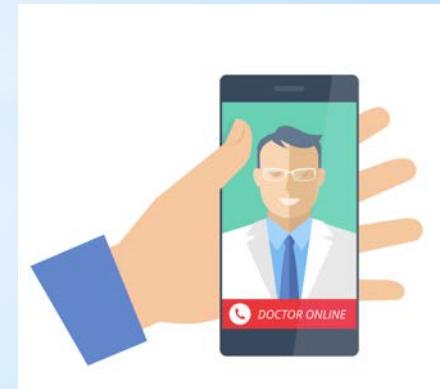


THE SLEEP APNEA EPIDEMIC

DIAGNOSE AND TREAT WITH
SLEEP TECH IN YOUR OFFICE

Integrative Healthcare Symposium
February 2018, New York City

Jordan Stern, MD
Founder & CEO, BlueSleep®



Founder and CEO of BlueSleep a digital healthcare company for sleep.

Industry sponsored clinical trials for the following companies:

Beddit (Apple)

Fitbit

Bedjet

Prosomnus

Neogia

Olympus Medical

The material in this presentation does not conflict with any of the relationships with the above companies

*Conflict Slide

*30,000 foot view
The Sleep Landscape



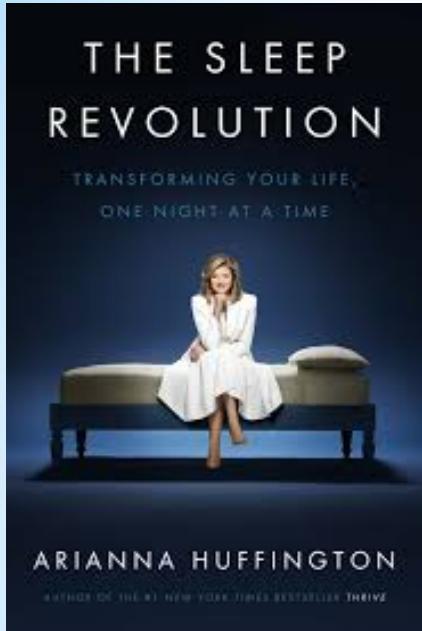


Map showing economic costs of insufficient sleep across five OECD countries

Jess Plumridge/RAND Europe



*The Global Sleep Problem



beddit

**BEDDIT 3
SLEEP TRACKER
AVAILABLE AGAIN**

Set out to solve your sleep - with nothing to wear.

The New York Times

"Of all the apps I've seen, Beddit's provided the most attractive and detailed sleep information."

MOLLYWOOD NYTIMES



Sleep NOW

1925. Nathaniel Kleitman. Grandfather of sleep
(PhD, U Chicago. Studies on the physiology of sleep, 1925)

1953. Aserinsky describes REM sleep

1953. William Dement names sleep stages and AHI defines sleep studies

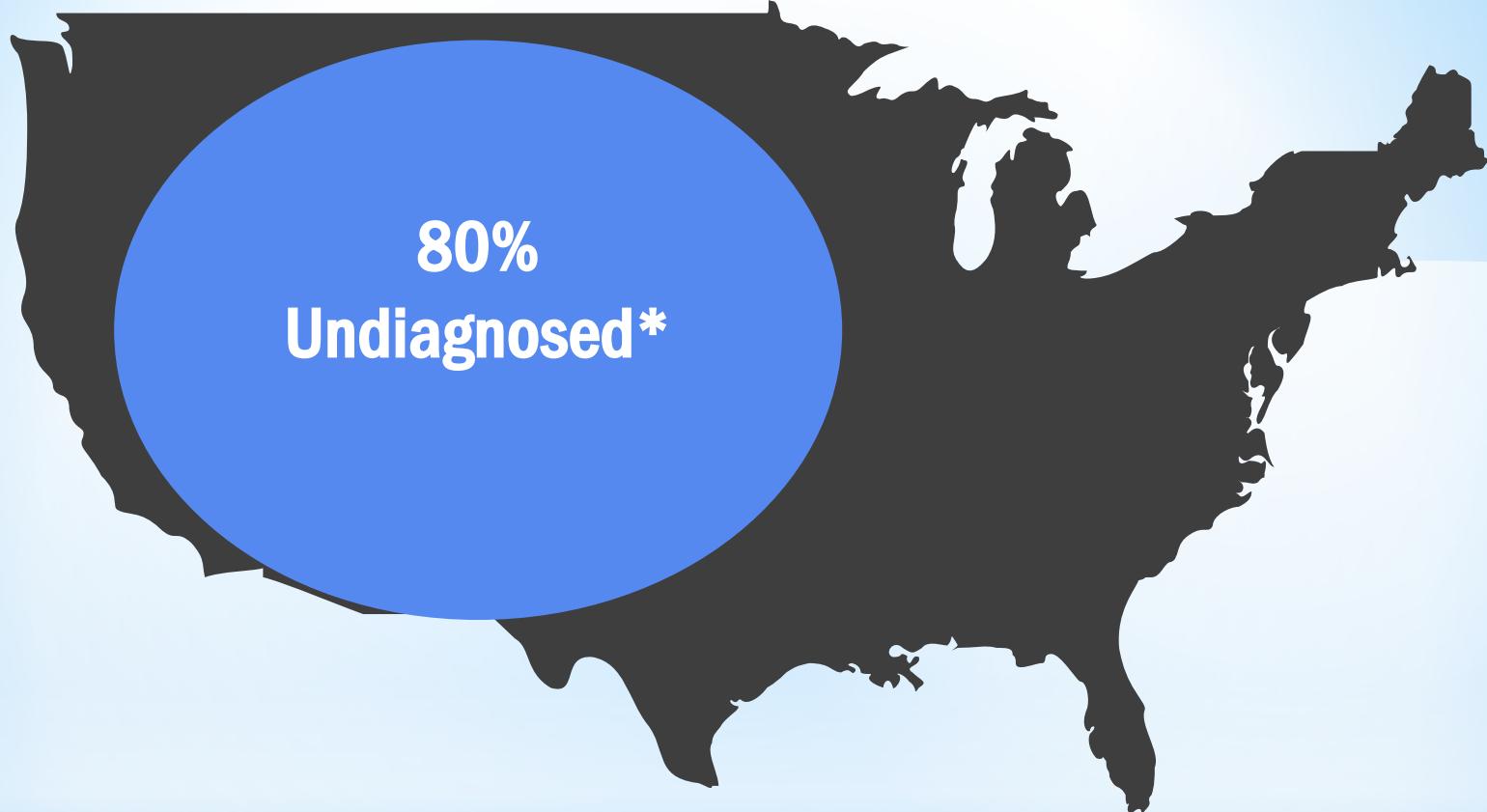
1978. Creation of AASM and certification

1999. Discovery of Hypocretin receptor 2 gene

2008. HST. 2008 CMS accepts HSTs

2008. Sleep Tech takes off with Apps 2008

2018 Connected Sleep
Wearables, sensors, ... Apps



*Sleep Apnea
Undiagnosed

American Sleep Apnea Association

- **80% undiagnosed in US***
- Sleep labs and CPAP poorly tolerated
- Fragmented Care
- Resulting in poor compliance

The SLEEP Apnea Problem

*American Sleep Apnea Association

*WHAT IS sleep apnea? (OSA)



Interruptions in breathing during sleep caused by a narrowing of the nose and throat and associated with:

- Poor quality sleep
- Excessive daytime sleepiness
- Serious medical conditions
- Transportation/MVA accidents
- Absenteeism (and presenteeism)

**\$160B economic burden
in the US**

(Sleep Medicine, Harvard Medical School/McKinsey and Co, December 2010)

- Interrupted sleep
- Fragmented sleep architecture
- Decrease REM sleep and Deep Sleep
- Fewer hours of sleep
- Less or absent dreaming

