TECHNOLOGY & APPS IN SLEEP MEDICINE

Wisconsin Sleep Society

Alexander Villareal, MD – 9/23/2016

OUTLINE

- Definitions and introduction
- Insomnia / Circadian Disorders
- RLS
- Sleep Disordered Breathing
- Research & Education
- Delivery of Healthcare

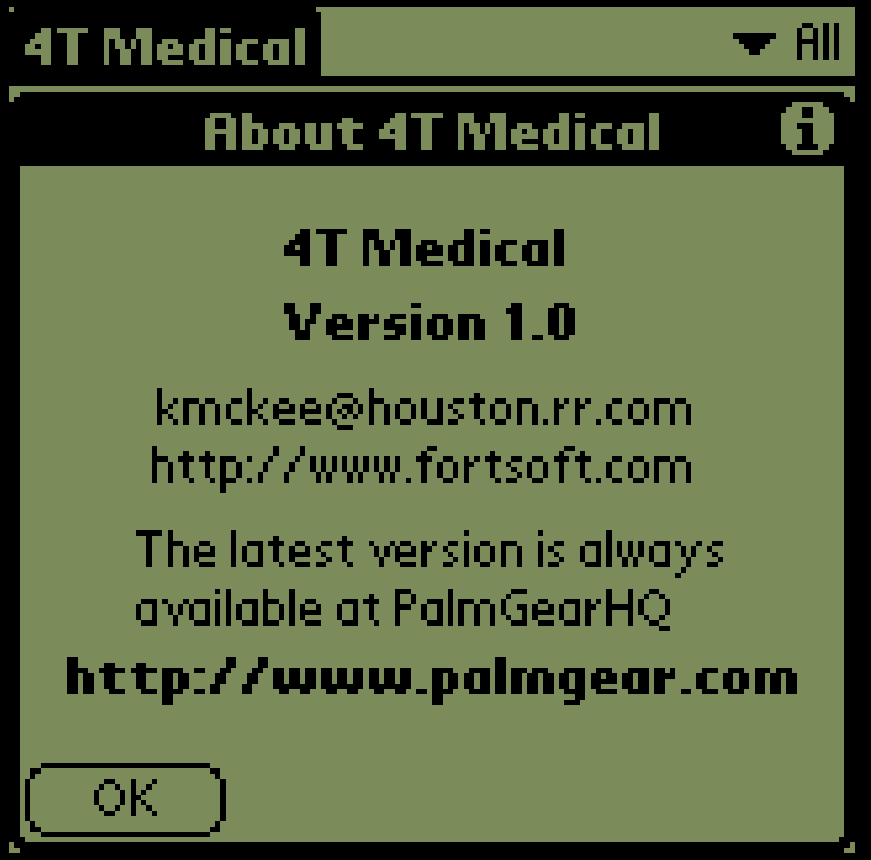
TECHNOLOGY

- ***Merriam-Webster Dictionary***
- ***1a*** **:** the practical application of knowledge especially in a particular area **:** <medical *technology*>
  - ***b*** **:** a capability given by the practical application of knowledge <a car's fuel-saving *technology*>
- ***2*****:** a manner of accomplishing a task especially using technical processes, methods, or knowledge <new *technologies* for information storage>
- ***3*****:** the specialized aspects of a particular field of endeavor <educational *technology*>

APP

- **Merriam-Webster Dictionary**
- a computer program that performs a special function

EPOCRATES & PALM 1998



CHRONIC INSOMNIA

- Sleep disturbance > 30 days:
  1. Difficulty in initiating sleep
  2. Difficulty in maintaining sleep
  3. Waking up too early
- Adequate opportunity and circumstances for sleep
- Daytime disturbances

INSOMNIA UPDATES

- Cognitive behavioral treatment for insomnia is the preferred treatment for insomnia.
  - *Qaseem, A. Ann Intern Med.* 2016; 165(2):125-133. doi: 10.7326/M15-2175
- Esmirtazapine being studied for insomnia in menopause – Phase II
  - Ruwe, F. J Clin Psychopharmacol. 2016 Oct;36(5):457-64.
- Melatonin 3 mg helped night shift workers with insomnia
  - Sadeghniiat-Haghighi, K. Work. 2016 Sep 7

ACP American College of Physicians®
Leading Internal Medicine, Improving Lives

CLINICAL GUIDELINE

Management of Chronic Insomnia Disorder in Adults: A Clinical Practice Guideline From the American College of Physicians

Amir Qaseem, MD, PhD, MHA; Devan Kansagara, MD, MCR; Mary Ann Forciea, MD; Molly Cooke, MD; and Thomas D. Denberg, MD, PhD; for the Clinical Guidelines Committee of the American College of Physicians*

Description: The American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on the management of chronic insomnia disorder in adults.

Methods: This guideline is based on a systematic review of randomized, controlled trials published in English from 2004 through September 2015. Evaluated outcomes included global outcomes assessed by questionnaires, patient-reported sleep outcomes, and harms. The target audience for this guideline includes all clinicians, and the target patient population includes adults with chronic insomnia disorder. This guideline grades the evidence and recommendations by using the ACP grading system, which is based on the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach.

Recommendation 1: *ACP recommends that all adult patients receive cognitive behavioral therapy for insomnia (CBT-I) as the initial treatment for chronic insomnia disorder. (Grade: strong recommendation, moderate-quality evidence)*

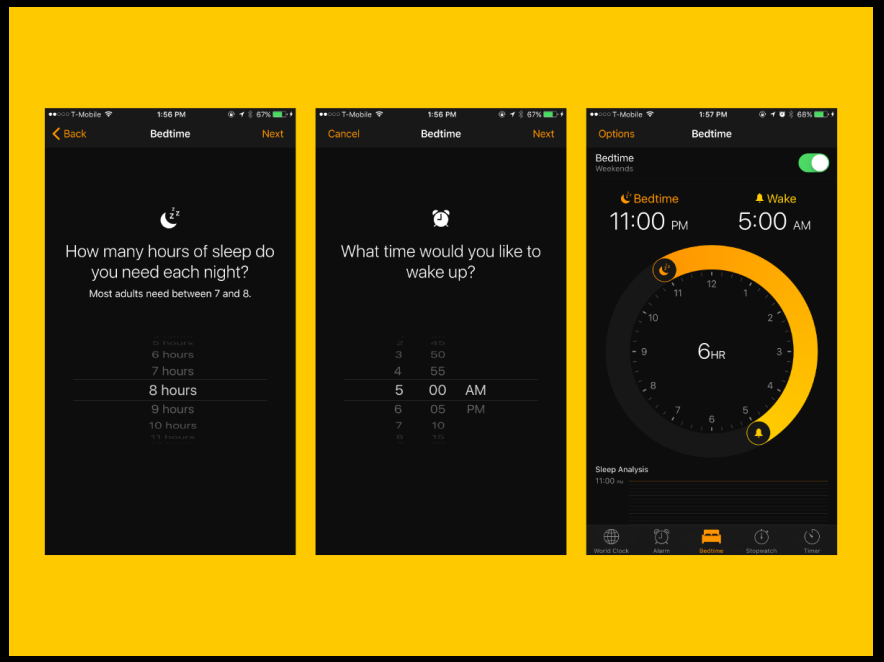
Recommendation 2: *ACP recommends that clinicians use a shared decision-making approach, including a discussion of the benefits, harms, and costs of short-term use of medications, to decide whether to add pharmacological therapy in adults with chronic insomnia disorder in whom cognitive behavioral therapy for insomnia (CBT-I) alone was unsuccessful. (Grade: weak recommendation, low-quality evidence)*

Ann Intern Med. 2016;165:125-133. doi:10.7326/M15-2175 **www.annals.org**
For author affiliations, see end of text.
This article was published at www.annals.org on 3 May 2016.

APPLE'S IPHONE

Night Shift Mode – iOS 9.3

Bedtime – iOS 10

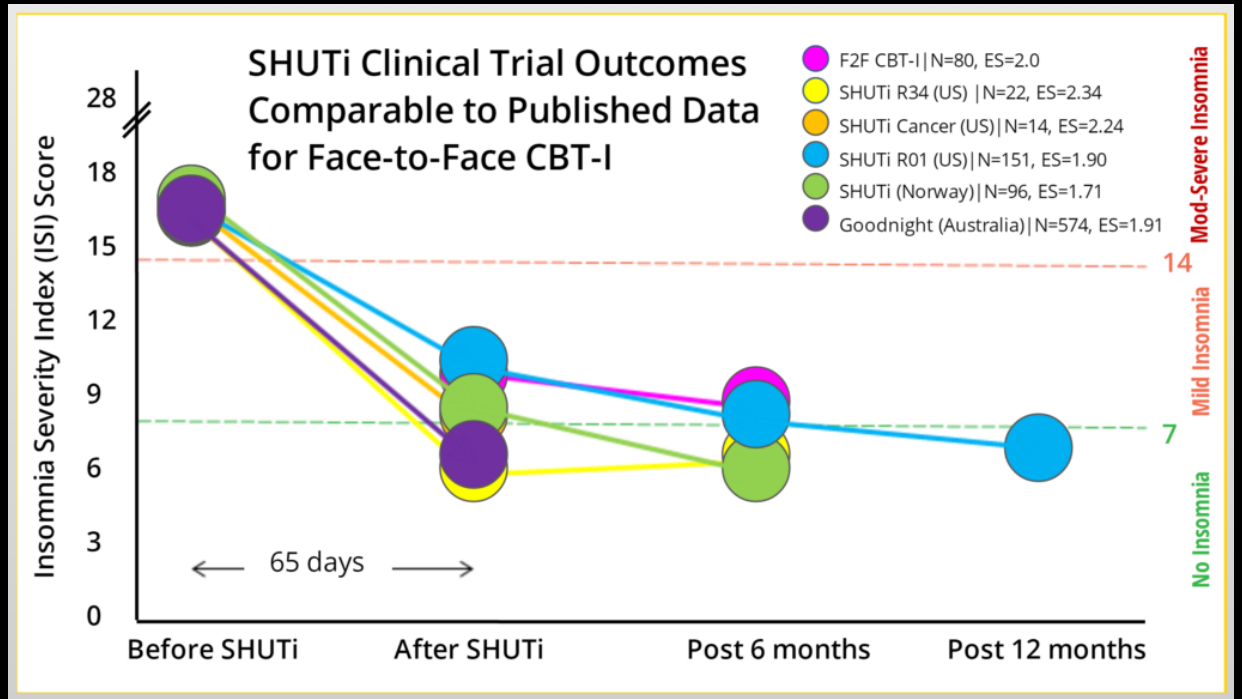


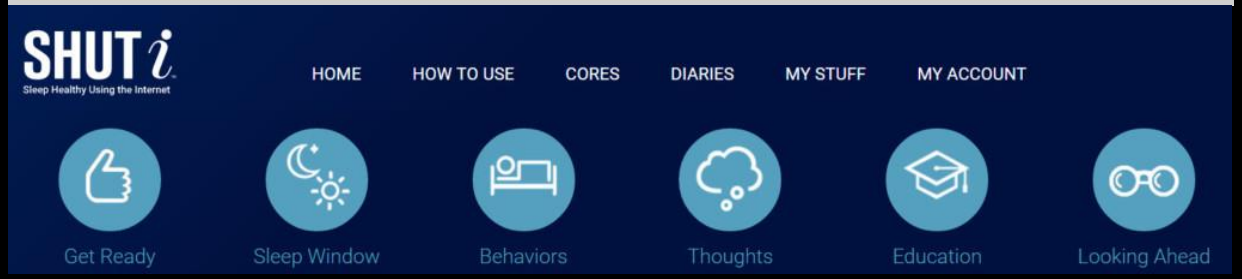
INTERNET BASED CBTI

- Shuti - http://www.myshuti.com/
  - $135 – 156 for 16 – 20 weeks
- Sleepio - https://www.sleepio.com/
  - $ 300 for 1 year
- Somnio - http://www.somnio.org/
  - $149 for 8 weeks
- RESTore - http://restore.cbtprogram.com/
  - £ 99 – 199 for 7 weeks (UK)
- CBTI Coach - http://www.ptsd.va.gov/public/materials/apps/cbti-coach-app.asp
  - Free / VA Developed – To be used with a therapist*

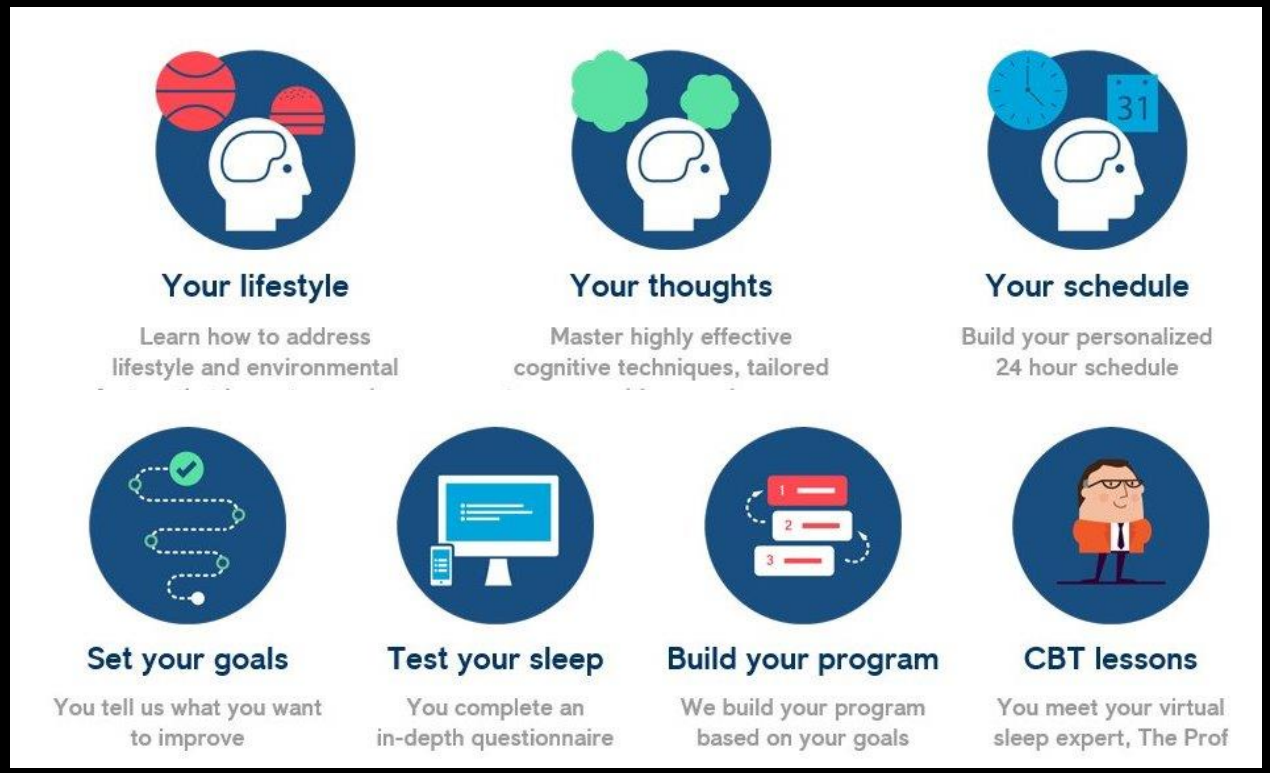
- Charles Morin, Ph.D
- University of Virginia
- Modular program
- 6 weeks
- No app available
- Robust evidence
- Healthcare version

