

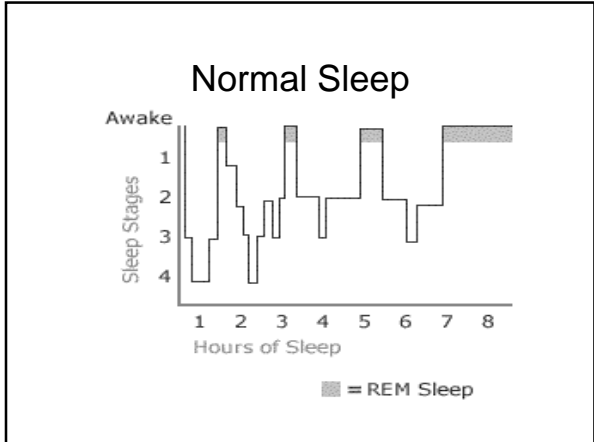
NRRCC
Sleep Apnea
April 28, 2009
Lisa Bolin, MD, FAASM

OUTLINE

- Normal sleep
- Obstructive Sleep Apnea
- Central Sleep Apnea
- Complex Sleep Apnea
- Treatment Options


Normal Sleep

- Comprised of different stages
- Stages N1 and N2 (light, non-REM sleep)
- Stage N3 (slow wave sleep, deep sleep)
- REM sleep (dream sleep)



HOW MUCH SLEEP DO YOU NEED?

- The amount that makes you feel rested.
- Adults (6-8 hrs)
- Teens (8-10 hrs)
- Children (8-9 hrs)
- Infants and Toddlers (9-14 hrs)



SLEEP FACTS

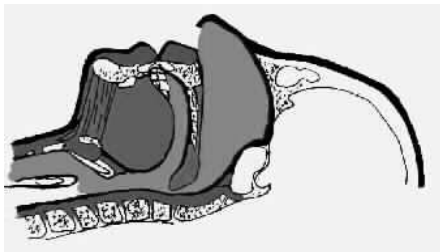
- 40 Million people have a sleep disorder
- 18 Million have obstructive sleep apnea
- Asleep at the wheel crashes are almost equal to alcohol related crashes
- Cost \$70 billion annually

Data provided by the National Sleep Foundation

Obstructive Sleep Apnea

- Most common form of sleep apnea
- Decreased muscle tone during sleep causes airway collapse
- Airway collapse causes increased work of breathing, which triggers an arousal
- Usually worse when supine or during REM sleep

OSA: Physiology



OSA: Incidence

- Men: 4-8%
- Women: 2-4%

Since many patients with sleep apnea go undiagnosed, these numbers are likely much higher in reality, with sleep apnea occurring in up to 25% of the United States population

**Obstructive Sleep Apnea:
Risk Factors**

- Male > Female (for now!)
- Post-menopause
- Overweight
- Family history

Symptoms of OSA

- Snoring
- Daytime sleepiness
- Frequent nocturnal waking/urination
- Morning headache
- Breath-holding spells
- Non-restorative sleep
- Heartburn
- Irritability or concentration problems
- Personality changes/depression

Diagnosis

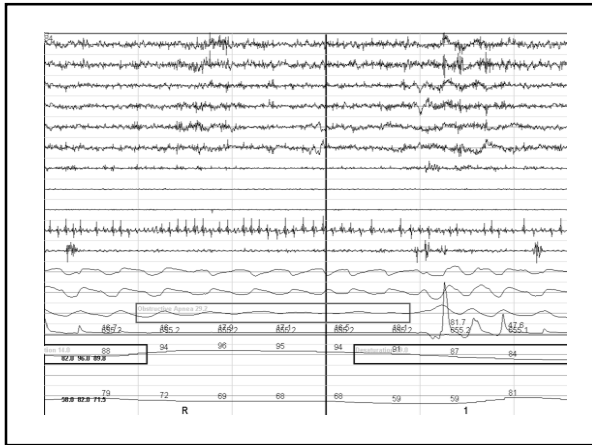
- Requires a polysomnogram (sleep study)
- Nocturnal oximetry can be normal even with significant apnea
- Mild
5-15 apneas/hr
- Moderate
15-30 apneas/hr
- Severe
> 30 apneas/hr