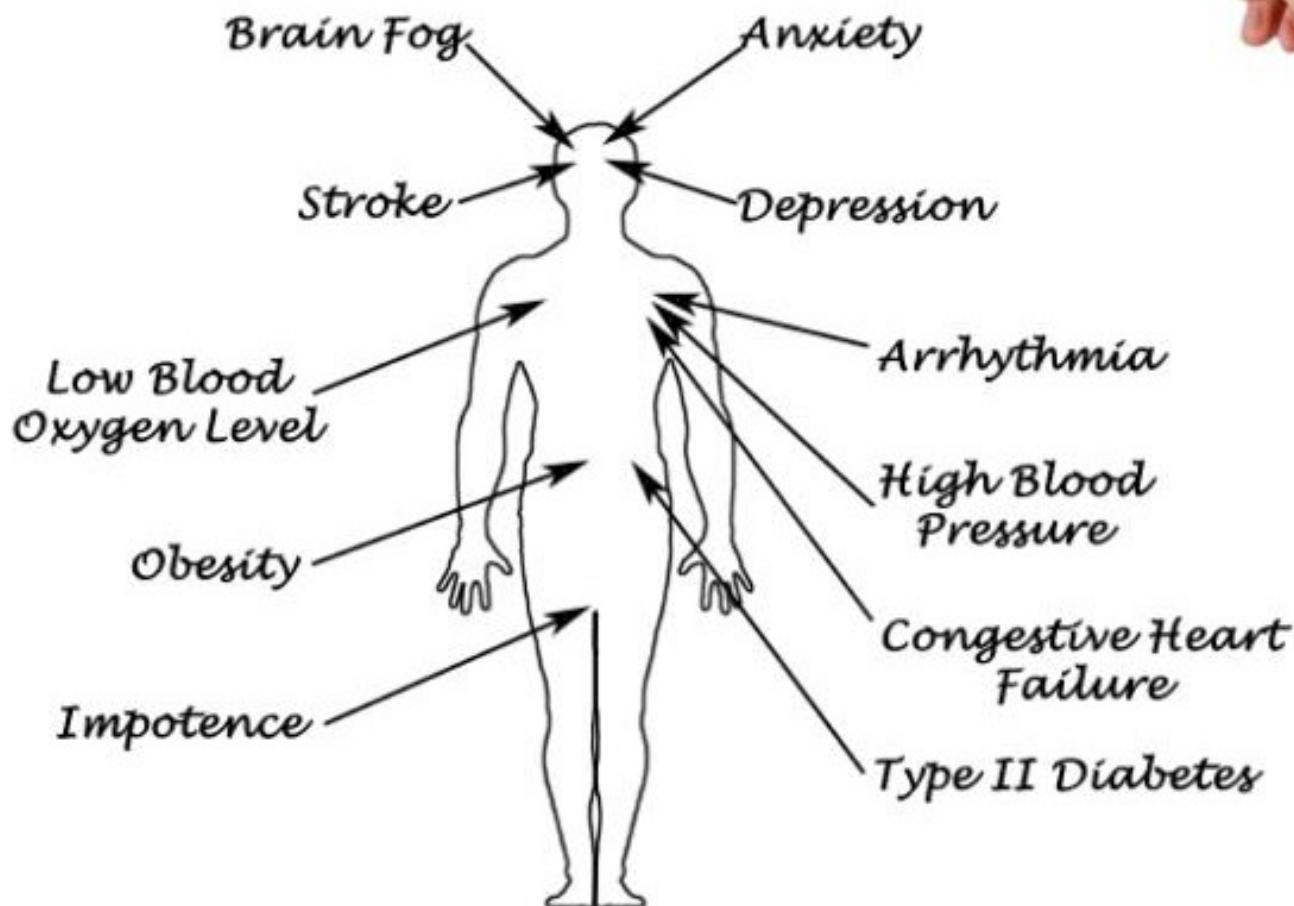
* Effect of OSAS on Sleep

- Excessive Daytime Sleepiness
- Unrested in the morning
- Lack of memory consolidation
- Decreased motor performance (crashes)
- Poor mental function (decision making, concentration)
- Irritability (ADHD in children ... and adults?)
- Poor sexual performance

***Direct impact of OSAS on performance**

* Effects of sleep apnea

Side Effects From Sleep Apnea



- ADHD
- Sleep maintenance insomnia
- Bruxism
- Morning headaches
- Poor memory
- Unable to lose weight
- Low sex drive, ED, impotence

*Other related signs of OSAS

“Increased Prevalence of Sleep Disordered Breathing in Adults”

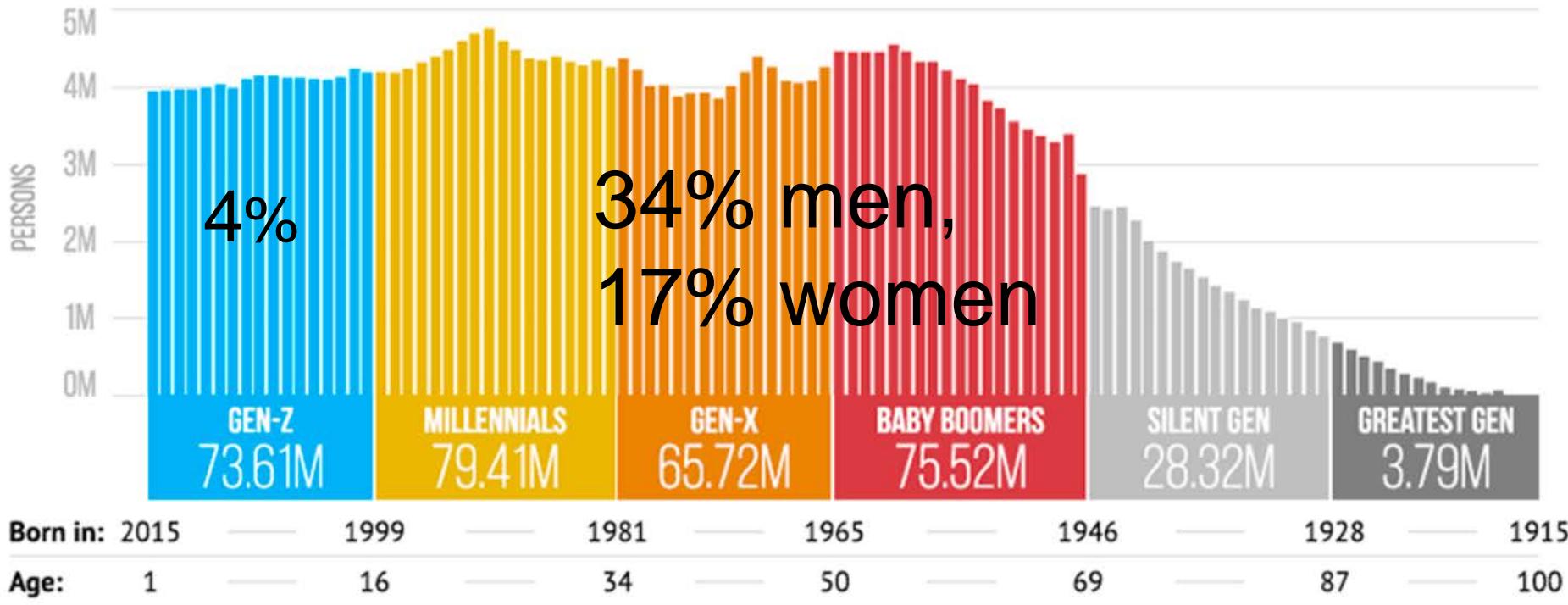
American Journal of Epidemiology 2013. Peppard, Barnett,
Young, et al.

MEN	30-70 yrs old.	34%
WOMEN	30-70 yrs old.	17%

MEN	50-70 yrs old.	43%
WOMEN	50-70 yrs old	28%

Total US Population by Age and Generation

as of December 2015



The Math:

M: 34-70: 23.8M

F: 34- 70: 11.9M

P: 3.0M

Total: >37M

*Most recent sleep apnea numbers

American Journal of Epidemiology 2013. Peppard, Barnett, Young, et al.

