FTS Workshop:

Non-CPAP Treatments for Sleep Apnea

Robert L. Owens, MD
University of California San Diego

ATS 2020 VIRTUAL
July 28th, 2020

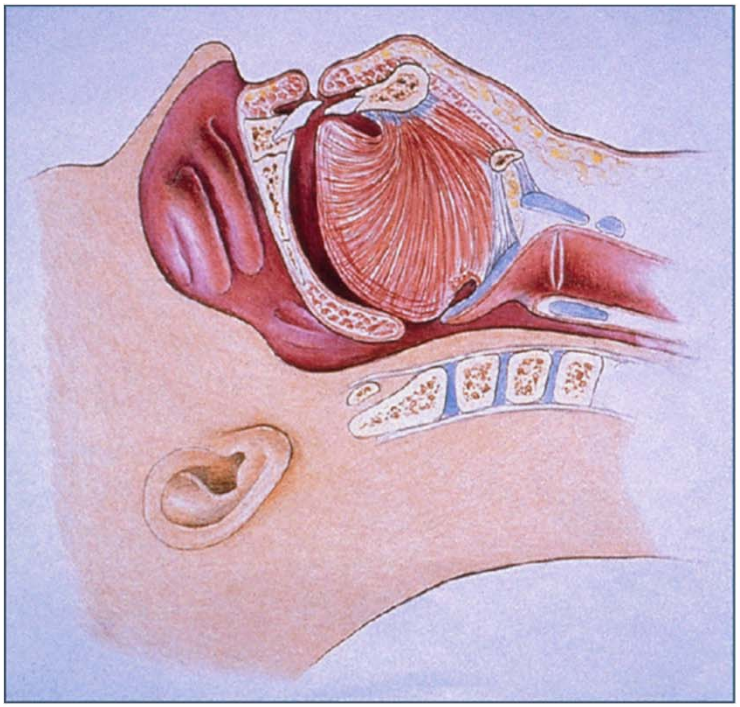
Disclosures

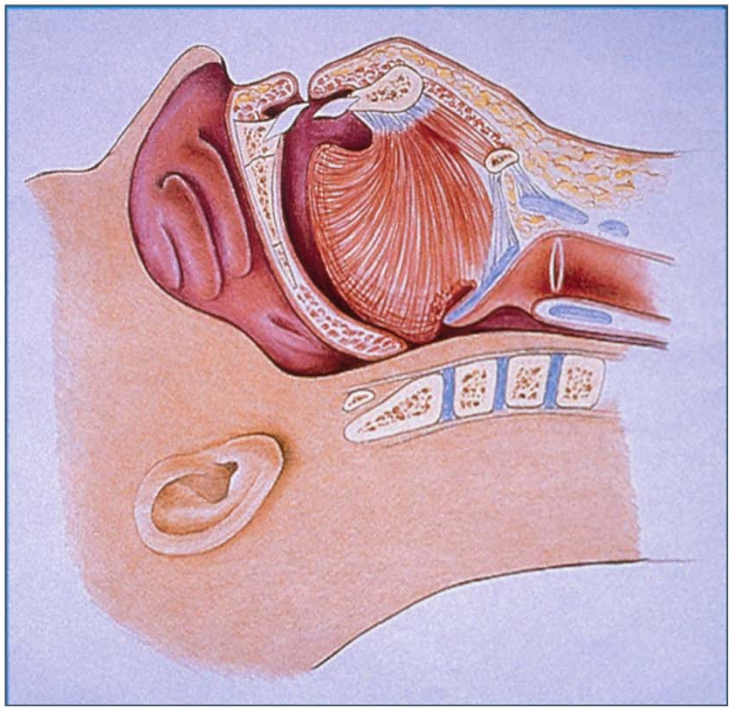
- ResMed, a maker of PAP devices, donated money for the UCSD Sleep Medicine Clinic

Outline

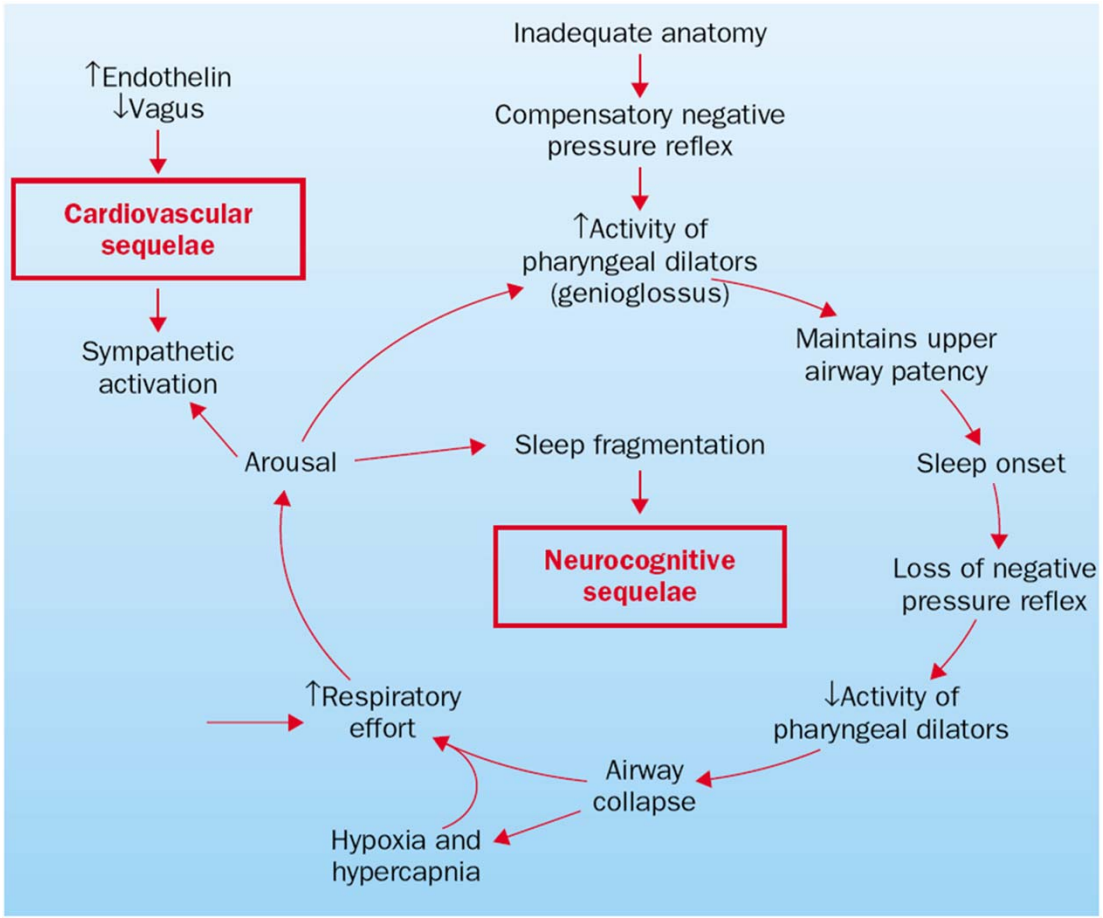
- (Brief) Obstructive Sleep Apnea Introduction
- How good is CPAP anyway?
- Non PAP therapies
- Another way to think about OSA Pathogenesis (and non PAP therapy)

Pathophysiology





Pathophysiology



Estimation of the global prevalence and burden of obstructive sleep apnoea: a literature-based analysis

Lancet Resp Med 2019

Adam V Benjafield, Najib T Ayas, Peter R Eastwood, Raphael Heinzer, Mary S M Ip, Mary J Morrell, Carlos M Nunez, Sanjay R Patel, Thomas Penzel, Jean-Louis Pépin, Paul E Peppard, Sanjeev Sinha, Sergio Tufik, Kate Valentine, Atul Malhotra

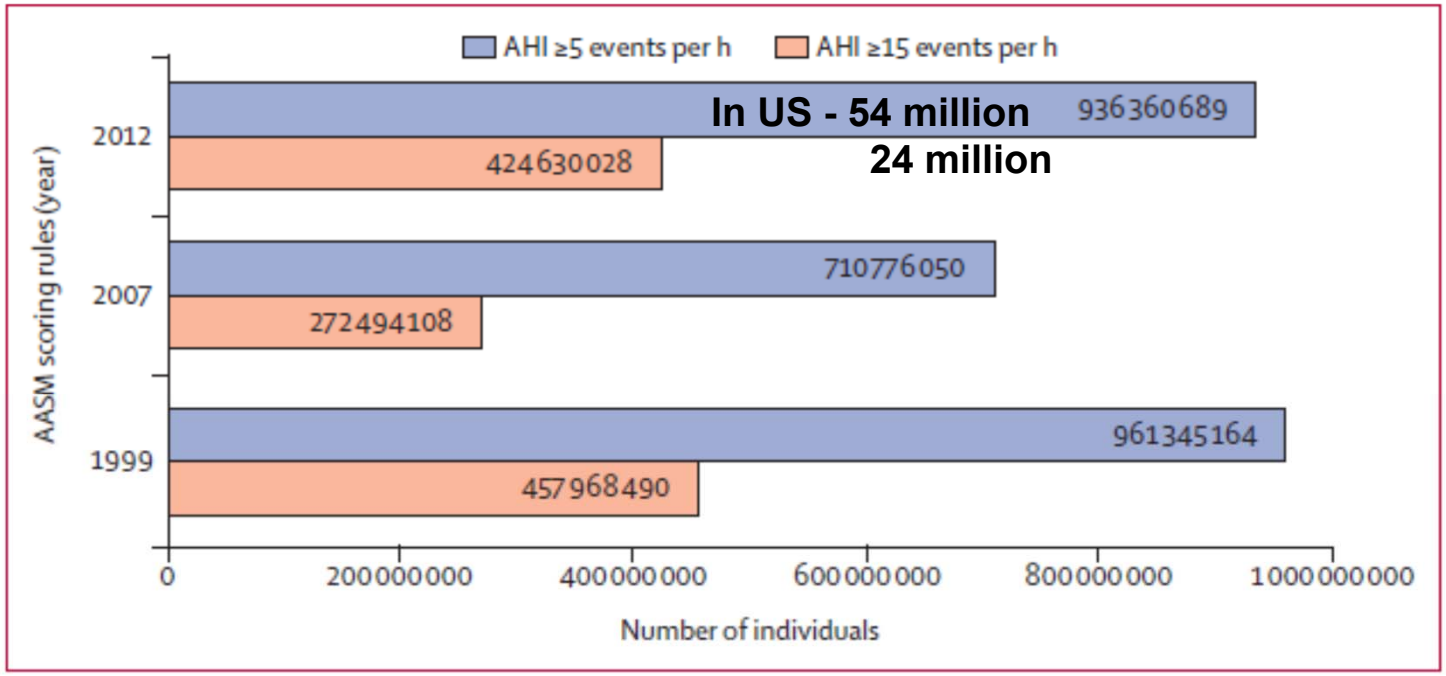
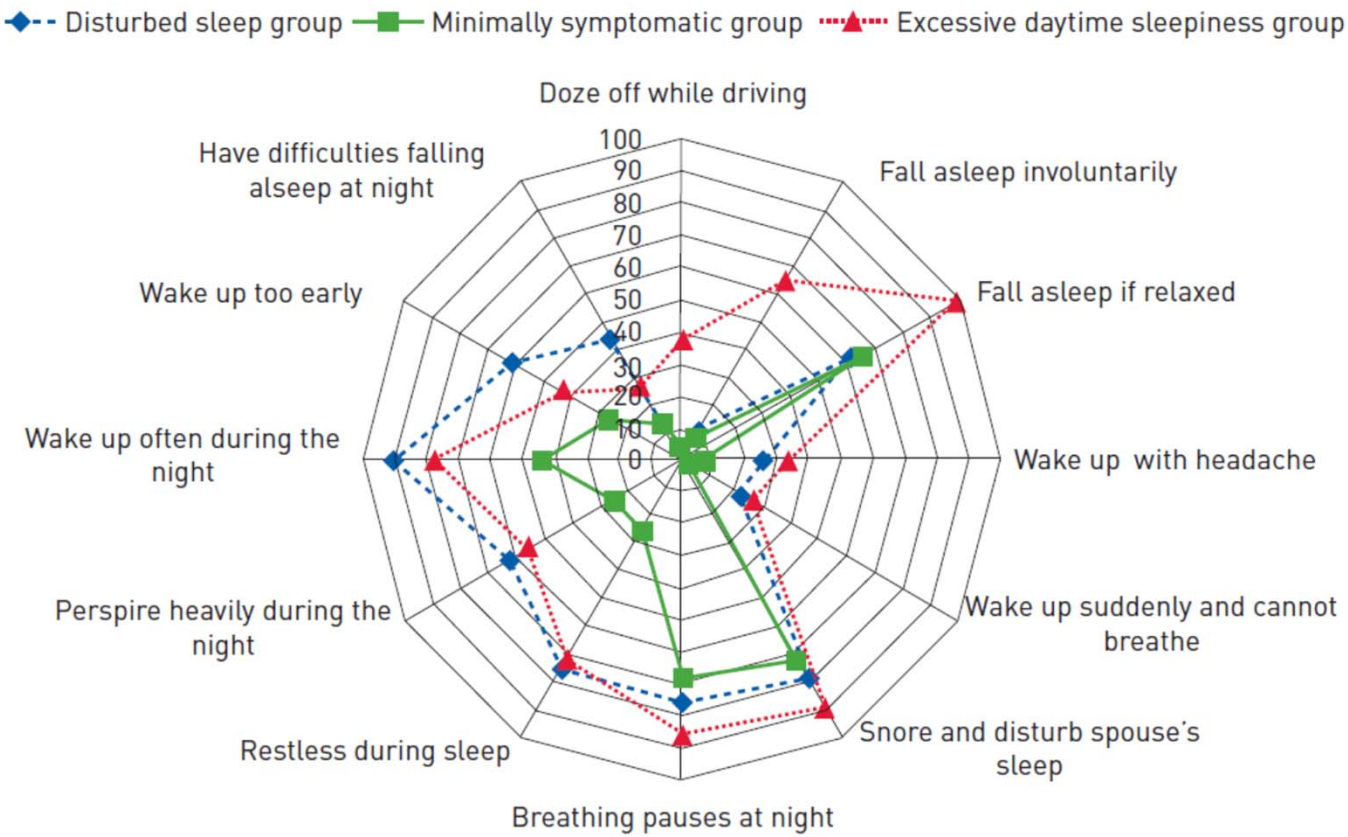


***Figure 1*: Estimated prevalence of obstructive sleep apnoea based on different scoring rules**
AASM=American Academy of Sleep Medicine. AHI=apnoea-hypopnoea index.

Does the patient need their OSA treated?

Does the patient need their OSA treated?



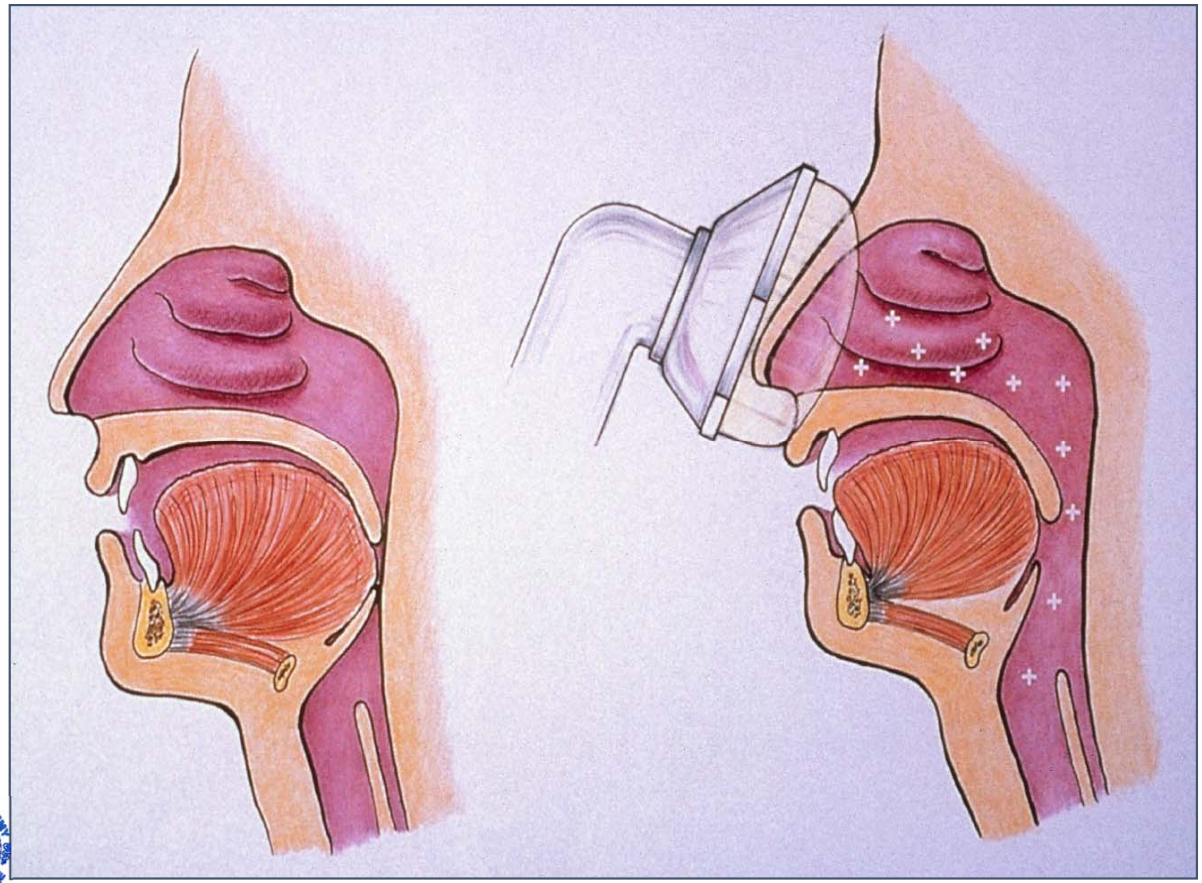
Ye ERJ 2014

Outline

- (Brief) Obstructive Sleep Apnea Introduction
- **How good is CPAP anyway?**
- Non PAP therapies
- Another way to think about OSA Pathogenesis (and non PAP therapy)