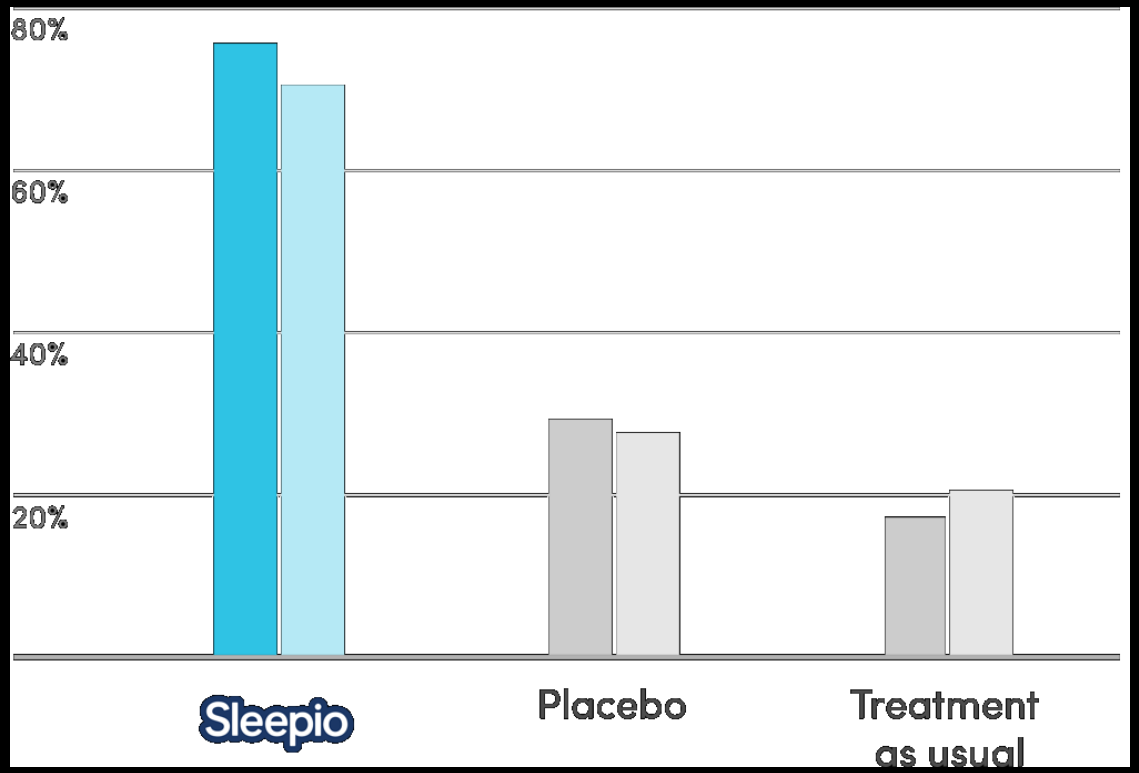
SHUTi™
Sleep Healthy Using the Internet





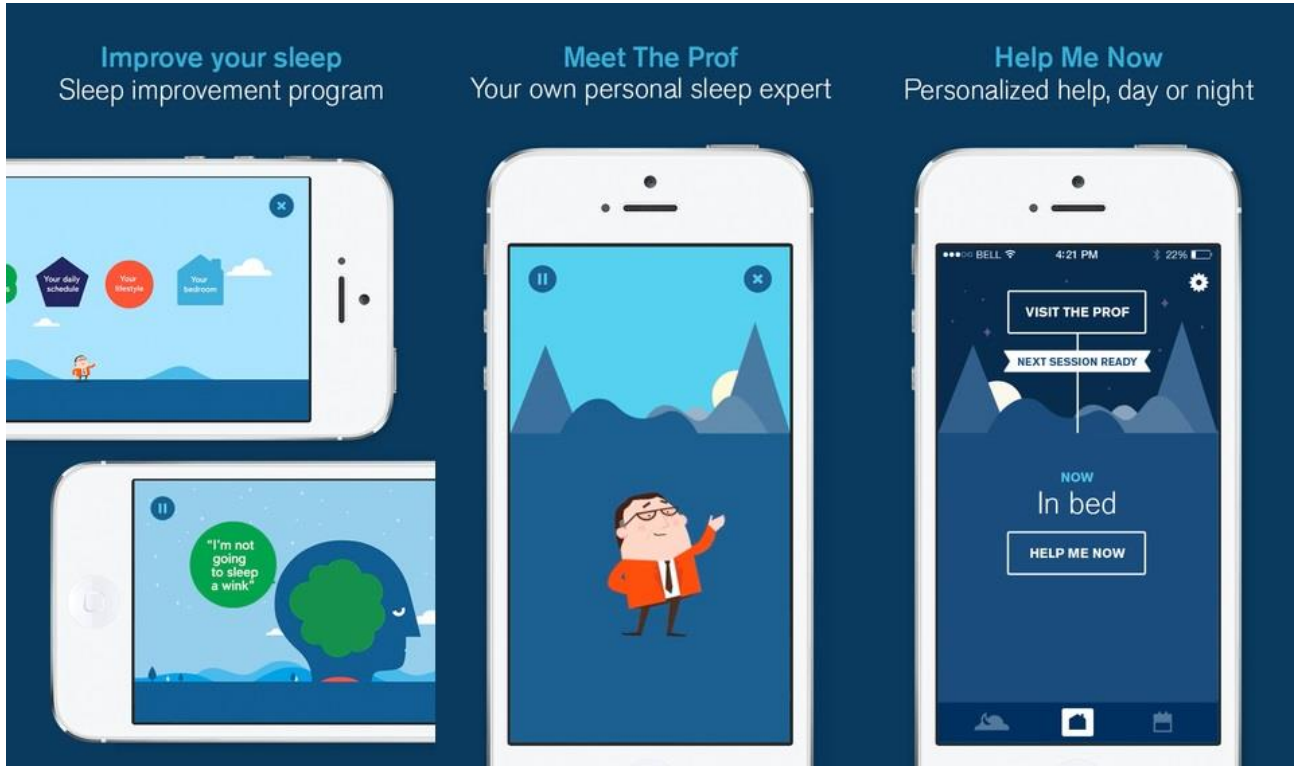
Sleepio™


Your lifestyle
Learn how to address lifestyle and environmental
Your thoughts
Master highly effective cognitive techniques, tailored
Your schedule
Build your personalized 24 hour schedule
Set your goals
You tell us what you want to improve
Test your sleep
You complete an in-depth questionnaire
Build your program
We build your program based on your goals
CBT lessons
You meet your virtual sleep expert, The Prof


80%
60%
40%
20%
Sleepio
Placebo
Treatment as usual

Sleepio™

- Colin Espie, Ph.D
- University of Oxford
- Flexible program
- 8 weeks, but
- 1 year commitment
- iOS app only
- Shift work, jet lag, new parents, pregnancy
- Healthcare version

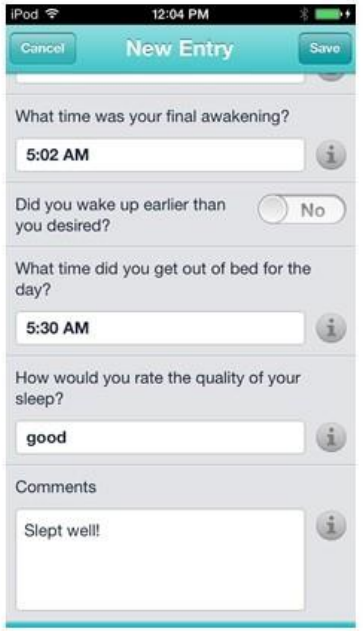


CBTI COACH

- Augment face-to-face care
- Free – iOS & Android
- Collaboration between
  - VA's National Center for PTSD
  - Stanford School of Medicine
  - DoD's National Center for Telehealth & Technology

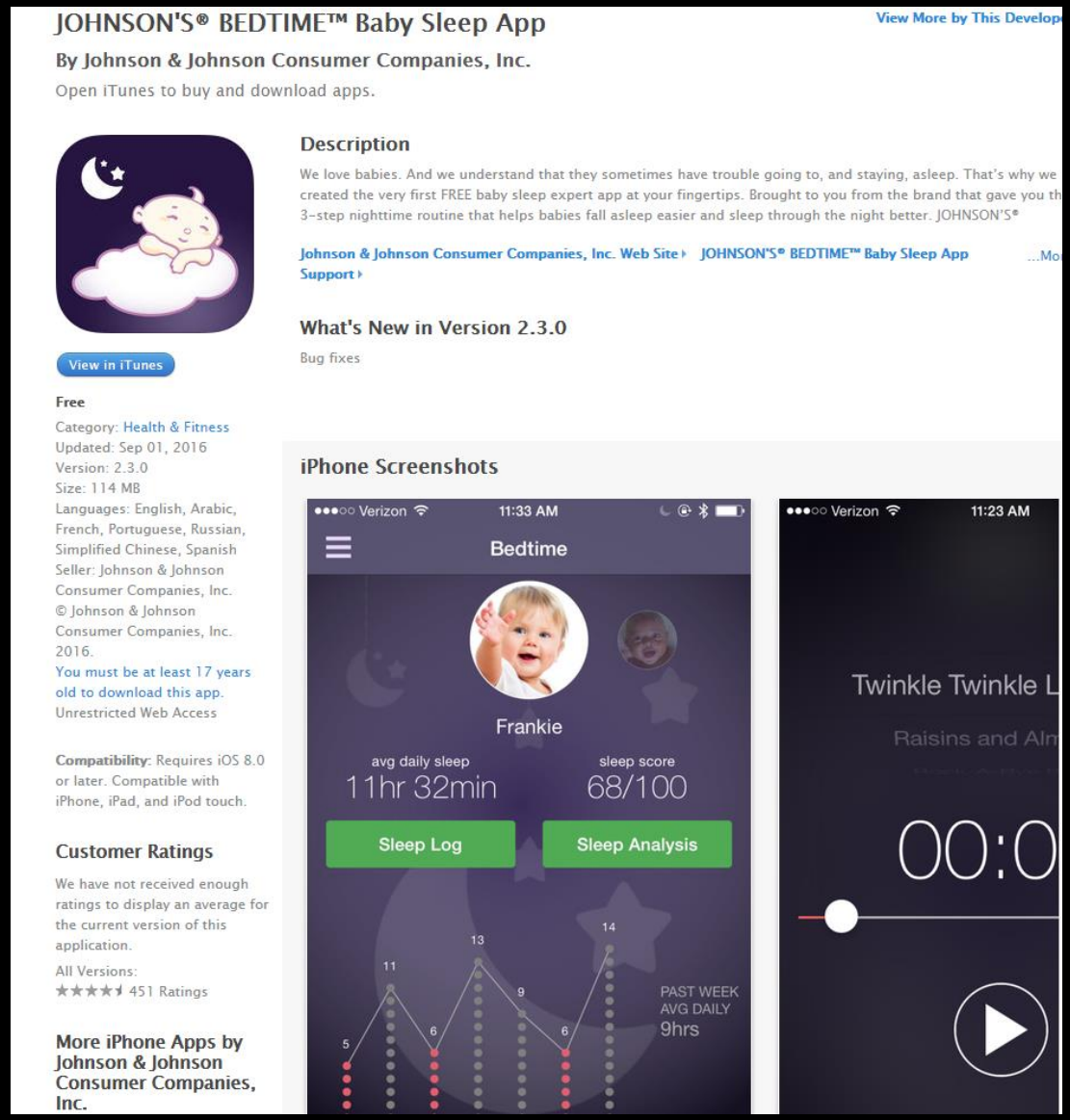
CBTI COACH

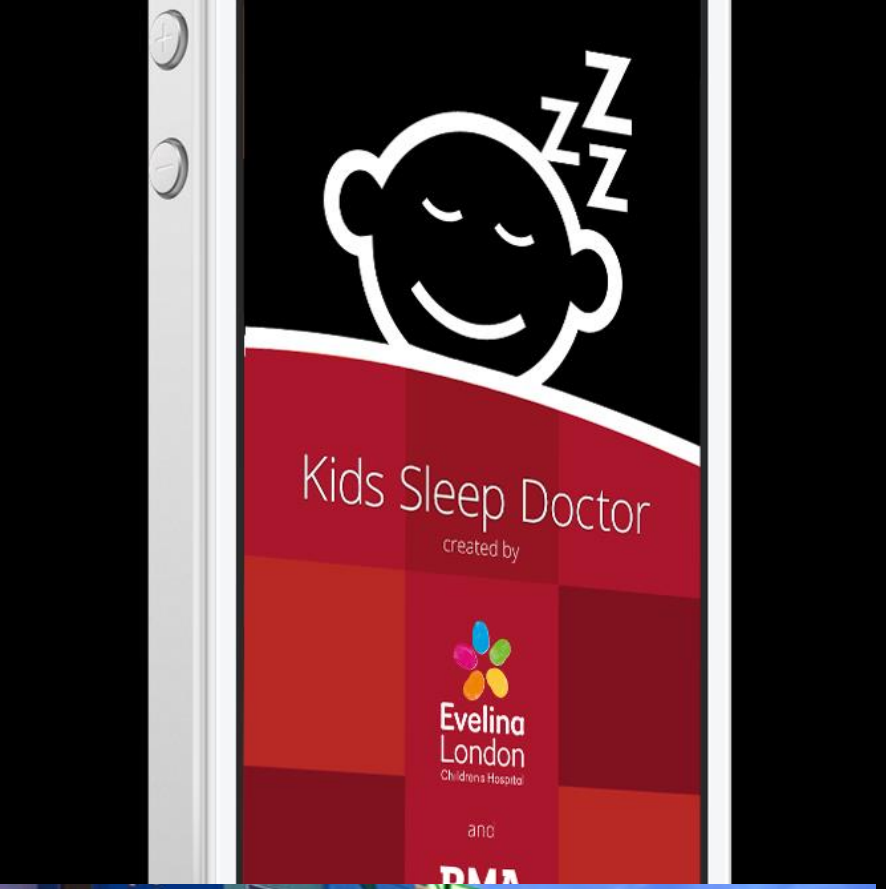
- KEY FEATURES
- Sleep diaries
- Ability to update a sleep prescription with provider recommendations
- Tools and exercises for quieting your mind
- Learn about sleep, the benefits of sleep hygiene and terms used in CBT-i
- Set reminder messages with tips, motivation and alarms to change sleep habits



