Obstructive Sleep Apnea in the Elderly

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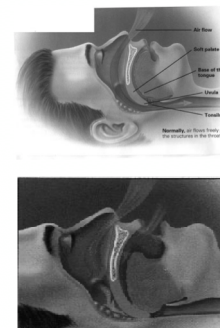
Director, Comprehensive Sleep Disorders Clinic UPMC Presbyterian
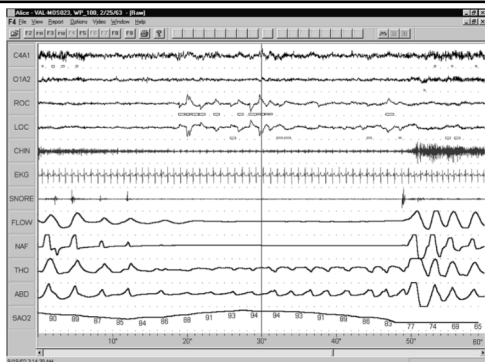

Obstructive sleep apnea

Syndrome characterized by repetitive episodes of partial or complete upper airway obstruction during sleep, associated with snoring, sleep fragmentation, and intermittent hypoxemia.


Obstructive apnea

Definitions

- Apnea: No airflow for 10 seconds or longer.

- Hypopnea: A decrement in airflow lasting longer than 10 seconds. Commonly requires a fall in oxygen saturation and/or arousal.

- Apnea Hypopnea Index (AHI): Total number of apneas and hypopneas divided by hours asleep
  - AHI < 5   normal
  - AHI   5-15 mild OSA
 - AHI 15-30 moderate OSA
  - AHI > 30   severe OSA

OSA is extremely common in older adults

2911 men over age 65 living at home
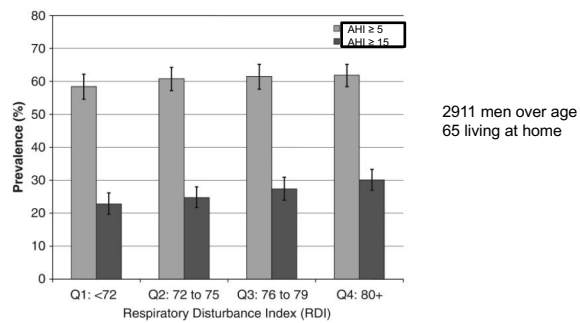
Mehra R et al, J Am Geriatr Soc 2007; 55:1356-64

OSA risk factors in older adults

- Increasing age
- Obesity (importance wanes with age)
- Male gender (less important after menopause)
- Excess soft tissue in airway (Mallampati score)
- Retrognathia
- Alcohol use

Obesity-OSA association wanes with age

Odds Ratio for Moderate to Severe OSA for each 5.3 kg/m² BMI increase

N=5615
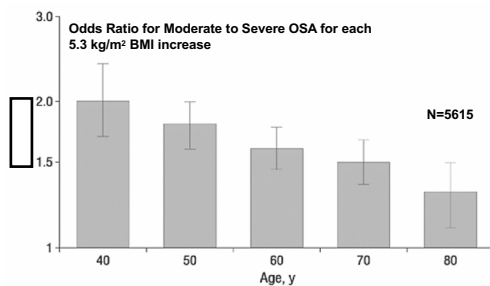
Young T et al, Arch Int Med 2002; 162:893-900

OSA signs and symptoms

- Loud snoring (less prevalent in older age)
- Witnessed apnea, choking/gasping arousals
- Daytime sleepiness, fatigue, poor concentration
- Nocturnal awakenings, nocturia
- Depressed mood
- Hypertension, diabetes, cardiovascular disease