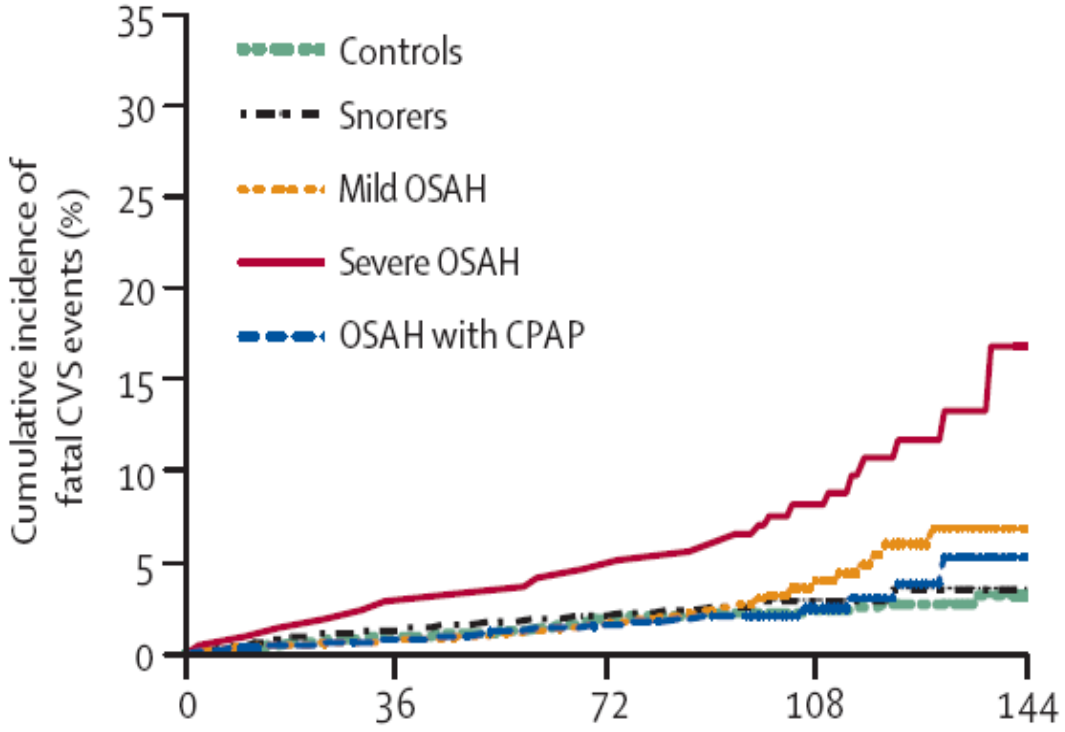
Continuous Positive Airway Pressure

Positive Airway Pressure



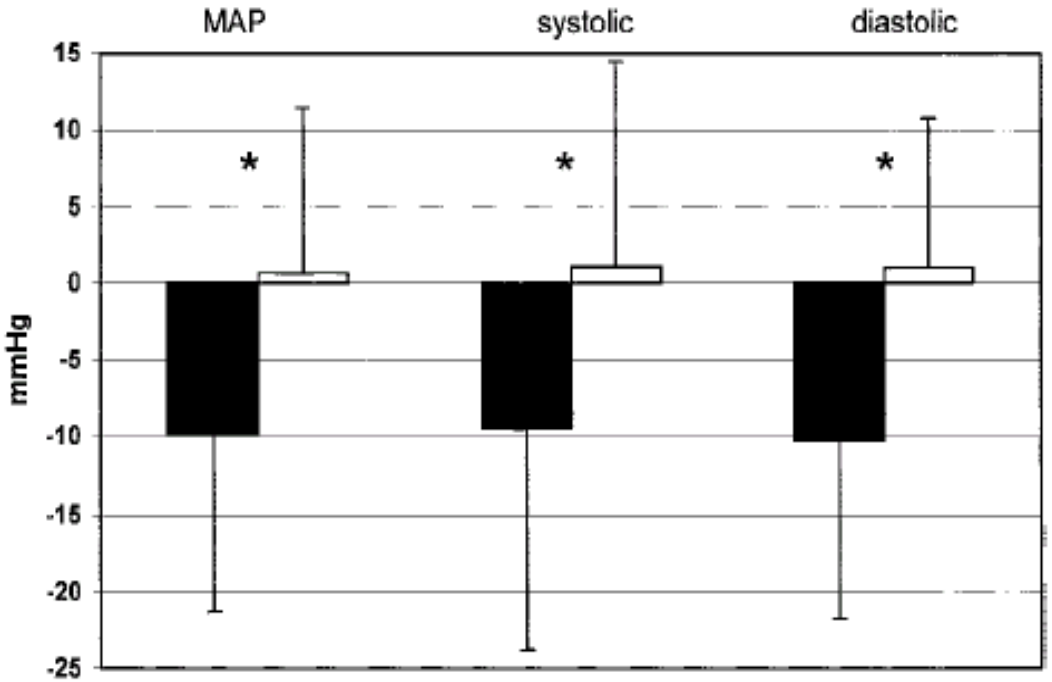
Impact of PAP – CV outcomes

Observational Trial of Long-term Cardiovascular Outcomes from OSA



Marin *Lancet* 2005

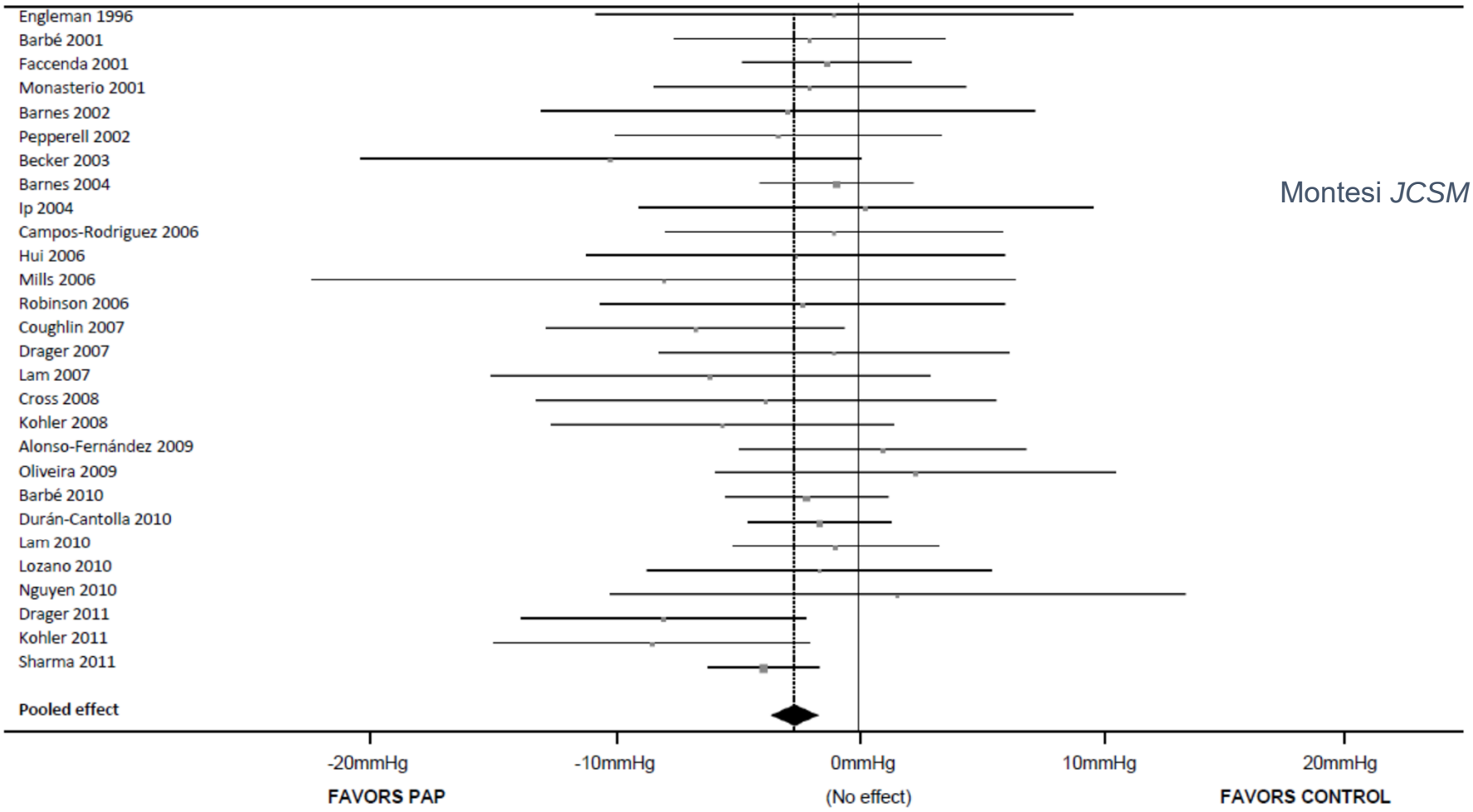
Impact of PAP – blood pressure



Effect of CPAP (black) vs. sham (white) on BP

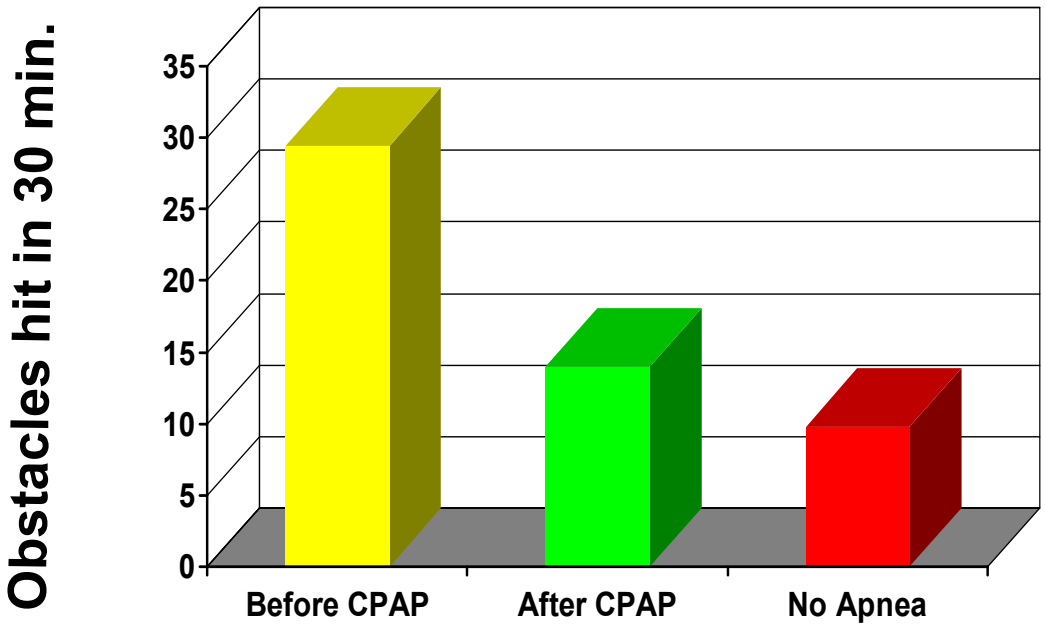
Becker *Circulation* 2003

Effect of OSA treatment on blood pressure



Montesi *JCSM* 2012

Impact of PAP – Cognitive performance



Findley *Clin Chest Med* 1992

Impact of PAP – Golf Handicap

NEW RESEARCH

JCSM
Journal of Clinical Sleep Medicine

http://dx.doi.org/10.5664/jcsm.3256

Treatment of Obstructive Sleep Apnea Syndrome with Nasal Positive Airway Pressure Improves Golf Performance

Marc L. Benton, M.D., F.A.A.S.M.; Neil S. Friedman, R.N.

Morristown Medical Center, Morristown, NJ

2013

Impact of PAP – Dose Response

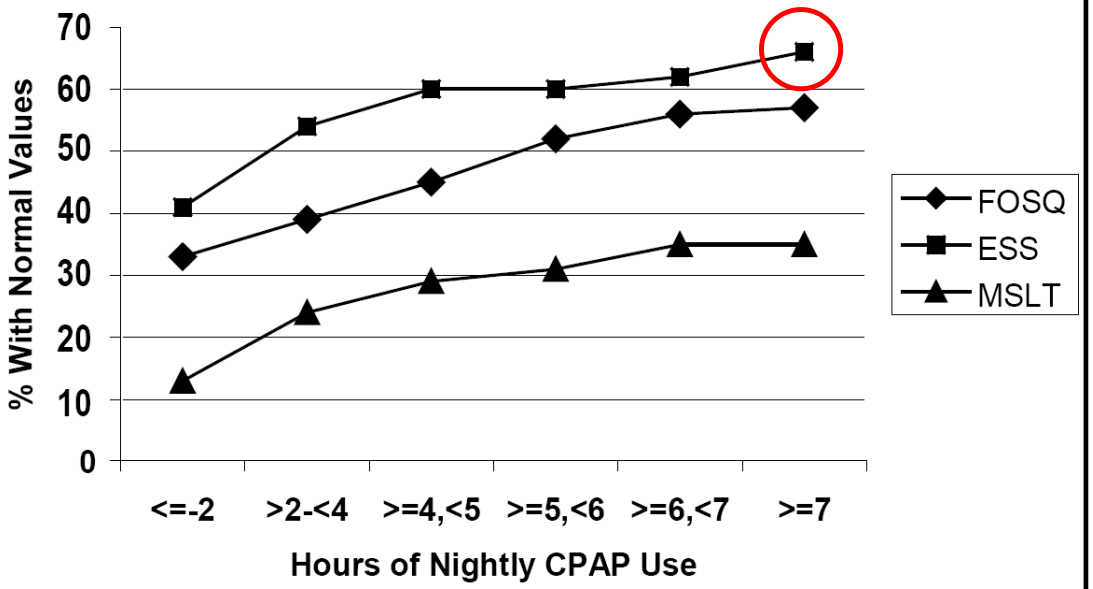


Figure 1—Cumulative proportion of participants obtaining normal threshold values on the Epworth Sleepiness Scale (ESS), Multiple Sleep Latency Test (MSLT), and Functional Outcomes of Sleep Questionnaire (FOSQ). A cumulative proportion function was applied to the data in Table 3. CPAP refers to continuous positive airway pressure.

Stimulants for residual sleepiness in CPAP adherent patients?

Weaver *SLEEP* 2007

Adherence to CPAP

- Patient report: 75%
- Objectively measured use
  - ≥ 4 hrs for ≥ 5 nights/week: 46%
- Intensive compliance programs: 65-80%

Sleep Med. 2019 July ; 59: 114–116. doi:10.1016/j.sleep.2019.01.004.

Short-term CPAP adherence in obstructive sleep apnea: a big data analysis using real world data

Peter A. Cistulli[a,g,*], **Jeff Armitstead**[b,g], **Jean-Louis Pepin**[c,g], **Holger Woehrle**[d,g], **Carlos M. Nunez**[e,g], **Adam Benjafield**[e,g], and **Atul Malhotra**[f,g]

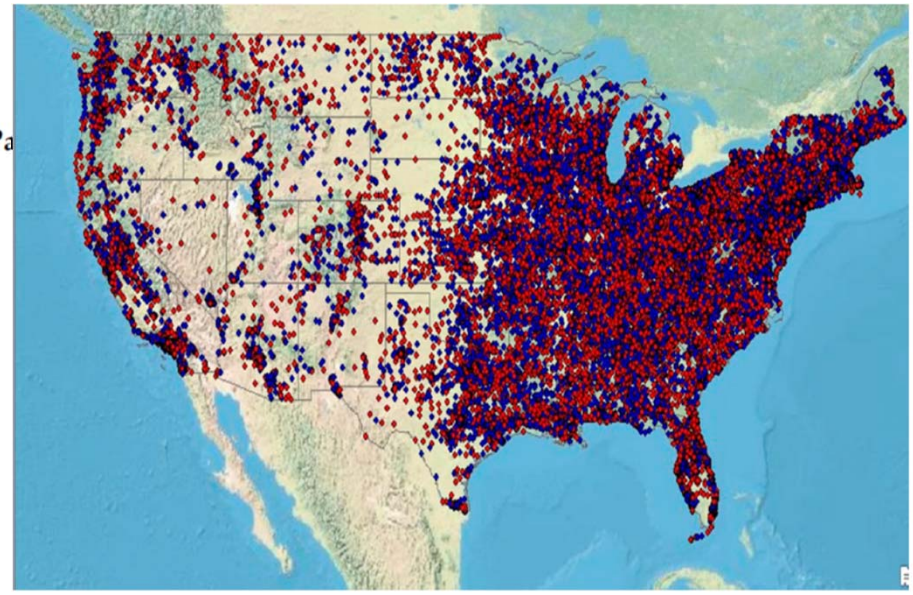
- ResMed Airview Database 2014-2017
- 2.62 MILLION patients
  - Mile wide, inch deep?
- 75% of those who were SET UP* met CMS adherence

Journal of
Clinical Medicine
2020

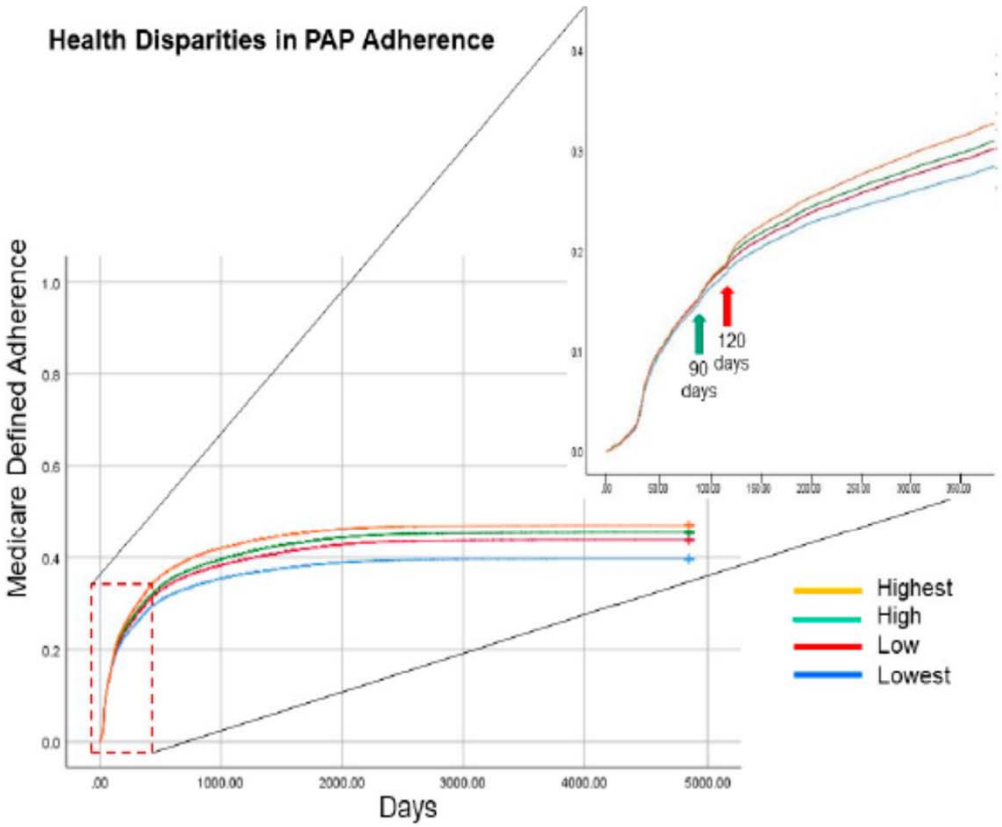
Article

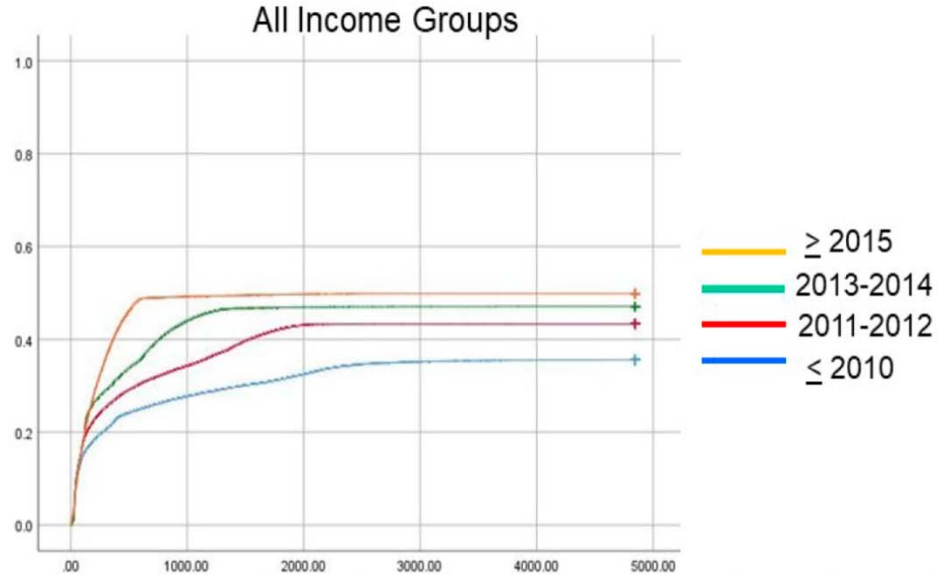
Socioeconomic Inequities in Adherence to Positive Airway Pressure Therapy in Population-Level Analysis

Abhishek Pandey [1,2], Suresh Mereddy [1], Daniel Combs [3], Safal Shetty [1], Salma I. Pa
Saif Mashaq [1], Azizi Seixas [4], Kerry Littlewood [2], Girardin Jean-Luis [4] and
Sairam Parthasarathy [1,*]