PEDIATRIC INSOMNIA

- Johnson's Bedtime Baby
- Jodi A. Mindell, Ph.D
- Unrestricted Educational grant by Johnson's
- Infants and Toddlers
- Sleep logs
- Access to sleep panel for questions
- Free - $$$



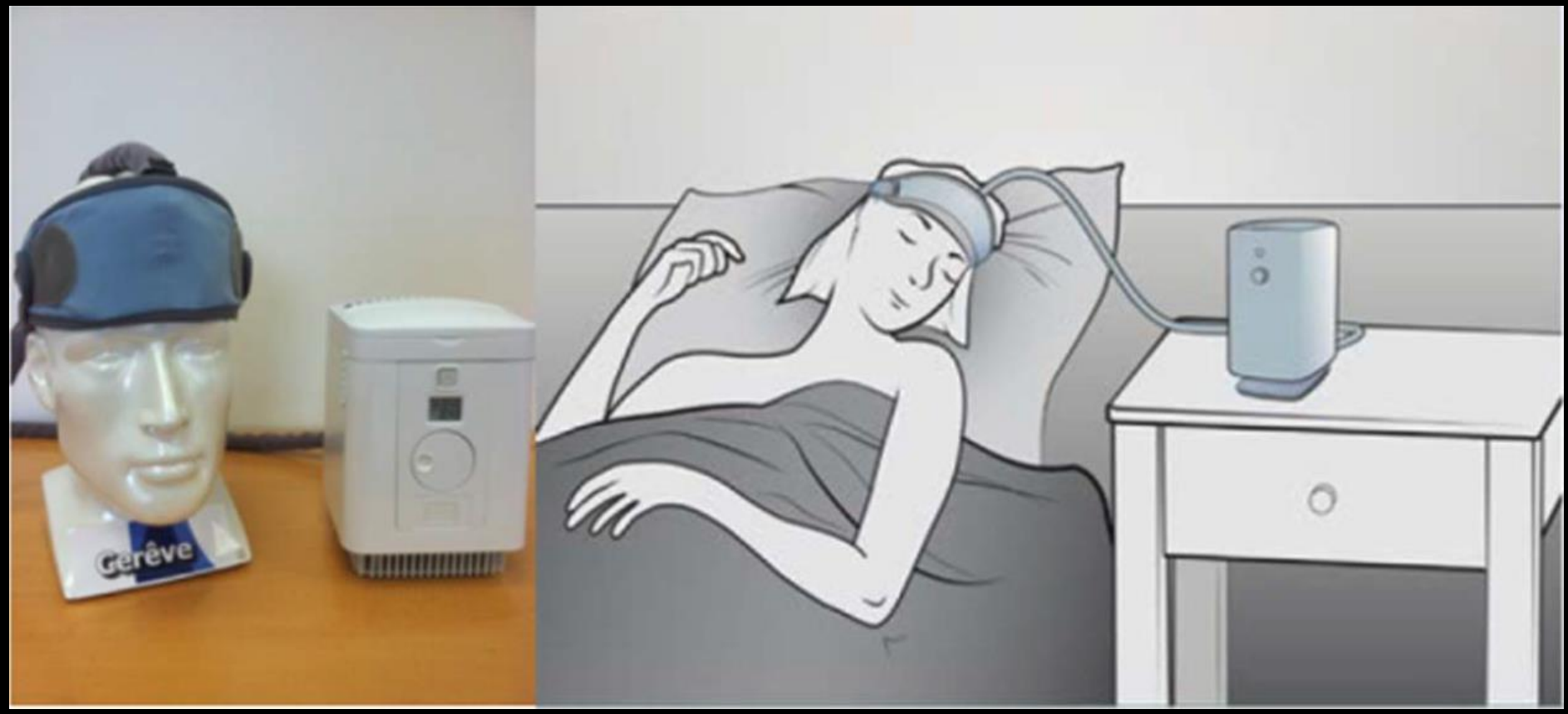


PEDIATRIC INSOMNIA

- Kids Sleep Doctor
- Paul Gringras
- Head of Sleep Medicine
- Evelina Children's Hospital in London
- Newborns to teenagers
- Personalised sleep tips
- Easy to digest weekly summary report
- Report sharing functionality
- Free - $$$

CERÊVE SLEEP SYSTEM

FDA Approved 05/13/2016



CERÊVE SLEEP SYSTEM

- Cooling device comprised of three components:
  - the bedside unit
  - forehead pad
  - headgear.
- The device pumps chilled fluid through the forehead pad, at patient selectable temperatures between 57 and 61 °F.
- Reduces sleep latency to Stage 1 and Stage 2 sleep in primary insomnia.
- Efficacy of other sleep measures associated with insomnia has not been established.

- http://www.accessdata.fda.gov/cdrh_docs/reviews/DEN140032.pdf

RESTLESS LEGS SYNDROME (RLS)

- Urge to move
- Rest induced
- Gets better with activity
- Evening and night accentuation

RLS AWARENESS DAY

SEPTEMBER 23, 2016

TARGETED PRESSURE FOR RLS

- Restiffic ® - $ 299 pair
- Targeted Pressure on Abductor Hallucis and Flexor Hallucis Brevis Muscles to Manage Moderate to Severe Primary Restless Legs Syndrome

Kuhn PJ. J Am Osteopath Assoc. 2016.

METHODS

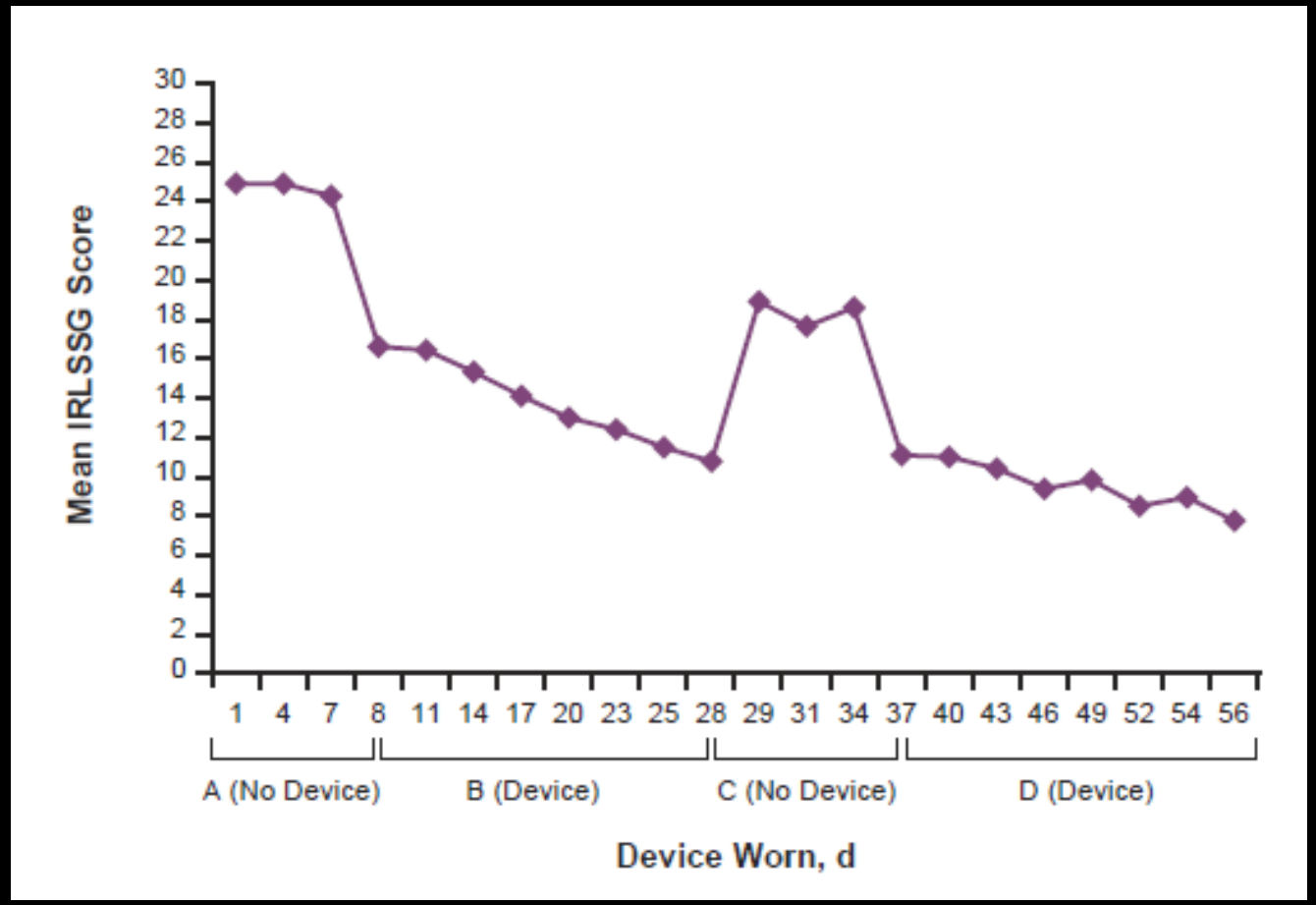
Inclusion Criteria

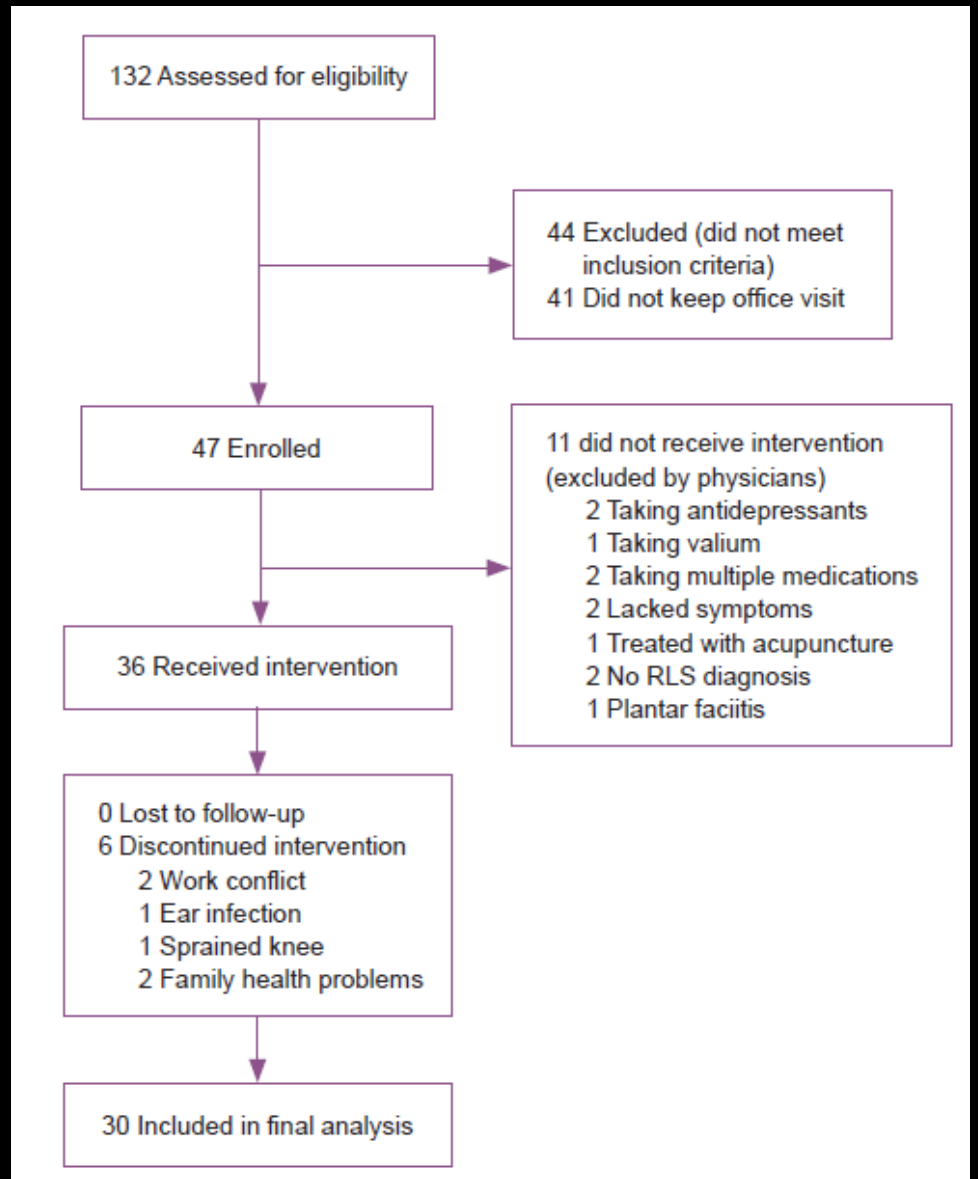
- Ages of 18 and 75 years
- Moderate to severe primary RLS
- IRLSSG Rating Scale ≥ 15
- Evening & nighttime symptoms with sleep impairment due to RLS
- RLS > 6 months with symptoms ≥ 2 to 3 times per week.
- RLS Meds discontinued > 30 days

Exclusion Criteria

- Pregnancy
- Taking medications known to affect
- RLS (eg, antidepressants).
- Disqualifying medical conditions:
  - claudication; diabetes mellitus; fragile, thin skin; impaired wound healing; foot injury, Parkinson's, OSA

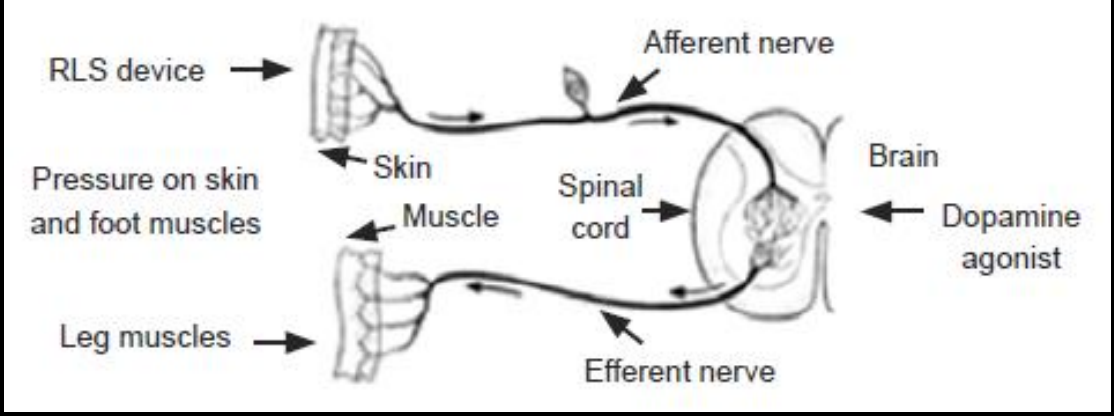
Kuhn PJ. J Am Osteopath Assoc. 2016.