OSA and sleepiness

Sleepiness (mean Epworth Score) vs AHI (events per hour): <5, 5 - <15, 15 - <30, ≥30
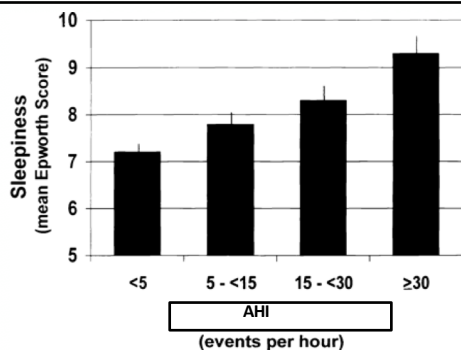
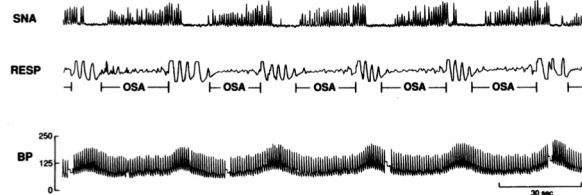Gottlieb DJ et al, AJRCCM 1999; 159:502-7

OSA severity predicts progression in Alzheimer's biomarkers

208 cognitively normal people aged 55-90 followed for 2 years with measures of CSF amyloid β and Pittsburgh compound B on PET scan.
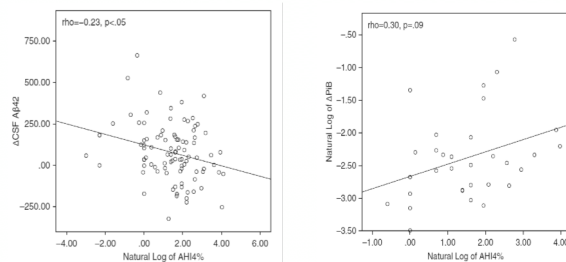
Sharma R et al, AJRCCM 2018; 197:933-43

OSA and sympathetic neural activity

Somers VK et al, JCI 1995; 96:1897-904

Effect of OSA on mortality

Apnea-hypopnea index (events /hr)
< 5.0
5.0 - 14.9
15.0 - 29.9
≥ 30.0

Adjusted analyses:

Mild OSA: HR 0.93
                (0.80-1.08)

Moderate OSA: HR 1.17
                (0.97-1.42)

Severe OSA: HR 1.46
                (1.14-1.85)

Adjusted for age, sex, race, BMI, smoking, SBP, DBP, HTN, DM, CVD
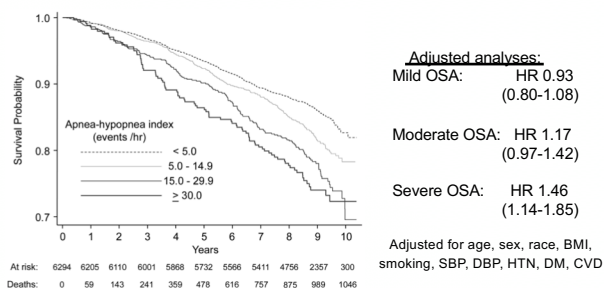
Punjabi NM et al, PLoS Med 2009; 6:e1000132

PCP screening for OSA

- Study of 5 Practice Based Research Networks across the country.
- 23% of PCPs routinely screen for OSA – all using review of systems.
- Prevalence of OSA diagnosis was 8.9%

Patients without OSA diagnosis	Age 30-64 (n=1124)	Age ≥ 65 (n=630)
Loud snoring	57%	46%
Daytime tiredness	65%	49%
Falling asleep driving	17%	10%
Discussed symptoms with PCP	22%	18%

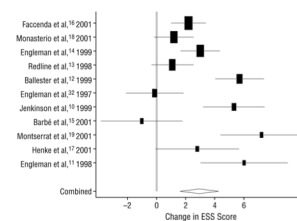**Mold JW et al, JABFM 2011; 24:138-45**

Reasons to treat OSA

- **Proven reasons:**
  - Improve symptoms (snoring, sleepiness, vitality, nighttime awakenings)

