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SLEEP MEDICINE UPDATE 2023

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OBSTRUCTIVE SLEEP APNEA

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- Nothing to disclose

REFERENCES TO OFF-LABEL USAGE(S) OF PHARMACEUTICALS OR INSTRUMENTS

- Nothing to disclose

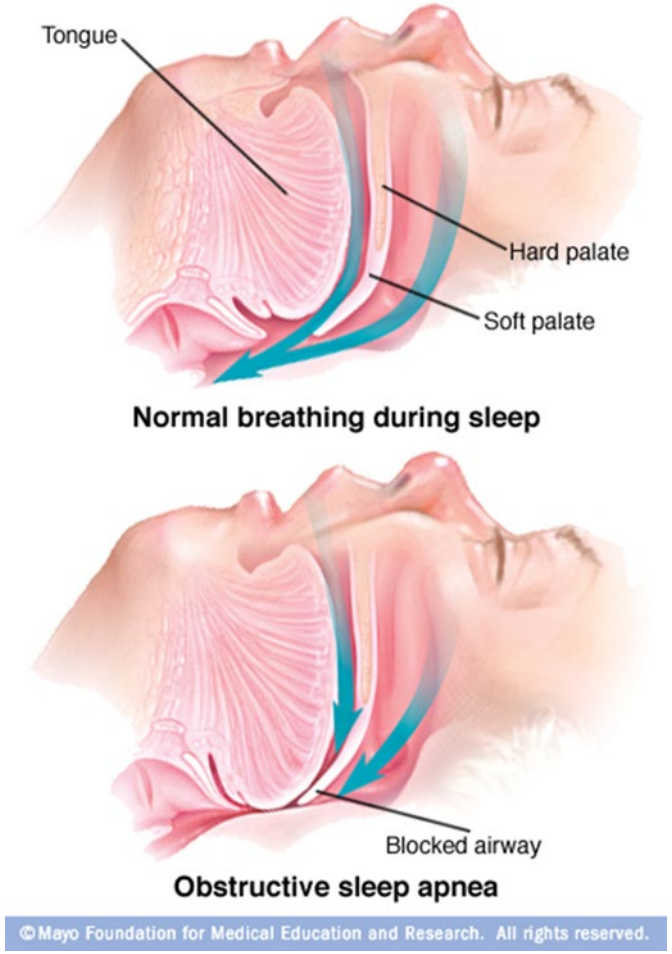
All relevant financial relationships have been mitigated.

LEARNING OBJECTIVES

- Epidemiology of Obstructive Sleep Apnea (OSA)
- Signs and symptoms of OSA
- Effects of OSA
- Diagnosing OSA
- Review current treatment options available for sleep apnea

OBSTRUCTIVE SLEEP APNEA

- Repetitive cessation (apnea) or reduction (hypopnea) of airflow during sleep despite adequate respiratory effort
- Caused by collapse of the upper airway during sleep



EPIDEMIOLOGY

- 15-30% in males and10-15% females (AHI≥ 5)
- 15% in males and 5% in females (AHI≥ 5 plus symptoms or AHI≥15)
- Prevalence in women increases after menopause
- Prevalence of OSA in Asians is similar to that in the US
- More prevalent in African Americans younger than 35 years old compared to Caucasians of the same age group
- Prevalence has been increasing probably related to increasing rates of obesity and or increased detection rates

Young T et al. Burden of sleep apnea: Rationale, design, and major findings of the Wisconsin Sleep Cohort Study. WMJ.2009;108(5):246.

Peppard PE et al. Increased prevalence of sleep disordered breathing in adults. Am J Epidemiol. 2013;177(9):1006.

Dempsey JA et al. Pathophysiology of sleep apnea. Physiol Rev. 2010;90(1):47.