- Philips EncoreAnywhere
- N= 176,000
- Linked users to zip code



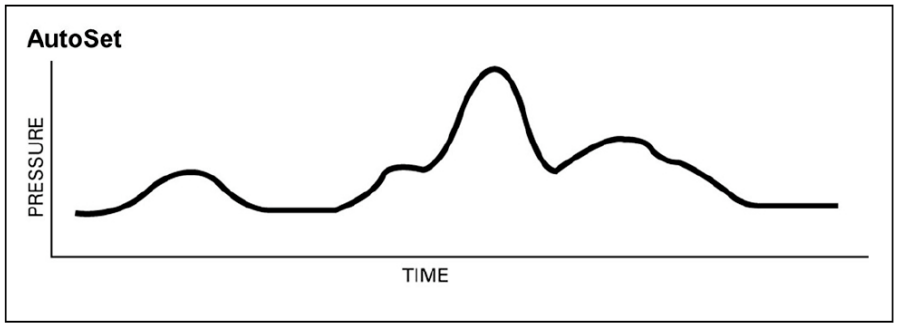


1. **Health disparities in PAP adherence**
2. **Adherence improving over time**

Steady Improvements in Acceptability

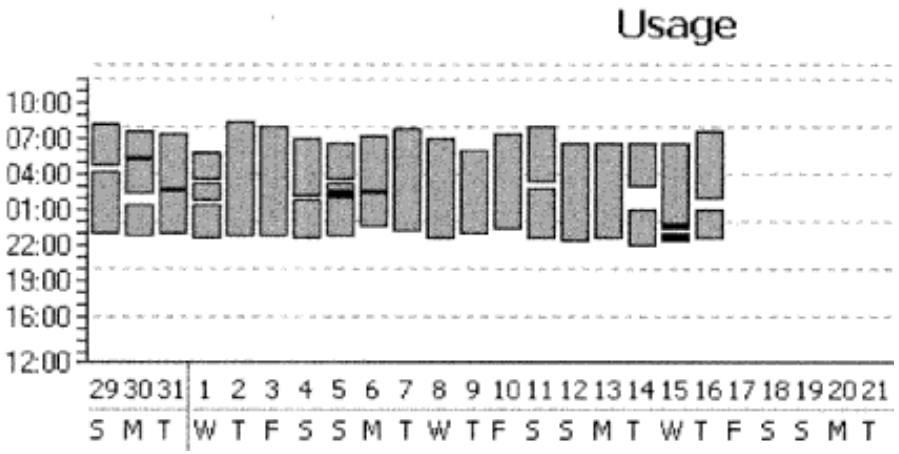
Interfaces

Auto-titrating PAP



Steady Improvements in Acceptability

Monitoring



[Original Research **Sleep Disorders**]

CHEST 2018

Patient Engagement Using New Technology to Improve Adherence to Positive Airway Pressure Therapy

A Retrospective Analysis

Atul Malhotra, MD; Maureen E. Crocker, BS; Leslee Willes, MS; Colleen Kelly, PhD; Sue Lynch, RN; and Adam V. Benjafield, PhD

the patient engagement platform is accessed via logging in on the myAir website. Interactions with the patient include: a myAir score, usage-based praise messages, usage-based exception messages, exception-based leak, exception-based AHI, and "badges." The daily myAir score consists of usage hours, mask seal (to indicate levels of leak), events per hour, and number of times for mask on/off. Personalized coaching and reinforcement messages are sent via e-mail and are designed to increase self-management skills, recognize success, and identify and resolve basic treatment issues. These messages generally provide tips on how to make PAP therapy more comfortable or be messages of encouragement when patients meet a certain milestone (eg, average hours of use $>$ 4 h). Patients in the APE group do not receive any additional materials. Patients in the UCM group did not use the patient engagement tool.

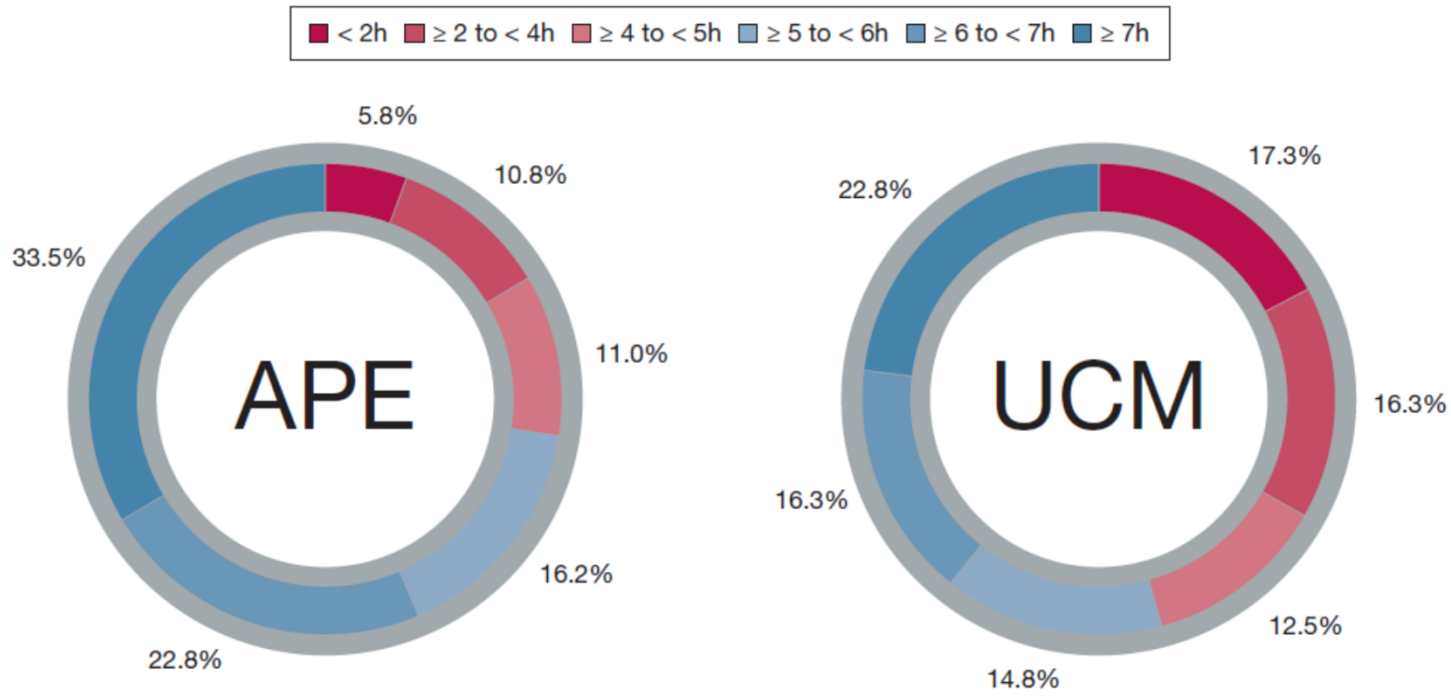


Figure 2 – *Distribution of mean nightly positive airway pressure usage. See Figure 1 legend for expansion of abbreviations.*

Who to treat with CPAP?

- Can always do a therapeutic trial
- Those with symptoms
- Those with severe medical co-morbidities
- Those with severe disease (by AHI or substantial oxygen desaturations)

Outline

- (Brief) Obstructive Sleep Apnea Introduction

  Anatomy is the underlying problem

- How good is CPAP anyway?

  PAP works, adherence getting better

- **Non PAP therapies**

- Another way to think about OSA Pathogenesis (and non PAP therapy)

Assumptions about Non PAP therapies

- Adherence for non PAP therapies > CPAP
- Non PAP therapies as effective, or “effective AHI” = CPAP
  - Weighted average of AHI
  - Effectiveness in terms of AHI, ESS, Blood pressure?
- Cheaper?
- More patient-centric

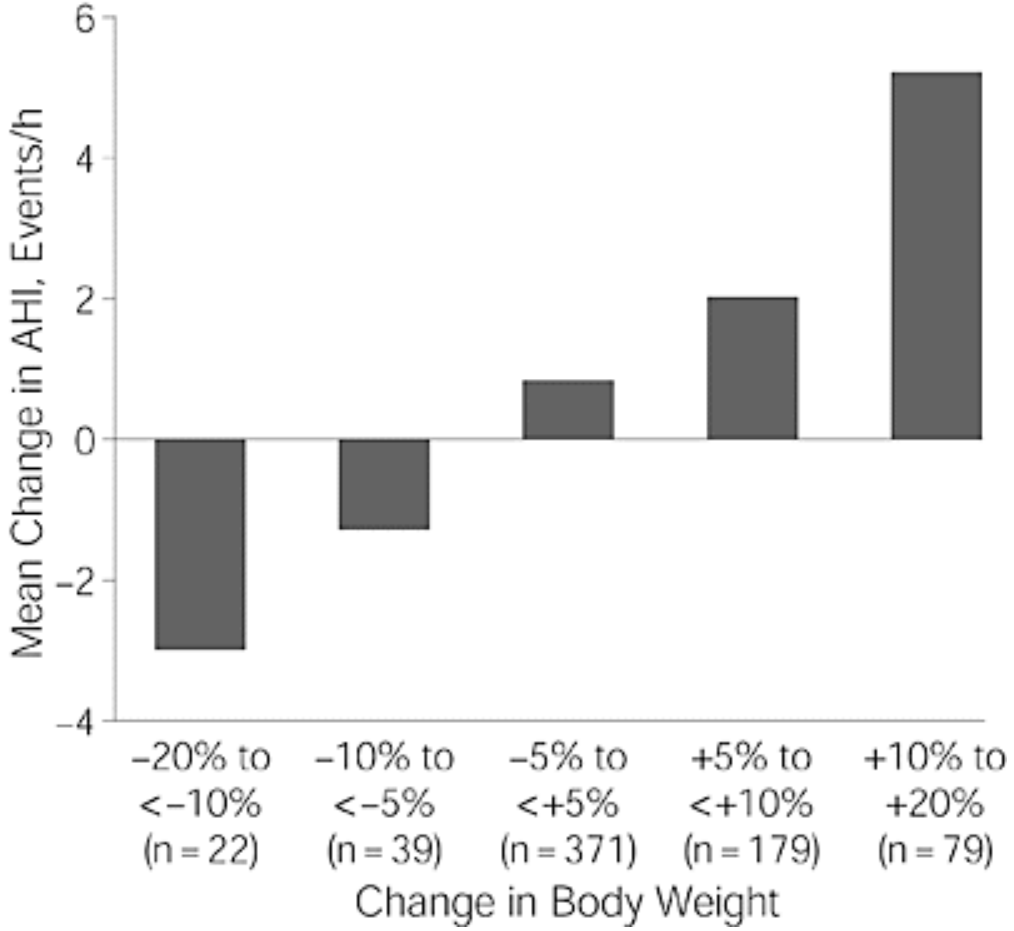
Non PAP Therapies

- **Behavioral**
- Oral Appliances
- Upper Airway Surgery
- Other Devices

Behavioral Interventions

- **Weight Loss**
- Avoid supine sleep
- Avoid alcohol and sedatives
- Allow adequate time for sleep

Weight loss and OSA severity



Adapted from Peppard *JAMA* 2000

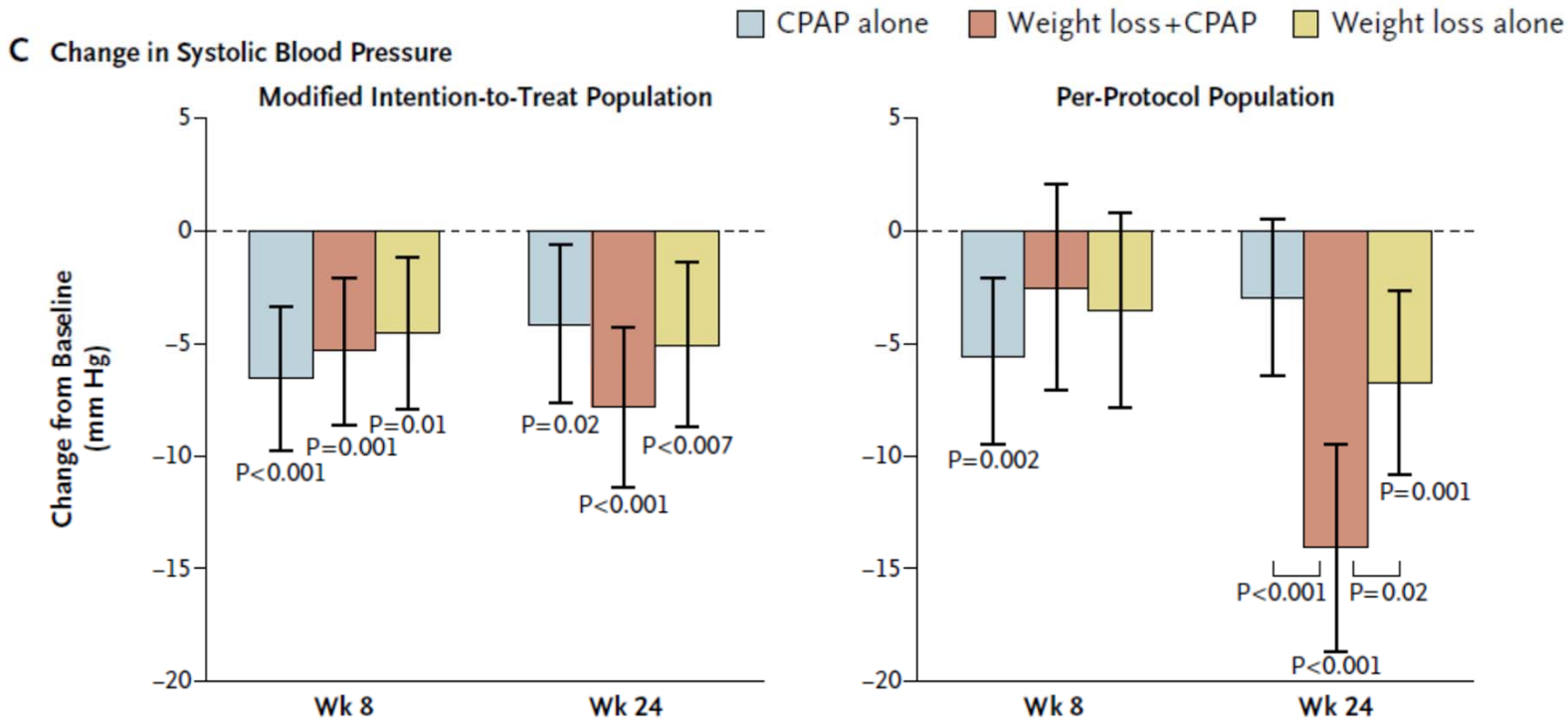
Gastric Banding Surgery versus Continuous Positive Airway Pressure for Obstructive Sleep Apnea: A Randomized Controlled Trial

	Randomized LGB		
	Baseline ($n = 28$)	9 mo ($n = 25$)	18 mo ($n = 24$)
Anthropometry			
BMI, kg/m^2	39.1 ± 2.9	35.9 ± 3.5*	35.7 ± 3.9*
Weight, kg	115.4 ± 16.9	106.7 ± 18.0*	106.1 ± 18.0*
Neck circumference, cm	40.9 ± 4.3	40.1 ± 4.8	40.6 ± 3.8
Waist circumference, cm	123.5 ± 10.3	116.4 ± 13.2*	115.0 ± 12.5*
Hip circumference, cm	127.5 ± 8.6	120.8 ± 8.4*	120.8 ± 8.9*
Sleep measures			
AHI off CPAP treatment, events/h	51.5 ± 23.5	39.3 ± 26.4*	34.1 ± 24.6*

How much weight do I need to lose?

Bakker AJRCCM 2018

Weight loss is still important and should be part of OSA care



But weight loss is hard….

AMERICAN THORACIC SOCIETY DOCUMENTS

The Role of Weight Management in the Treatment of Adult Obstructive Sleep Apnea

An Official American Thoracic Society Clinical Practice Guideline

David W. Hudgel, Sanjay R. Patel, Amy M. Ahasic, Susan J. Bartlett, Daniel H. Bessesen, Melisa A. Coaker, P. Michelle Fiander, Ronald R. Grunstein, Indira Gurubhagavatula, Vishesh K. Kapur, Christopher J. Lettieri, Matthew T. Naughton, Robert L. Owens, Jean-Louis D. Pepin, Henri Tuomilehto, and Kevin C. Wilson; on behalf of the American Thoracic Society Assembly on Sleep and Respiratory Neurobiology

THIS OFFICIAL CLINICAL PRACTICE GUIDELINE OF THE AMERICAN THORACIC SOCIETY WILL BE APPROVED OCTOBER 2018

Conclusions: Weight-loss interventions, especially comprehensive lifestyle interventions, are associated with improvements in OSA severity, cardiometabolic comorbidities, and quality of life. The American Thoracic Society recommends that clinicians regularly assess weight and incorporate weight management strategies that are tailored to individual patient preferences into the routine treatment of adult patients with OSA who are overweight or obese.

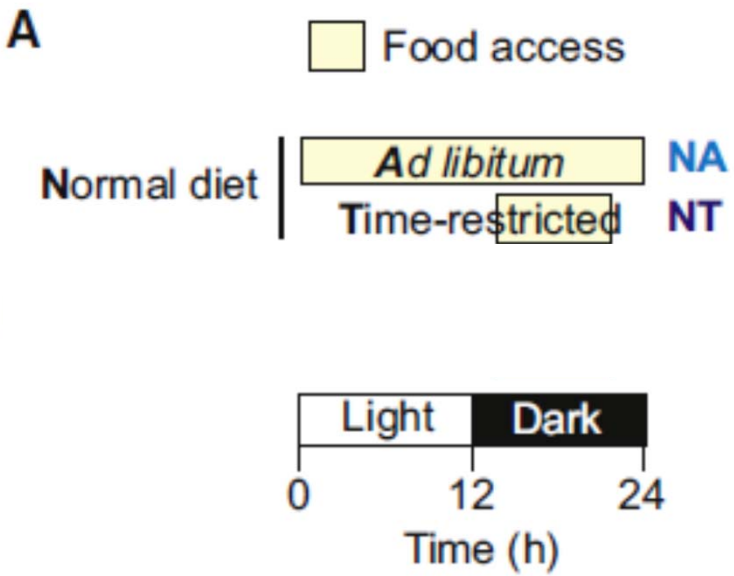
Cell Metabolism
Article

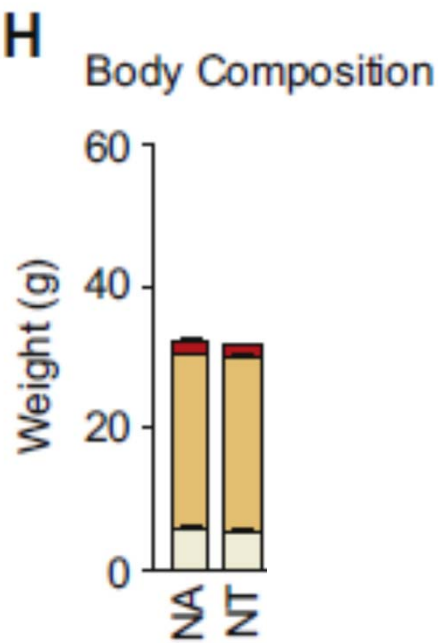
2016

Time-Restricted Feeding without Reducing Caloric Intake Prevents Metabolic Diseases in Mice Fed a High-Fat Diet

Megumi Hatori,[1,4] Christopher Vollmers,[1,4] Amir Zarrinpar,[1,2,4] Luciano DiTacchio,[1,4] Eric A. Bushong,[3] Shubhroz Gill,[1] Mathias Leblanc,[1] Amandine Chaix,[1] Matthew Joens,[1] James A.J. Fitzpatrick,[1] Mark H. Ellisman,[3] and Satchidananda Panda[1,*]

- Eating in line with circadian phase seems healthier than eating outside circadian phase