- **Theoretical reasons:**
  - Reduce CVD risk (stroke, heart failure, CAD, Afib, DM, mortality)
  - Reduce risk of cognitive decline/dementia

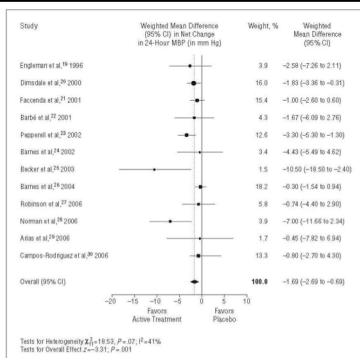## Continuous Positive Airway Pressure

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CPAP improves sleepiness

Mean improvement in Epworth score of 2.9.

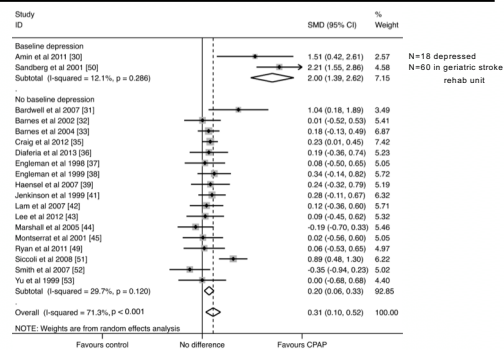**Patel SR et al, Arch Int Med 2003; 163:565-71**

CPAP lowers blood pressure

Mean improvement in 24-hour blood pressure of about 2 mm Hg

Haentjens P et al, Arch Int Med 2007; 167:757-64

CPAP and Depression

N=18 depressed
N=60 in geriatric stroke rehab unit

Povitz M et al, PLoS Med 2014; 11:e1001762

CPAP and Cognition

- 6-month RCT of 1,105 OSA patients to CPAP or sham.

- Mean AHI 40

- Significant improvement in sleepiness.

- No improvement in attention, psychomotor function, learning, memory, executive function or frontal lobe function.

Kushida CA et al, Sleep 2012; 35: 1593-602

CPAP and CV events - RCT

- RCT of 2,717 non-sleepy OSA and CVD patients randomized to CPAP or usual care for 3.7 years
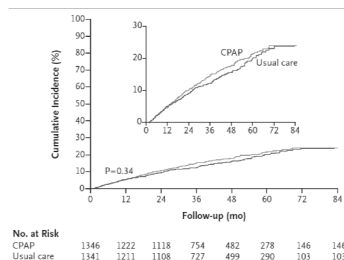
No effect on CVD endpoints

CPAP adherence 3.3 hours/night

McEvoy RD et al, NEJM 2016; 375: 919-31

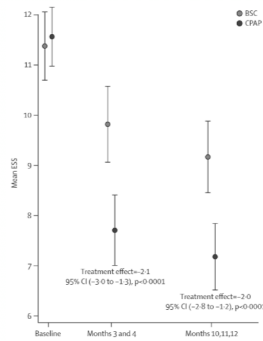## CPAP in older adults

RCT of 278 adults > 65 with newly diagnosed OSA in the UK

Significant improvement in self-reported and objective measures of sleepiness, sleep-related QOL, vitality, and mobility.

No improvement in cognition, BP, or cardiovascular events.

McMillan A et al, Lancet Respir Med 2014; 2:804-12

How to diagnose and initiate OSA treatment?

Traditional OSA care delivery model

Possible OSA → Sleep Study → CPAP Titration → Initiate CPAP
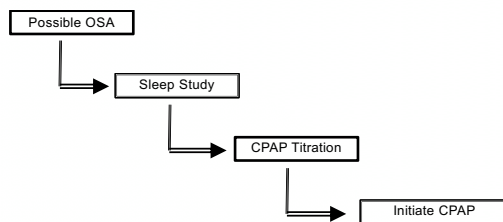
Shortfalls of traditional pathway