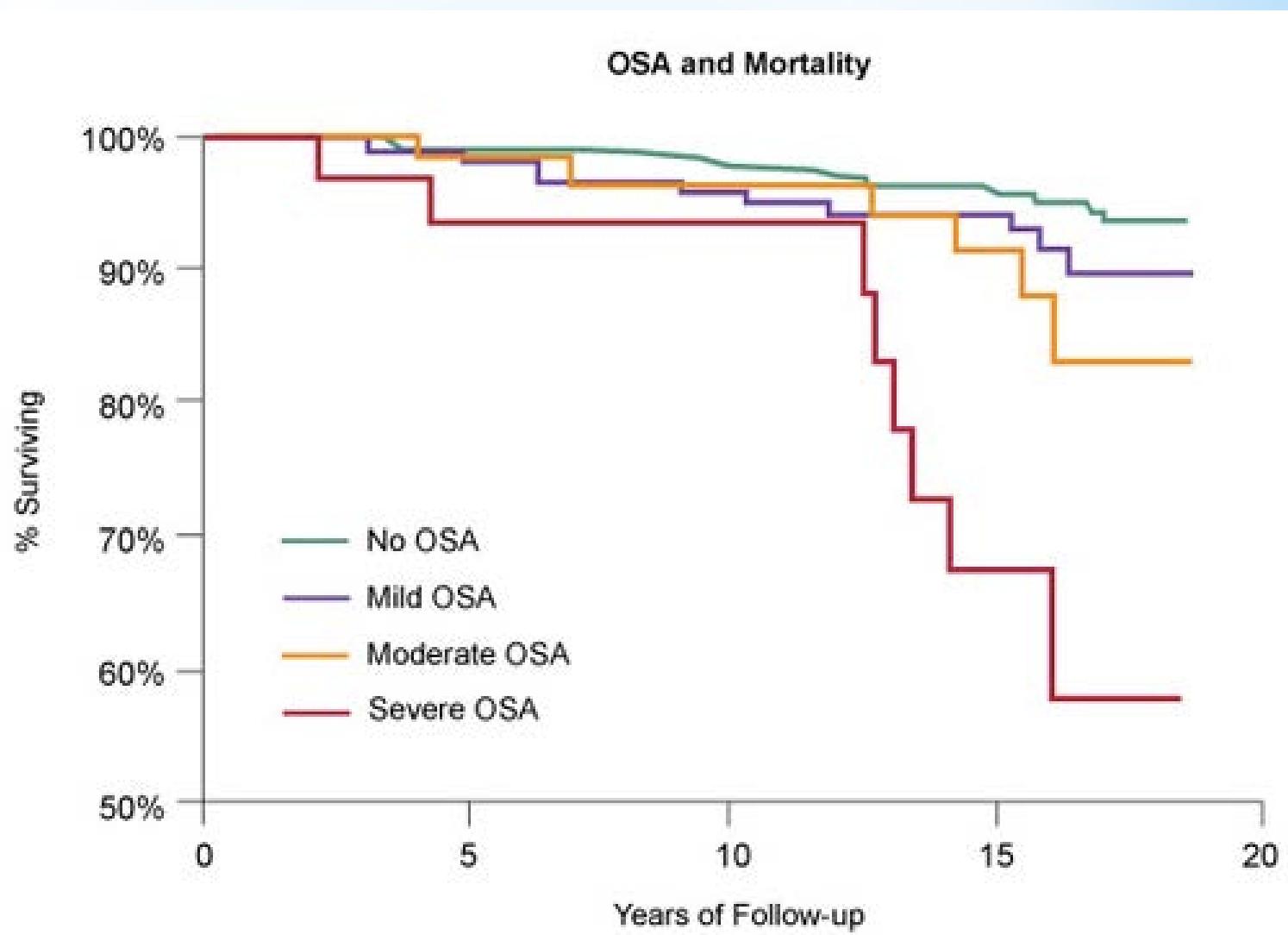
Believe the Swiss

23% of women with Moderate to Severe OSAS (AHI>15)
49.7% of men
(Average age 57, 40-85 range
Average BMI: 25)

*Prevalence of sleep-disordered breathing in the general population: the HypnoLaus study.

*Health impact of untreated sleep apnea

[Sleep](#). 2008 Aug 1; 31(8): 1071-1078. [Terry Young](#), PhD,¹ [Laurel Finn](#), MS,¹ [Paul E. Peppard](#), PhD,¹ et al.

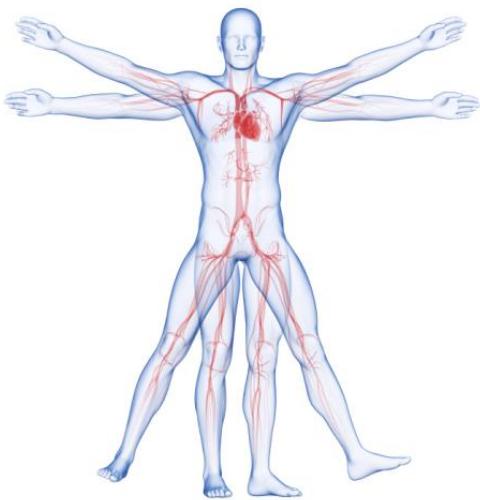


*Sleep apnea and Hypertension



- High blood pressure is a common chronic medical condition.
- It affects over 40% of people between the ages of 50 and 60 years of age in the United States.
- Sleep Apnea is a risk factor for the development of hypertension.
- Approximately 50% of those with sleep apnea have hypertension. In fact, elevated blood pressure might be the only clue that a person has sleep apnea.
- **Fortunately, treatment of sleep apnea may result in better control or even resolution of hypertension.**

*Stroke and diabetes



Stroke: Sleep apnea might be a risk factor for having a stroke
People who have had a stroke are at greater risk of having sleep apnea, and a second stroke if their sleep apnea is not treated

Redline S, Yenokyan G, Gottlieb DJ, et al. Obstructive sleep apnea-hypopnea and incident stroke: the sleep heart health study. Am J Respir Crit Care Med 2010;182:269-77.

Diabetes:

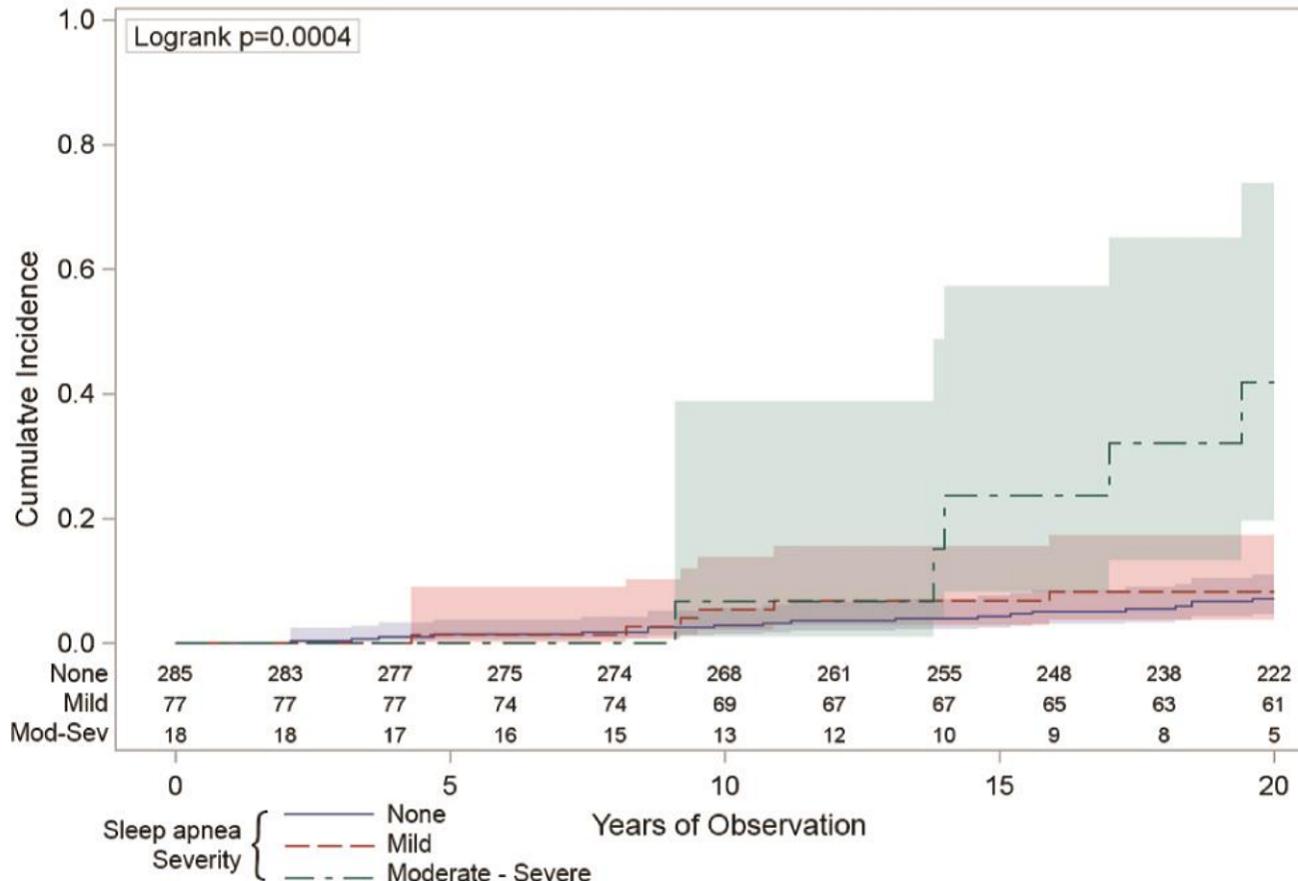
- Severe OSAS is associated with elevated levels of HbA1c
- Association between gestational diabetes and sleep apnea