RISK FACTORS

- Older age
- Male gender
- Obesity
- Craniofacial and upper airway abnormalities
- Smoking may increase the risk
- Family history of OSA
- Nasal congestion
- Drugs- narcotics, benzodiazepines, and alcohol

RISK FACTORS

- Comorbid medical conditions
  - Hypertension, heart failure, atrial fibrillation, pulmonary hypertension
  - Obesity hypoventilation syndrome
  - End-stage kidney disease
  - Chronic lung disease such as COPD, asthma and pulmonary fibrosis
  - Stroke and transient ischemic attacks
  - Pregnancy, Polycystic ovary syndrome
  - Hypothyroidism, Acromegaly
  - Parkinson’s disease

SIGNS AND SYMPTOMS

- Snoring
- Nocturnal choking, snorting, or gasping
- Witnessed apneas
- Daytime sleepiness
- Nonrestorative sleep
- Insomnia with frequent awakenings
- Morning headaches
- Mood changes, cognitive deficits, lack of concentration
- Nocturia

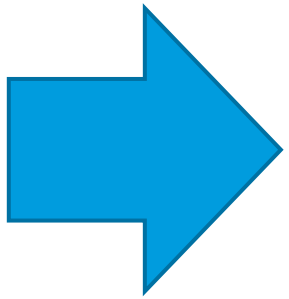
PHYSICAL EXAMINATION

- Obesity
- Crowded oropharyngeal airway
- Large neck and/or waist circumference
- Craniofacial abnormalities

PATHOPHYSIOLOGICAL EFFECTS

Intermediary Mechanisms

- Sympathetic Activation
- Endothelial Dysfunction
- Vascular Oxidative Stress
- Inflammation
- Hypercoagulability
- Metabolic Dysregulation
  - Leptin resistance
  - Obesity
  - Insulin resistance



Risk of Cardiovascular Disease

- Hypertension
- Congestive Heart Failure
- Arrhythmias
- Cardiac Ischemia
- Cerebrovascular Disease
- Sudden death
- Pulmonary hypertension

OTHER CONSEQUENCES OF OSA

- Marital stress
- Health care associated errors
- Motor vehicle accidents
- Sexual dysfunction
- Poor quality of life

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POLL OPEN

WHICH PATIENT IS BEST SUITED FOR A HOME SLEEP APNEA TEST?

1 17 year old male, BMI 30, who snores and falls asleep at school

✓ 2 38 year old male, BMI 32, habitual snorer with daytime sleepiness and HTN

3 48 year old female, BMI 28, mild snoring, insomnia and daytime fatigue

4 52 year old male, BMI 29, moderate COPD on O2, intermittent snoring and frequent nocturnal awakening

5 53 year old male, BMI 60 with moderate pulmonary hypertension, daytime hypercapnia and sleepiness

ANSWER

2. 38 year old male, BMI 32, habitual snorer with daytime sleepiness and HTN

Collop NA et al. Portable Monitoring Task Force for the American Academy of Sleep Medicine. J Clin Sleep Med. 2007;3(7):737

RATIONALE

- Home sleep studies should be performed in patients with high pre-test probability for having moderate or severe OSA without significant cardiovascular comorbidities
- Choice 1 since he is young should probably ask about his sleep patterns first
- Choice 3 should probably investigate about her insomnia that maybe the cause of her daytime symptoms if negative then may pursue HSAT if suspected
- Choice 4-5 both have significant comorbidities that a polysomnogram should be recommended
- Reference: Collop NA et al. Portable Monitoring Task Force for the American Academy of Sleep Medicine. J Clin Sleep Med. 2007;3(7):737

DIAGNOSING SLEEP APNEA

- Overnight sleep study or polysomnogram
  - GOLD STANDARD
- Home sleep apnea testing or portable monitoring
  - Performed in conjunction with a comprehensive sleep evaluation
  - Patients with ***a high pretest probability of moderate to severe OSA***
  - Absence of comorbid sleep or medical disorders
    - Central sleep apnea, periodic limb movements, insomnia, circadian rhythm disorders, parasomnias, narcolepsy
    - Moderate to severe pulmonary disease, moderate to severe cardiac disease, heart failure, neurological disease

- Collop NA et al. Clinical guidelines for the use of unattended portable monitors in the diagnosis of obstructive sleep apnea in adult patients. Portable Monitoring Task Force of the American Academy of Sleep Medicine. J Clin Sleep Med 2007; 3:737.

SEVERITY OF OSA

- Apnea-hypopnea index (AHI)
  - Apneas + hypopneas / total sleep time in hours
- Respiratory Disturbance index (RDI)
  - Apneas + hypopneas + RERAs / total sleep time in hours
- Respiratory Event index (REI)
  - Apneas + hypopneas / total recording time
- Normal < 5 events per hour
- Mild 5-14 events per hour
- Moderate 15-30 events per hour
- Severe > 30 events per hour

WHEN TO TREAT SLEEP APNEA?