- Limited by number of sleep beds and techs.
  - Long waiting times

- Inconvenient to many patients.
  - Those with caregiver responsibilities
  - Those with transportation issues at night
  - Those uncomfortable with sleeping in front of strangers

Laboratory vs. home sleep testing
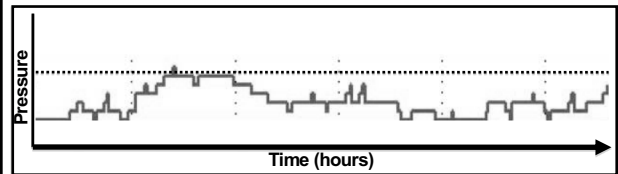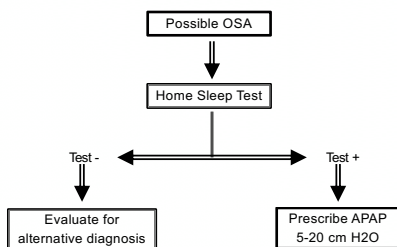

Auto-titrating CPAP (APAP)

- Devices measure flow and/or impedance and adjust pressure up and down within a prescribed range to provide the minimum pressure required.

Home sleep testing pathway

```
                    Possible OSA
                         │
                    Home Sleep Test
                    │           │
          Test -    ◄───────►    Test +
              │                     │
     Evaluate for          Prescribe APAP
  alternative diagnosis     5-20 cm H2O
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- Increases access and reduces burden.
- Makes OSA diagnosis and treatment easier for the non-specialist.

RCTs of lab versus home strategies

Impact at 90 days on usage, sleepiness, and quality of life outcomes

Study	N	CPAP Usage		Δ Epworth		Δ Quality of Life		
		Lab	Home	Lab	Home	Lab	Home	Test
Mulgrew	68	5.4 hrs	6.0 hrs	-10.0	-8.0	2.2	1.9	SAQLI
Kuna	296	2.9 hrs	3.5 hrs	-2.9	-2.6	1.8	1.8	FOSQ
Rosen	373	3.7 hrs	4.7 hrs	-7.4	-7.0	0.7 / 3.6	0.9 / 3.1	SAQLI / FOSQ
Hui	172	3.1 hrs	3.6 hrs	-2.2	-3.5	-0.1	0.2	SAQLI
Corral	430	5.3 hrs	5.1 hrs	-4.9	-4.2	6.5	6.7	FOSQ

Two shorter term trials also found no benefit of lab versus home-based evaluation and treatment.

Mulgrew AT et al, Ann Intern Med 2007; Berry RB et al, Sleep 2008; Skomro RP et al, Chest 2010; Kuna ST et al, Amer J Respir Crit Care Med 2011; Rosen CL et al, Sleep 2012; Hui D et al, Sci Reports 2017; Corral J et al, Amer J Respir Crit Care Med 2017

Cost effectiveness of home testing

- CPAP acceptance:
  - 87% in lab vs. 84% in home

- Patient preference:
  - 76% home testing vs. 24% lab testing

- Costs per patient:
  - $1001 in lab vs. $744 in home
  - €736 in lab vs. €320 in home

- No difference in traffic accidents, hospitalizations, or CV events.

Skomro RP et al, Chest 2010; 138:257-63; Rosen CL et al, Sleep 2012; 35:757-67; Corral J et al, AJRCCM 2017; 196:1181-90

Study limitations

- All studies exclude those at high risk for alternative forms of sleep-disordered breathing (CHF, COPD, opiate use, etc).