A
Food access
Normal diet
Ad libitum
NA
Time-restricted
NT
Light
Dark
0
12
24
Time (h)


H
Body Composition
Weight (g)
60
40
20
0
NA
NT

Cell Metabolism
Clinical and Translational Report

Ten-Hour Time-Restricted Eating Reduces Weight, Blood Pressure, and Atherogenic Lipids in Patients with Metabolic Syndrome

Michael J. Wilkinson,[1,3] Emily N.C. Manoogian,[2,3] Adena Zadourian,[1] Hannah Lo,[1] Savannah Fakhouri,[2] Azarin Shoghi,[2] Xinran Wang,[2] Jason G. Fleischer,[2] Saket Navlakha,[2] Satchidananda Panda,[2,4,*] and Pam R. Taub[1,*]

2020

- N = 19
- 10 hour feeding phase
- 10 week intervention, recording food intake via an app
- Actigraphy, continuous glucose monitoring, bloods, weights

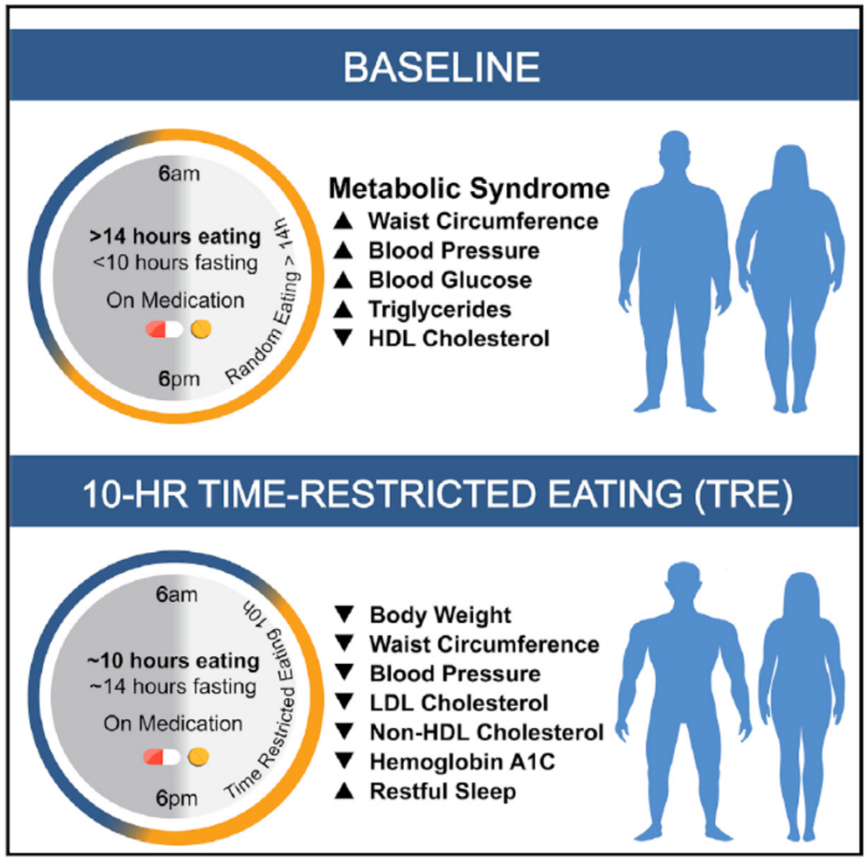


Table 1. Changes in Health Metrics from Baseline to End of 12 Weeks of Time-Restricted Eating

	Baseline (mean (SD))	TRE (mean (SD))	Change in TRE Baseline (mean (SD))	Percent Change	p Value
Weight, BMI, Body Fat, and Blood Pressure					
Daily eating interval[a]	15.13 (1.13)	10.78 (1.18)	−4.35 (1.32)	−29%	8.847E−11
Weight (kg)	97.84 (19.73)	94.54 (18.38)	−3.30 (3.20)	−3%	0.00028
BMI (kg/m^2)	33.06 (4.76)	31.97 (4.44)	−1.09 (0.97)	−3%	0.00011
Percent body fat (%)	36.62 (4.18)	35.61 (4.02)	−1.01 (0.91)	−3%	0.00013
Waist circumference (cm)	109.14 (11.21)	104.68 (14.79)	−4.46 (6.72)	−4%	0.0097
Visceral fat rating	16.68 (5.97)	16.11 (5.89)	−0.58 (0.77)	−3%	0.004
Systolic BP (mmHg)[b]	127.88 (8.89)	122.76 (13.35)	−5.12 (9.51)	−4%	0.041
Diastolic BP (mmHg)[b]	78.47 (8.74)	72.00 (10.75)	−6.47 (7.94)	−8%	0.004

Behavioral Interventions

- **Weight Loss**

This should be standard of care for overweight and obese OSA patients

- **Avoid supine sleep… DEVICES**
- Avoid alcohol and sedatives
- Allow adequate time for sleep

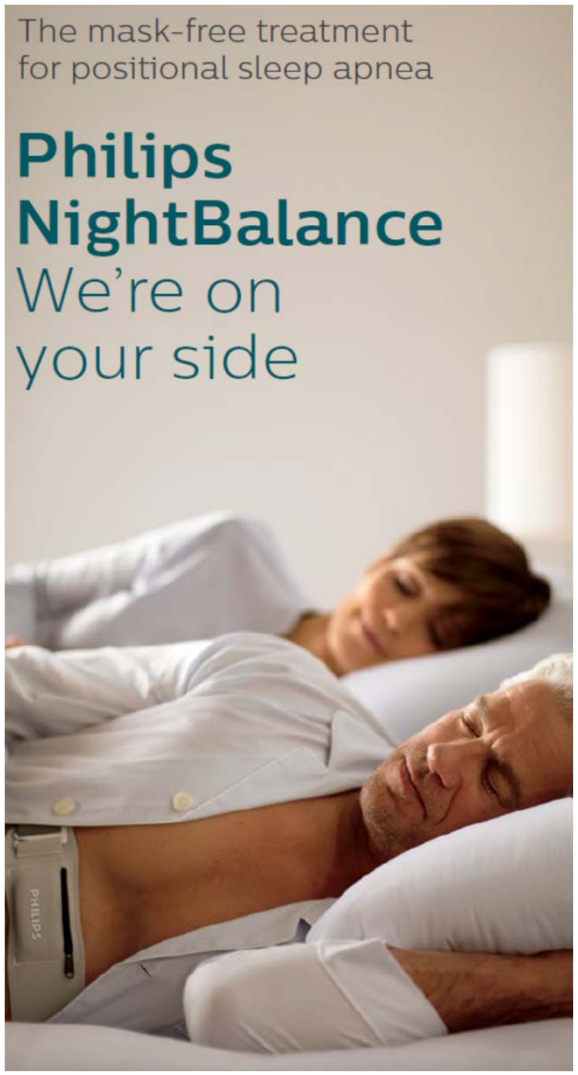
Making Sense of the Noise: Toward Rational Treatment for Obstructive Sleep Apnea

Eric J. Kezirian, MD, MPH

AJRCCM 2020

- Many therapies have limited evidence
  - Trials are small, non randomized
- Often have the assumption that adherence will be better than CPAP
- Variety of surgeries, oral appliances with different operator skill
- Limited outcome data beyond AHI

Position Therapy

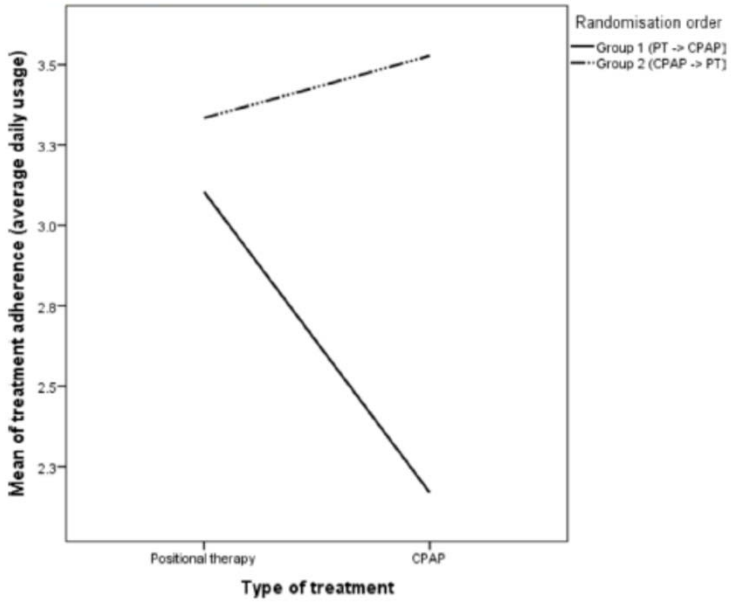


ORIGINAL RESEARCH

Comparing treatment effects of a convenient vibratory positional device to CPAP in positional OSA: a crossover randomised controlled trial

Thorax 2020

Yingjuan Mok ,[1,2] Alvin Tan,[1,3] Pon Poh Hsu,[1,3] Audrey Seow,[4] Yiong Huak Chan,[5] Hang Siang Wong,[1,2] Yvonne Poh,[4] Keith K H Wong[6]



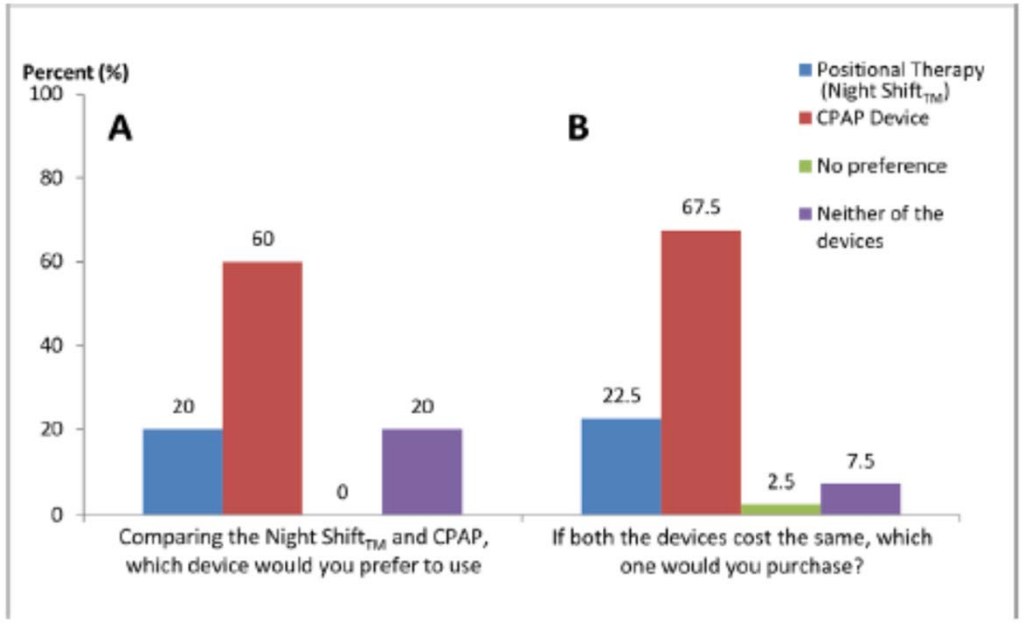


Figure 3 Patient treatment adherence. CPAP, continuous positive airway pressure; PT, positional therapy.

Non PAP Therapies

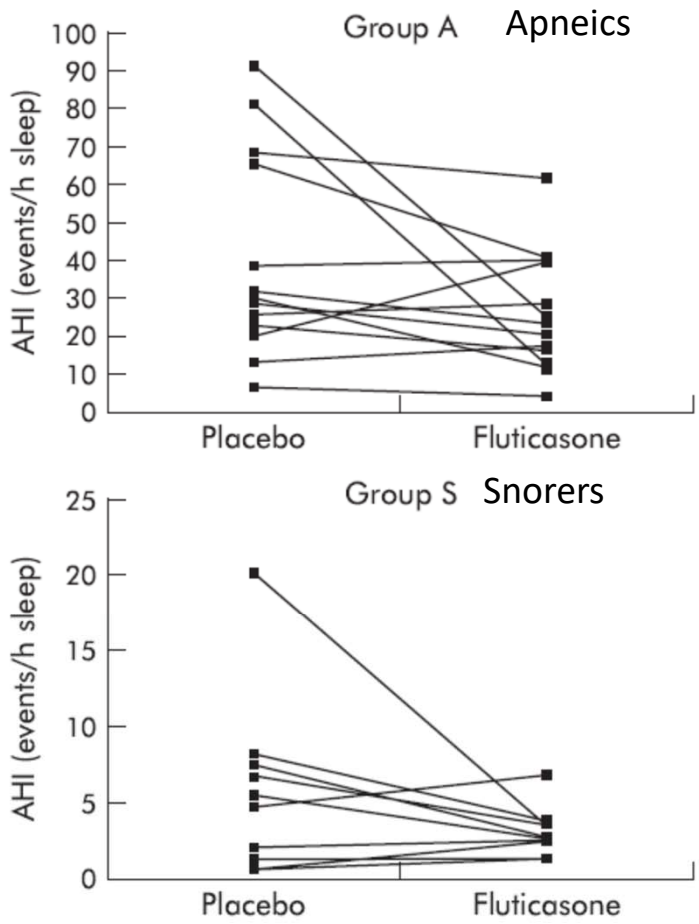
- Behavioral
- **Oral Appliances**
- Upper Airway Surgery
- Other Devices

Start above the oropharynx if needed…

SLEEP DISORDERED BREATHING

Intranasal corticosteroid therapy for obstructive apnoea in patients with co-existing rhinitis

J L Kiely, P Nolan, W T McNicholas



Oral appliances

- Not one device
- Variable efficacy
  - Variable practitioner skill
  - Hard to predict good response
  - Less data re: outcomes compared to PAP
- Not insignificant side effects
  - TMJ discomfort, dental misalignment, and salivation

Dorsal Fin Appliance

EMA Appliance

Narval Appliance

TAP Appliance

Herbst Appliance

Journal of
Clinical Medicine

MDPI

Review

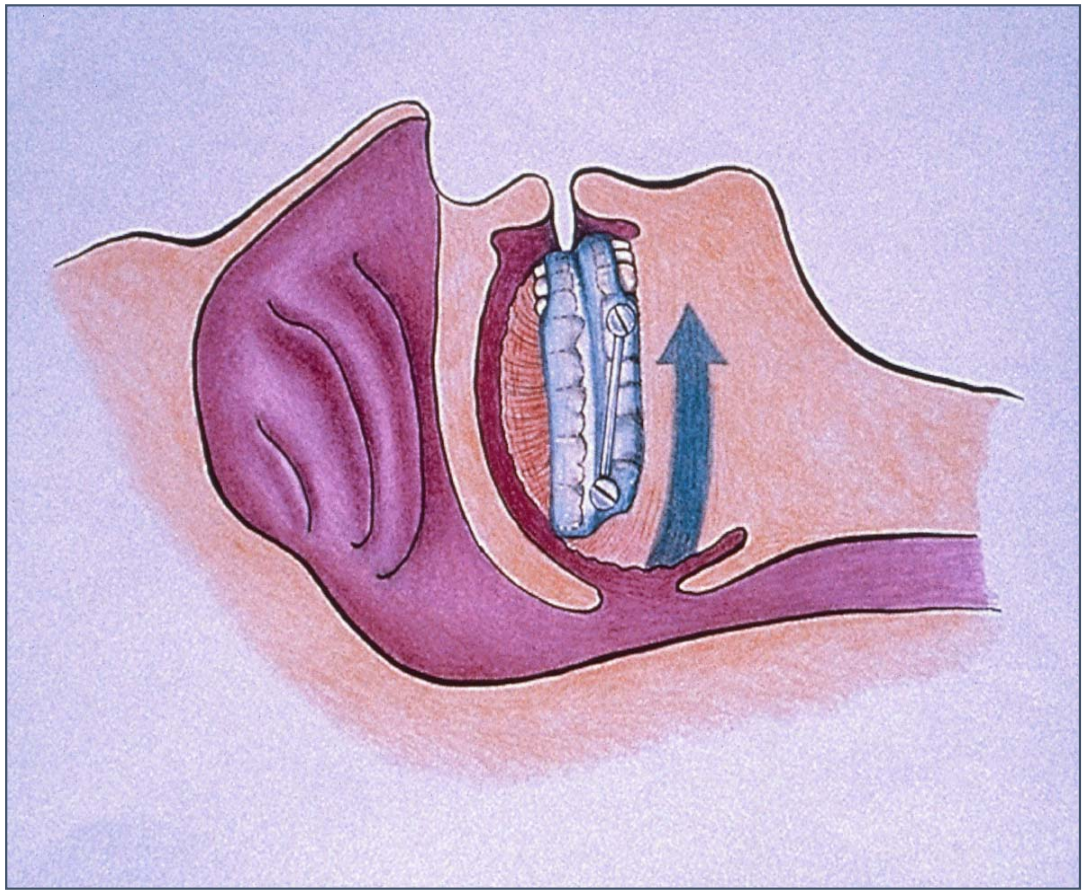
Oral Appliance Therapy for Obstructive Sleep Apnoea: State of the Art

Kate Sutherland [1,2,*] and Peter A. Cistulli [1,2]

[1] Sleep Research Group, Charles Perkins Centre and Northern Clinical School, Faculty of Medicine and Health, University of Sydney, Sydney, NSW 2006, Australia; peter.cistulli@sydney.edu.au
[2] Department of Respiratory Medicine, Royal North Shore Hospital, Sydney, NSW 2065, Australia
* Correspondence: kate.sutherland@sydney.edu.au

Received: 1 November 2019; Accepted: 27 November 2019; Published: 2 December 2019

Oral appliances



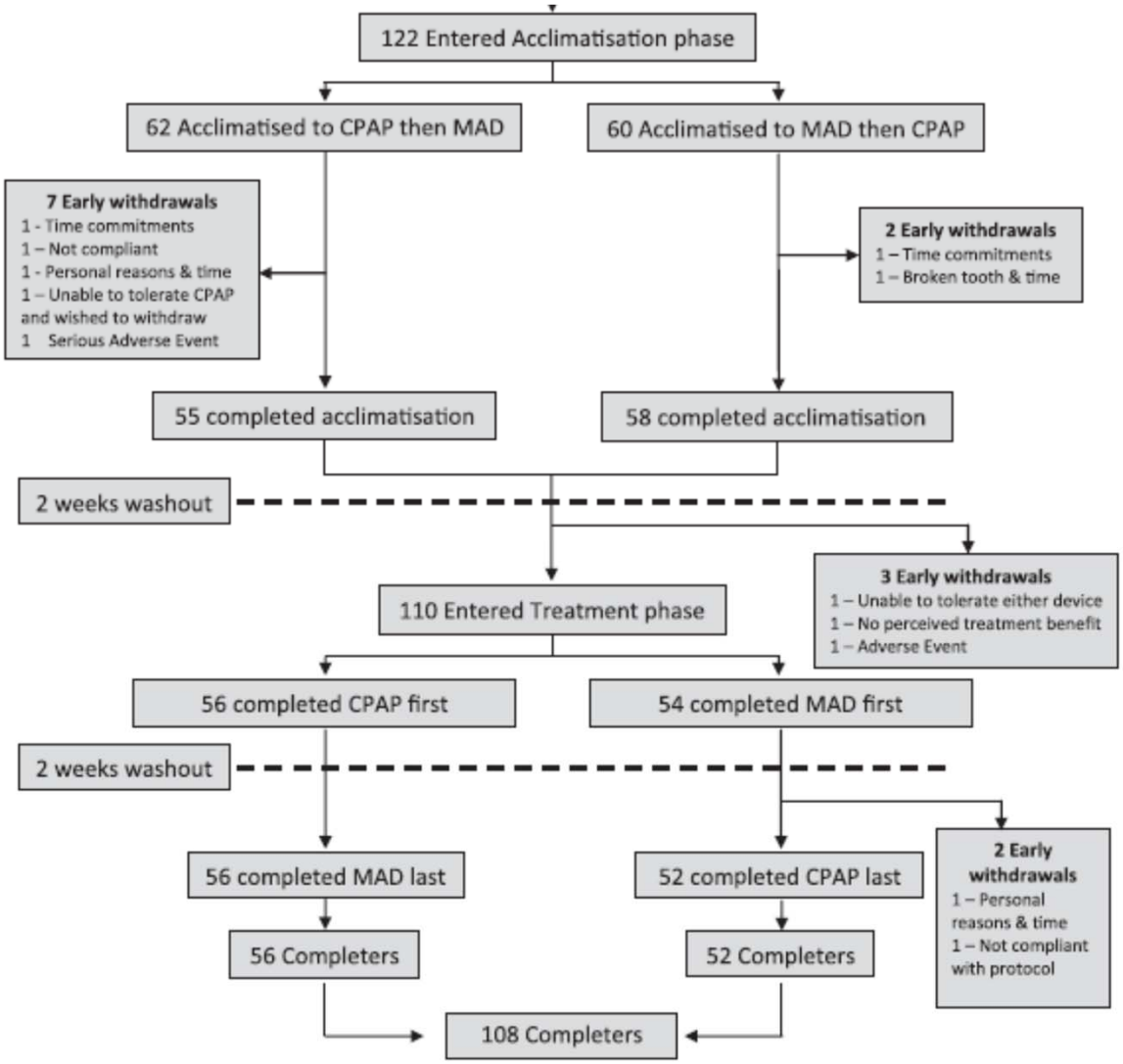
Health Outcomes of Continuous Positive Airway Pressure versus Oral Appliance Treatment for Obstructive Sleep Apnea