SLEEP STUDY

RECORD

- Brain waves (EEG)
- Eye movements
- Breathing
- Heart (ECG)
- Oxygen level
- Leg/arm movements (EMG)





Medical Problems Due to Untreated Obstructive Sleep Apnea

- Hypertension
- Congestive Heart Failure
- Stroke
- Daytime sleepiness
- Insomnia
- Mood disturbances
- ??Diabetes (OSA is associated with insulin resistance which can lead to diabetes)

Sleep apnea and HTN

- Normally, blood pressure drops at night
- Blood pressure in OSA remains high due to frequent waking, *not* due to low oxygen levels
- This leads to daytime high blood pressure

Sleep Apnea and Other Heart Problems

- If apneas are severe (frequent, prolonged, or associated with very low oxygen), this can lead to an abnormal heart rhythm at night
- Untreated sleep apnea can make atrial fibrillation harder to treat
- Untreated severe apnea increases risk of sudden cardiac death by 2.6 times

OSA in Hospitalized Patients

- Can lead to major complications if undiagnosed or untreated!

Case #1

- Obese 46 yr old man hospitalized for left total knee arthroplasty
- Hypoxia noted post-operatively, but this resolved by the time he left post-op recovery
- Due to the hypoxia, nocturnal oximetry was ordered

Case #1

- Patient had increasing pain of left knee, so a narcotic PCA with a basal rate was added at midnight
- Nurse found patient apneic, pulseless during a routine check of VS around 0300
- Review of nocturnal oximetry showed frequent, severe cyclic desaturations suggestive of OSA

Case #2

- 65 yr old man with known OSA
- Intubated x 7 days for pneumonia
- Did fairly well on PS trials, but still had moderate secretions
- Pt demanded extubation on day 7, but agreed to 2 additional days on ventilator

Case # 2

- On day 9, patient again indicates desire for extubation. He and family are counseled at length about consequences of early extubation, especially given his OSA
- Due to patient and family wishes, he is extubated in the afternoon
- He was placed on bi-level PAP overnight

Case # 2

- The next morning, he had worsening hypoxia
- CXR showed complete white-out of left lung, likely due to mucus plug
- Multiple attempts at intubation made by anesthesiologist, but unsuccessful
- Pt was difficult to mask-ventilate due to upper airway obstruction (44% O2 sats)

Case # 2

- Patient brought emergently to OR for tracheostomy
- He subsequently recovered, and trach was removed within the next few weeks
- He is on CPAP at home and is doing well

OSA in Hospitalized Patients

- Can lead to difficult intubations
- Narcotics can worsen OSA
- Benzodiazepines may worsen OSA
- General anesthesia can worsen OSA, making extubation more difficult post-operatively
- Many people are undiagnosed

Central Sleep Apnea

- Lack of effort to breathe
- Can be associated with stroke, congestive heart failure or idiopathic (primary)
- Can also be caused by high altitude, narcotics, and substance abuse
- Occurs in about 4% of the population
- Usually treated with bi-level PAP with back-up rate or with ASV

**Central Sleep Apnea:
Symptoms**

- Daytime sleepiness or fatigue
- Irritability
- Poor concentration
- Insomnia
- Frequent nighttime arousals

Central Sleep Apnea: Risk Factors

- Elderly
- Male
- Congestive heart failure
- Stroke

Complex Sleep Apnea

- Central apneas are seen when PAP applied to treat underlying obstructive sleep apnea
- ?Transient vs. true disorder
- Usually treated with Bi-level PAP or ASV