RESULTS

Total IRLSSG Score		
Baseline	**Final**	**Follow up**
25.1 (5.3)	7.8 (6.3)	9.26 (0.33)



- Targeted pressure on the abductor hallucis and flexor halluces brevis muscles with an external RLS device reduced the symptoms of moderate to severe primary RLS
- ***Proposed mechanism of action***:
- Pressure induces relaxation of leg muscles through dopaminergic pathways

Kuhn PJ. J Am Osteopath Assoc. 2016.

SLEEP DISORDERED BREATHING

- Central sleep apnea (CSA)
- Obstructive sleep apnea (OSA)
- Snoring
- Hypoventialtion

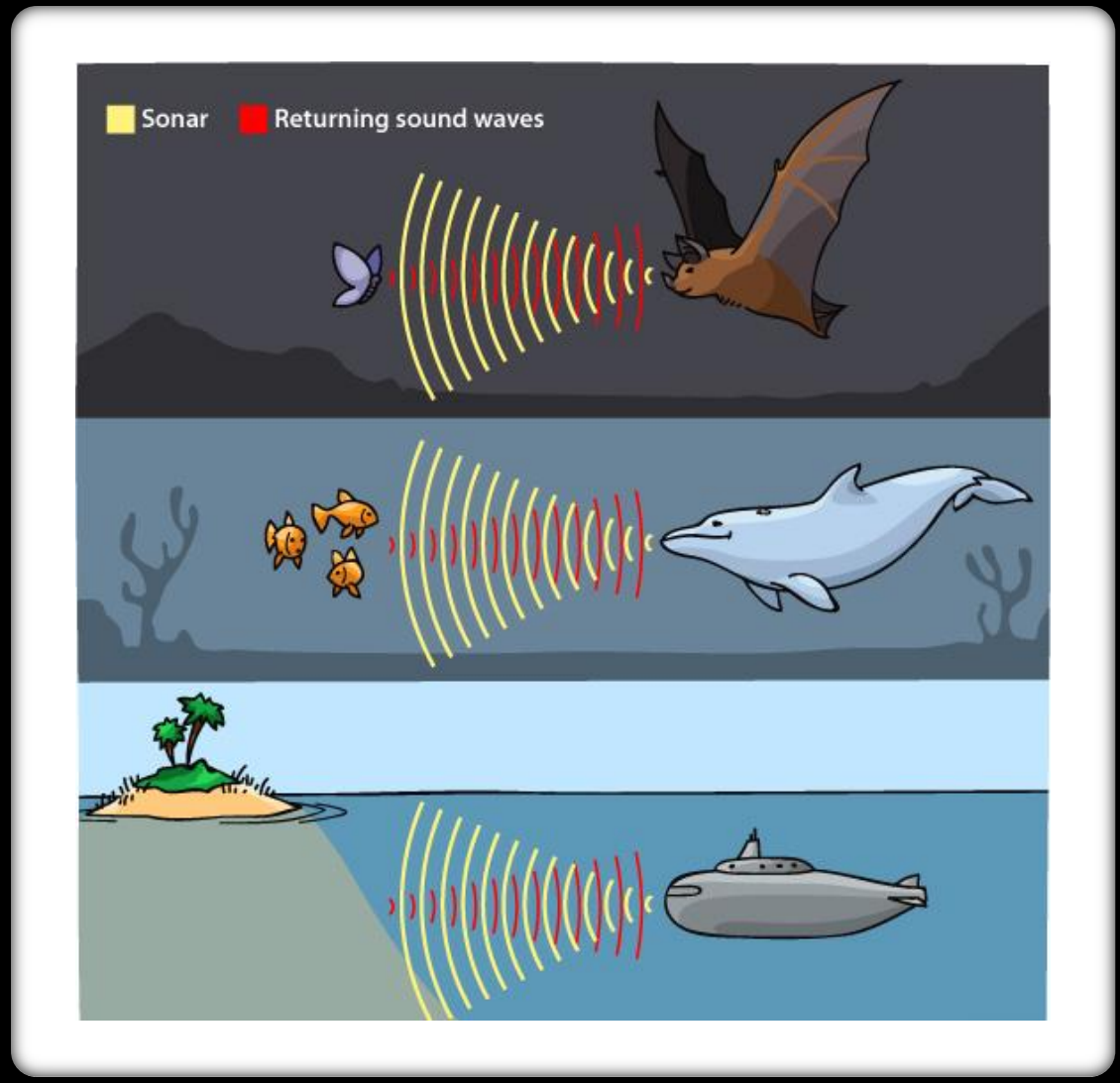
APNEA APP

- Developed by the University of Washington
- Contactless solution for detecting OSA, CSA & hypopneas
- Transforms the phone into an active sonar system
- Smartphone 3 feet away from the subject
- Emits frequency-modulated sound signals & listens to their reflections
- Monitors breathing chest & abdomen movements
- Can simultaneously identify and track breathing from multiple subjects

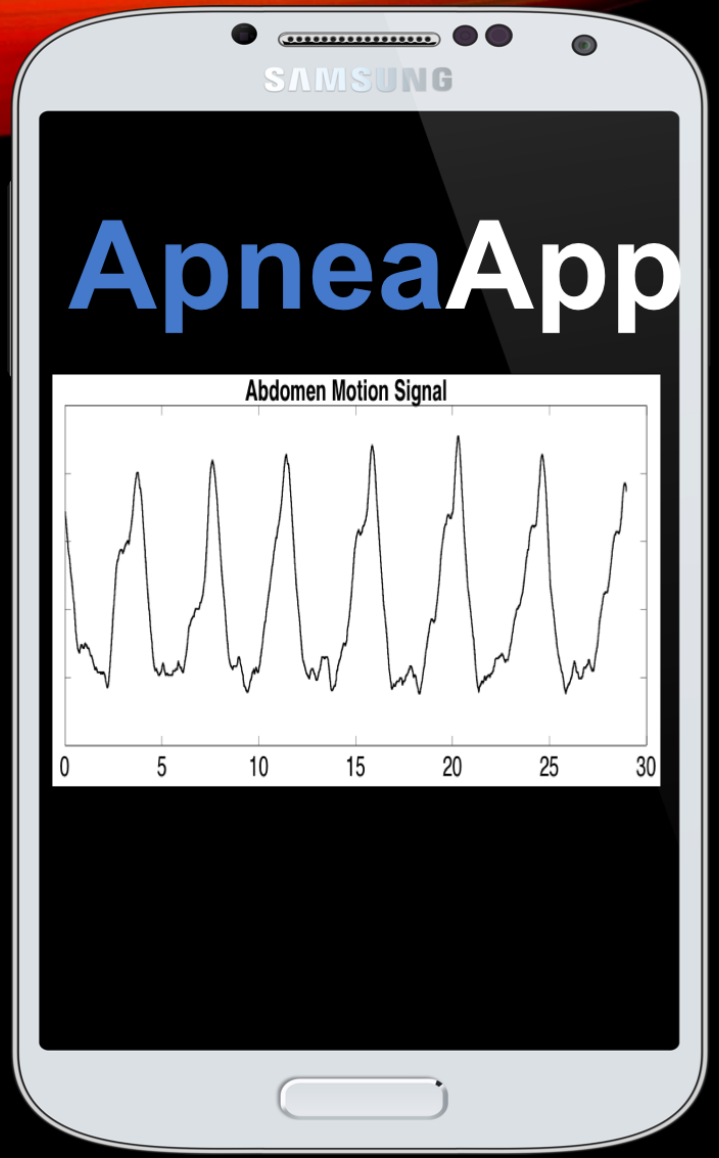
http://apnea.cs.washington.edu/#apneaapp

SONAR

- **SO**und **N**avigation **A**nd **R**anging
- Technique that uses sound propagation to detect objects
- Active sonar is emits pulses of sounds and listens for echoes



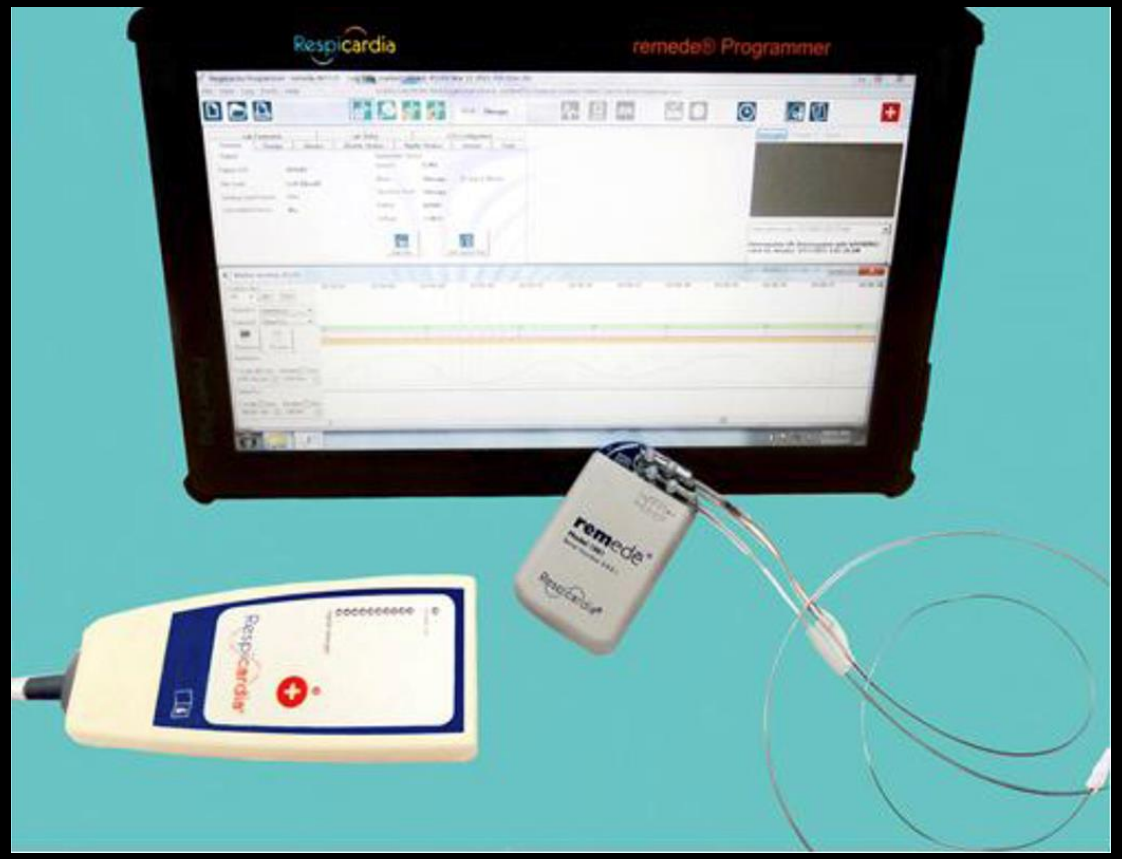
APNEA APP



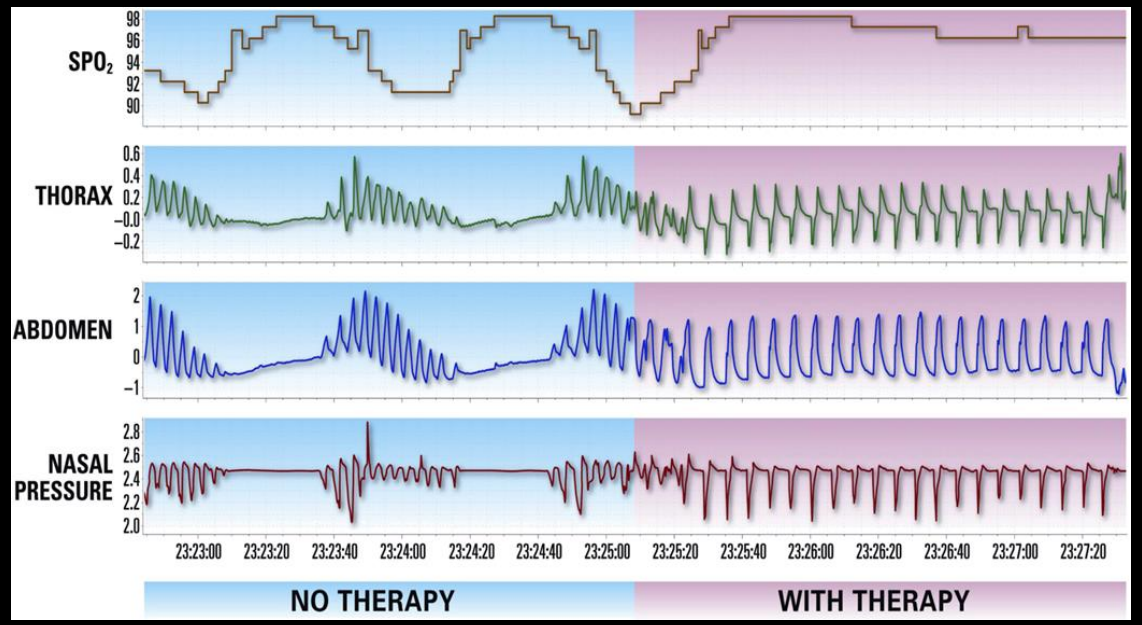
- Harborview sleep center
- 37 patients - 296 hours
- Polysomnography as baseline
- AHI correlation 98%
  - Central apnea 99%
  - Obstructive apnea 98%
  - Hypopnea 95%

- Contactless Sleep Apnea Detection on Smartphones. Nandakumar R et al. MobiSys, 2015
- http://apnea.cs.washington.edu/#apneaapp

PHRENIC NERVE STIMULATION FOR CSA



The Remedē System ®



Abraham WT et al. JCHF. 2015;3(5):360-369. doi:10.1016/j.jchf.2014.12.013

PHRENIC NERVE STIMULATION FOR CENTRAL SLEEP APNEA (CSA)