A Randomized Controlled Trial

AJRCCM 2013

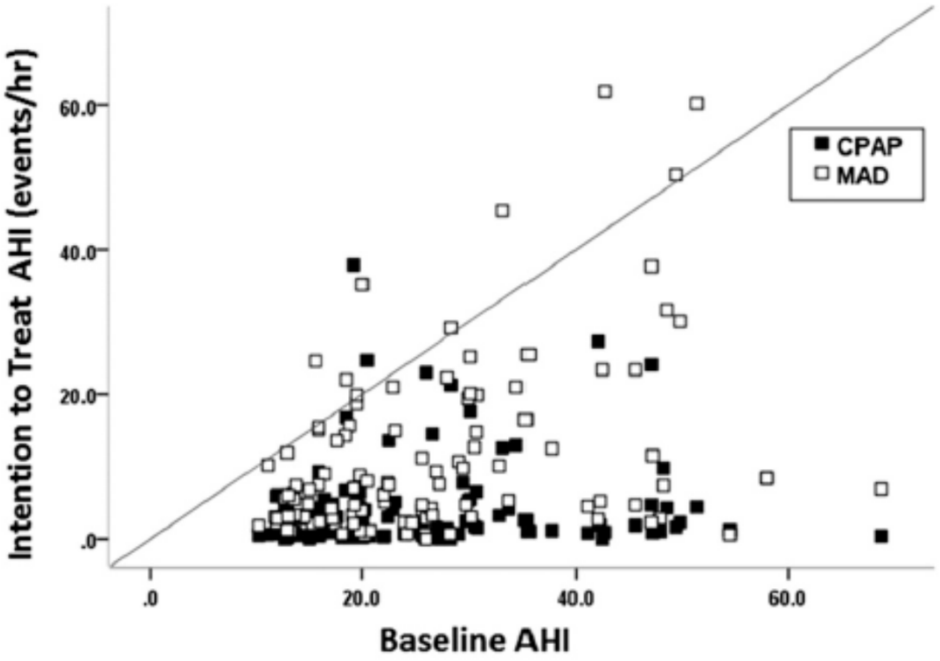
Craig L. Phillips[1,2], Ronald R. Grunstein[2,3], M. Ali Darendeliler[4], Anastasia S. Mihailidou[5,6], Vasantha K. Srinivasan[4], Brendon J. Yee[2,3], Guy B. Marks[2,7], and Peter A. Cistulli[1,2]

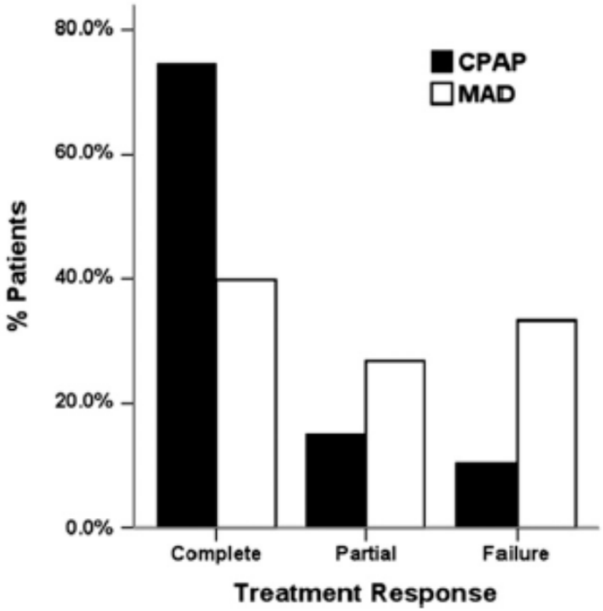
Kind of data you would like to have



Moderate to severe OSA

PAP More effective at reducing the AHI





Compliance higher with oral appliance

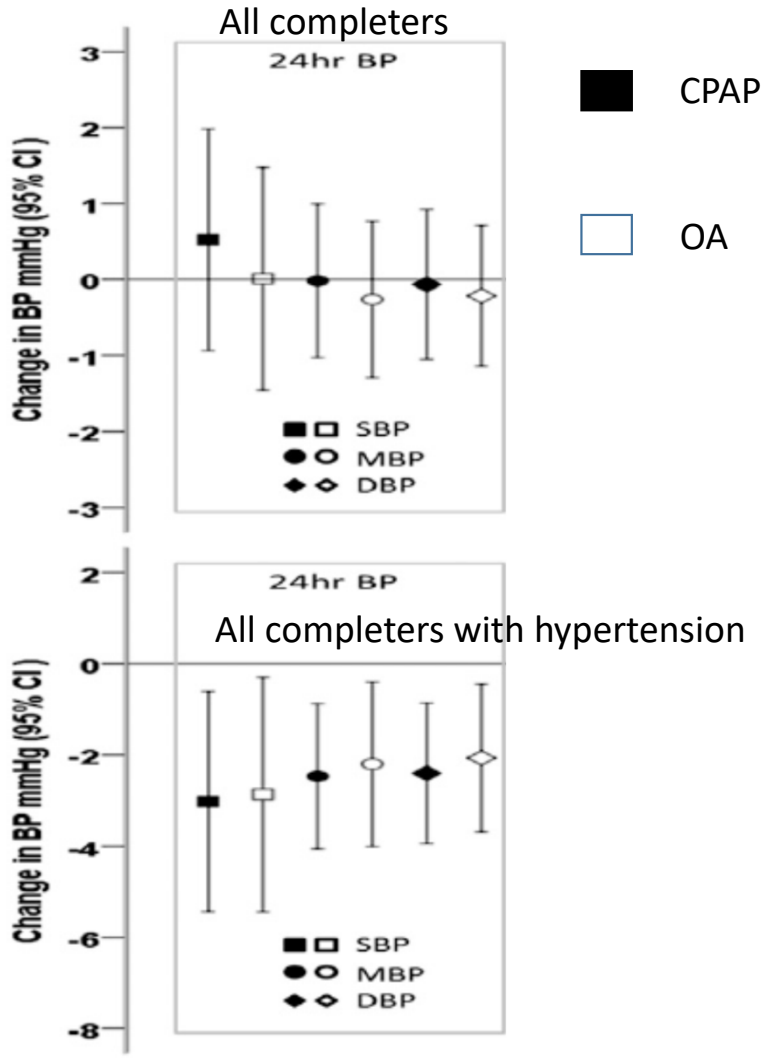
TABLE 2. INTENTION-TO-TREAT POLYSOMNOGRAPHY AND SELF-REPORTED COMPLIANCE

Variable	Mean (SD) CPAP	Mean (SD) MAD	*P* Value
Polysomnography			
AHI, h^{-1}	4.5 (6.6)	11.1 (12.1)	<0.0001
ODI 3%, h^{-1}	6.0 (9.7)	9.0 (11.6)	0.0001
Min Sp_{O_2}, %	90.6 (5.0)	87.2 (5.9)	<0.0001
Sp_{O_2} T90, % total sleep time	5.8 (16.9)	6.6 (15.7)	0.04
Arousal index, h^{-1}	16.6 (10.6)	19.2 (11.6)	0.02
Sleep latency, min	11.5 (15.7)	15.3 (21.3)	0.002
Sleep efficiency, %	82 (12)	82 (12)	0.9
Diary data			
Subj compliance, h/night	5.2 (2.0)	6.5 (1.3)	<0.0001
Subj sleep, h/night	6.9 (0.9)	7.1 (0.7)	0.005

Reduction in Epworth Sleepiness Scale about the same

OA similar to CPAP

- Effective AHI close
- Both lowered BP in those with HTN
- Which therapy should you try first?
  - **Variable response?**
  - Payor?

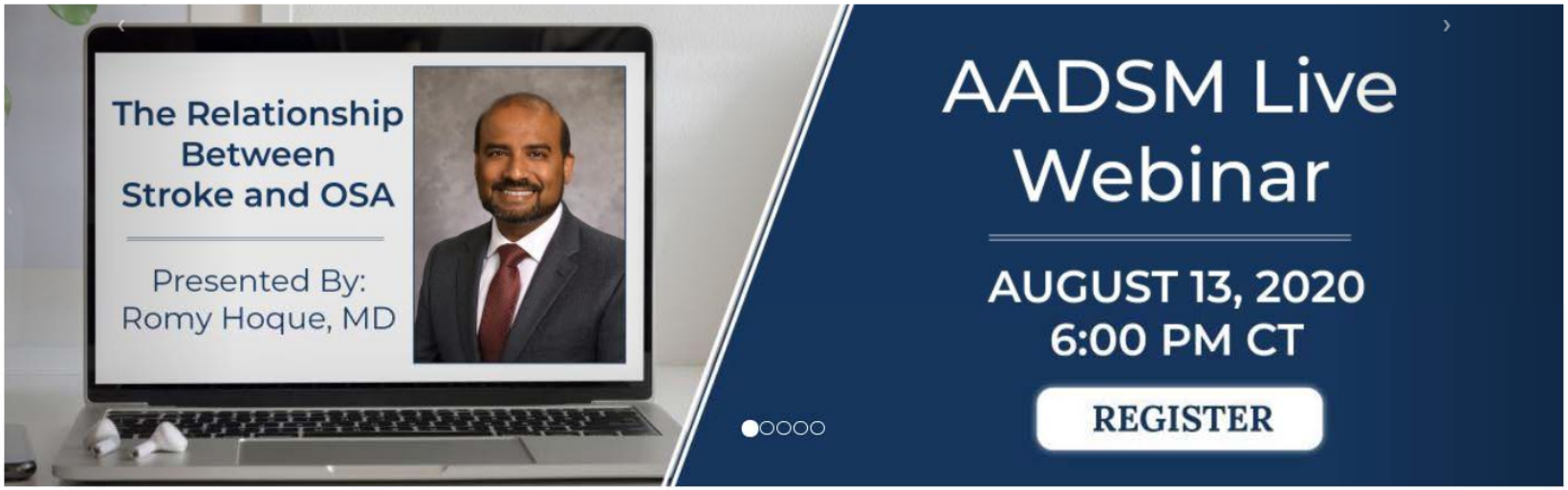


Predictors of response

- Less severe OSA as assessed by the AHI
- Lower CPAP holding pressure
- Younger
- Less Obese
- Women

4. Factors Related to Oral Appliance Efficacy and Prediction Methods

The uncertainty around the level of AHI reduction achieved following OA therapy has remained a clinical barrier to the implementation of OAs in routine clinical practice. A clinical prediction method has been a focus of much research, but this 'holy grail' remains elusive. A complexity in comparing prediction studies is the variation in treatment response definitions. Many studies have started to



Recent News

2021 Annual Meeting Call for Topics and Speakers
Submit suggestions for topic ideas or speakers for the 2021 AADSM Annual Meeting

Dr. David Schwartz Named

Membership

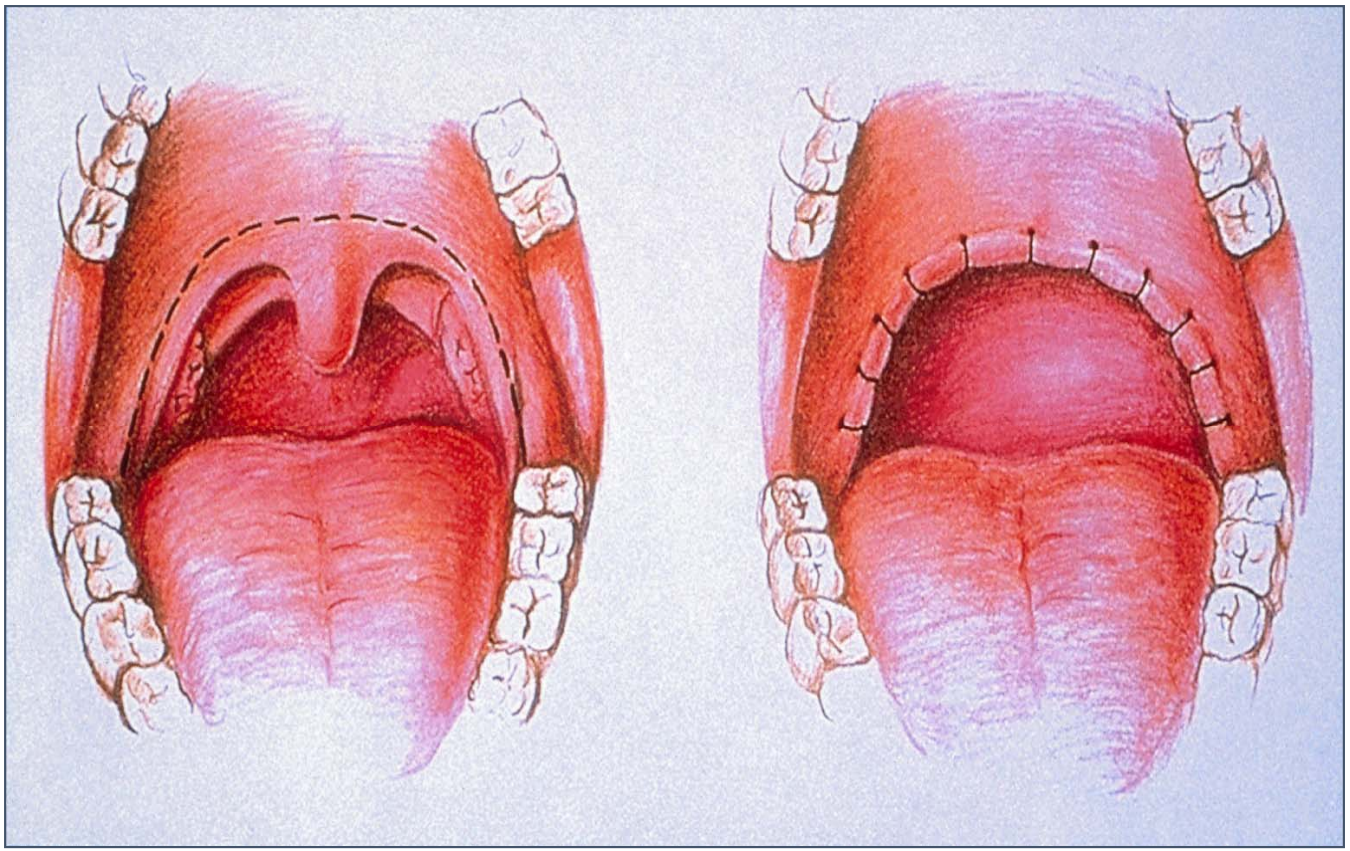
Join the American Academy of Dental Sleep Medicine and gain access to exclusive educational resources, practice management support, networking opportunities and more.

- Login Now
- Member Benefits and Join

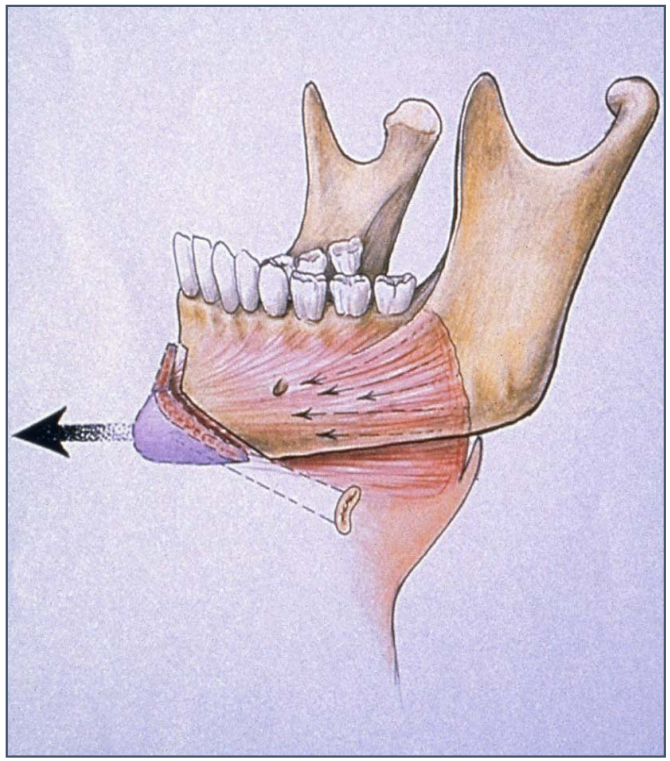
Surgical Treatment Options

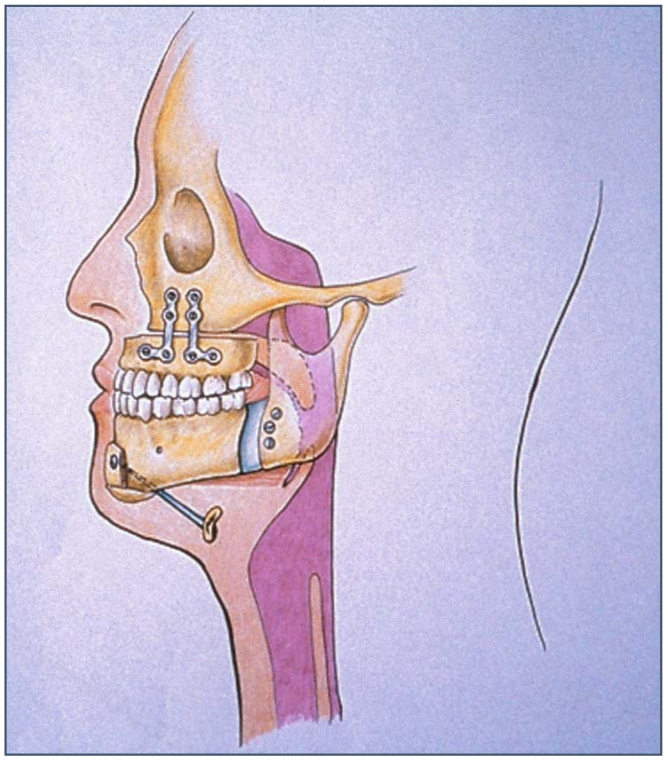
- Nasal operation
- Tonsillectomy
- Uvulopalatopharyngoplasty (UPPP)
- Laser-assisted uvulopalatopharyngoplasty (LAUP)
- Radiofrequency tissue volume reduction
- Palatal implants
- Genioglossal advancement
- Maxillomandibular advancement

Uvulopalatopharyngoplasty (UPPP)



Best results with most radical surgeries





Surgical Treatment Options

- Some similar predictors of success: more mild OSA, less obesity, obvious upper airway abnormality
  - “Kissing tonsils”
- Similar shortcomings as OA therapy research
- Co-evaluation with ENT colleague