Treatments

<ul style="list-style-type: none">• OSA<ul style="list-style-type: none">– Tracheostomy– Surgery– Dental device– Pillar procedure– Weight loss– CPAP– Bi-level PAP	<ul style="list-style-type: none">• CSA<ul style="list-style-type: none">– Bi-level PAP– ASV
--	---

Tracheostomy

- First treatment for sleep apnea
- Very effective
- Still occasionally used for OSA if patient cannot tolerate PAP device

Surgery

- Uvulopalatopharyngoplasty (UPPP)
- Still only 40% effective
- Painful procedure
- Up to 50% of those successfully treated will snore again within 5 years after UPP
- Laser procedures less effective

Dental Devices

- For mild sleep apnea
- Advances mandible to help advance tongue and open posterior oropharynx
- About 70% effective for mild apnea
- Can cause jaw pain or clicking (TMJ)
- Can change bite

DENTAL DEVICES



Photos compliments of Jonathan Parker, DDS

Pillar Procedure

- Synthetic threads are injected into the soft palate to create scar tissue
- Helps stabilize the upper airway
- May not be covered by insurance
- Only for mild sleep apnea in patients without big tonsils or large tongue

Weight Loss

- Usually helps apnea, but may not resolve it
- Muscle is lost along with fat, so the airway can remain floppy
- Most successful are those who have gastric bypass surgery

CPAP

- Continuous Positive Airway Pressure
- Acts as an “air splint” for the throat
- One continuous pressure setting (therefore, does not help with ventilation)
- CPAP is the most effective therapy for OSA
- CPAP not usually helpful for central apnea

Auto-CPAP

- Self- adjusting CPAP
- Algorithm adjusts pressure based on airflow
- Used for OSA
- Has capability to show:
 - Compliance (hours of use)
 - Apnea index
 - Mask leak
 - Pressure

Auto-CPAP

- Generally gives lower pressures overall
- May be especially good in those with positional apnea
- Tolerated *at least* as well as traditional CPAP
- Can offer immediate therapy for inpatients with suspected apnea

Bi-level Positive Airway Pressure

- Used for more severe cases of OSA if high pressures are required or if there is intolerance to CPAP
- Used for medical disorders with hypoventilation (neuromuscular disorders, severe obesity)
- Used for central sleep apnea, but a back-up rate may be necessary

Auto Bi-level

- Self-adjusting bi-level PAP
- Both IPAP and EPAP adjust based on flow
- Used mainly for obstructive sleep apnea
- Likely not adequate to treat hypoventilation syndromes

Adaptive Servo-Ventilation ASV

- Used for central or complex sleep apnea
- Targets a consistent minute ventilation
- Algorithm adjusts airflow to maintain V_T
- Requires full face mask for accurate breath to breath analysis
- NOT for treating hypoventilation syndromes/neuromuscular disease

ASV

- Requires in-lab titration to set end-expiratory pressure (EEP)
- EEP is titrated to treat obstruction (starting EEP is usually 4 cm H₂O pressure)
- Maximum EEP is 10 cm H₂O pressure, so may not be effective in complex sleep apnea that requires high pressures to treat the obstructive component

What About Patient Tolerance?

- Education is a key piece to increasing patient tolerance/compliance to any PAP device
- Mask fit is very important. Many people try multiple masks before finding the right fit.
- Accurate pressure helps-it can be uncomfortable if pressure is too high or too low

Summary

- The best treatment for OSA is CPAP
- Central and complex sleep apnea are less common than obstructive sleep apnea, but may respond to various forms of positive airway pressure
- Screening nocturnal oximetry may be normal even with significant sleep apnea

Summary

- Obstructive sleep apnea may be present in up to 25% of the patients we treat in the hospital
- Obstructive sleep apnea can lead high blood pressure, heart failure, and stroke
- Obstructive sleep apnea can cause complications during hospital stay, including respiratory failure

Summary

- Auto-set machines may be helpful for high-risk hospitalized patients with previously undiagnosed sleep apnea (**but would need confirmatory sleep study after discharge*)