Inclusion Criteria

- Polysomnography (PSG)
- AHI > 20/hour
- > 50% Central sleep apnea (CSA)
- Stable, optimal medical therapy for any comorbidity

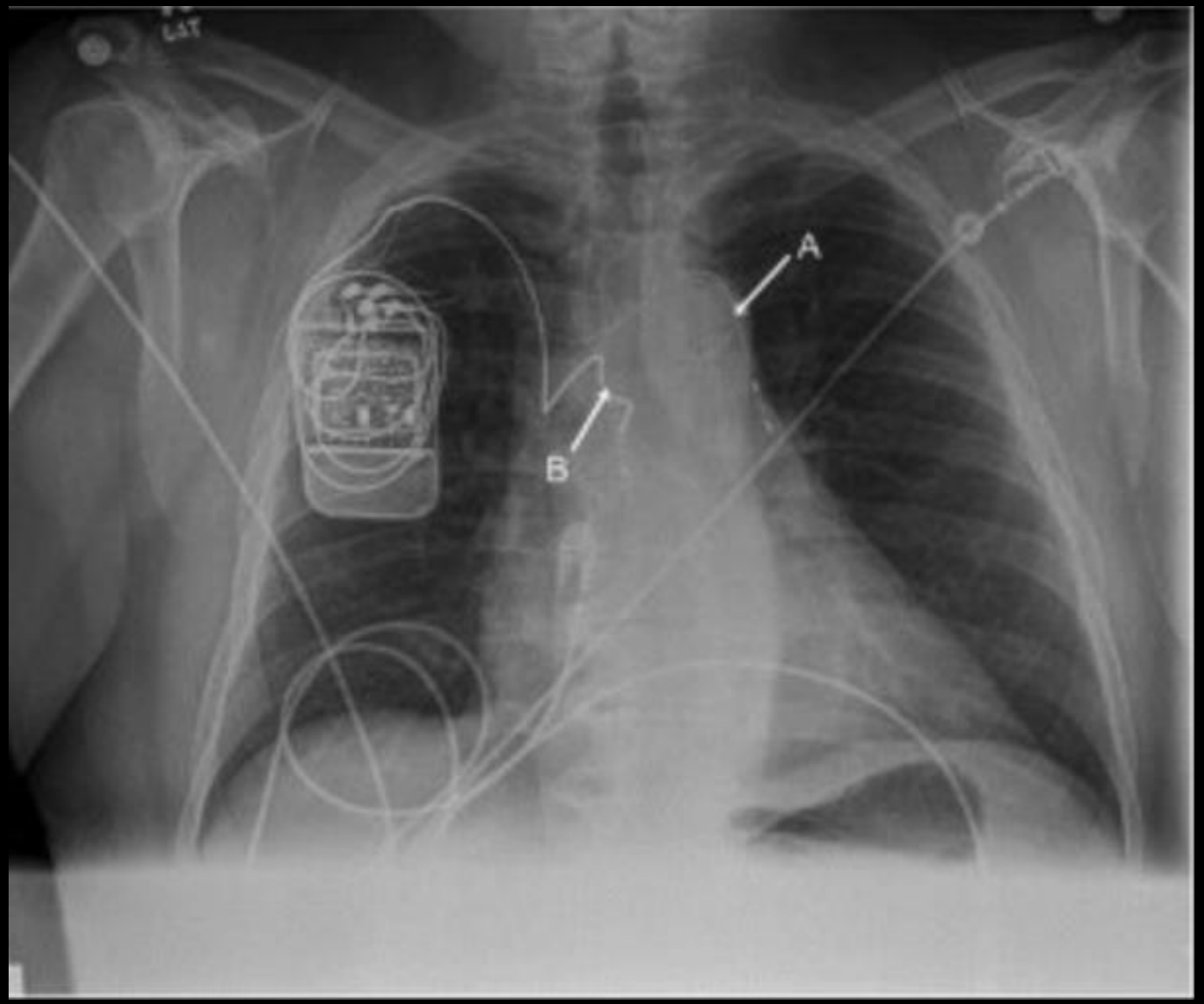
Exclusion Criteria

- > 20% OSA
- Phrenic nerve palsy,
- SaO2 <90% on room air
- Severe COPD
- Creatinine >2.5 mg/dl
- Cardiac procedure in the 3 months

Abraham WT et al. JCHF. 2015;3(5):360-369. doi:10.1016/j.jchf.2014.12.013

PHRENIC NERVE STIMULATION FOR CSA

- Implanted Remedē System
- The neurostimulator was implanted in the right pectoral area
- Stimulation lead (A) in the left pericardiophrenic vein
- Sensing lead (B) in the azygos vein



Abraham WT et al. JCHF. 2015;3(5):360-369. doi:10.1016/j.jchf.2014.12.013

EFFECTS ON SLEEP PARAMETERS

Parameter	Baseline	3 Months	6 Months	p Value
AHI	49.4 ± 14.9	22.8 ± 13.6	23.3 ± 13.3	≤ 0.0001
CAI	28.1 ± 14.7	5.0 ± 8.8	4.5 ± 7.2	< 0.0001
OAI	3.0 ± 2.8	3.9 ± 4.8	3.8 ± 5.2	0.0223
MAI	3.0 ± 3.7	0.3 ± 0.6	0.6 ± 1.5	< 0.0002
HI	15.4 ± 12.4	13.5 ± 9.0	14.4 ± 8.3	0.0179
ODI4	46.0 ± 18.8	22.0 ± 13.8	22.9 ± 13.3	< 0.0001
Arousal Index	35.5 ± 18.4	23.4 ± 10.9	24.7 ± 12.3	< 0.0001
Sleep efficiency%	69.3 ± 16.8	76.9 ± 15.6	81.4 ± 12.5	< 0.0001
REM sleep, %	11.2 ± 6.3	16.2 ± 8.1	17.4 ± 6.9	< 0.0001

Abraham WT et al. JCHF. 2015;3(5):360-369. doi:10.1016/j.jchf.2014.12.013

PULSE ARTERIAL TONOMETRY (PAT) IN ADOLESCENTS ≥ 12

- FDA Approved – July 26, 2016
- Itamar WatchPAT 200U
- 17 patients (11♂ and 6 ♀)
- Pooled from 3 prospective studies
- Simultaneous PSG & PAT
- AHI correlation R=0.92, p < 0.0001
- Correlation 100% with AHI > 10/hr

http://www.accessdata.fda.gov/cdrh_docs/pdf15/k153070.pdf

FIRST HSAT IN CHILDREN

- Embla Embletta Sleep Data Recording System (K122516)
- FDA approved 1/23/2013
- Type 2 device (Compass)
  - Adults & children
  - Neonates
  - Infants
- Type 3 device (Gold & MPR)
  - Adults & children
  - Not neonates nor infants

https://www.accessdata.fda.gov/cdrh_docs/pdf12/K122516.pdf

HYPOGLOSSAL NERVE STIMULATION IN ADOLESCENT WITH DOWN SYNDROME

Case Report

- Severe OSA [AHI]: 48.5 events/hour
- s/p adeno tonsillectomy
- CPAP intolerant
- Long-standing tracheotomy
- BMI 24.6 (95 percentile) - overweight

- Hypoglossal nerve stimulator therapy was well tolerated
- Overall AHI: 3.4
- Tracheotomy removed after 5 months after implantation
- Potentially, another group that could benefit from treatment.

- Diercks GR. Pediatrics. 2016

PAP MOBILE APPLICATIONS

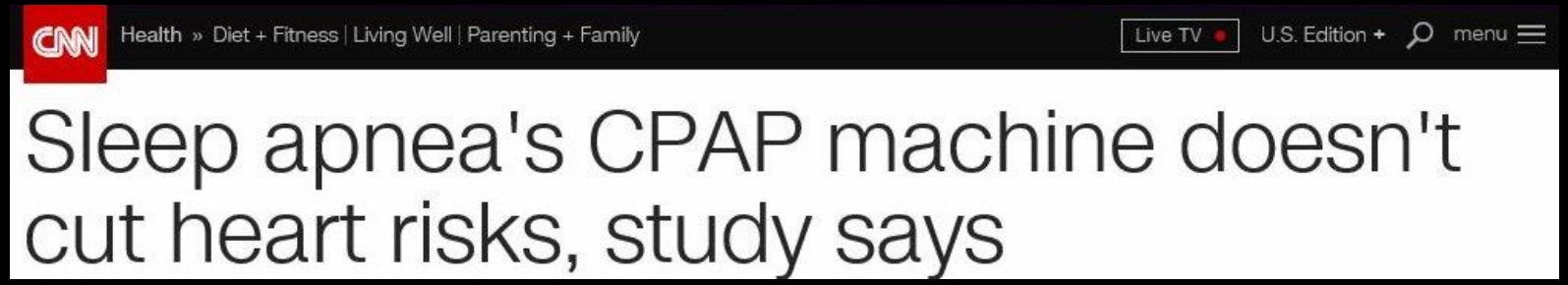
- DreamMapper (Philips Respironics)

- MyAir (ResMed)

- SmartLink (DeVilbiss)

- Nitelog (Z1)

EDITION
US
THE HUFFINGTON POST
INFORM • INSPIRE • ENTERTAIN • EMPOWER
NEWS
POLITICS
ENTERTAINMENT
WELLNESS
WHAT'S WORKING
VOICES
VIDEO
SLEEP + WELLNESS
IN PARTNERSHIP WITH
sleep number
CPAP Doesn't Prevent Cardiovascular Events in Sleep Apnea, According to the NEJM, But Can That Be True?
09/02/2016 12:38 pm ET | Updated Sep 06, 2016


CNN
Health » Diet + Fitness | Living Well | Parenting + Family
Live TV
U.S. Edition +
menu
Sleep apnea's CPAP machine doesn't cut heart risks, study says

The Washington Post
To Your Health
CPAP machines don't prevent heart attacks, strokes in some sleep apnea sufferers

SLEEP APNEA CARDIOVASCULAR ENDPOINTS (SAVE)

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 8, 2016 VOL. 375 NO. 10

CPAP for Prevention of Cardiovascular Events in Obstructive Sleep Apnea

R. Doug McEvoy, M.D., Nick A. Antic, M.D., Ph.D., Emma Heeley, Ph.D., Yuanming Luo, M.D., Qiong Ou, M.D., Xilong Zhang, M.D., Olga Mediano, M.D., Rui Chen, M.D., Luciano F. Drager, M.D., Ph.D., Zhihong Liu, M.D., Ph.D., Guofang Chen, M.D., Baoliang Du, M.D., Nigel McArdle, M.D., Sutapa Mukherjee, M.D., Ph.D., Manjari Tripathi, M.D., Laurent Billot, M.Sc., Qiang Li, M.Biostat., Geraldo Lorenzi-Filho, M.D., Ferran Barbe, M.D., Susan Redline, M.D., M.P.H., Jiguang Wang, M.D., Ph.D., Hisatomi Arima, M.D., Ph.D., Bruce Neal, M.D., Ph.D., David P. White, M.D., Ron R. Grunstein, M.D., Ph.D., Nanshan Zhong, M.D., and Craig S. Anderson, M.D., Ph.D., for the SAVE Investigators and Coordinators*

METHODS

Inclusion Criteria

- 45-75 years
- CAD or CVD
- OSA REI ≥ 12/hour (HSAT)
- Use sham CPAP ≥ 3 hours x 1 week

Exclusion Criteria

- Epworth ≤ 15 / 24 (Sleepiness)
- Sats <80% for >10% of recording
- Cheyne Stokes Respiration

MCEVOY RD ET AL. N ENGL J MED 2016;375:919-931.

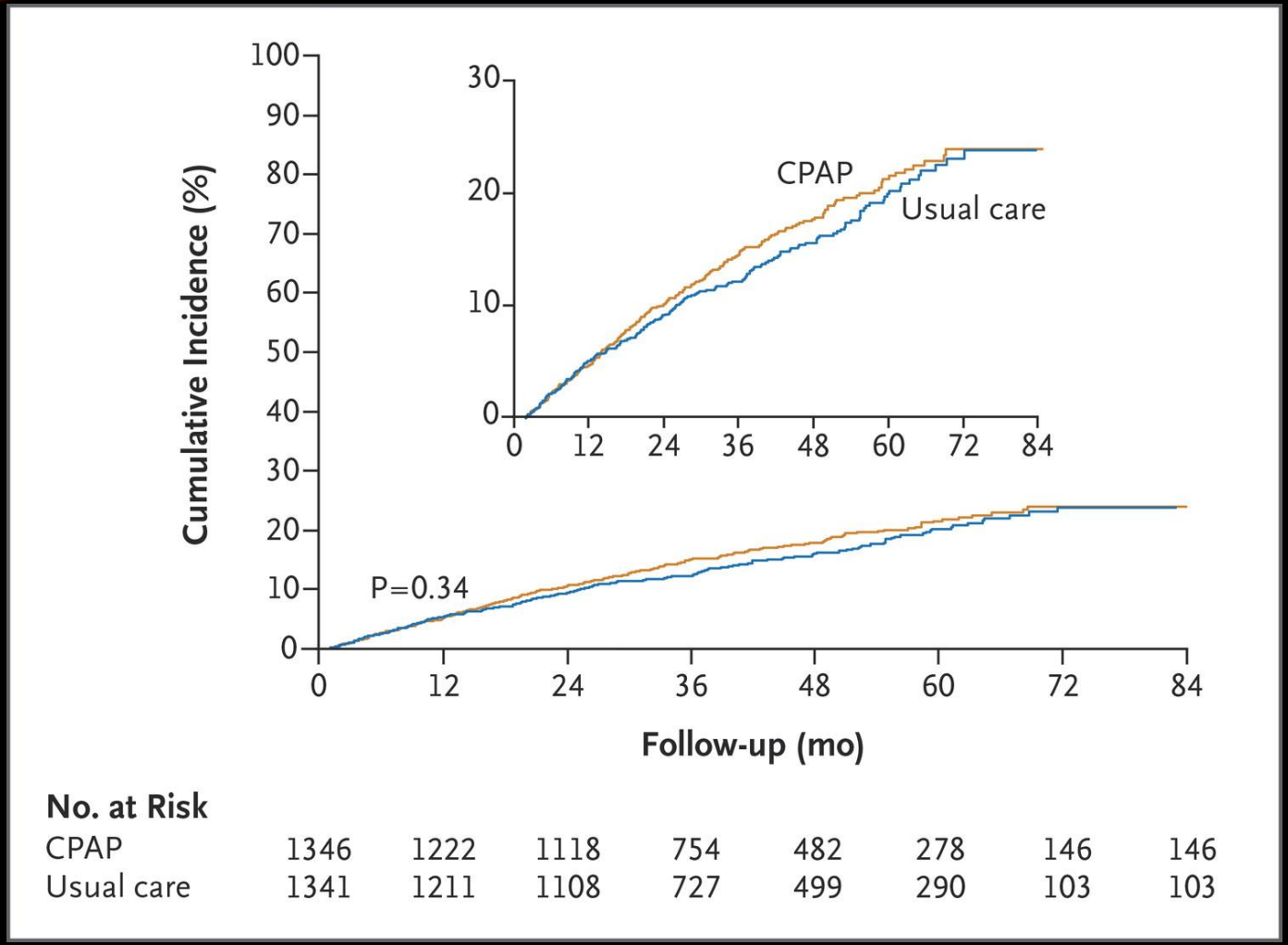
RESULTS

- 15,325 patients assessed
- 2,717 eligible patients
- 1,359 patients – CPAP + usual care
- 1,358 patients – usual care
- Mean age: 61 years
- Male 81%
- Asian ~ 63%
- White ~ 25%

- Mean BMI: 29
- Mean REI: 28/hour
- Mean Epworth 7.4
- Mean Follow up 3.7 years
- Adherence: 42% > 4 hours per night
  - 1 month: 4.4±2.2 hours per night
  - 1 year: 3.5±2.4 hours per night
  - Thereafter: 3.3±2.3 hours per night
- Residual AHI 3.7 per hour (machine)

MCEVOY RD ET AL. N ENGL J MED 2016;375:919-931.