- Moderate to severe OSA with or without symptoms (AHI>15)
- Mild OSA (AHI 5-14)
  - With symptoms **or**
  - Comorbid conditions such as cardiovascular disease, diabetes, stroke, cognitive dysfunction, mood disorders

TREATMENT OPTIONS FOR OSA

- Weight loss
- Positional therapy
- Positive Airway Pressure (PAP) therapy
- Oral Appliances
- Surgery
- Hypoglossal nerve stimulation
- Airway training exercises
- Tongue muscle stimulation
- Expiratory positive airway pressure
- Negative pressure device

WEIGHT LOSS

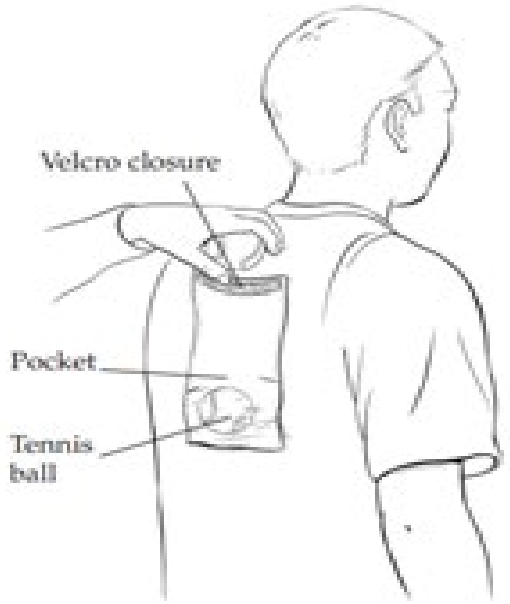
- Recommended to all patients with OSA who are overweight
- Available strategies include behavioral modifications, dietary therapy, exercise, drug therapy and bariatric surgery
- Can be curative on some patients
- Improvement in overall health and metabolic parameters
- Decrease the number of apneas and hypopneas
- Reduce blood pressure
- Improve quality of life
- Probably decrease daytime sleepiness

POSITIONAL THERAPY

- Goal is to maintain sleeping in the non supine position
- Certain patients based on sleep study may demonstrate OSA that develops or worsens during sleep in the supine sleeping position
- These patients tend to have less severe OSA, less obese, and younger[1]
- Various devices varying from sleep apnea shirt, positional belts, pillows to vibratory feedback devices around the neck or chest

1. Morgenthaler et al. Practice parameters for the medical therapy of obstructive sleep apnea. Sleep. 2006;29(8):1031.

POSITIONAL THERAPY



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POSITIONAL THERAPY

POSITIONAL THERAPY

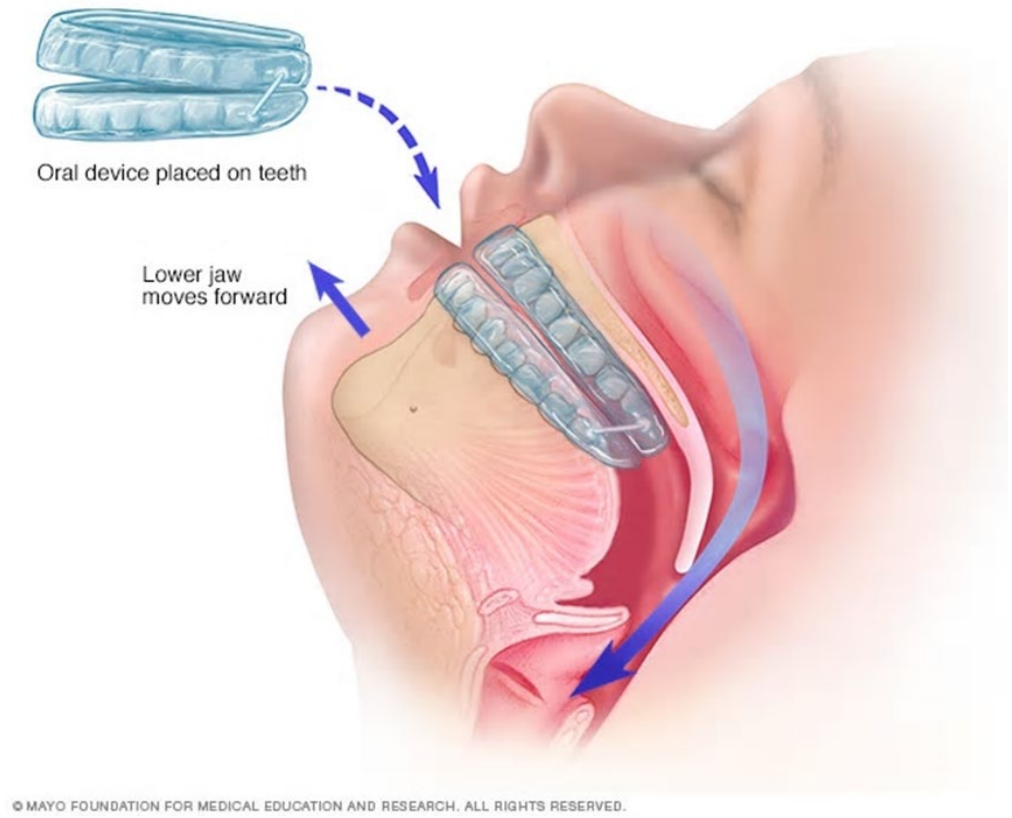
- Other options
  - Night Shift sleep positioner worn around the neck or chest
  - Phillips NightBalance Lunoa Sleep therapy worn around the chest
  - Sleep connection: worn around the wrist
  - Positional pillows

