 - Smaller posterior airspace
 - Larger soft palates
- CT
- MRI

DISE

- Not a perfect simulation of sleep
- 50% change in surgical plan

Agenda

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Treatment

Lifestyle Changes

Oral Appliances

Airflow Devices

Surgery

hyoid

laser

neurostimulator

Lifestyle Changes

Weight Loss!

No smoking!

No alcohol before bed!

Medication adjustments—e.g. no benzodiazepines

Elevating bed with plywood or pillow wedge

No supine sleeping

Oral Appliances

- Less effective than CPAP
- Recommended for mild-moderate
- Recommended for CPAP intolerance

Airflow Devices

CPAP vs BiPAP vs APAP

- Continuous
- Bilevel
- Autoadjusting

Benefits

- Reduced AHI
- Less sleepiness
- Improved QOL
- Reduced CVE risk
- Reduced MVAs

Compliance!

Surgery

- Risky patient population
- Possible multiple procedures
- Worst case scenario: tracheotomy
- Nasal
- Palatal
- Hypopharyngeal
- Combo

Case Study

- ~60 YO WF
- Military Sexual Trauma
- Poor tolerance to CPAP mask
- Severe dry eye
- "Interested in the Inspire treatment and presents for a repeat diagnostic study."
- Told sleep medicine: doing well with BiPAP
- Told me: not doing well with BiPAP



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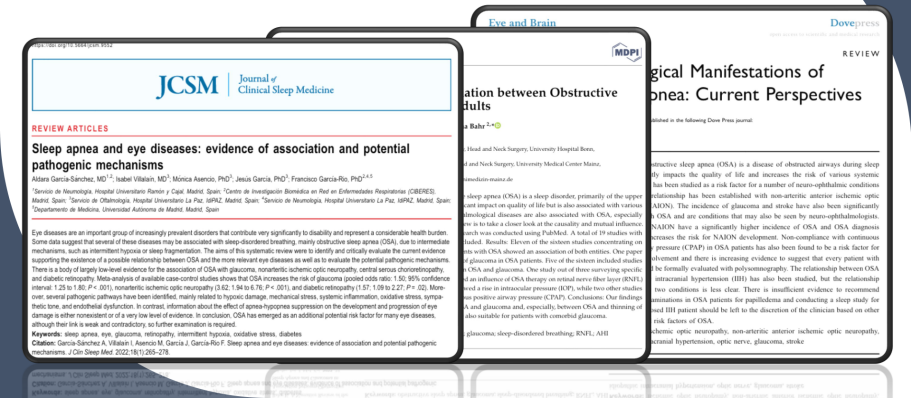
Associated Systemic Conditions

- Nocturnal hypoxia
- Ischemia
 - Chronic
 - Transient
- Hypertension vs Hypotension
- Metabolic Syndrome

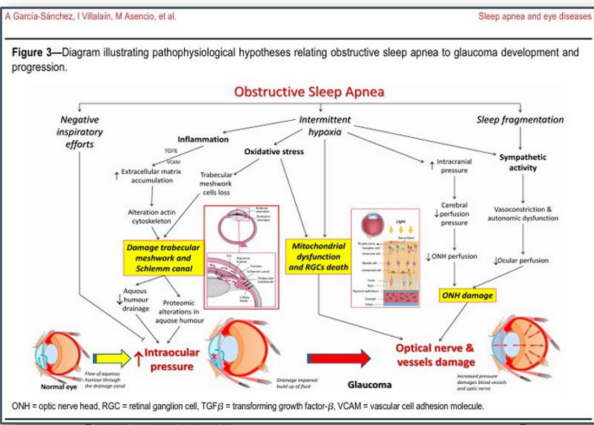
Associated Ocular Conditions

- NAION
 - Driven by hypotension
 - Pathway of ischemia in SPCAs providing blood flow to optic nerve head
- NTG
 - Transient hypoperfusion
 - Complicated by OPP and nocturnal hypotension

The Migraine Connection



The M



Agenda

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Where does sleep apnea belong?

- Pulmonary?
- Neurology?
- Cardiology?
- Primary Care?
- ENT?
- Optometry / Ophthalmology?

Who coordinates care?

- Do YOU order the sleep study yourself?
- At risk and noncompliant patients

Which patients are predisposed?

- Overweight
- Smokers
- Alcohol Use