HypnoLaus Study

- General population, Lausanne, Switzerland
- 2121 people, 48% men, median age 57
- Moderate to severe OSA (AHI >=15)
  - 49.7% of men
  - 23.4% of women
- Upper quartile associated with:
  - HTN, OR 1.6
  - DM, OR 2.0
  - Metabolic syndrome, OR 2.8
  - Depression, OR 1.9

Outline

- HypnoLaus study: OSA effect on mortality
- US Preventive Services Task Force recommendations for OSA screening
- SAVE Study
- AASM Clinical Practice Guidelines for Diagnostic Testing for OSA
- Who needs O2 with CPAP?
- Oronasal mask vs nasal mask
- Factors Contributing to Unintentional Leak
- Multidisciplinary Clinic for CPAP-Intolerance
- OSA in Non-Obese Patients

Figure 1. Kaplan-Meier survival curves across categories of the apnea–hypopnea index (AHI).

US Preventive Services Task Force (USPSTF)
Recommendations for screening asymptomatic primary care patients for OSA
Commissioned a systematic review
Conclusion:
“The current evidence is insufficient to assess the balance of benefits and harms of screening for OSA in asymptomatic adults”

OSA is highly prevalent and underdiagnosed especially in minorities
Hispanic Community Health Study
- 14,440 participants
- 25.8% prevalence of OSA
- Only 1.3% had been diagnosed with OSA

Community study of 2200 white, African American, Chinese and Hispanic individuals
Sleep study
- Moderate OSA in 34%
- Severe OSA in 15%
- Had been diagnosed in 7% of moderate group and 15% of severe group

Conclusion:
“The current evidence is insufficient to assess the balance of benefits and harms of screening for OSA in asymptomatic adults”
Rated evidence as insufficient because
- Absence of RCTs assessing effect of screening and of treatment on outcomes
- Suboptimal performance characteristics of existing screening instruments
- Concern over residual confounding in observational studies
SAVE Study
- Sleep Apnea Cardiovascular Endpoints study, secondary prevention trial
- McEvoy et al NEJM Sept 2016
- Designed to evaluate effectiveness of CPAP in reducing rate of CV events in pts with OSA
- Patients with untreated moderate to severe OSA, and coronary or cerebrovascular disease
  - Excluded patients with Epworth > 15
  - Excluded pts with O2 sat <80% for > 10 mins
  - Excluded pts with CSR
- Randomized to CPAP + usual care, or usual care without CPAP
- Required min CPAP usage 3 hrs on baseline run-in

Mean follow up 3.7 years
- No decrease in death from cardiovascular cause
- CPAP reduced snoring and daytime sleepiness, and improved health related QOL and mood
- Editorial recommends offering CPAP in symptomatic patients, patients with severe hypoxemia
- 42% used CPAP >/= 4 hrs/nt
- In pts who used CPAP >/= 4 hrs/nt found lower risk of stroke

Does CPAP Decrease CV Risk in OSA?
- Yu et al, JAMA 2017
- Meta-analysis of RCTs
- Found no significant association between PAP and major CV events, RR 0.77
- Problems with study:
  - Included pts with central sleep apnea
  - Mean PAP adherence 1.4-6.76 hrs/night
  - RR 0.77 comparable to benefit of statins, beta blockers or antiplatelet agents in reducing vascular events

Bottom Line: Does CPAP Lower Risk of Cardiovascular Disease?
- Clear association of OSA and cardiovascular disease
- No RCTs showing use of CPAP lowers this risk
- Non-RCTs show benefit
- CPAP has beneficial effect in HTN
- Problems with RCTs to date
  - Low CPAP compliance
  - Studies selected less symptomatic patients
  - Better, larger RCTs needed
**Treatment of OSA**

- Treat patients with AHI ≥ 15
- Treat patients with AHI 5-15
  - Symptomatic
  - Significant comorbidity

**AASM Clinical Practice Guideline for Diagnostic Testing for Adult OSA**

- 2017
- 6 recommendations

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**AASM Clinical Practice Guideline 2017**

1. Recommend clinical tools, questionnaires and prediction algorithms not be used to diagnose OSA in adults in the absence of polysomnogram or home sleep test
2. Recommend that PSG or HST with a technically adequate device be used for the dx of OSA in uncomplicated adult pts presenting with signs and symptoms that indicate an increased risk of moderate to severe OSA

**AASM Practice Guideline 2017**

- Uncomplicated patient defined by absence of:
  - Conditions that increase risk of non-obstructive sleep disordered breathing (Central sleep apnea, Sleep related hypoventilation, Sleep related hypoxemia)
  - Concern for significant non-respiratory sleep disorder that requires evaluation, or that interfere with accuracy of HSAT
  - Environmental or personal factors that preclude adequate acquisition and interpretation of data from HSAT
Increased risk of moderate to severe OSA indicated by present of excessive daytime sleepiness and at least 2 of the following 3 criteria:
- Habitual loud snoring
- Witnessed apneas or gasping or choking
- Diagnosed hypertension

3. Recommend if a single home test is negative, inconclusive, or technically inadequate, PSG be performed for the diagnosis of OSA
4. PSG rather than HST be used for diagnosis of OSA in patients with significant cardiorespiratory disease, potential respiratory muscle weakness due to a neuromuscular condition, awake hypoventilation or suspicion of sleep related hypoventilation, chronic opioid medication use, history of stroke, or severe insomnia