Obstructive Sleep Apnea and Diabetes A State of the Art Review.
CHEST 2017; 152(5):1070-1086

Journal of Clinical Sleep Medicine

Official Publication of the American Academy of Sleep Medicine

The univariate association between sleep apnea and incident stroke.



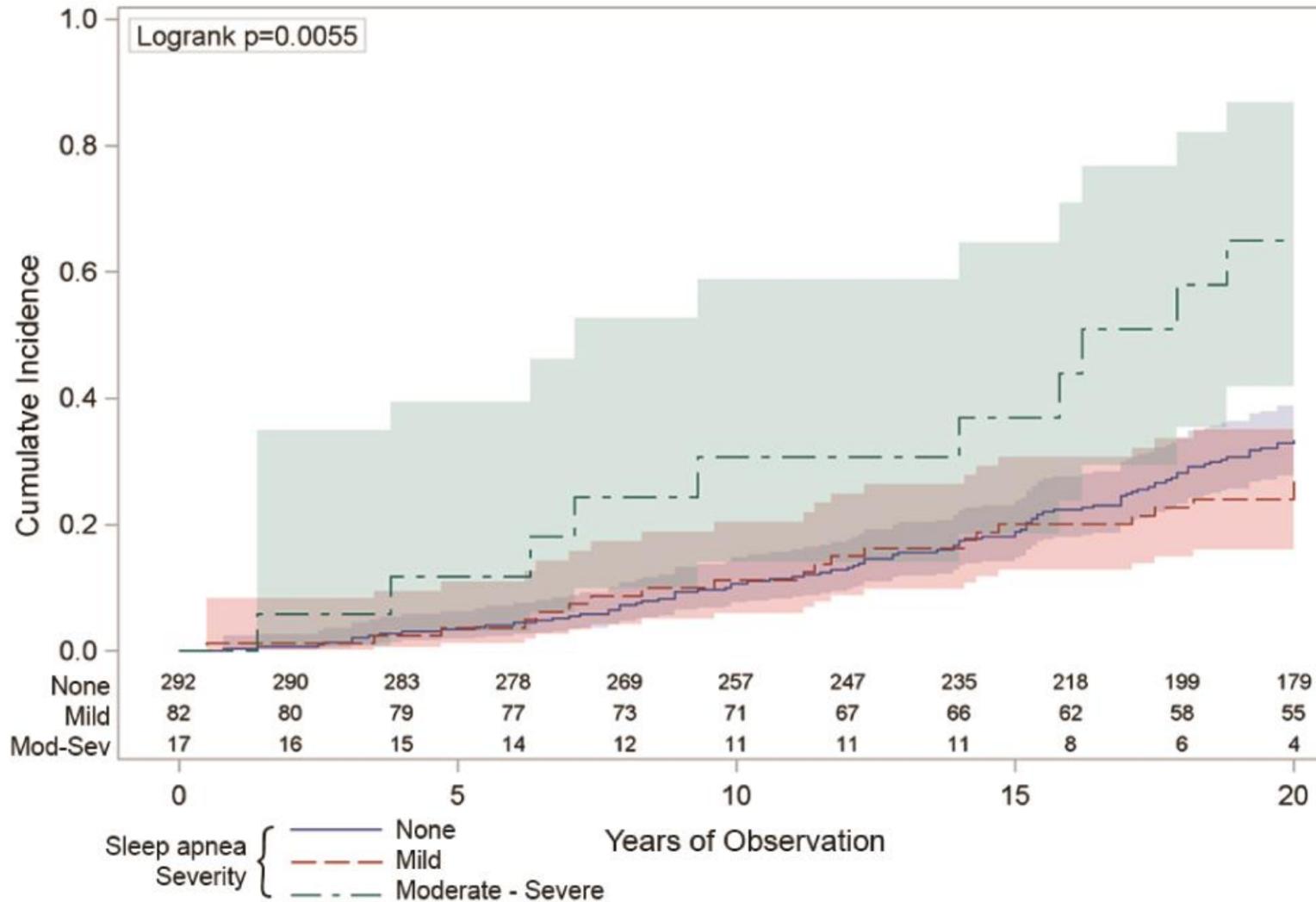
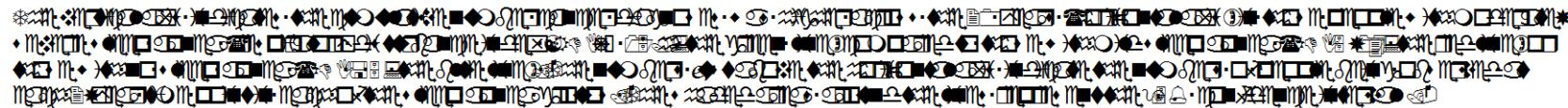
- Ears: Hearing loss
- Eyes: Sudden blindness, glaucoma
- Endocrine: Diabetes, PCOS, obesity
- Pain: Fibromyalgia, narcotics increase OSA
- OB: Third trimester OSAS and fetal risk
- GYN: Post menopausal risk
- Kidneys: Nocturia
- Urology: ED, low testosterone, testosterone replacement
- Dermatology: Psoriasis, premature aging
- Cancer: Increased incidence and decreased response to treatments

***Other risks and findings**

Journal of Clinical Sleep Medicine

Official Publication of the American Academy of Sleep Medicine

The univariate association between sleep apnea and the incidence of cancer.