- Role of home testing in these patients remains unclear.

What if CPAP is not tolerated?

Oxygen does not improve sleep quality
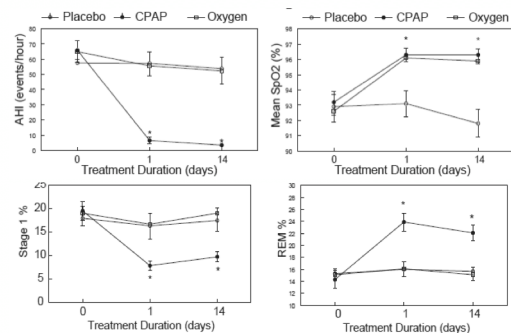
Loredo J et al, Sleep 2006; 29: 564-71

Oxygen vs. CPAP vs. no treatment

- Randomized trial of 281 patients found no effect of oxygen on BP or other cardiovascular measures.

Variable	CPAP (N=90)	NSO (N=94)	HLSE (N=97)	CPAP vs. HLSE	NSO vs. HLSE	CPAP vs. NSO
Table 2. Effect of Treatment on 24-Hour Blood Pressure.						
24-Hr mean arterial blood pressure						
Baseline	89.5±8.6	88.6±10.0	87.7±9.3			
12 Wk	87.8±8.1	90.2±11.1	89.0±11.2	−2.4 (P=0.04)	0.4 (P=0.71)	−2.8 (P=0.02)
24-Hr mean systolic blood pressure						
Baseline	124.7±13.5	125.3±16.9	123.6±14.3			
12 Wk	123.4±12.8	126.9±16.5	124.7±16.4	−1.9 (P=0.25)	1.2 (P=0.45)	−3.1 (P=0.06)
24-Hr mean diastolic blood pressure						
Baseline	72.0±7.7	70.8±8.3	69.6±8.6			
12 Wk	69.8±7.5	71.7±9.8	70.9±10.1	−2.8 (P=0.005)	−0.1 (P=0.95)	−2.8 (P=0.006)

Gottlieb DJ et al, NEJM 2014; 370:2276-85

Mandibular advancement devices

- Pull mandible forward resulting in dilation of the upper airway
- ~55% success rate in normalizing AHI
- More preferable than CPAP to patients
- Adherence is greater than CPAP

RCT of CPAP vs. MAD

- Randomized 126 patients in cross-over fashion to CPAP vs. MAD

- Residual AHI better with CPAP (4.5 vs. 11.1)
- Adherence better with MAD (6.5 h vs. 5.2 h)

- Similar effect on Epworth (7.5 CPAP vs. 7.2 MAD)
- Quality of life better with MAD

Phillips CL et al, AJRCCM 2013; 187: 879-87

MAD Details

- Prerequisites
  - Teeth (at least 4 teeth per quadrant)
  - Ability to move mandible forward
  - Better outcomes with sleep specialist dentists

- Side Effects
  - TMJ pain
  - Tooth pain/movement

OSA care pathway in 2020
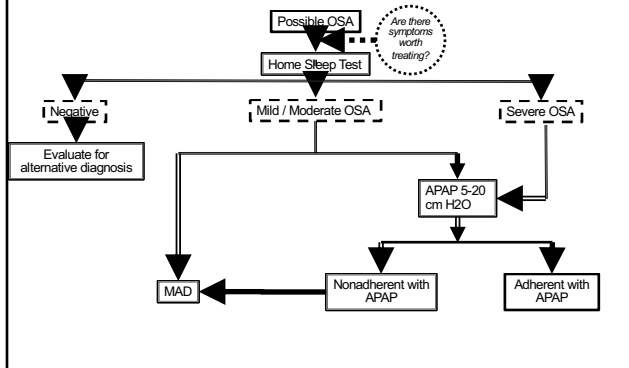
Medicare bureaucracy

- OSA therapy will only be covered if a face to face visit documenting reason OSA is suspected occurs *PRIOR* to sleep study

- CPAP initially covered for 3 months, based on:
  - Sleep study showing AHI4% ≥ 5 (past 12 months if new order)

- CPAP covered beyond 3 months, based on:
  - Face to face encounter documenting benefit
  - Adherence (≥4 hrs on 70% of nights in a consecutive 30-day period)

- New style of CPAP mask covered, based on:
  - Face to face encounter documenting benefit in past 12 months