Image from official product website www.nightshifttherapy.com

Image from official product website www.mylunoa.com

Image from official product website www.sleep-connection.com

ORAL APPLIANCES

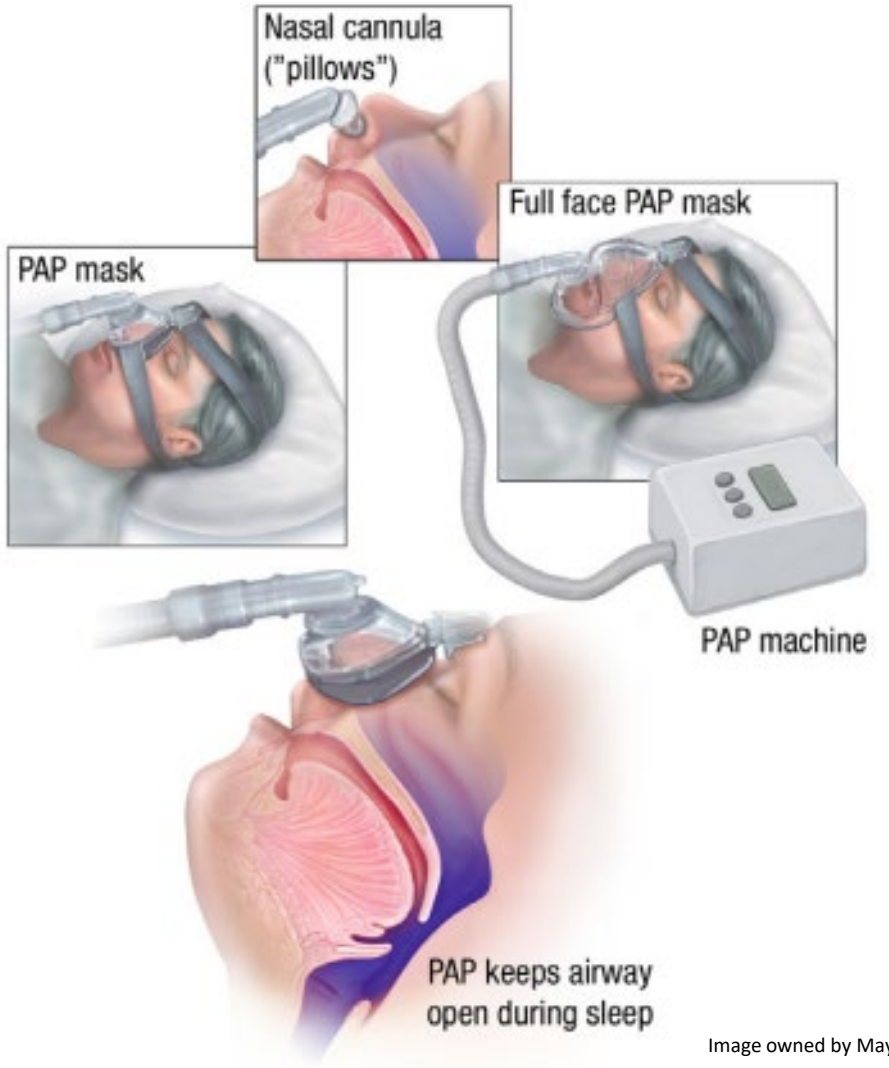


ORAL APPLIANCES

- Various names
  - Oral Appliance therapy (OAT)
  - Dental Appliance
  - Mandibular advancement device (MAD)
  - Tongue retaining devices
- First reported in the 1930s
- Fitted by a dentist over weeks to months
- Most appropriate for mild to moderate OSA
- May be less effective in severe OSA
- Designed to protrude the mandible forward
- Once adequately titrated a repeat study is needed to assess efficacy

PAP THERAPY

- Mainstay of therapy for patients with OSA
- Works by stenting the airway open
- Recommended for OSA of any severity