Cumulative Event Curve of the Primary End Point.



No. at Risk								
CPAP	1346	1222	1118	754	482	278	146	146
Usual care	1341	1211	1108	727	499	290	103	103

MCEVOY RD ET AL. N ENGL J MED 2016;375:919-931.

The NEW ENGLAND JOURNAL of MEDICINE

SECONDARY END POINTS WERE NOT DIFFERENT

- Death from cardiovascular causes, Myocardial infarction, Stroke, Hospitalization for heart failure, Hospitalization for unstable angina, Hospitalization for transient ischemic attack, Composite of ischemic cardiovascular events, Composite of major cardiovascular events, Composite of cerebral events, Composite of cardiac events, Revascularization procedures, Death from any cause, New-onset atrial fibrillation, Newly diagnosed diabetes, Blood pressure.

MCEVOY RD ET AL. N ENGL J MED 2016;375:919-931.

QUALITY OF LIFE IMPROVED WITH CPAP

- Epworth Sleepiness Scale score
- Hospital Anxiety and Depression Scale
- SF-36
  - Physical component
  - Mental Component
- EQ-5D utility score

MCEVOY RD ET AL. N ENGL J MED 2016;375:919-931.

AUTHOR'S CONCLUSION

- Therapy with CPAP plus usual care, as compared with usual care alone, did not prevent cardiovascular events in patients with moderate-to-severe obstructive sleep apnea and established cardiovascular disease.

MCEVOY RD ET AL. N ENGL J MED 2016;375:919-931.

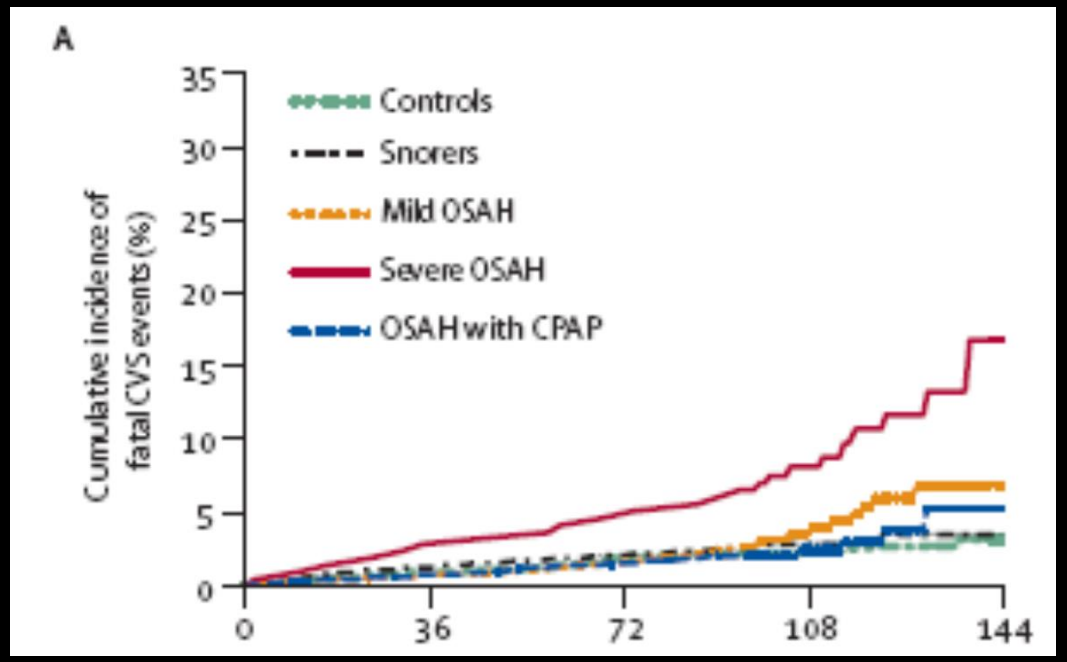
CRITICAL APPRAISAL TOOL (CAT)

- PATIENTS
  - Secondary CV prevention
  - Middle age / older Asian men
  - "Leaner" for Wisconsin
  - Non-sleepy
  - Mild hypoxemia
- INTERVENTIONS
  - Usual Care
  - CPAP + Usual care
  - Poor adherence to CPAP
- COMPARISON
  - Both groups had similar characteristics
- OUTCOMES
  - Low / borderline CPAP adherence did not appear to improve secondary CV mortality / morbidity outcomes in non-sleepy, overweight Asian men with mild hypoxemia within 3-4 years.
  - Quality of life appeared to improve

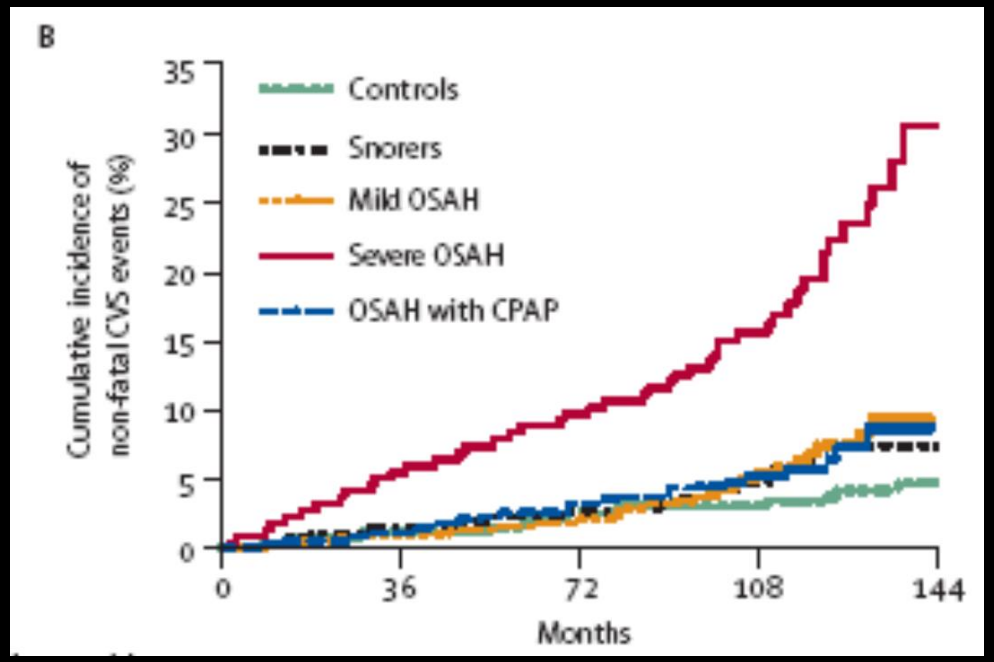
SHOULD WE TREAT OSA?

CPAP AND PRIMARY CV PREVENTION IN MEN

Mortality

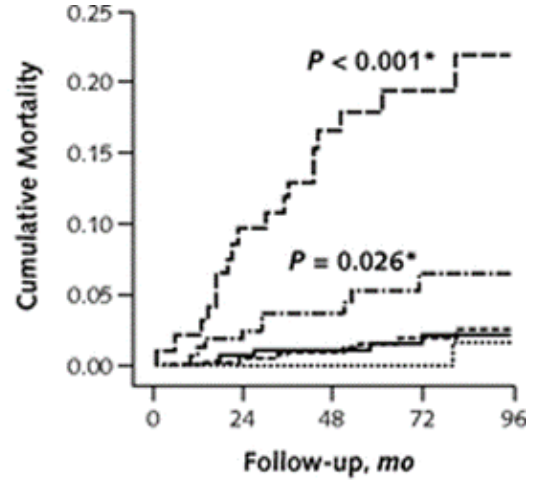


Morbidity



Marin JM. Lancet. 2005 Mar 19-25;365(9464):1046-53

CPAP PRIMARY CV MORTALITY PREVENTION IN WOMEN



Patients at risk, *n*					
AHI <10 (control group)	277	255	198	102	23
AHI of 10–29 and treated with CPAP	155	140	102	55	18
AHI ≥30 and treated with CPAP	419	381	280	148	48
AHI of 10–29 and untreated	166	146	102	49	12
AHI ≥30 and untreated	93	78	55	28	7

— AHI <10
····· AHI of 10–29 and treated with CPAP
---- AHI of 30 and treated with CPAP
-·- AHI of 10–29 and untreated
– – – AHI of 30 and untreated

Campos-Rodriguez, F. Ann Intern Med. 2012;156(2):115-122. doi:10.7326/0003-4819-156-2-201201170-00006

patients
telemedicine
health
telehealth
care
information
technology
system
data
patient
service
research
use
services
used
intervention
medical
clinical
treatment
management
stroke
studies
compared
remote
results
systems
healthcare
hospital
group
rural
support
assessment
review
years
significant
hospitals
applications
outcomes
primary
control
practice
groups
potential
electronic
therapy
journal
cases
visits
current
work
implementation
internet
trial
disease
approach
technologies
consultation
images
costs
telephone
interventions
effects
conducted
program
knowledge
symptoms
well
impact
need
provide
cost
education
time
e-health
different
mobile
children
improve
number
development
based
delivery
diagnosis
participants
access
digital
however
new
evaluation
communication
analysis
monitoring
model
quality
program
included
satisfaction
home
diabetes
depression
randomized
level
internet
many
outcome
available
effectiveness
network
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provide
future
major
methods
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older
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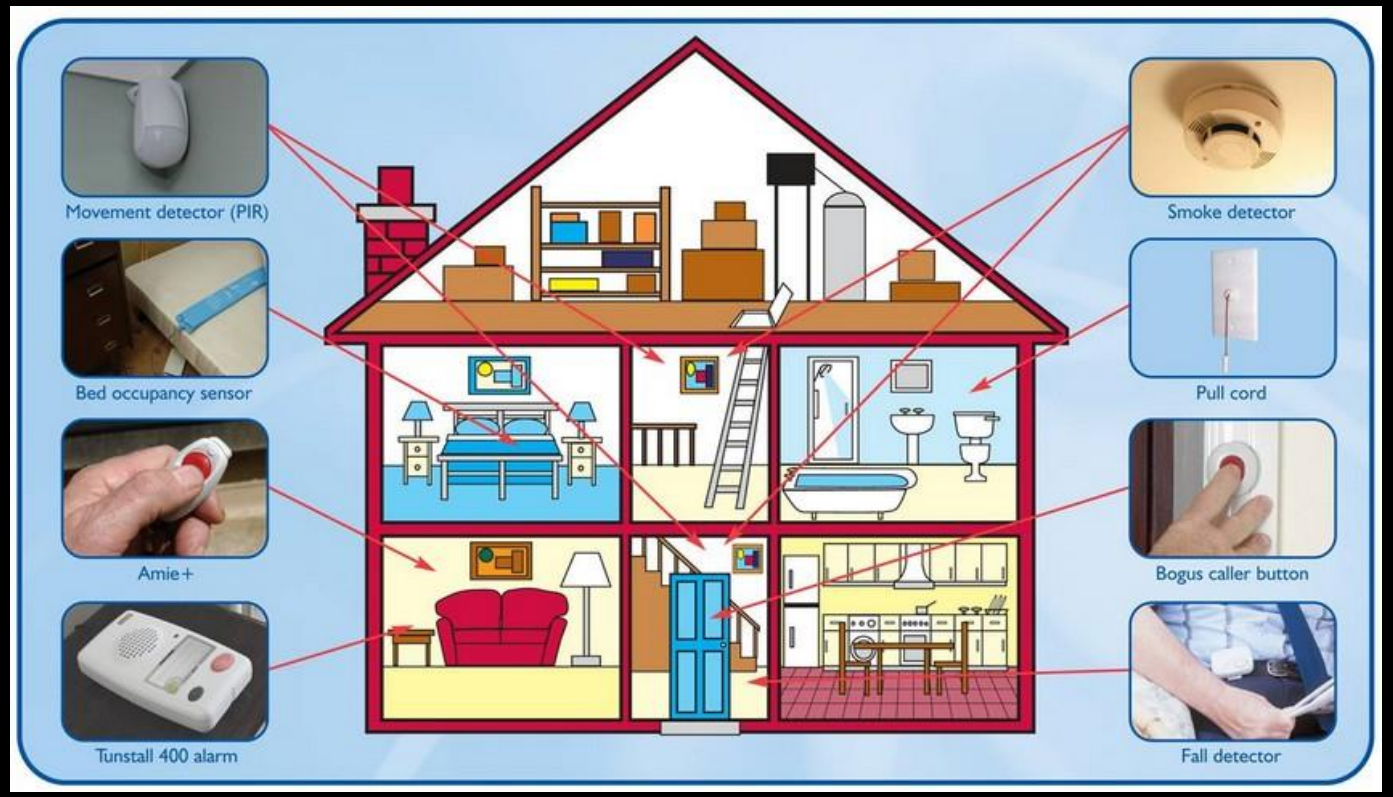
increased
method
months
consultation
improve
mobile
children
different
development
journal
comments
as
number
follow-up
evaluated

TELEHEALTH

- e-health or m-health
- Delivery of health care services, health information services and health care education through telecommunications technologies
- Entails preventive, curative, and promotive aspects
- Encompasses telecare and telemedicine