Non PAP Therapies

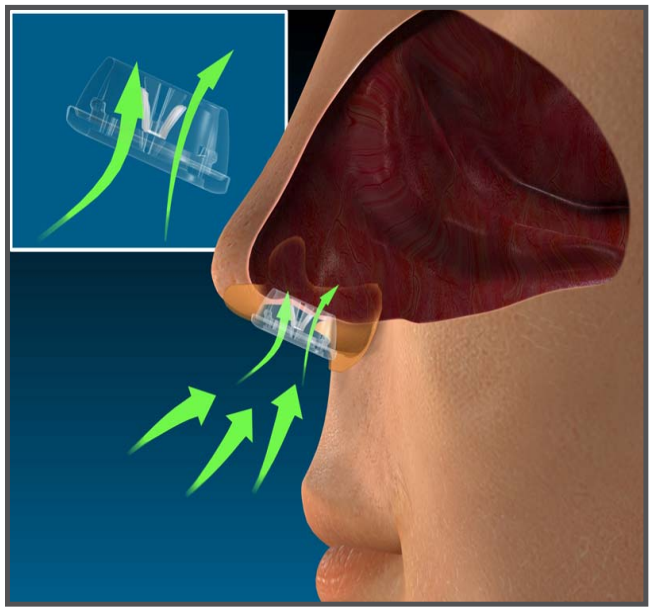
- Behavioral
- Oral Appliances
- Upper airway Surgery
- **Other Devices**

Trying to create larger/stiffer airway
Few good trials
Patient selection/procedure/operator specific

Nasal Valves

Provent Therapy, Ventus Medical

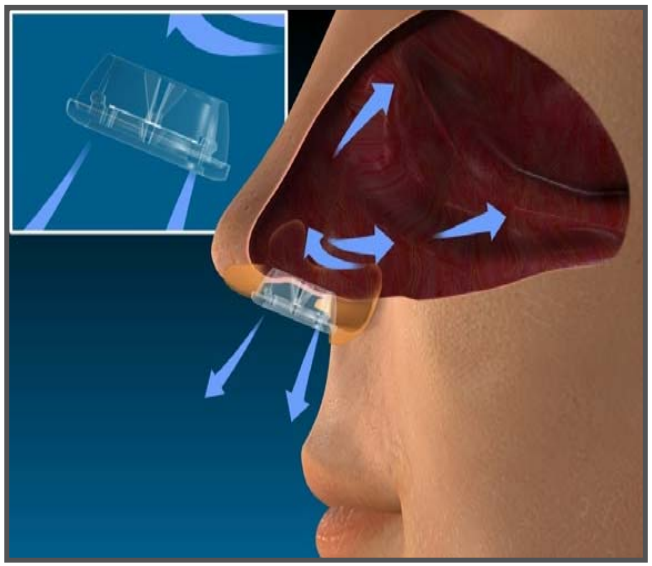
Nasal valves act during expiration



Inspiration

Valve open

Normal breathing

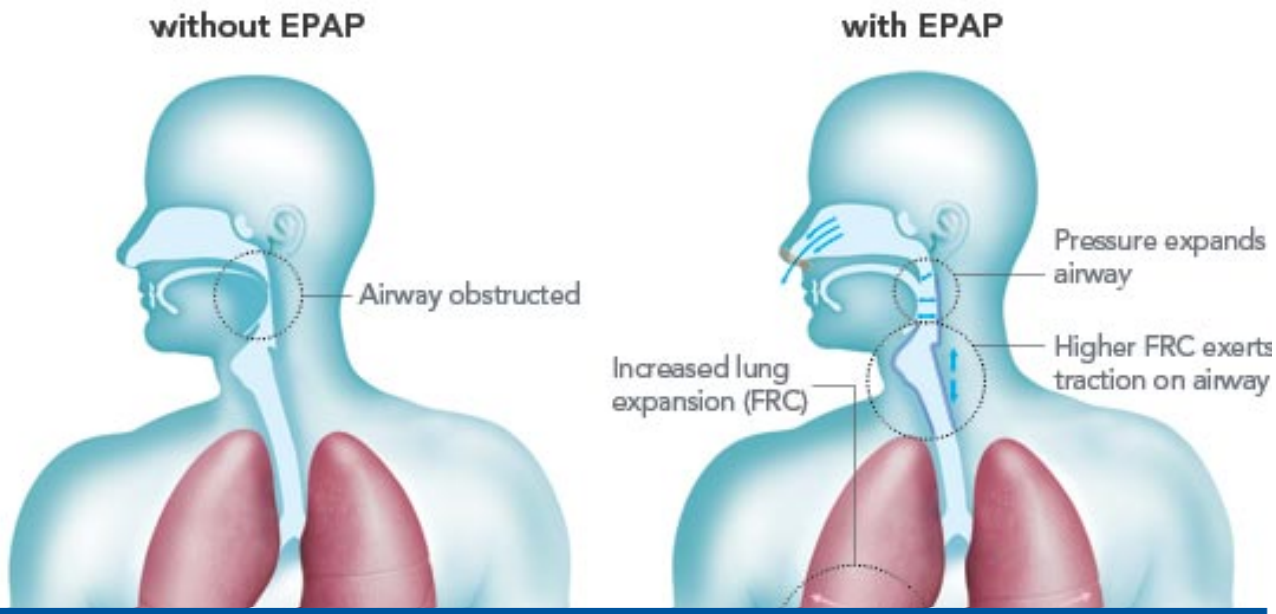


Expiration

Valve closed, increased resistance

Creates positive pressure

What (we think) nasal valves do



RANDOMIZED TRIAL OF NOVEL EPAP DEVICE FOR TREATMENT OF OSA

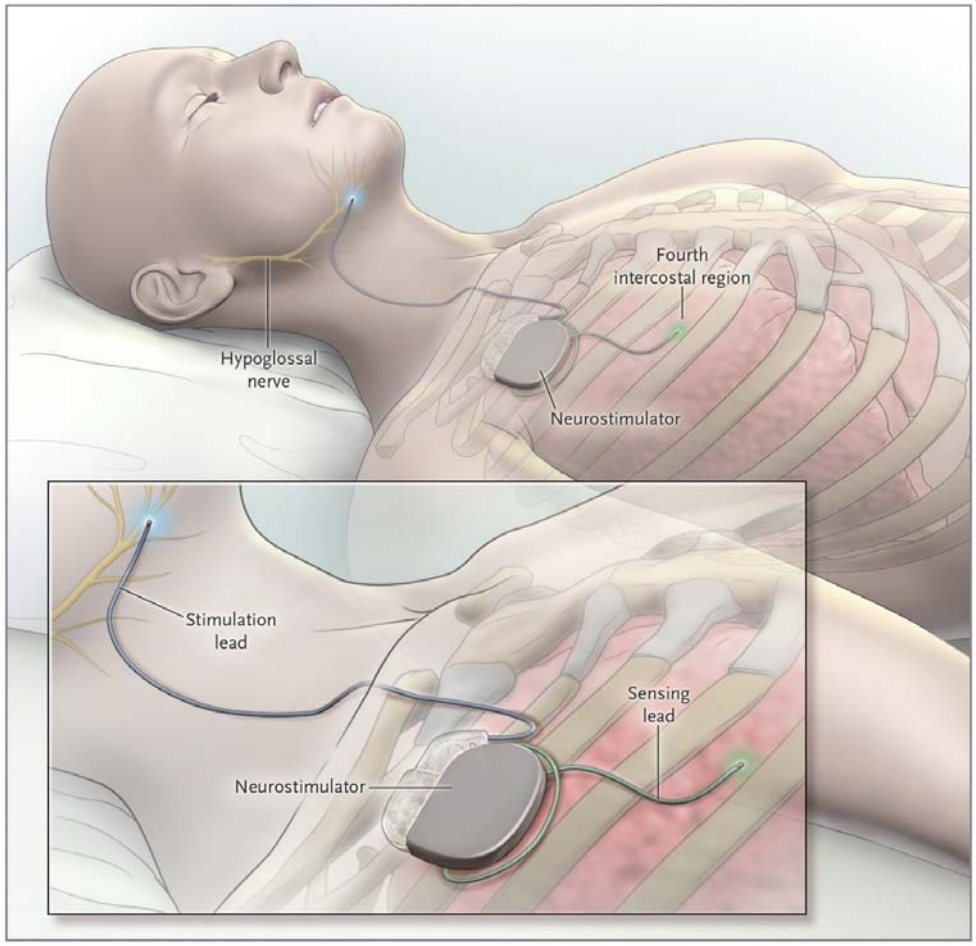
A Novel Nasal Expiratory Positive Airway Pressure (EPAP) Device for the Treatment of Obstructive Sleep Apnea: A Randomized Controlled Trial

Richard B. Berry, MD[1]; Meir H. Kryger, MD[2]; Clifford A. Massie, PhD[3]

Winx

No longer available

Hypoglossal Nerve Stimulator therapy



Strollo *NEJM* 2014

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Upper-Airway Stimulation for Obstructive Sleep Apnea

Patrick J. Strollo, Jr., M.D., Ryan J. Soose, M.D., Joach
Nico de Vries, M.D., Jason Cornelius, M.D., Oleg F
Ronald D. Hanson, M.D., Tapan A. Padhya, M.D., Dav
M. Boyd Gillespie, M.D., B. Tucker Woodson, M.D., Paul H. Va
Mark G. Goetting, M.D., Olivier M. Vanderveken, M.D., Ph
Lennart Knaack, M.D., and Kingman P. Strohl, M.D., for

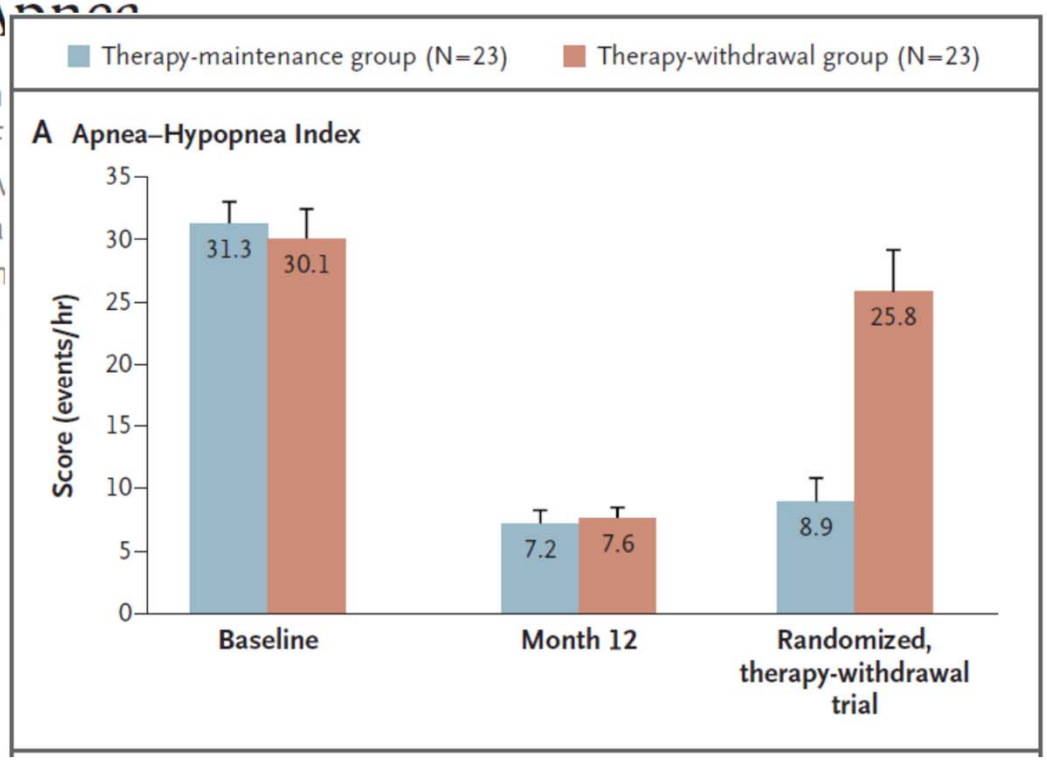
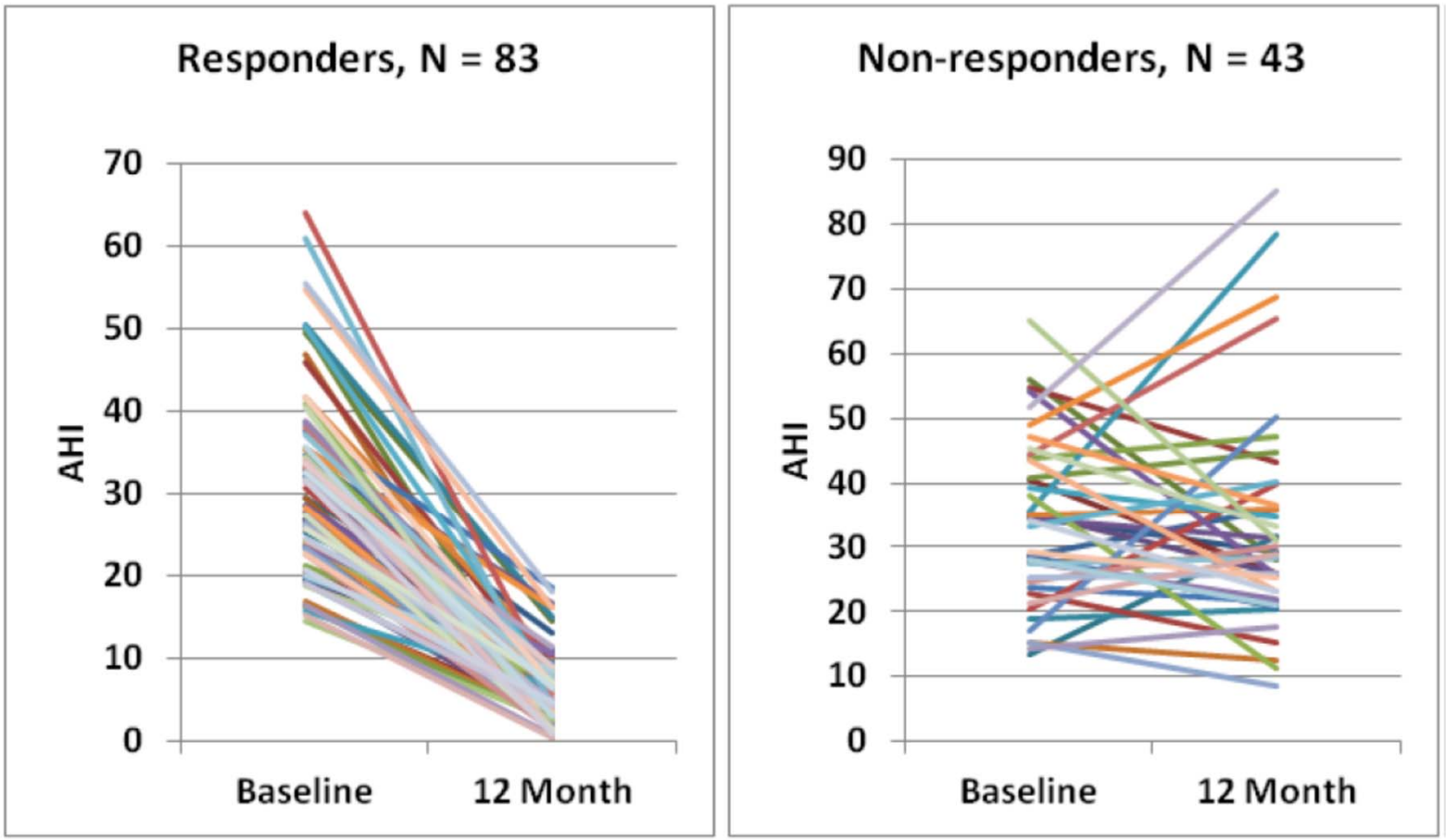


Figure S3. AHI Changes in Responders and Non-responders

BMI<32

Cost



Upper Airway Muscle Training

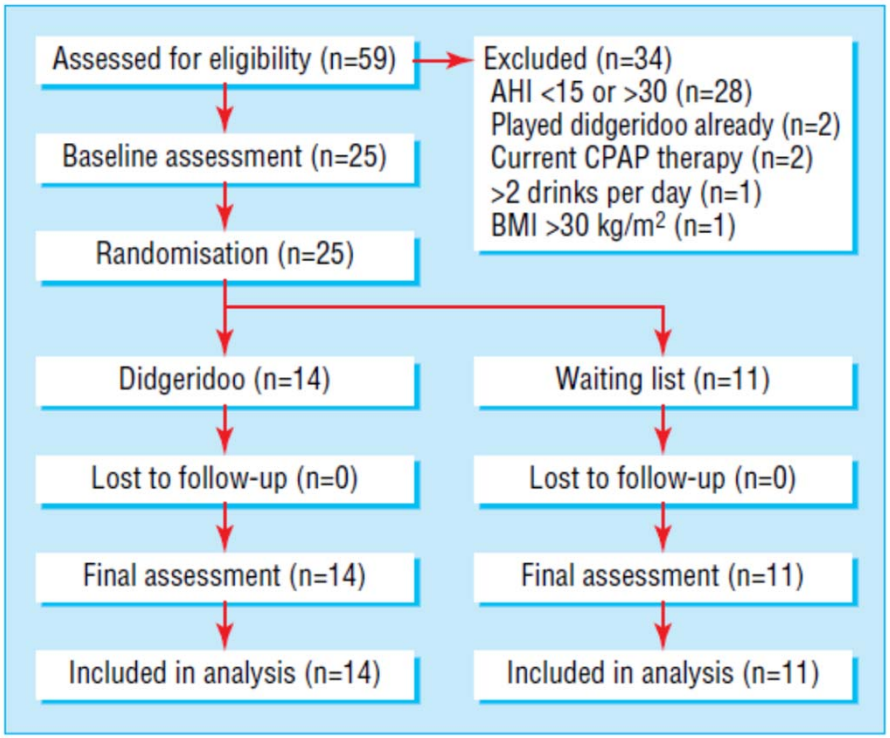
Cite this article as: BMJ, doi:10.1136/bmj.38705.470590.55 (published 23 December 2005)

Research

Didgeridoo playing as alternative treatment for obstructive sleep apnoea syndrome: randomised controlled trial

Milo A Puhan, Alex Suarez, Christian Lo Cascio, Alfred Zahn, Markus Heitz, Otto Braendli

Fig 1 Man playing didgeridoo



Improvements in AHI, ESS

Outline

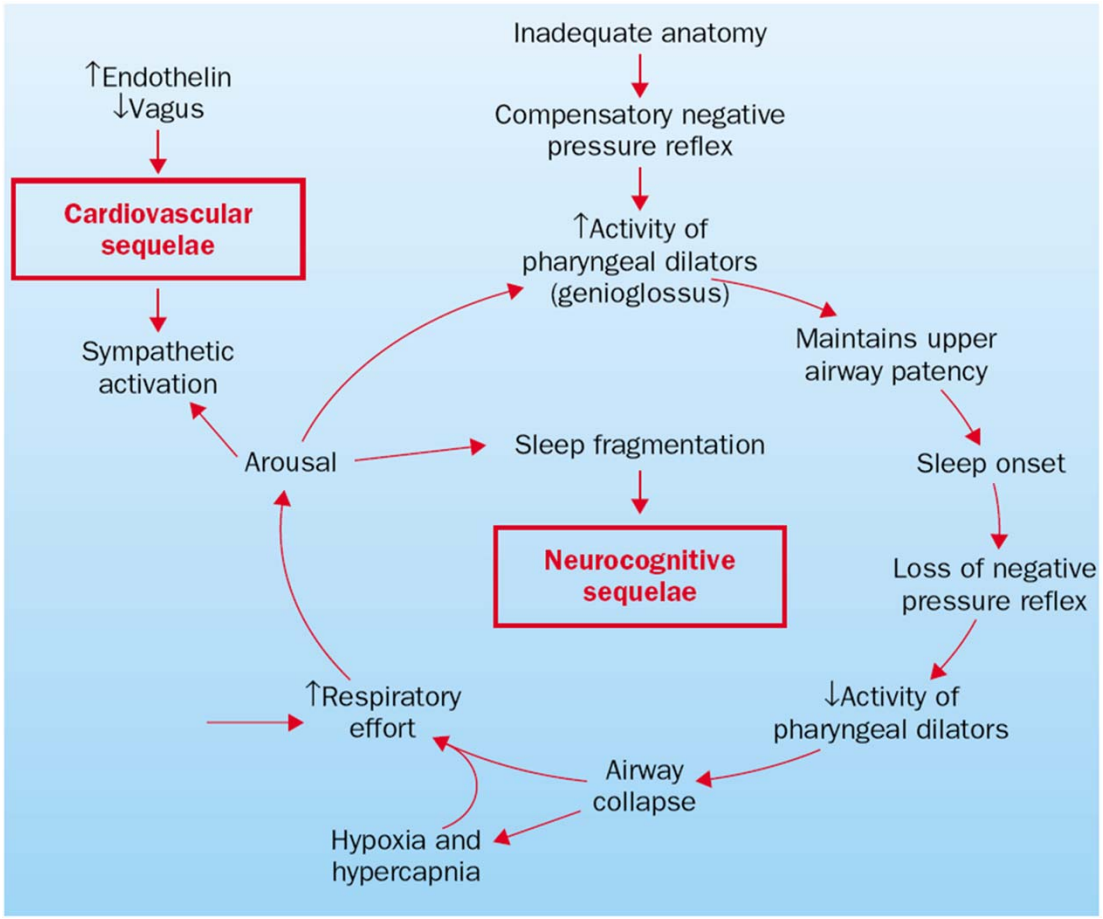
- (Brief) Obstructive Sleep Apnea Introduction

  Anatomy is the underlying problem
- How good is CPAP anyway?