- Different modes of PAP therapy available
- Different mask interfaces available



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PAP MASKS

QUESTION 2

- A 50-year-old female with a history of hypertension, diabetes and stroke was recently diagnosed with OSA with an overall AHI of 30 events per hour.
- She underwent PAP titration and CPAP at a final pressure of 10 cm H2O appeared to be effective and was set for home CPAP using nasal pillows.
- Upon follow-up visit the patient was complaining of difficulty tolerating her CPAP therapy.

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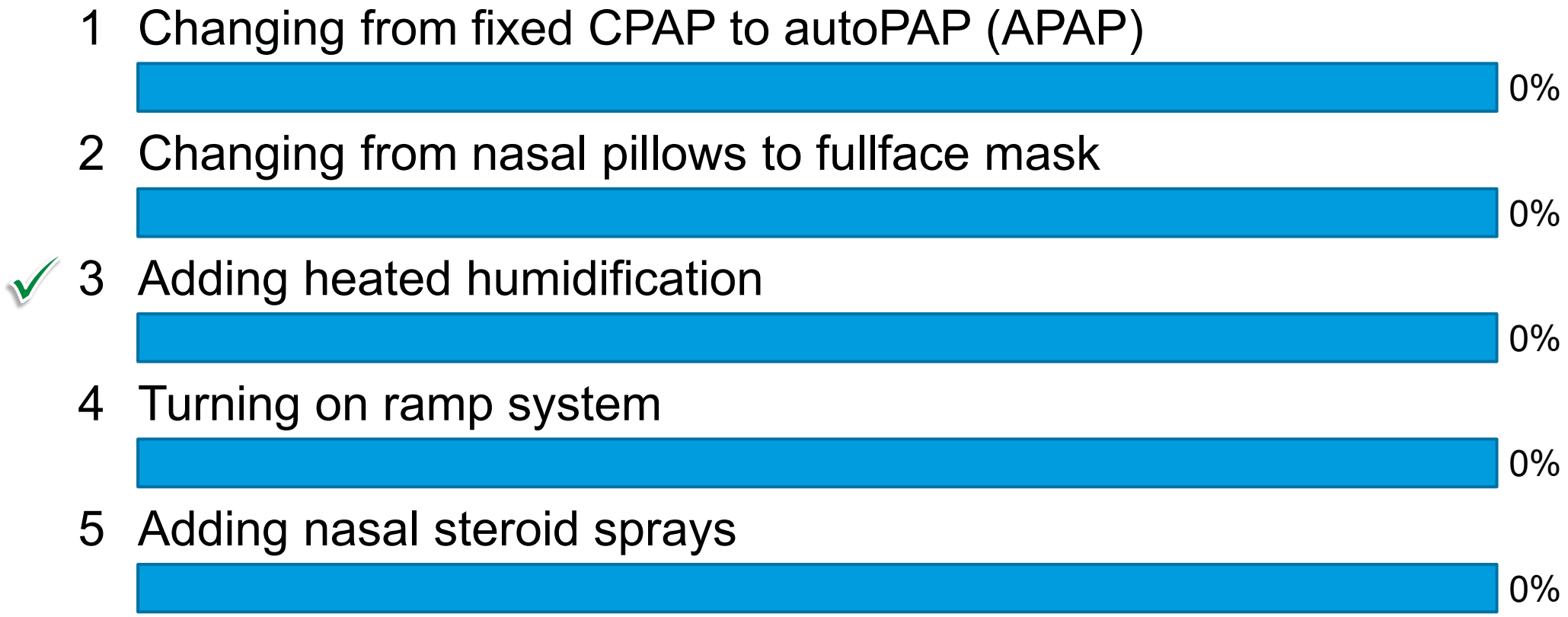
POLL OPEN

IN ADDITION TO EDUCATION WHICH OF THE FOLLOWING INTERVENTIONS HAS BEEN SHOWN TO IMPROVE PAP COMPLIANCE?