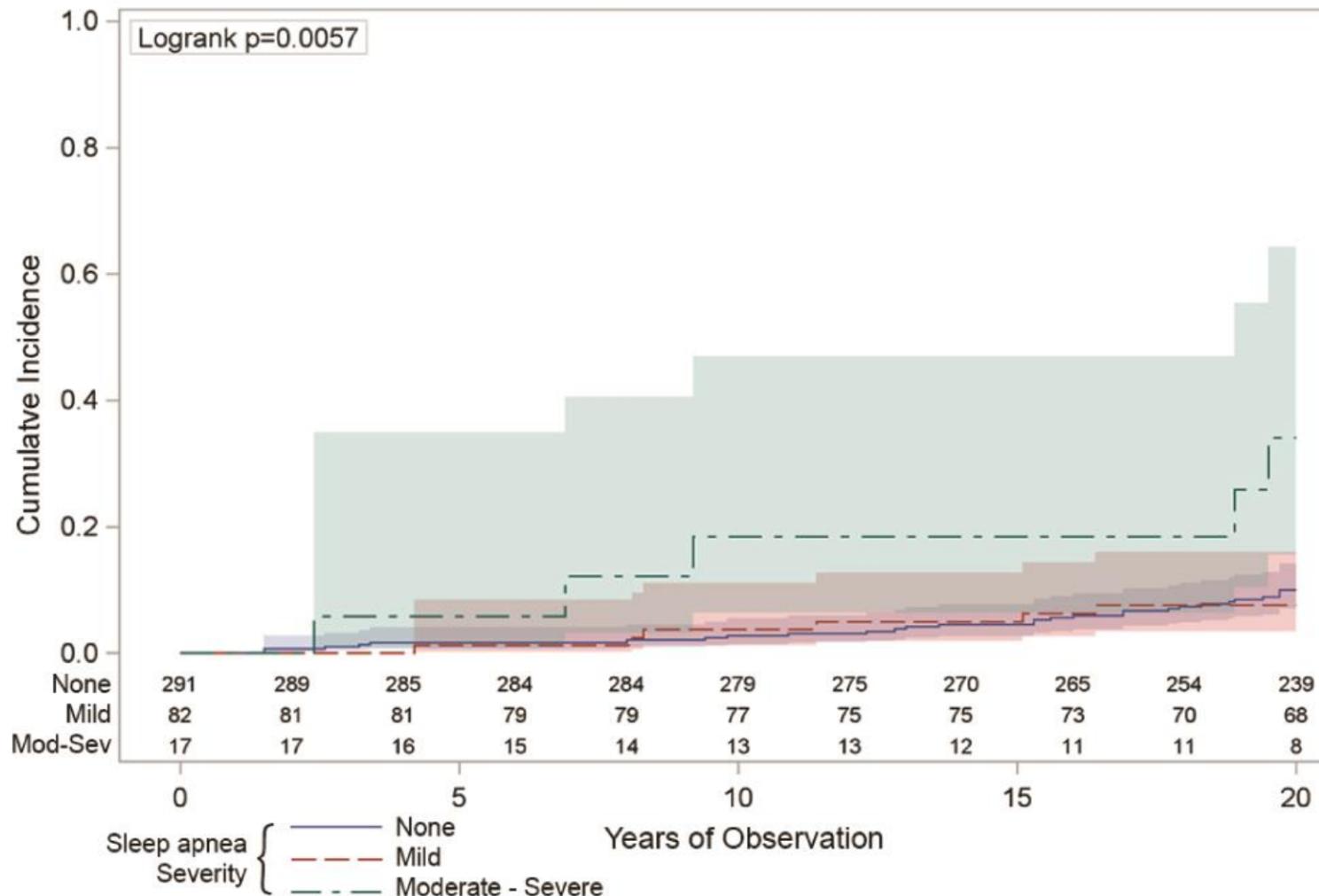


Journal of Clinical Sleep Medicine

Official Publication of the American Academy of Sleep Medicine

The univariate association between sleep apnea and cancer mortality.

Abstract: Sleep apnea has been associated with increased risk of all-cause mortality. We sought to determine if this association is specific to cancer mortality. We used the Sleep Heart Health Study cohort to examine the association between sleep apnea and cancer mortality. The study included 1000 participants with no history of cancer at baseline. Participants were followed for cancer mortality over 20 years. The primary outcome was cancer mortality. Secondary outcomes were all-cause mortality and cardiovascular mortality. Cox proportional hazard models were used to estimate hazard ratios (HR) and 95% confidence intervals (CI). The Logrank p-value was 0.0057.



*What Can I Do?

- SCREEN
- TEST
- TREAT



*screening

The Stop Bang Questionnaire

Snoring? Do you snore loudly (heard through closed doors)?

Tired? Fatigued or sleepy during the day, fall asleep driving?

Observed? Gasping or stop breathing during sleep?

Pressure? High blood pressure?

Body Mass Index (more than 35 – severely obese)

Age? Over 50?

Neck size? 17" or above in men, 16" or above in women

Gender? Male?

Yes to 3 or more is an increased risk for sleep apnea

*Lab testing (polysomnography)

The Gold Standard



The “Old Standard”

*Home sleep testing technology



- In 2008, the Center for Medicare and Medicaid Services (CMS) agrees to pay for sleep apnea treatment based on a home sleep test, and reimburses for HST.
- Home sleep testing is replacing the much more costly and disruptive lab test for diagnosing sleep apnea.
- Hundreds of peer reviewed studies including our own; analyzing data from thousands of tests using dozens of portable devices confirms the effectiveness of HSTs

*Home sleep apnea test



*Diagnosis with Home sleep apnea testing technology



Portable home sleep testing costs:

90% less than sleep labs

Studies show that testing with Home Sleep Tests and non-specialized personnel yields same results as more expensive and more time consuming tests

- Lease a kit for about \$50/month
- Practice on yourself and your staff
- Instruct patients and test 1-2 nights
- CPT: 95806
- Average Medicare reimbursement: \$190
- Obtain an interpretation from a Board Certified Sleep Specialist

* How Do I Do HST?

Recording : Raw data signals

Device			ApneaLink Air	Type:	III
Recording	Date: 09/08/2017	Start: 11:19pm	End: 7:17am	Duration - hr:	7:58
Flow evaluation		Start: 11:29pm	End: 7:15am	Duration - hr:	7:15
Oxygen saturation evaluation		Start: 11:29pm	End: 7:17am	Duration - hr:	7:39

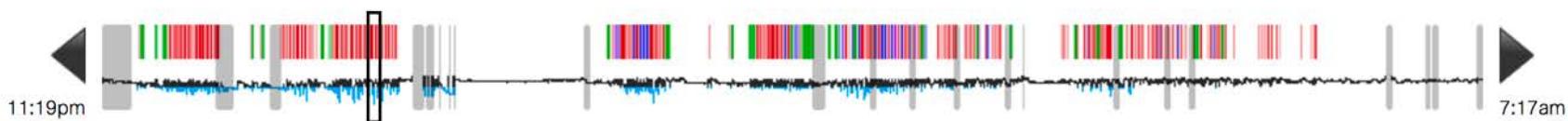
Statistics

		27.9					
NORMAL		MILD	MODERATE		SEVERE		
0	5		15		30		
Events Index			AHI:	27.9	AI:	24.1	HI: 3.9
Supine	Time - hr	6:21 (87.5%)	AHI:	31.9	AI:	27.5	HI: 4.4
Non-supine	Time - hr	0:54 (12.5%)	AHI:	0.0	AI:	0.0	HI: 0.0
Upright	Time - hr	0:00 (0.0%)	AHI:	0.0	AI:	0.0	HI: 0.0
Events totals					Apneas:	175	Hypopneas: 28
Apnea index	Obstructive:	20.6	Central:	3.0	Mixed:	0.4	Unclassified: 0.0
Cheyne-Stokes respiration					Time - hr:	0:00	Percentage: 0
Oxygen desaturation					ODI:	27.4	Total: 210
Oxygen saturation %			Baseline:	95	Avg:	94	Lowest: 75
Oxygen saturation - eval time %			≤90%sat:	14	≤85%sat:	3	≤80%sat: 0
					≤88%sat:	7	≤88%Time - hr: 0:31
Breaths		Total:	4423	Avg/min:	10.1	Snores:	881
Pulse - bpm		Min:	45	Avg:	54	Max:	75