TELECARE

- Mainly used to monitor people to get real-time emergency support via mobile phone, computer and other telecommunication technology
- Helps to manage a wide range of issues and risks associated with a person living alone



TELEMEDICINE

- Use of medical information exchanged from one site to another via electronic communications to improve a patient's clinical health status
- Includes a growing variety of applications and services using two-way video, email, smart phones, wireless tools and other forms of telecommunications technology

TELEMEDICINE

Synchronous Live Interactions

- Offer real-time interactions between a patient and a clinician by means of online communication, phone conversations, home visits, etc.
- They're usually applied to clinical interview, physical examination and discussion of assessment / plan

Asynchronous Interactions

- Convey medical data such as bio-signals and medical images to a clinician at a convenient time for assessment
- Does not need the presence of both parties

SPECIAL ARTICLES

JCSM
Journal of Clinical Sleep Medicine

pii: jc-00350-15
http://dx.doi.org/10.5664/jcsm.5098

American Academy of Sleep Medicine (AASM) Position Paper for the Use of Telemedicine for the Diagnosis and Treatment of Sleep Disorders

An American Academy of Sleep Medicine Position Paper

Jaspal Singh, MD, MHA, MHS[1]; M. Safwan Badr, MD[2]; Wendy Diebert, RN[3]; Lawrence Epstein, MD[4]; Dennis Hwang, MD[5]; Valerie Karres, BS, RPSGT[1]; Seema Khosla, MD[6]; K. Nicole Mims, MD[1]; Afifa Shamim-Uzzaman, MD[7]; Douglas Kirsch, MD[1]; Jonathan L. Heald, MA[8]; Kathleen McCann[8]

[1]Carolinas HealthCare System, Charlotte, NC; [2]Wayne State University, Detroit, MI; [3]The VirtualEngine, LLC, St. Louis, MO; [4]Welltrinsic, Darien, IL; [5]Kaiser Permanente, Fontana, CA; [6]North Dakota Center for Sleep, Fargo, ND; [7]University of Michigan, Ann Arbor, MI; [8]American Academy of Sleep Medicine, Darien, IL

THE VA EXPERIENCE IN MILWAUKEE

- Sleep Medicine started in 2008
- Retrospective study 2008 – 2012
- Sleep consult to PAP Rx interval
  - ↓ ≥60 days to ≤7 days
- ↑ Consults & Sleep studies
- ↑ Data download / follow up

- Baig MM. Telemed J E Health. 2016

SO WHAT COULD THE FUTURE DELIVERY OF HEALTHCARE FOR SLEEP PATIENTS LOOK LIKE?

OPTISOM - PROJECT Z

Helps to identify, educate, and manage employees' sleep health

http://www.optisom.com/project-z/

DOMINIC A. MUNAFO M.D. FABSM -- BRETTON HEVENER B.S., RPSGT -- DEREK H. LOEWY PH.D., D.ABSM, CBSM

OPTISOM CLINICAL TEAM

DAVID FRENCH – CEO

TAY NGUYEN - CTO

THOMAS LEE
CHIEF SLEEP ADVOCATE

OPTISOM BUSINESS TEAM

WHAT SLEEP ISSUES ARE INCLUDED

- Jet Lag
- Shift Work
- Restless Legs
- Chronic Stress
- Hypnotic Dependence
- Sleep Deprivation
- Transient Insomnia
- Chronic Insomnia
- Obstructive Sleep Apnea
- Conditioned Arousal
- Sleep Hygiene – Lifestyle
- Sleep Hygiene – Environment
- Delayed Sleep Phase Syndrome
- Advanced Sleep Phase Syndrome
- And more!

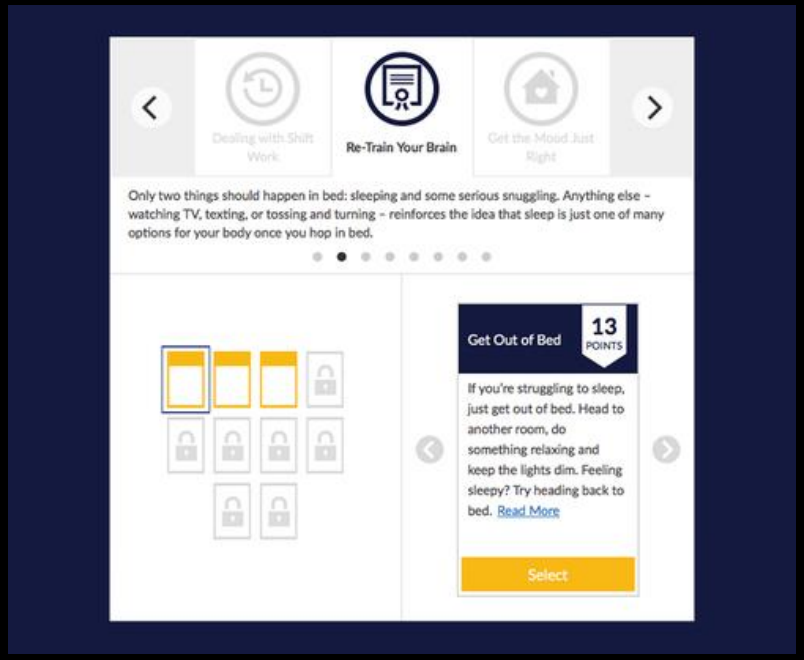
WHAT DO THEY PROMISE?

- Better Productivity
- Better Health
- Better Safety
- Cost savings
- Happy workers
- Return on investment (ROI) 1 : 3 $

HOW DO THEY DO IT?