RATIONALE

- Based on studies the intervention that seems to help most is adding heated humidification

- References:

- Palm A et al. Factors influencing adherence to continuous positive air pressure treatment in obstructive sleep apnea and mortality associated with treatment failure- a national registry-based course study. Sleep Med 2018;51:85.
- Neil AM et al. Humidified nasal continuous positive airway pressure in obstructive sleep apnoea. Eur Respir J. 2003;22(2):258.

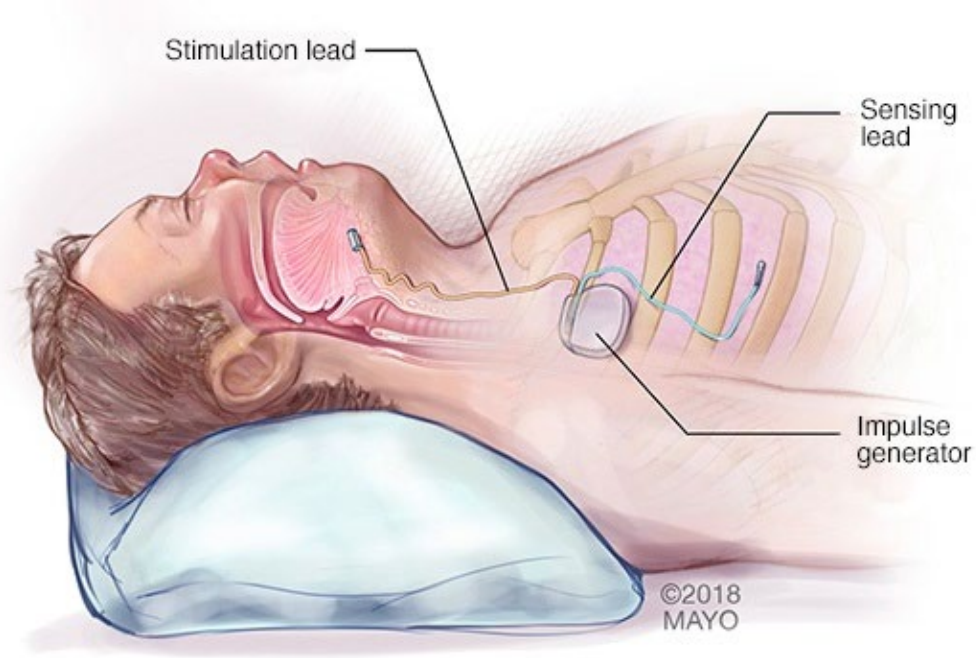
HOW TO IMPROVE ADHERENCE

- Early recognition and follow up
- Behavioral therapy
  - Cognitive behavioral therapy
  - Motivational enhancement therapy
- Fix interface related issues: change masks, mask fitting, mask liners
- Utilize the pressure relief or pressure ramp function
- Utilize humidification
- Evaluate for air leaks
  - Adding chin strap or switching to oronasal mask
- Pharmacological therapy
- Repeat titration or BilevelPAP trial

SURGERY

- Lots of options and variations
- Tracheostomy
- Uvulopalatopharyngoplasty (UPPP)
- Adenoidectomy, Tonsillectomy
- Maxillomandibular advancement surgery
- Others
  - Nasal septal surgery, Nasal valve repair
  - Tongue base reduction
  - Epiglottectomy, epiglottopexy
  - Hyoid suspension
  - Lateral pharyngoplasty
  - Pillar procedure

HYPOGLOSSAL NERVE STIMULATION



INDICATIONS

- Age > 21
- BMI < 32
- AHI range 15-65 events per hour
  - Less than 25% mixed or central events
- PAP failure or inability to tolerate PAP
- Appropriate airway anatomy
  - No concentric airway collapse during drug induced sleep endoscopy

HYPOGLOSSAL NERVE STIMULATION OUTCOMES

- STAR Trial [1]
  - Median AHI score at 12 months decreased 68% (29.3 to 9.0)
  - Significant improvement in the ESS and quality of life measures
- Five year outcomes[2]
  - AHI response rate was 75% (AHI < 20 events per hour and >50% reduction)
  - Serious device related events all related to lead/device adjustments were 6%
  - Improvement in ESS and quality of life persisted with normalization of scores from 33% to 78% and 15% to 67% respectively.