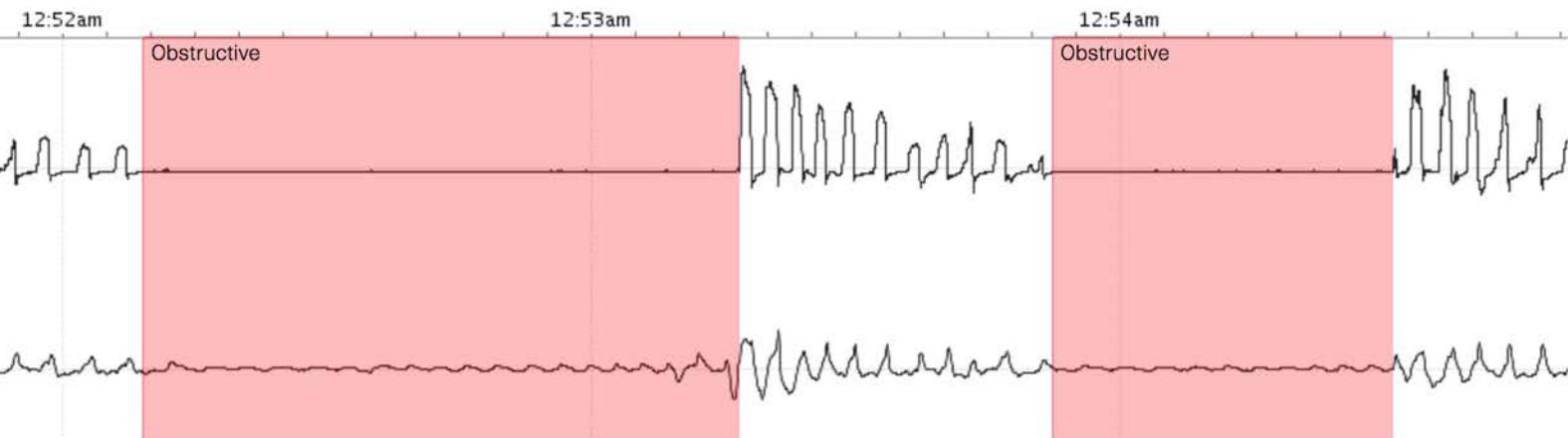
Data signals

Save**Cancel**Cheyne-Stokes
SnoresCentral apneas
HypopneasObstructive apneas
Desaturation

Mixed apneas

Unclassified apneas
Excluded data

Events



Flow

Effort

Body Position

Ox %

Pulse

Snore

Supine

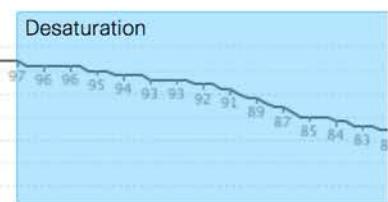
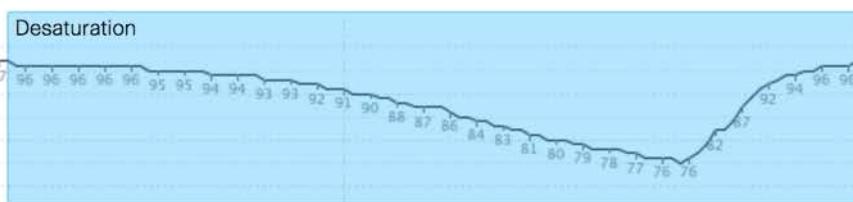
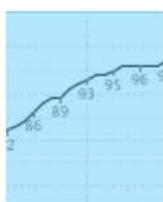
Supine

Supine

Supine

Supine

Supine

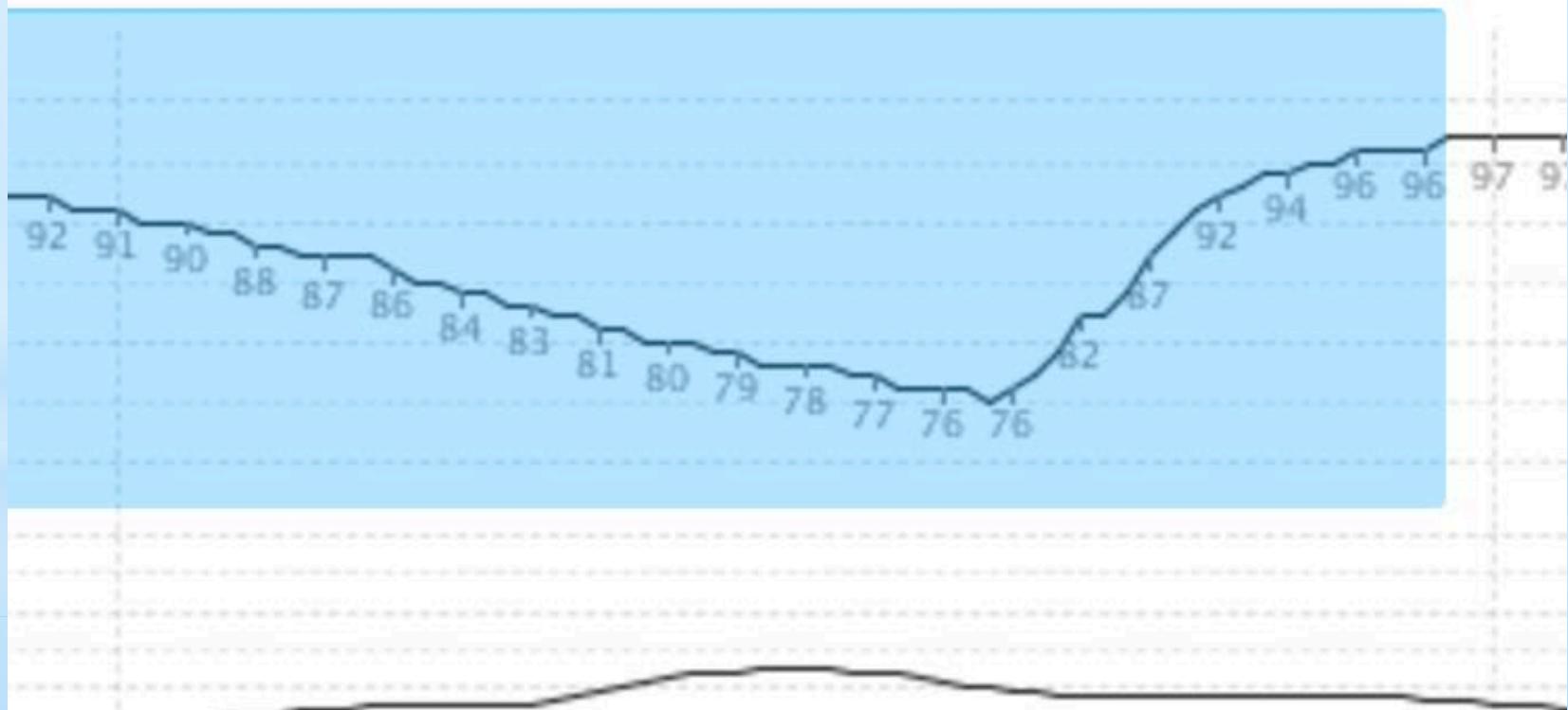
[Download HST raw data](#)



Supine

Supine

Supine



*treatment

MILD MODERATE OR SEVERE?

CPAP is not the right treatment
for many patients



Oral appliances are as effective as CPAP
in many cases

In office procedures are very effective
in properly selected patients



The benefits of more invasive and
much more costly robotic surgeries
and tongue pacemakers remain
to be proven



WEIGHT LOSS !!!