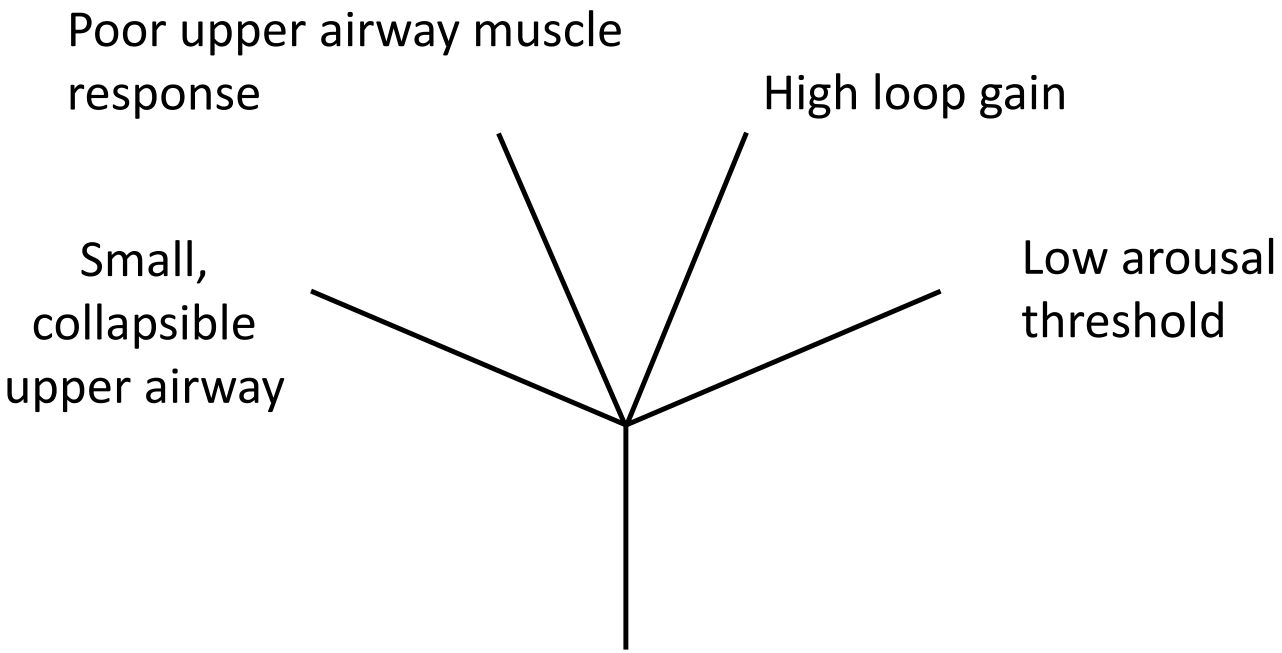
  PAP works, adherence getting better
- Non PAP therapies

  Variable response
- **Another way to think about OSA Pathogenesis (and non PAP therapy)**

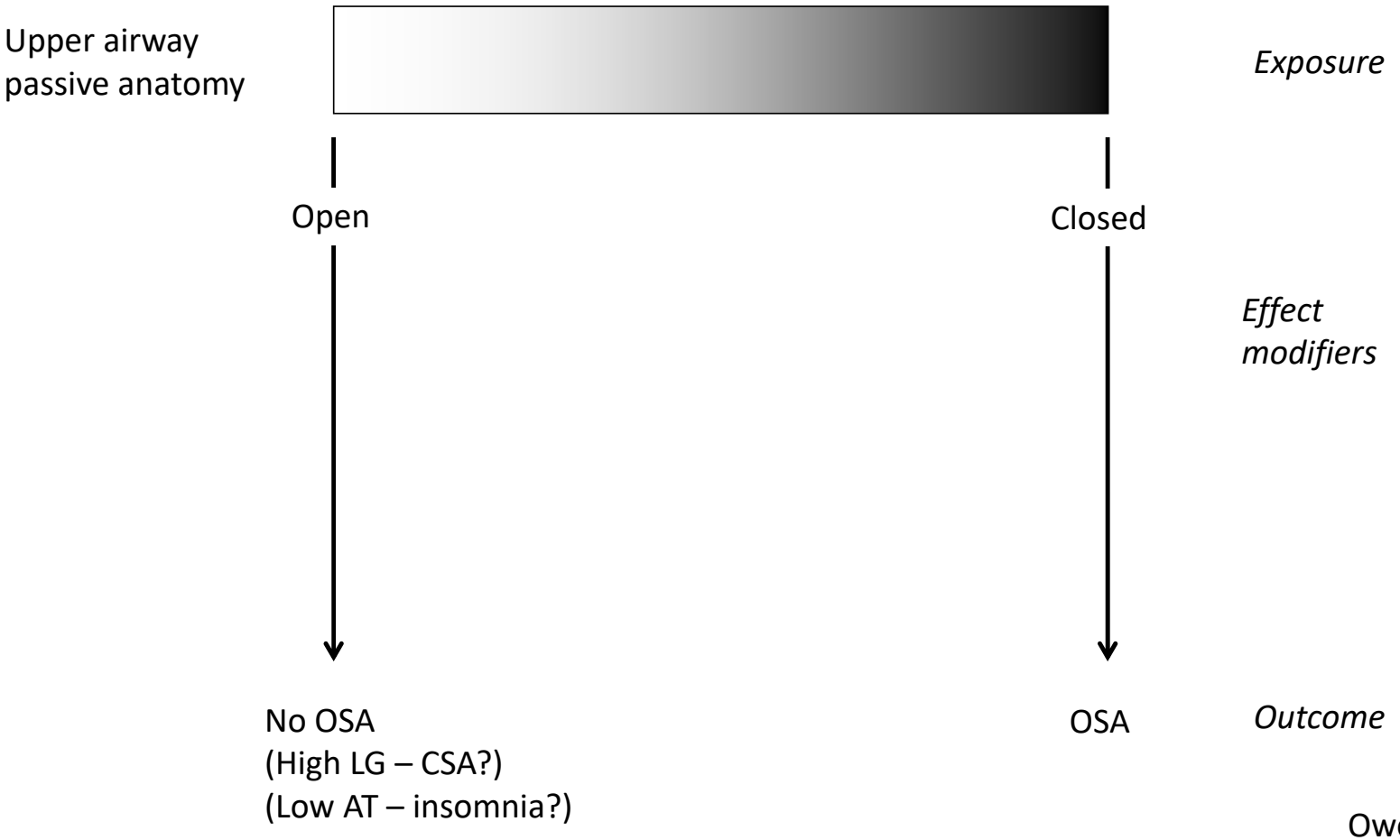
Pathophysiology



Pathogenesis of sleep apnea

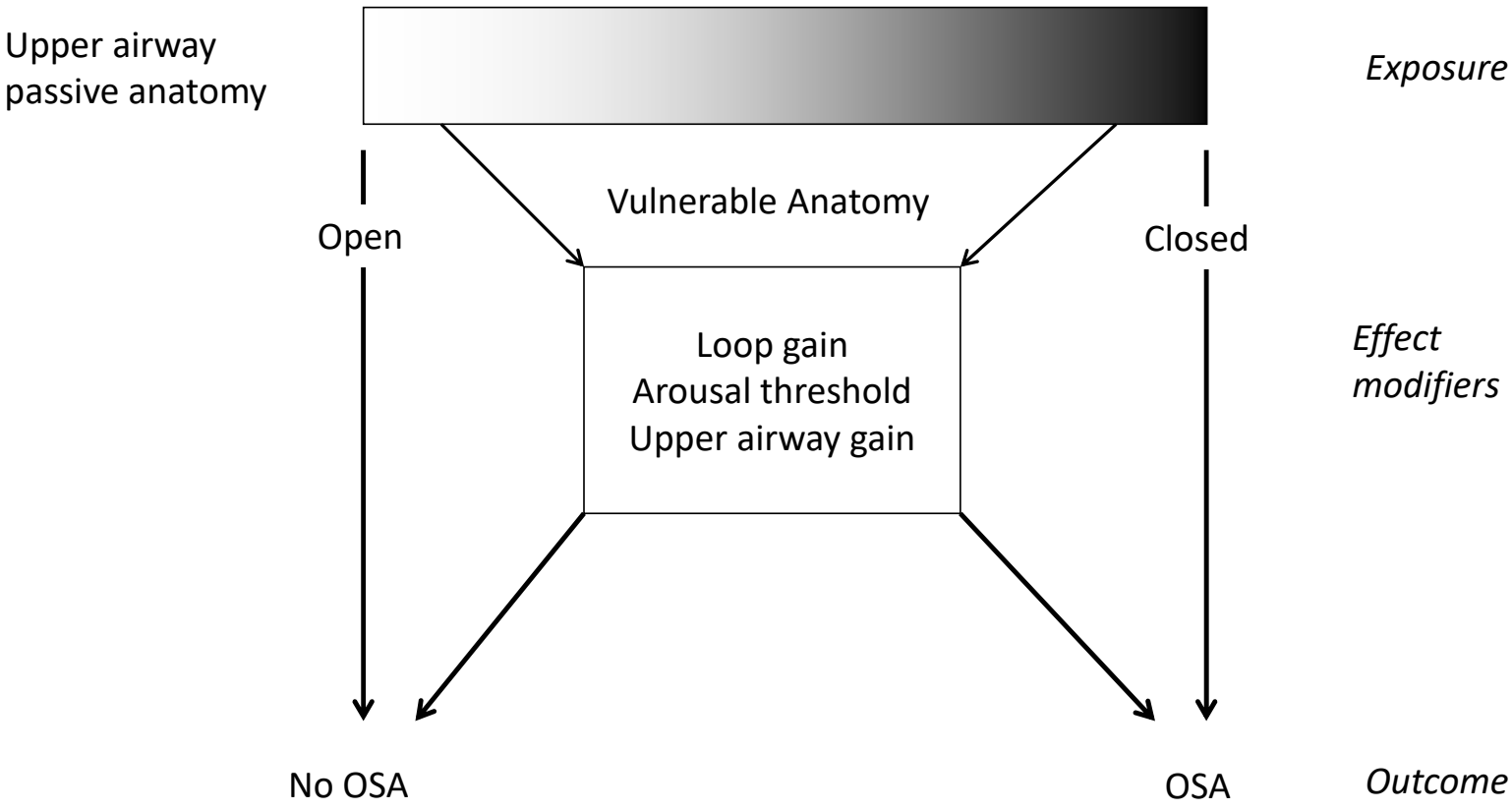


A new model that includes Effect Modification



Owens SLEEP 2015

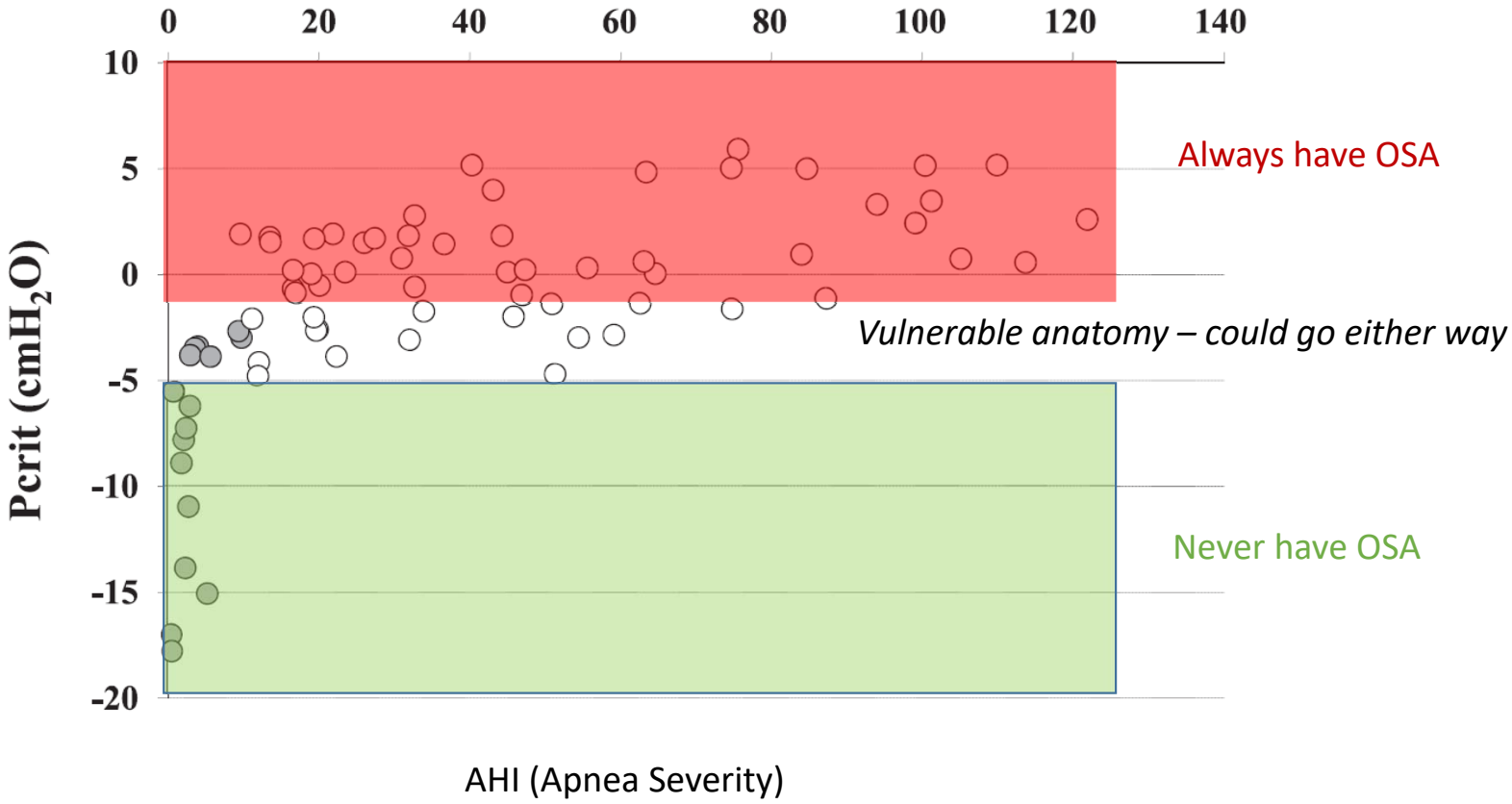
Non anatomical traits are important in some people



Anatomy is important in everyone

Worse Anatomy

Better Anatomy



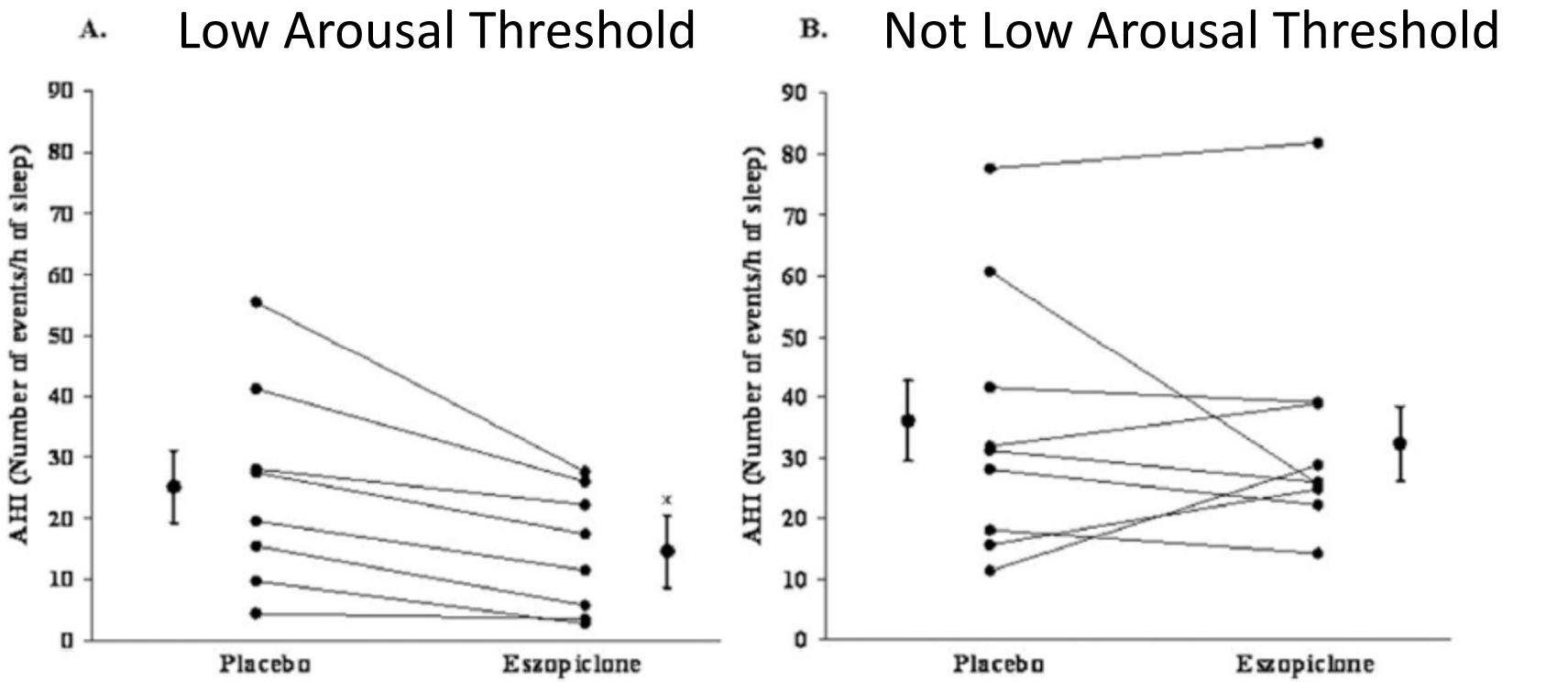
Physiology may help:

- Understand the cause of OSA in an individual (or group of people)
- Choose a primary treatment for OSA?
- Predict the improvement with non PAP anatomical therapy (e.g. surgery, oral appliance)
- Predict adherence to therapy?

Targeting the underlying problem

- Arousal Threshold
  - Sedative hypnotics (eszopiclone, trazodone)
  - ?Behavioral therapy
- Loop Gain
  - Oxygen
  - Acetazolamide
- Upper airway muscles
  - HGNS
  - Drugs?