1. Strollo PJ et al. Upper-airway stimulation for obstructive sleep apnea. NEJM 2014;370(2):139-149.

2. Woodson BT et al. Upper Airway Stimulation for Obstructive Sleep Apnea: 5-year Outcomes. OTO-HNS 2018 Jul;159(1):194-202.

HYPOGLOSSAL NERVE STIMULATION OUTCOMES

- ADHERE Registry*
  - 1,107 patients
  - 640 patients completed 6 month follow up
  - 382 patients completed 12 month follow up
  - After 12 months median AHI reduced from 32.8 to 9.5
  - Mean Epworth Sleepiness Score reduced from 11.4 to 7.2
  - Therapy usage was 5.6 ± 2.1 hours

- Erica Thaler et al. Results of the ADHERE upper airway stimulation registry and predictors of therapy efficacy. The Laryngoscope 2019 Vol 130, Issue 5: 1333-1338.

AIRWAY TRAINING EXERCISES

- Oropharyngeal exercises[1]
  - 3 months of oropharyngeal exercises involving the tongue, soft palate, and lateral pharyngeal wall
  - Decrease in neck circumference, snoring frequency, snoring intensity, daytime sleepiness, sleep quality, and AHI (22.4 vs. 13.7)
- Didgeridoo playing[2]
  - Four months of didgeridoo
  - Improvement in the daytime sleepiness and less bed partner sleep disturbance
  - Improvements in the AHI (22.3 down to 11.6)

1. Guimaraes KC et al. Effects of oropharyngeal exercises on patients with moderate obstructive sleep apnea syndrome. AJRCCM 2009 May 15;179(10):962-966.
2. Puhan MA et al. Didgeridoo playing as alternative treatment for obstructive sleep apnoea syndrome: randomized controlled trial. BMJ 2006 Feb 4;332(7536):266-270.

Puhan MA et al. Didgeridoo playing as alternative treatment for obstructive sleep apnoea syndrome: randomized controlled trial. BMJ 2006 Feb 4;332(7536):266-270.

INTRAORAL ELECTRICAL MUSCLE STIMULATION

- eXciteOSA®
- FDA Approved February 5th 2021 for **snoring and mild OSA**
- Mouthpiece used while awake 20 minutes a day for 6 weeks then once a week thereafter
- Electrical stimulation of the tongue
- Common side effects include salivation, tongue /tooth discomfort, tongue tingling, dental filling sensitivity, metallic taste, gagging and tight jaw

Image from official product website exciteosa.com

INTRAORAL ELECTRICAL MUSCLE STIMULATION

- 65 participants (68% male)
- Improvement in AHI from 10.2 to 6.8 events per hour
- Mean ESS reduced from 8.7 to 5.3
- Time spent snoring > 40 dB decreased from 36.5% to 21.5%
- Adherence was 85%

- Brandon Nokes et al. Sleep and Breathing 27 May 2022.

INTRAORAL ELECTRICAL MUSCLE STIMULATION

- 115 patients with primary snoring and mild sleep apnea
- 90% had some reduction in objective snoring with the mean reduction in the study population of 41%
- Bed partner reported snoring reduced significantly by 39%
- ESS reduced from 8.4 to 5.8
- PSQI reduced from 7.16 to 5.75
- Mean AHI reduced from 6.85 to 5.03

- Peter M. Baptista et al. J. Clin. Med. 2021

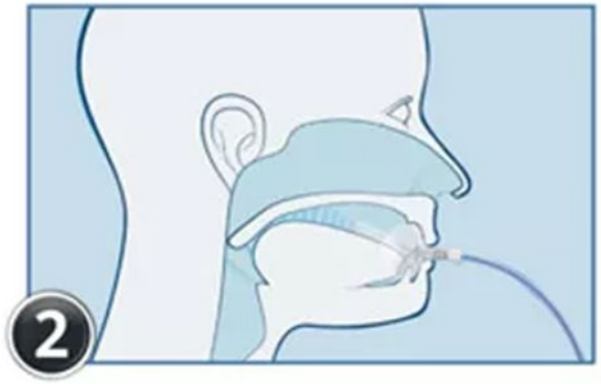
EXPIRATORY POSITIVE AIRWAY PRESSURE

- Bongo Rx
- FDA cleared for mild to moderate sleep apnea
- Works by creating expiratory positive airway pressure upon exhalation to keep the airways open