5. Suggest that if clinically appropriate a split-night diagnostic protocol, rather than a full-night diagnostic protocol for PSG be used for the diagnosis of OSA
6. Suggest that when initial PSG is negative and clinical suspicion for OSA remains, a 2nd PSG be considered for the diagnosis of OSA

Moderate to severe OSA observed during a minimum of 2 hours of recording time during the diagnostic PSG, AND
At least 3 hours available for CPAP titration
Shetty et al JCSM 2017

- Home study followed by autoPAP increasingly being used for dx and treatment of OSA
- Doesn’t evaluate for persistent O2 desaturation on CPAP
- Looked at 200 patients who had in-lab study
  - 50 required O2 + PAP
  - 150 required PAP alone

Oronasal Mask May Lead to More Upper Airway Obstruction and High CPAP Requirements

- Ng et al, JCSM 2016
  - 4 cases with OSA
  - Oronasal mask caused upper airway obstruction, improved with nasal mask
- Deshpande et al JCSM 2016
  - Retrospective study 358 titrations
  - Oronasal masks assoc with higher CPAP pressure and higher residual AHI
**Oronasal Mask May Lead to More Upper Airway Obstruction and High CPAP Pressure**

- Editorial: “we suggest that nasal masks or nasal pillows should be strongly considered over oronasal masks in OSA pts unless there is a clear indication otherwise”

**Oronasal Mask May Lead to Upper Airway Obstruction and Higher CPAP Pressure**

- Ebben et al, Sleep and Breathing 2016
- MRI done at CPAP 5, 10, 15 cm H2O using nasal and oronasal masks
- Found nasal mask more effective at opening the retropalatal airway

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**Andrade: Acute Change in CPAP Flow, Chest 2016**

**Andrade: Acute Change in CPAP Flow in Sleep Apnea**

- Nasal route
- Oronasal route
- Oral route
Unintentional leak associated with lower CPAP adherence

Oronasal masks associated with higher leak than nasal masks and nasal pillows

AutoPAP lowers mean CPAP pressure but does not decrease leak

C-flex/EPR does not decrease leak

Humidification does not decrease leak

Chin strap lowers mouth leak in majority of pts

Increased nasal resistance contributes to leak

Leak twice as high in older pts (>70 yrs old) c/w younger pts (<40 yrs old)
  - Loss of teeth
  - Change in skin elasticity
  - Decrease in subcutaneous fat

BMI associated with unintentional leak
Effects of CPAP on Body Weight in Patients with OSA

- Drager et al, meta-analysis
- RCTs, 3181 patients
- CPAP promotes weight gain
- Effect is small, avg .5 kg
- Hypothesize CPAP lowers energy expenditure during sleep; or hypoxia may suppress appetite

Multidisciplinary Alternatives to CPAP Program for CPAP-Intolerant Patients

- Shelgikar et al, JCSM 2017
- At University of Michigan
- For patients unable or unwilling to use CPAP
- Evaluation by:
  - Sleep Medicine – barriers to CPAP
  - Dental sleep medicine specialist – suitability for oral appliance
  - Oral and Maxillofacial Surgery-radiographic eval of airway. Genioglossus advancement, MMA
  - Otolaryngology-adjunctive, salvage or curative surgery
- Multidisciplinary conference

Multidisciplinary Alternatives to CPAP Program, Shelgikar et al JCSM 2017

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<th>Year</th>
<th>Number of Patients</th>
<th>Continuous CPAP</th>
<th>Oral Appliance</th>
<th>Robotic maxillofacial surgery</th>
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<th>Rhinoplasty</th>
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Results from first 20 consecutive implanted patients:

- Average AHI reduction from 33 to 5
  - 70% with AHI <5, 85% with AHI < 10, and 95% with AHI < 15
- Average ESS improvement from 10 to 6
- Average use of 7 hours/night
  - After mean follow-up of 230 days

UPMC Single-Center Experience Study

- Charts adapted from Kent et al.

![Graph showing AHI and ESS improvements](attachment:image.png)
**OSA in Non-Obese Patients**

- Grey et al JCSM 2017
- 25% of patients referred to academic sleep clinic had normal BMI
- No difference in severity of OSA c/w obese pts
- CPAP compliance lower in nonobese group
- Respiratory arousal threshold lower in nonobese group

**OSA in Non-Obese Patients, Grey et al**

- **ANATOMICAL FACTORS**
  - OBESITY
  - SMALL CRANIOFACIAL STRUCTURES
- **NONANATOMICAL FACTORS**
  - LOW RESPIRATORY AROUSAL THRESHOLD
  - UNSTABLE VENTILATORY CONTROL – HIGH LOOP GAIN
  - INEFFECTIVE UPPER AIRWAY DILATOR MUSCLES DURING SLEEP

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**Obstructive Sleep Apnea: Pearls**

- The prevalence of moderate and severe OSA is high
- Moderate and severe OSA is associated with increased cardiovascular risk
- Good CPAP compliance may decrease risk of developing type 2 Diabetes
- Insufficient data at present to recommend screening asymptomatic pts for OSA
- RCTs to date do not show CPAP improves cardiovascular risk in OSA

**OSA 2017: Pearls**

- Home studies useful for diagnosing OSA in uncomplicated pts with signs and symptoms indicating increased risk for moderate to severe OSA
- Oronasal masks can lead to more airway obstruction and higher CPAP pressure
- Newer positional therapy devices better tolerated and provide compliance data
- Non-obese pts with OSA have lower CPAP tolerance
**OSA 2017: Pearls**

- Newer focus on identifying which anatomic and nonanatomic factors contribute to OSA in individual patients