Nose: nasal patency is very important

Weight management – can be curative

Sleeping position

Reflux management

Refer to sleep specialist if no improvement

*Treating Mild OSAS

- Edema of upper airway causes snoring
- Can worsen sleep apnea
- Sleep Apnea causes reflux from smooth muscle relaxation during hypoxia
- Treating sleep apnea improves reflux
- Treating reflux improves snoring

* Acid Reflux & Sleep Apnea

NEW YORK TIMES BESTSELLER

NEW YORK TIMES BESTSELLER

DROPPING ACID THE REFLUX DIET COOKBOOK & CURE

A Groundbreaking Approach to Healthy Eating
Featuring 75 Delicious Original Low-Fat Recipes



JAMIE KOUFMAN, M.D.
JORDAN STERN, M.D.
and
FRENCH MASTER CHEF
MARC BAUER

KOUFMAN
STEIN
FRENCH
MASTER
BAUER



Sleep Apnea In The News Metro North Accident

Sen. Schumer wants Metro-North, LIRR engineers tested for sleep apnea after 2013 train accident

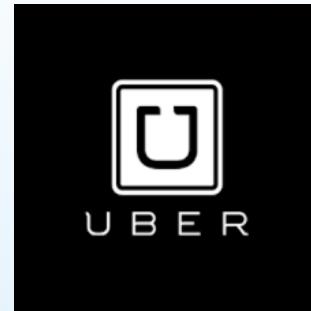
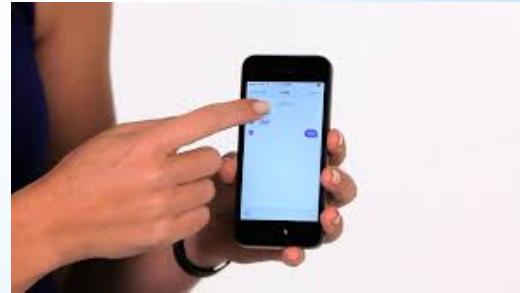
The Dec. 1, 2013, Metro-North derailment killed four passengers in the Bronx. An investigation determined it was caused by the engineer's sleepiness and his undiagnosed sleep apnea.

THE ASSOCIATED PRESS / Friday, January 30, 2015, 1:18 PM

A A /



Sleep Politics



The World Is Changing



How Fast Is Healthcare Changing?



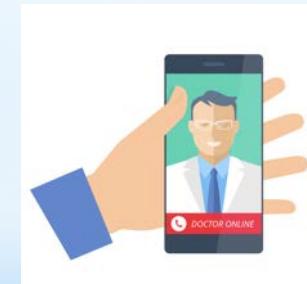
Delivery



Diagnosis



Treatment



Disruption ...
Things Now Look Different

Solve Your Sleep Problem Online

Board Certified Sleep Specialists
Better Sleep, Better Health, Better You!

[Schedule Video Sleep Evaluation](#)

A Trackable Disease
Tele consultations
Home Sleep Testing
Follow up visits
OAT or CPAP compliance
Surgery

*Sleep apnea can be
managed by telemedicine

*Telemedicine Applications in
Otolaryngology.* C Heneghan, AP Sclafani, J
Stern, et al. Aug **1999**. IEEE Engineering in
Medicine and Biology

NY Eye & Ear Infirmary, **1996-1999**

***Telemedicine
What's Not So new!**

What's (NOT) New About Telemedicine?

1. Licensing
2. Reimbursement

*What's New About
Telemedicine?

- Use of Electronic and Communication tech to deliver healthcare services including:
- Assessment, Diagnosis, consultation, treatment, education, care management, self management
- **INCLUDES:** Telemedicine, Store and Forward, remote patient monitoring
- **DOES NOT include:** audio alone, fax, messaging alone

* NYS Telemedicine Law

TELEHEALTH SERVICES

As a condition of payment, you must use an interactive audio and video telecommunications system that permits real-time communication between you, at the distant site, and the beneficiary, at the originating site. Asynchronous “store and forward” technology is permitted only in Federal telemedicine demonstration programs in Alaska or Hawaii.

***CMS Says:**

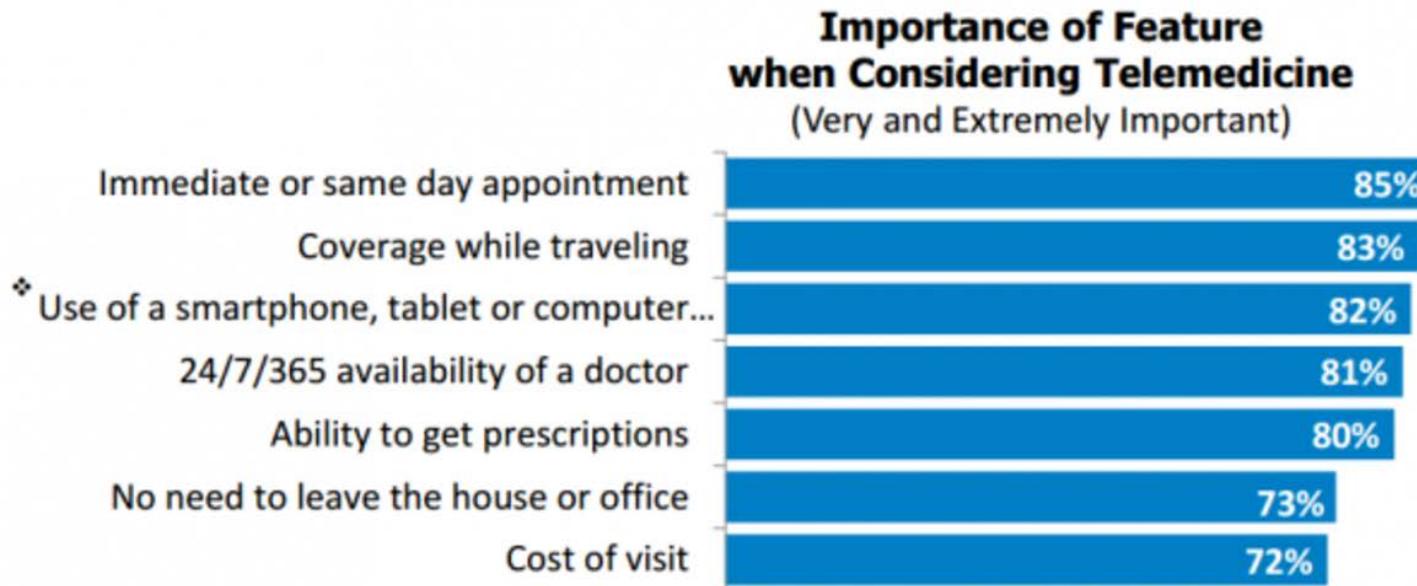
"VA offers close to 50 telehealth specialties. During fiscal year 2016, more than 700,000 veterans completed approximately 2 million telehealth appointments,"

*The VA System Says:

- American Well® finds **57 Percent** of physicians (2000 interviewed) are willing to see patients over video
- Just **12 percent of physicians were unwilling** to see a patient over video
- while **31 percent remained uncertain**
- **Work-life balance** was the most popular reason physicians cited for seeing patients over video, followed by **increased earning opportunity**, and **improved patient outcomes**

* Doctors Say:

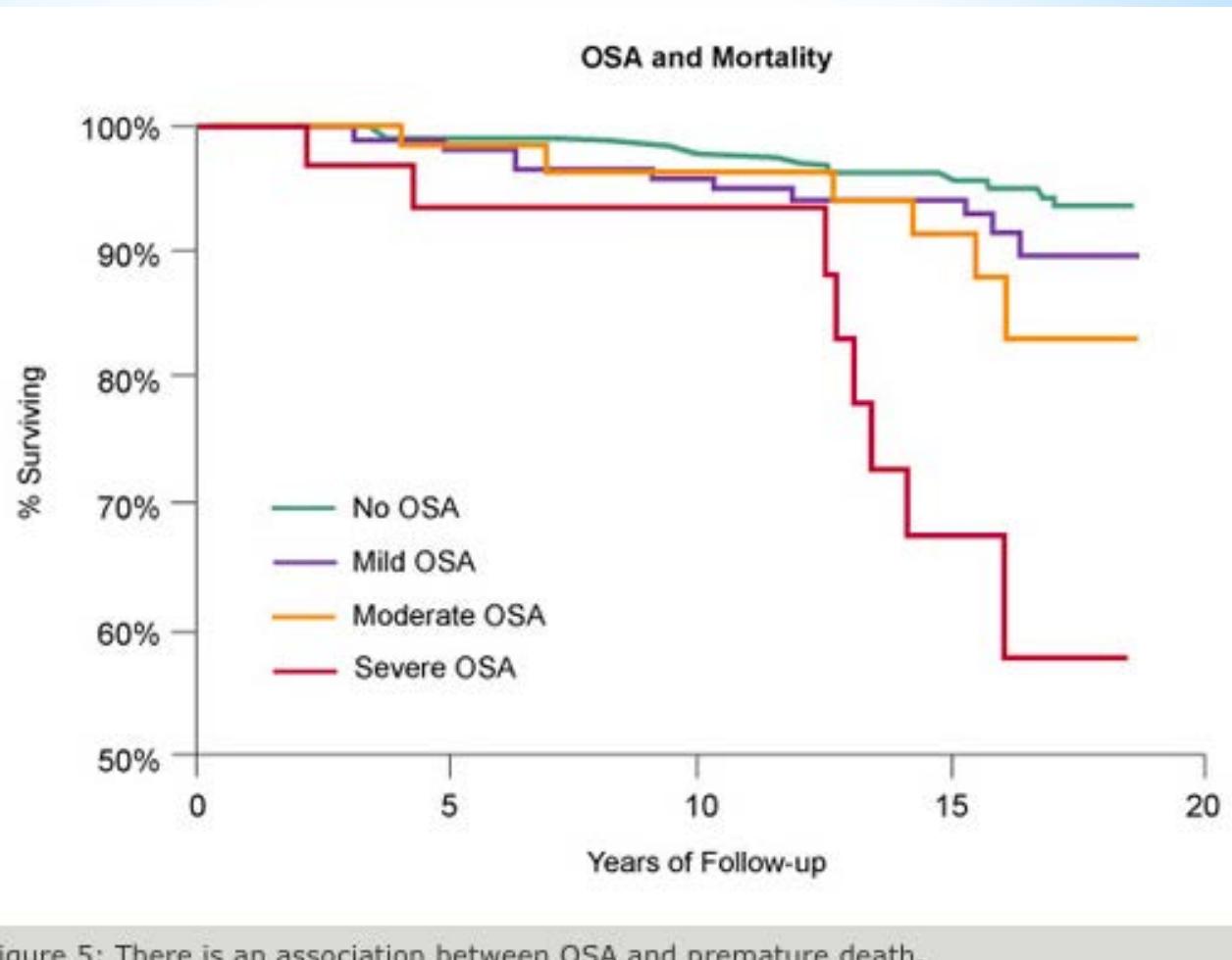
While all features tested are considered very or extremely important by most people using telemedicine, cost of the visit is lower in the priority



❖ Full feature described is "Use of smartphone, tablet or computer to make a video or telephone call"

Source: Blue Cross Blue Shield

Patients Say:



Sleep Heart Health Study Says:

[Sleep](#). 2008 Aug 1; 31(8): 1071-1078. [Terry Young](#), PhD,¹ [Laurel Finn](#), MS,¹ [Paul E. Peppard](#), PhD,¹ et al.

- The GOLD Standard: SLEEP LAB & CPAP ... (6 months wait and \$\$\$)
- The New Model:
 - Effective and Efficient
 - Quick turnaround
 - Tech adoption

Price \$ transparency

Existing vs Future Solutions

Sleep Specific:

HST/Distance scoring

CPAP/Daily downloads/integrated wireless

OAT compliance & sleep tracking

Sleep tracking with wearables and sensors

Online CBT (Sleepio, Shut i)

Existing Digital Sleep Solutions



DENTITRAC® MICRO-RECORDER

The DentiTrac® is a micro-recorder used to evaluate oral appliance compliance / wearing time. This appliance has been worn for 27 days out of a total of 29 days.



Note: Compliance may be calculated using various mathematical equations. The Overall compliance indicated above is an average of all days / nights. The "When Worn" compliance equation omits dates showing zero wearing time.



93% Compliant
(Everyday)

Serial Number: 182214
Start Date: April 25, 2017
Prescribed daily use: 5 hours
Average daily use (when worn): 7.9 hours

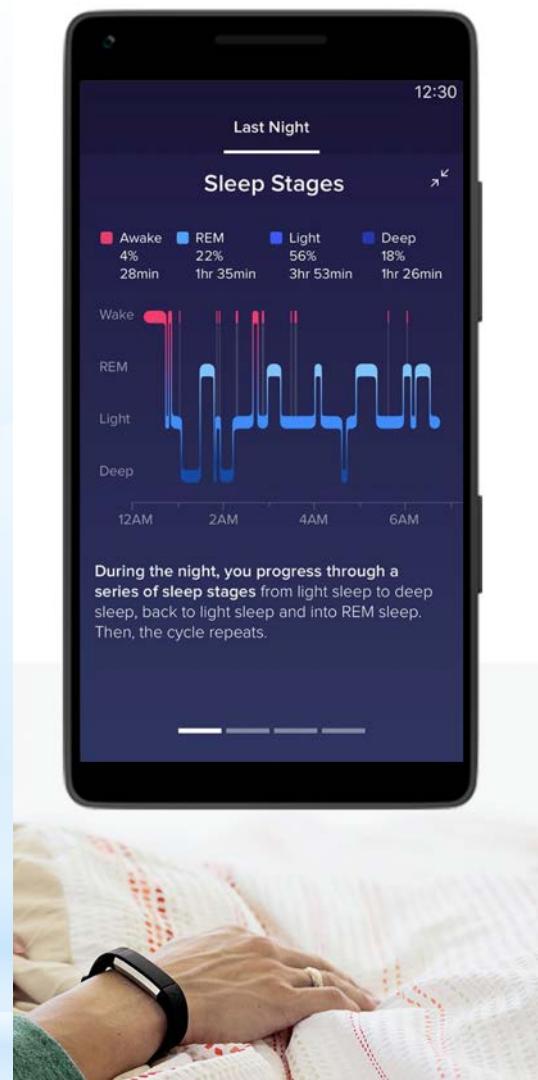
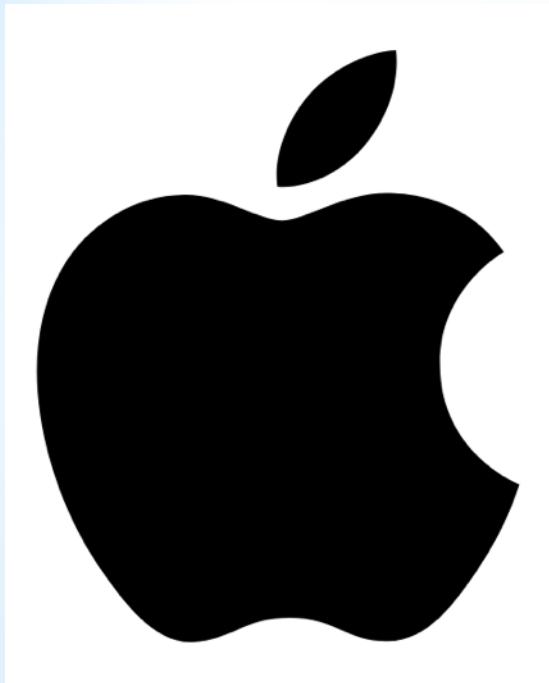
SUMMARY



* MTA Requiring Tracking
In OATs

260,000 mobile health
apps on the market ...

*Mobile Health



*Role Of Consumer Sleep Devices

- Remember the BIG PICTURE
- SLEEP is now part of the IOT
- Think outside the box!
- Bring Sleep into your practice

*Future Of Wellness
Is SLEEP!



Solve Your Sleep Problem Online

Board Certified Sleep Specialists
Better Sleep, Better Health, Better You!

[Schedule Video Sleep Evaluation](#)

jstern@BlueSleep.com

Epidemiological aspects of obstructive sleep apnea

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¹Department of Respiratory Medicine, Galway University Hospitals, Galway, Ireland; ²Sleep Disorders Centre, Guy's & St. Thomas' Hospitals, London, UK

Correspondence to: Brian D. Kent. Sleep Disorders Centre, Guy's & St. Thomas' Hospitals, London, UK. Email: Brian.kent@gstt.nhs.uk.

* *J Thorac Dis* 2015;7(5):920-929