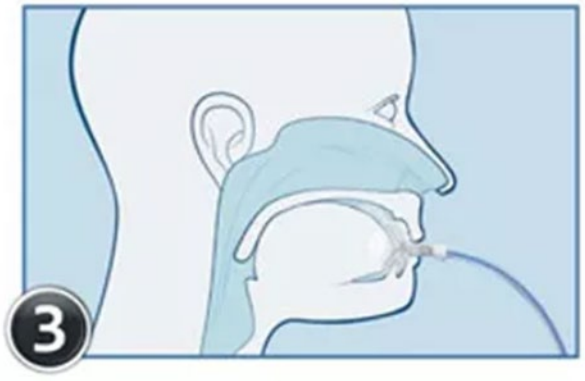
NEGATIVE PRESSURE DEVICE

- iNap
- Oral negative pressure device for sleep apnea
- Delivers light oral vacuum to keep airways open

Airway is blocked and air does not flow through properly.

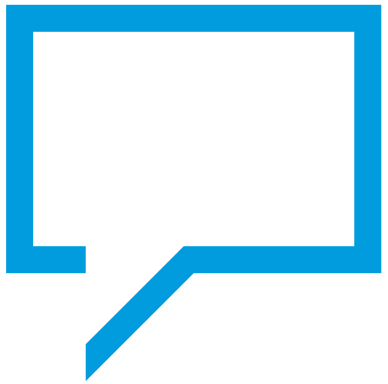


iNAP creates negative pressure within the oral cavity itself.



The negative pressure pulls the tongue and soft palate forward to keep the airway open.

QUESTIONS & DISCUSSION



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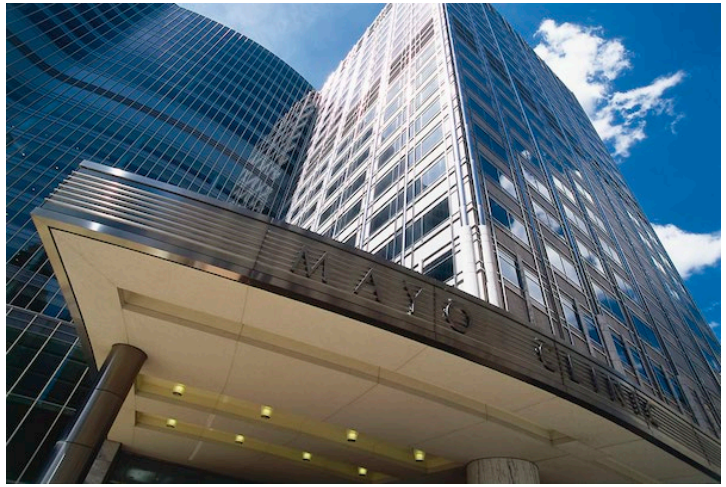

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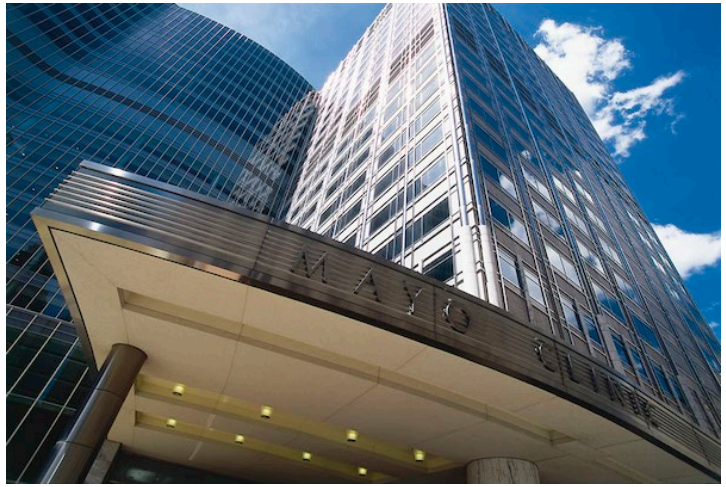

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