Targeting the underlying problem



Eckert Clin Sci 2011

SLEEP-DISORDERED BREATHING

The Combination of Supplemental Oxygen and a Hypnotic Markedly Improves Obstructive Sleep Apnea in Patients with a Mild to Moderate Upper Airway Collapsibility

Bradley A. Edwards, PhD[1,2,3]; Scott A. Sands, PhD[1,4]; Robert L. Owens, MD[1,5]; Danny J. Eckert, PhD[1,6]; Shane Landry, PhD[2,3]; David P. White, MD[1]; Atul Malhotra, MD[1,5]; Andrew Wellman, MD, PhD[1]

Sleep 2016

ORIGINAL ARTICLE

The Combination of Atomoxetine and Oxybutynin Greatly Reduces Obstructive Sleep Apnea Severity

A Randomized, Placebo-controlled, Double-Blind Crossover Trial

Luigi Taranto-Montemurro[1], Ludovico Messineo[1,2], Scott A. Sands[1], Ali Azarbarzin[1], Melania Marques[1,3], Bradley A. Edwards[4,5], Danny J. Eckert[6], David P. White[1], and Andrew Wellman[1]

2019

Can physiology **predict** those who respond to oral appliances and surgery?

JCSM
Journal of Clinical Sleep Medicine

SCIENTIFIC INVESTIGATIONS

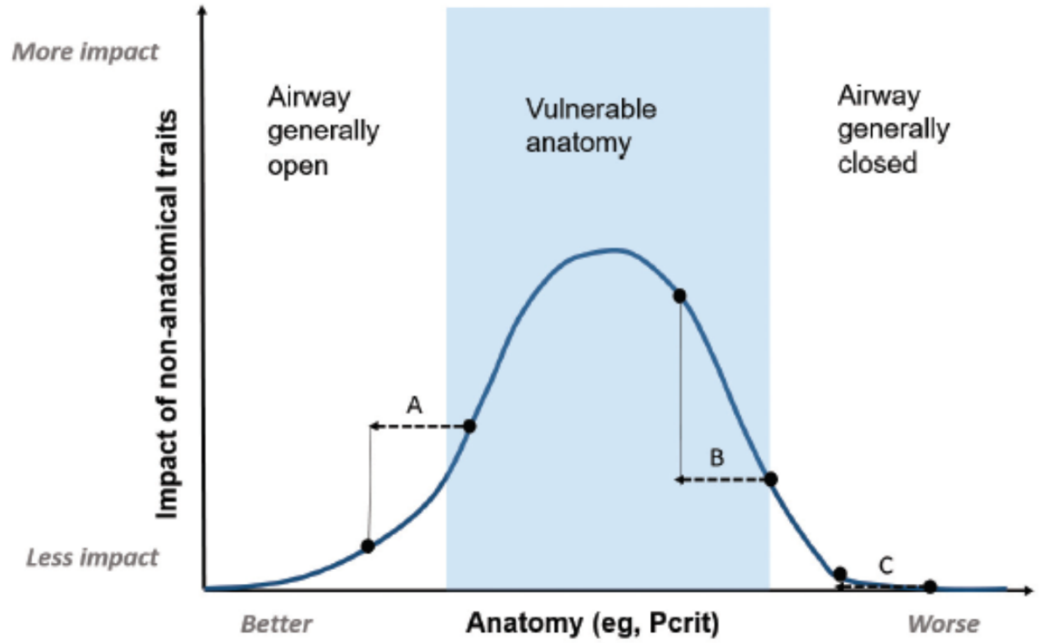
Physiology-Based Modeling May Predict Surgical Treatment Outcome for Obstructive Sleep Apnea

Yanru Li, MD[1,2]; Jingying Ye, MD[1,3]; Demin Han, MD, PhD[1]; Xin Cao, MD[1]; Xiu Ding[1]; Yuhuan Zhang[1,3]; Wen Xu, MD[1]; Jeremy Orr, MD[2]; Rachel Jen, MD[2]; Scott Sands, PhD[4,5]; Atul Malhotra, MD[2]; Robert Owens, MD[2]

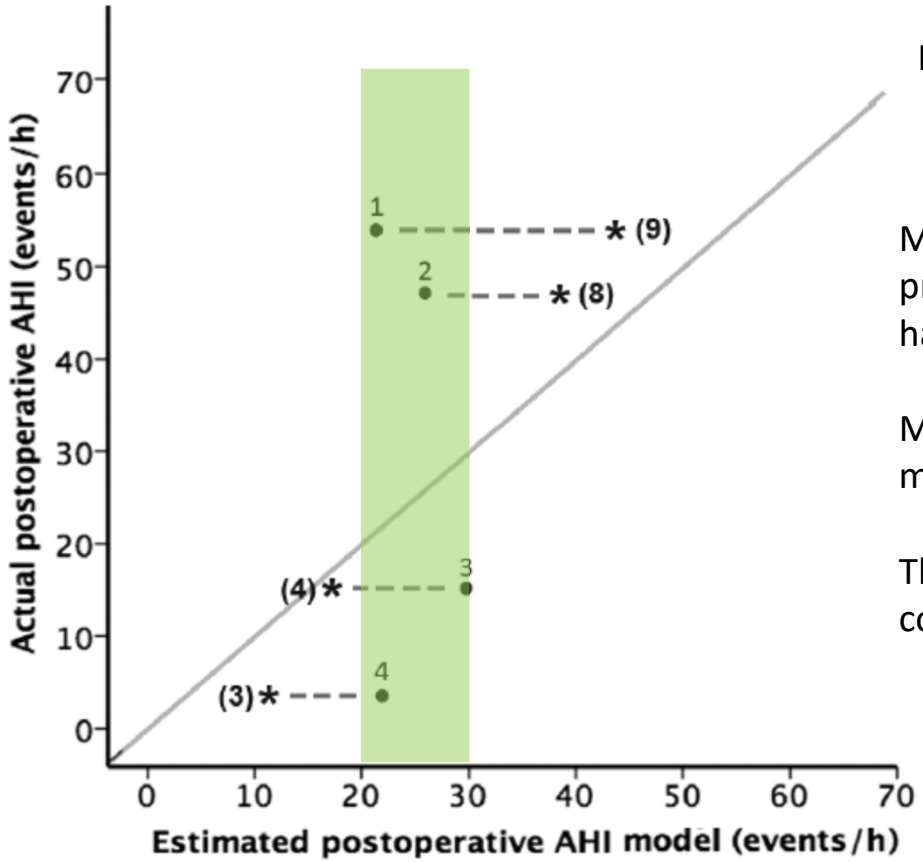
[1]Department of Otolaryngology Head and Neck Surgery, Beijing Tongren Hospital, Capital Medical University, Key Laboratory of Otolaryngology Head and Neck Surgery (Ministry of Education of China), Beijing, China; [2]Pulmonary and Sleep Division, University of California at San Diego, California; [3]Department of Otolaryngology Head and Neck Surgery, Beijing Tsinghua Changgung Hospital, Tsinghua University, Beijing, China; [4]Division of Sleep and Circadian Disorders, Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts; [5]Department of Allergy Immunology and Respiratory Medicine and Central Clinical School, The Alfred and Monash University, Melbourne, Australia

Can physiology **predict** those who respond to oral appliances and surgery?

Figure 3—The importance of nonanatomical traits is dependent on anatomy.



Can physiology **predict** those who respond to oral appliances and surgery?



Perfect prediction

Model without physiology predicted 4 individuals to have AHI 20-30 events/hour

Model with physiology did a much better job

Things like unstable ventilator control predict failure

Endotype may predict adherence

JCSM
Journal of Clinical Sleep Medicine

SCIENTIFIC INVESTIGATIONS

Obstructive Sleep Apnea without Obesity Is Common and Difficult to Treat: Evidence for a Distinct Pathophysiological Phenotype

Emma L. Gray, MBBS, MPH[1]; David K. McKenzie, FRACP, PhD[1,2]; Danny J. Eckert, PhD[2]

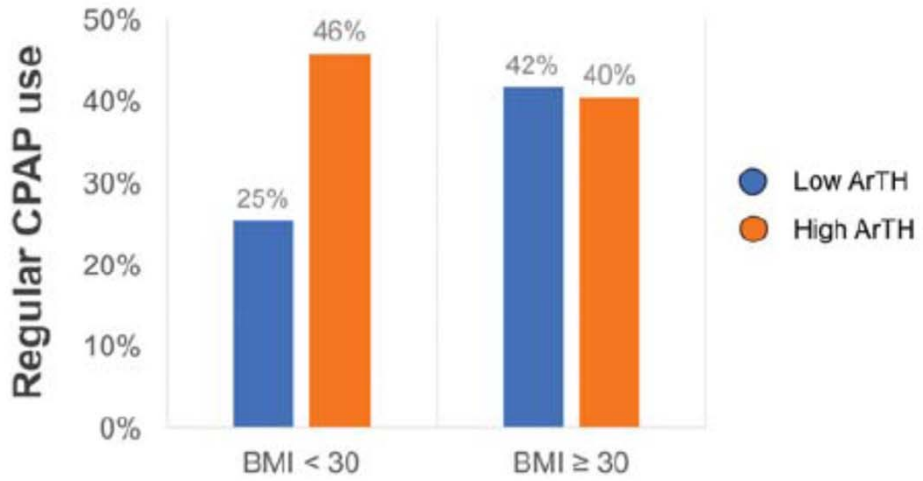
[1]Prince of Wales Hospital, Sydney, New South Wales, Australia; [2]Neuroscience Research Australia (NeuRA) and the University of New South Wales, Sydney, Australia

Evidence that lean, low arousal threshold patients do not adhere to CPAP

Prevalence, Associated Clinical Features, and Impact on Continuous Positive Airway Pressure Use of a Low Respiratory Arousal Threshold Among Male United States Veterans With Obstructive Sleep Apnea

Andrey Zinchuk, MD[1,*]; Bradley A. Edwards, PhD[2,3,*]; Sangchoon Jeon, PhD[4]; Brian B. Koo, MD[5]; John Concato, MD[1,6]; Scott Sands, PhD[7]; Andrew Wellman, MD, PhD[7]; Henry K. Yaggi, MD, MPH[1]

Figure 3—Regular CPAP use among male United States Veterans with low and high ArTH, stratified by obesity (n = 889).



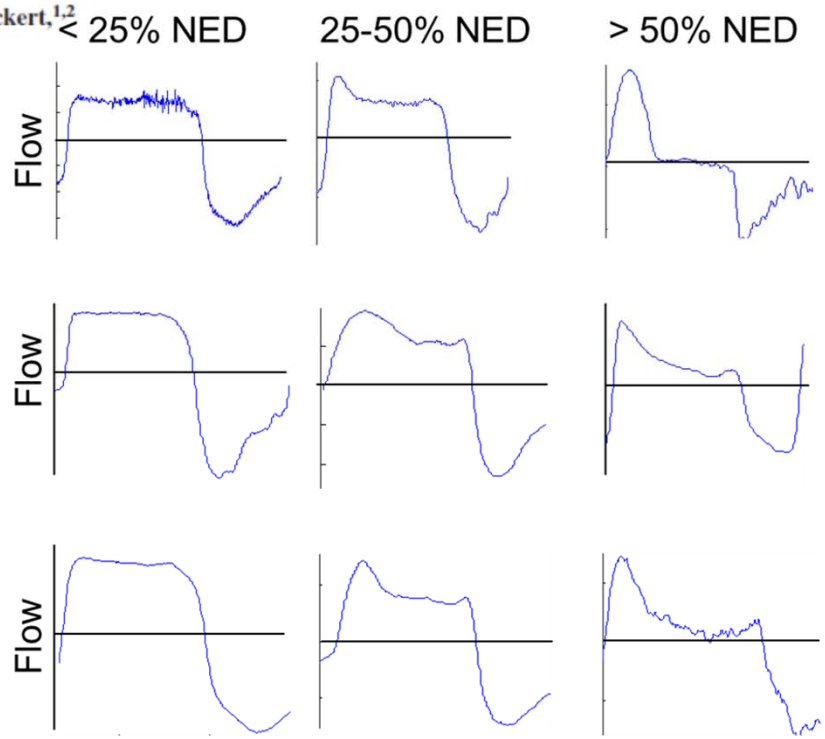
BMI (kg/m²)	Low ArTH / Total (n)	Odds Ratio (95% CI)	Wald χ^2 *P*
< 30	99 / 181	0.39 (0.21, 0.73)	.003
≥ 30	233 / 708	1.05 (0.77, 1.45)	.758

J Appl Physiol 116: 1105–1112, 2014.
First published January 23, 2014; doi:10.1152/japplphysiol.00853.2013.

HIGHLIGHTED TOPIC | *Upper Airway Control and Function: Implications for Sleep-Disordered Breathing*

The classical Starling resistor model often does not predict inspiratory airflow patterns in the human upper airway

Robert L. Owens,[1] Bradley A. Edwards,[1] Scott A. Sands,[1] James P. Butler,[1] Danny J. Eckert,[1,2] David P. White,[1] Atul Malhotra,[1,3] and Andrew Wellman[1]



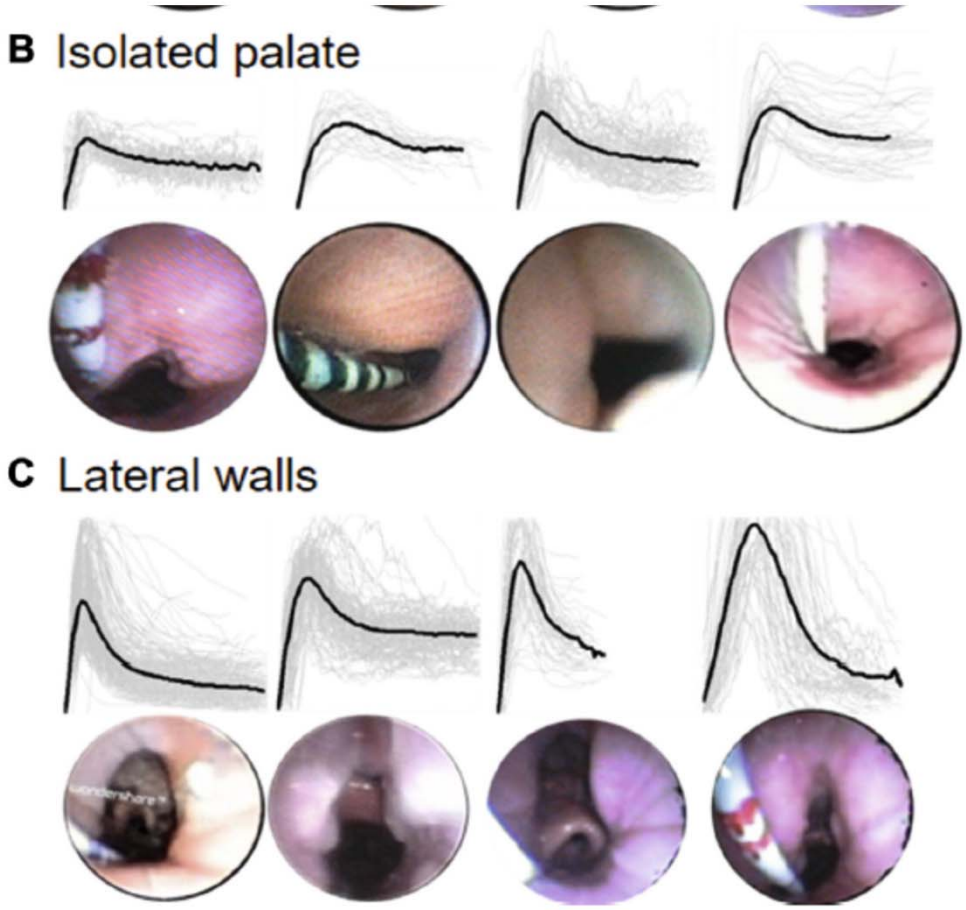
[Original Research **Sleep Disorders**]

CHEST

Airflow Shape Is Associated With the Pharyngeal Structure Causing OSA

Pedro R. Genta, MD; Scott A. Sands, PhD; James P. Butler, PhD; Stephen H. Loring, Eliot S. Katz, MD; B. Gail Demko, DMD; Eric J. Kezirian, MD, MPH; David P. White, Andrew Wellman, MD, PhD

Does the flow pattern tell you where the problem is?



Outline

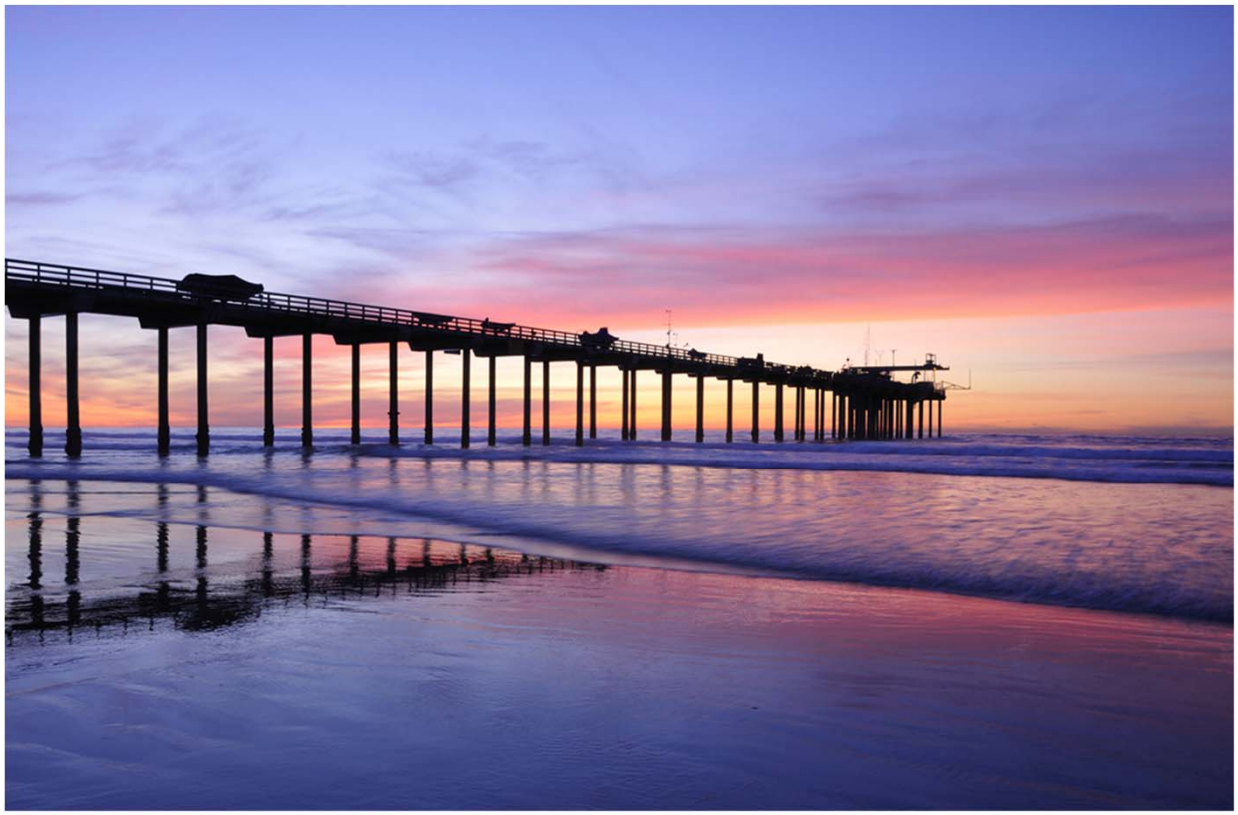
- (Brief) Obstructive Sleep Apnea Pathogenesis

  Anatomy is the underlying problem
- How good is CPAP anyway?

  PAP works, adherence getting better
- Non PAP therapies

  Variable response
- **Another way to think about OSA Pathogenesis (and non PAP therapy)**

  Some exciting stuff to come



rowens@health.ucsd.edu