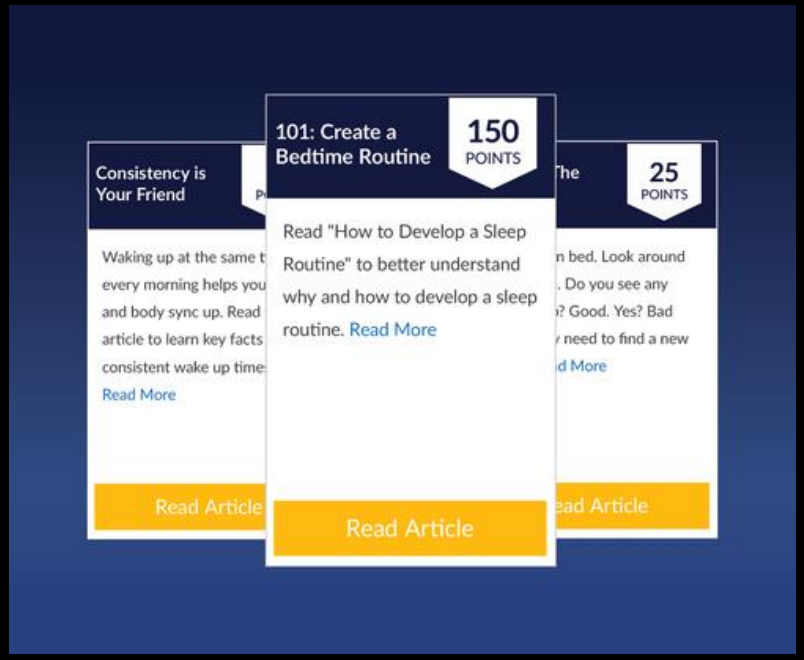
Sleep Health Screener

ProjectZ Therapy Modules



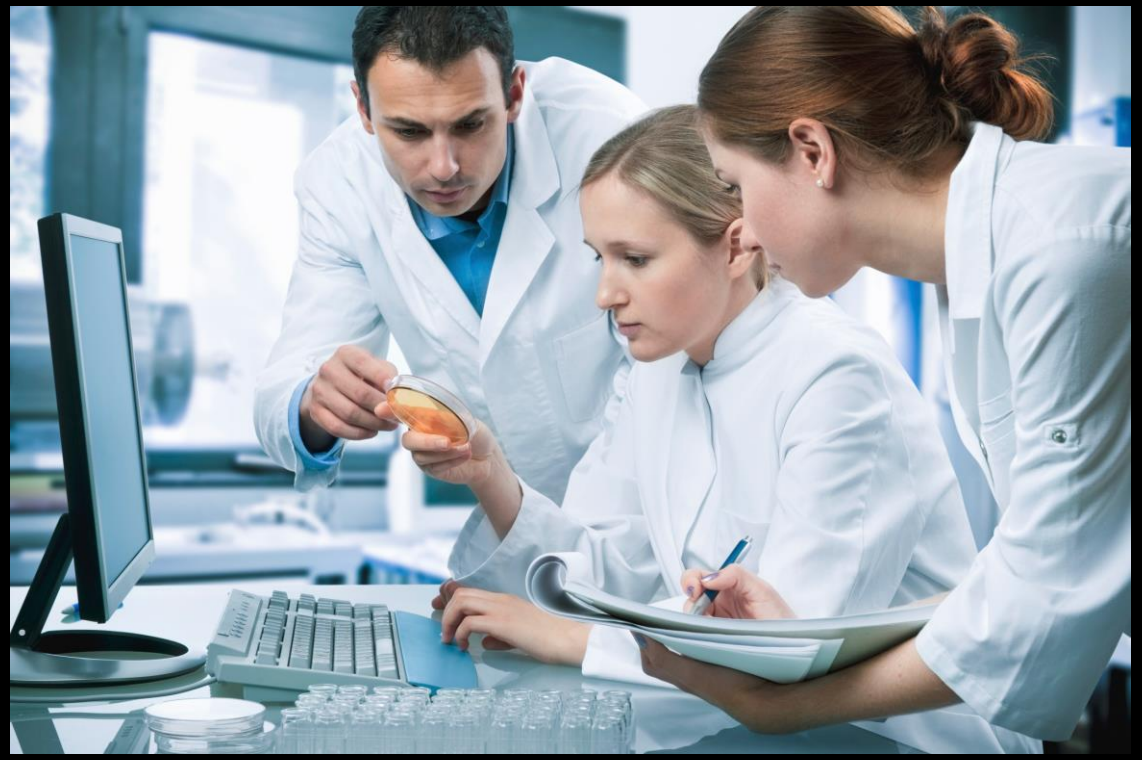
CONTINUATION

ProjectZ Challenge Cards



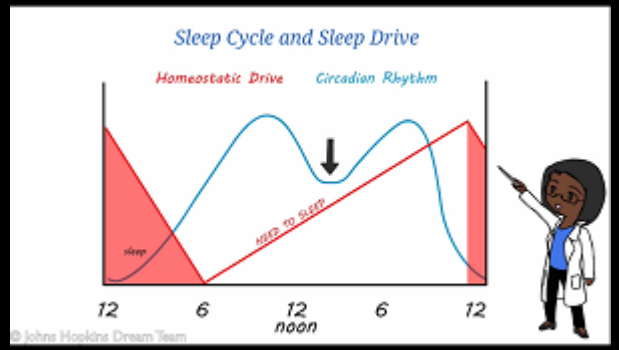
ProjectZ Dashboard

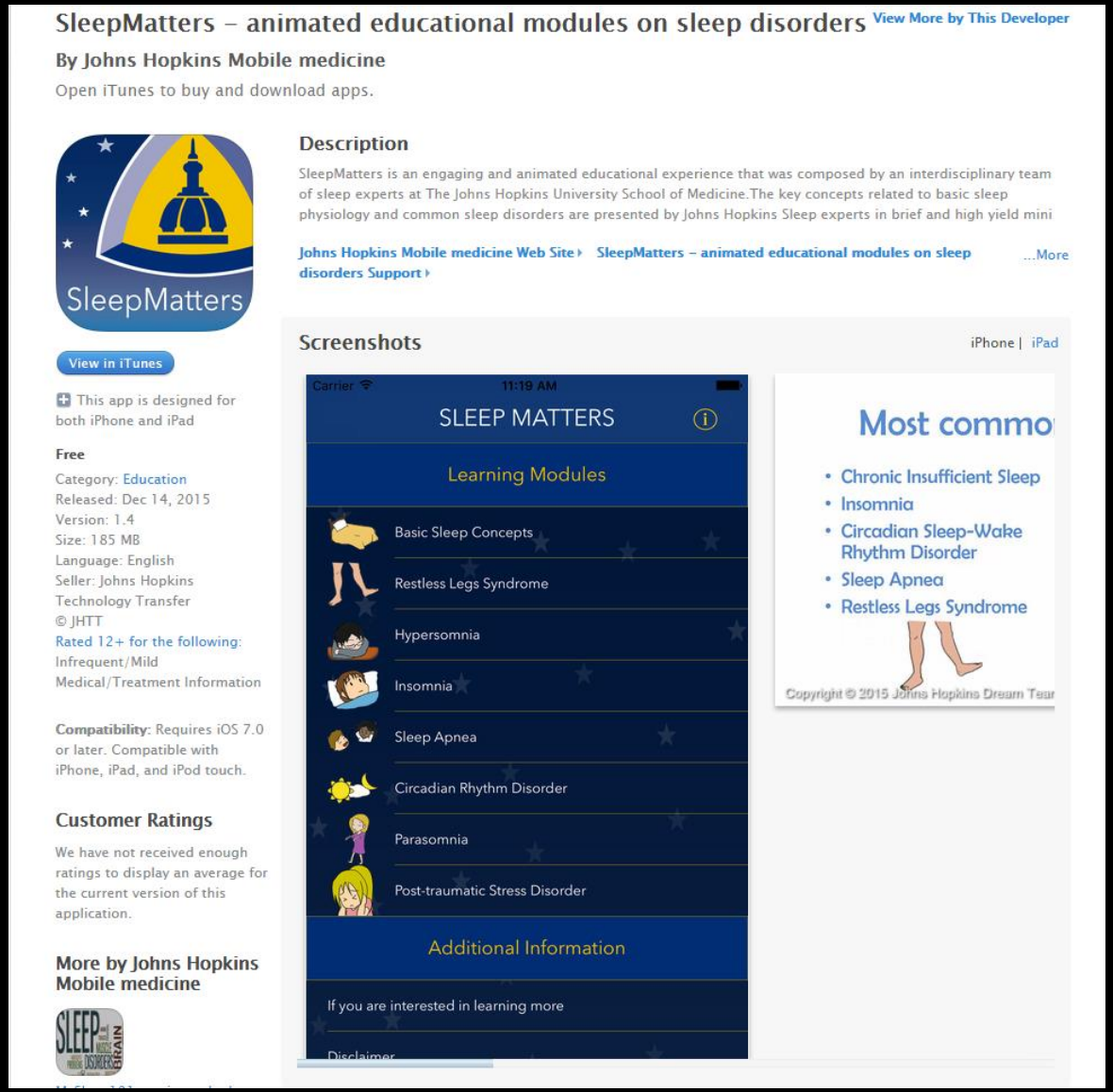
Research
Education



EDUCATION

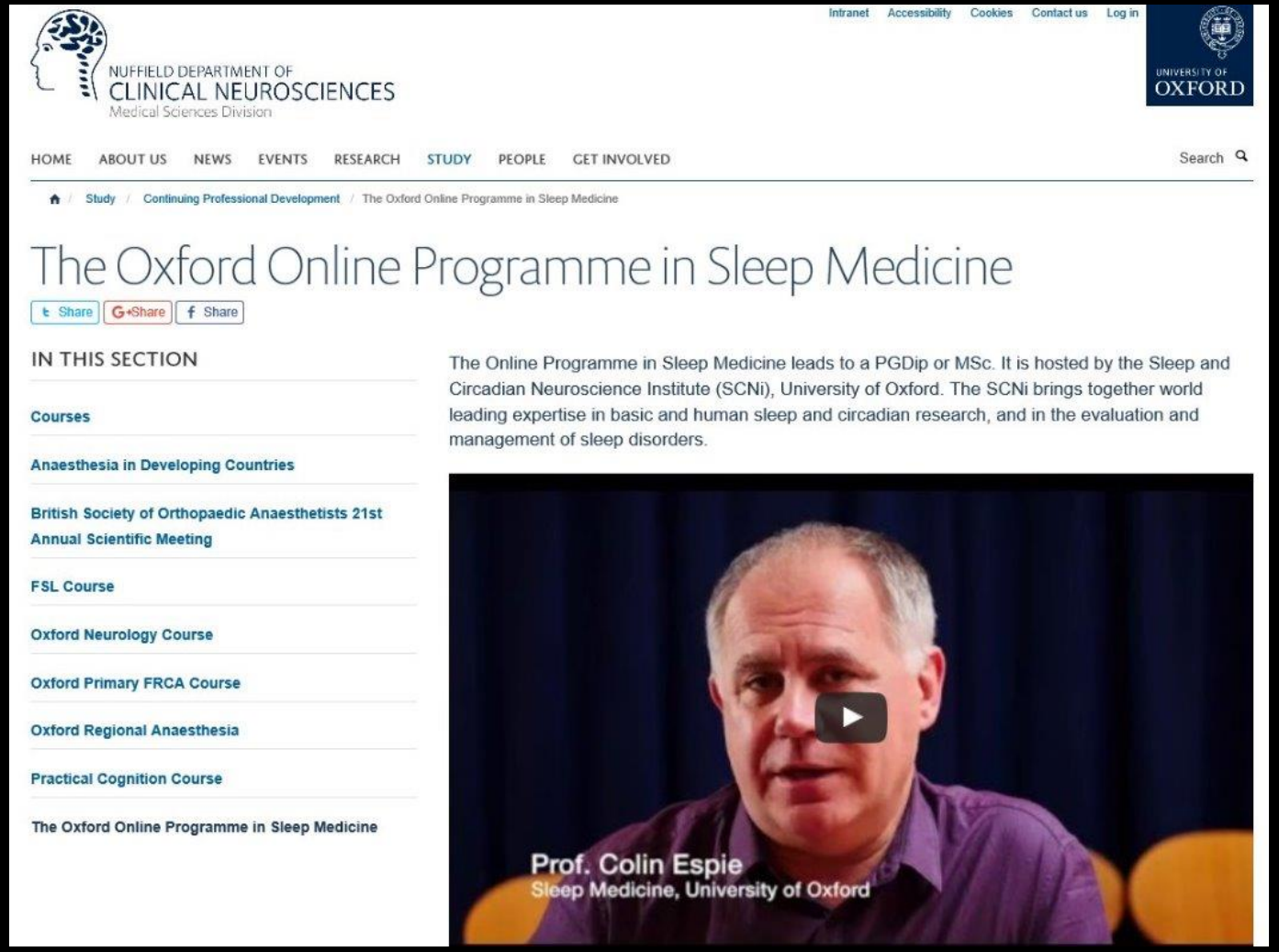
- SleepMatters
- The Johns Hopkins
- 10 minute lectures – mini module
- basic sleep physiology
- common sleep disorders





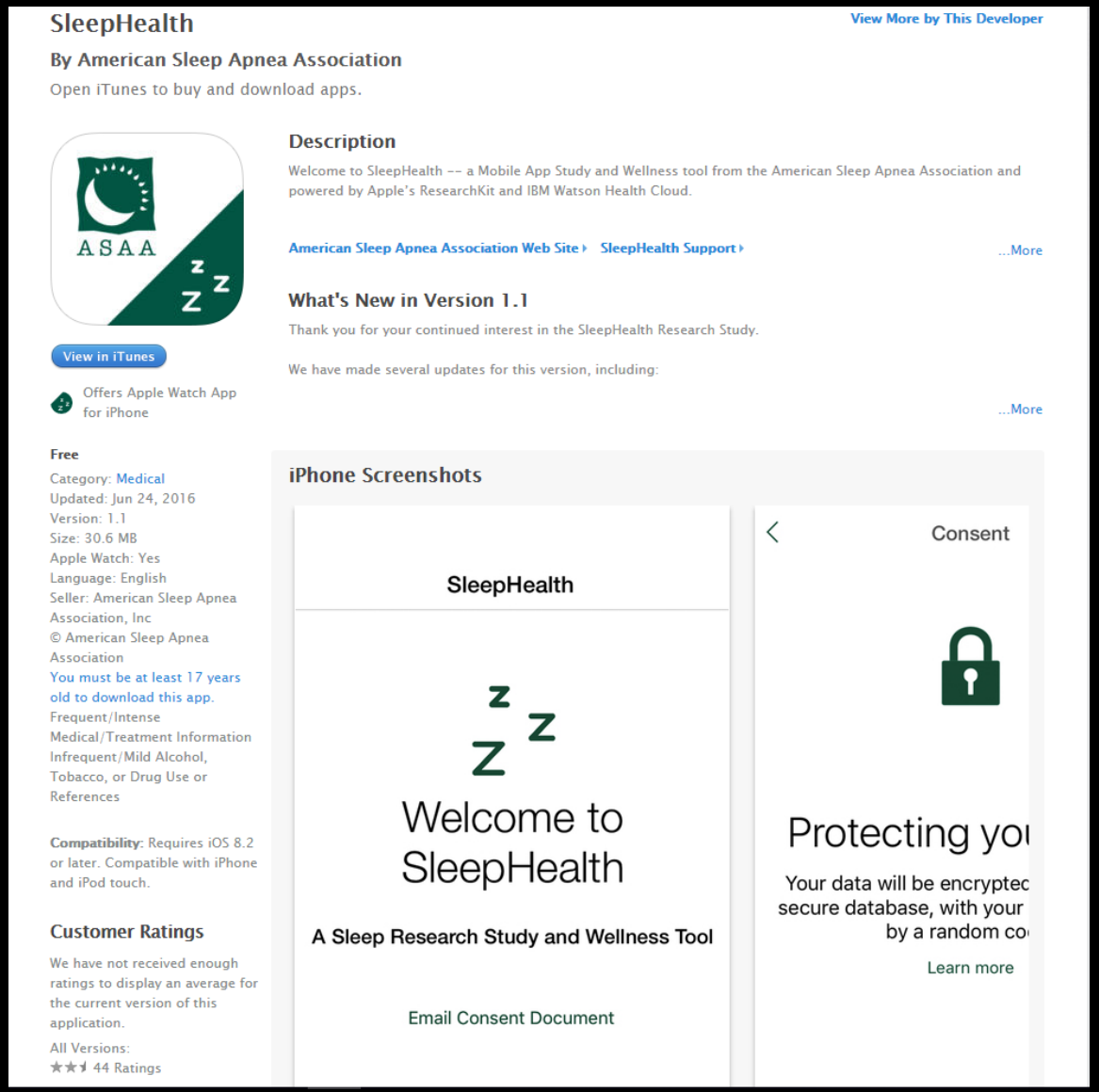
POSTGRADUATE DIPLOMA - 10/2017

- The Physiological Basis of Sleep
- Introduction to Sleep Medicine and Methodological Approaches
- Circadian Rhythm Disruption and Sleep
- Insomnias
- Sleep Disordered Breathing and Sleep-related Movement Disorders
- Hypersomnias and Parasomnias
- Sleep in Specialist Populations
- Sleep and Society



SLEEP HEALTH

- A Mobile App Study and Wellness tool
- American Sleep Apnea Association and the University of California, San Diego
- Powered by Apple's Research Kit and IBM Watson Health Cloud.



THE WISCONSIN SLEEP COHORT (WSC)

- Ongoing longitudinal study of the causes, consequences and natural history of sleep disorders in adults—particularly sleep apnea—now in its 26th year

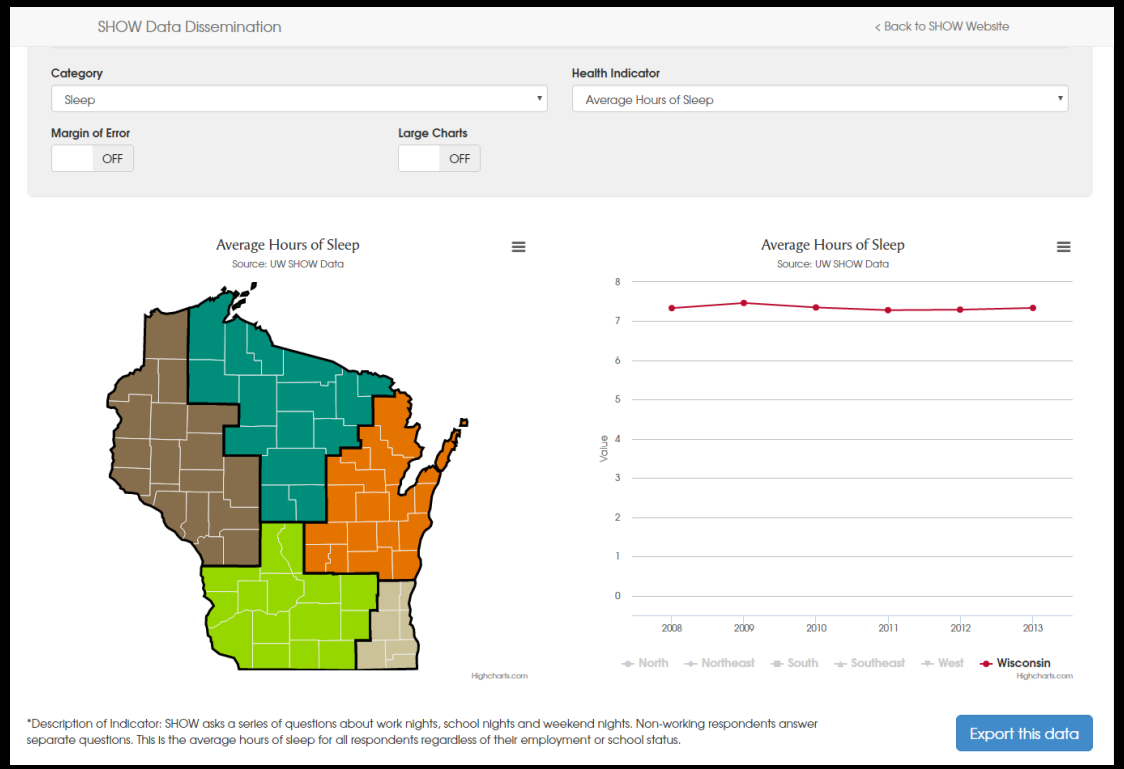
- 40-minute cognitive test battery
- Echocardiography and vascular imaging
- Ambulatory blood pressure
- Blood samples
- Gait and balance testing
- General and mental health questionnaires
- Physical activity questionnaires
- Neuroimaging

DATABASES

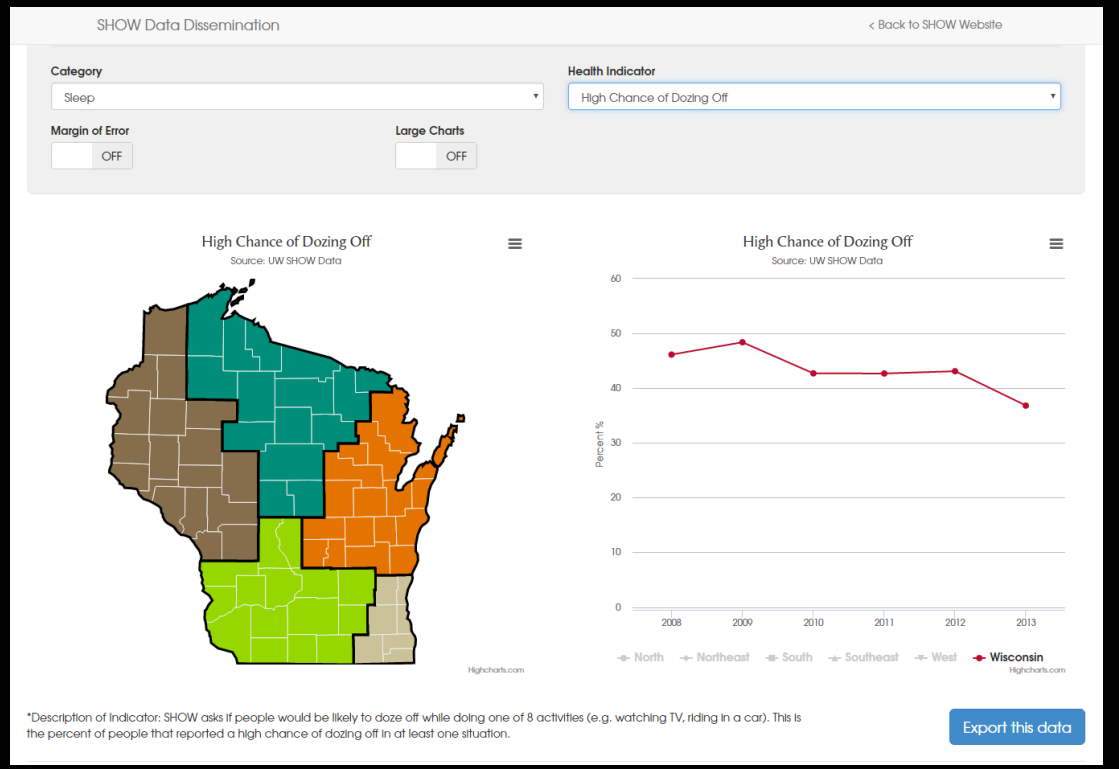
- SHOW is a novel program for monitoring population health
- It gathers information about health of state residents living in both urban and rural areas
- It offer new opportunities for epidemiologic and translational health research

SHOW DATA - SLEEP

Average Hours of Sleep



High Chance of Dozing Off

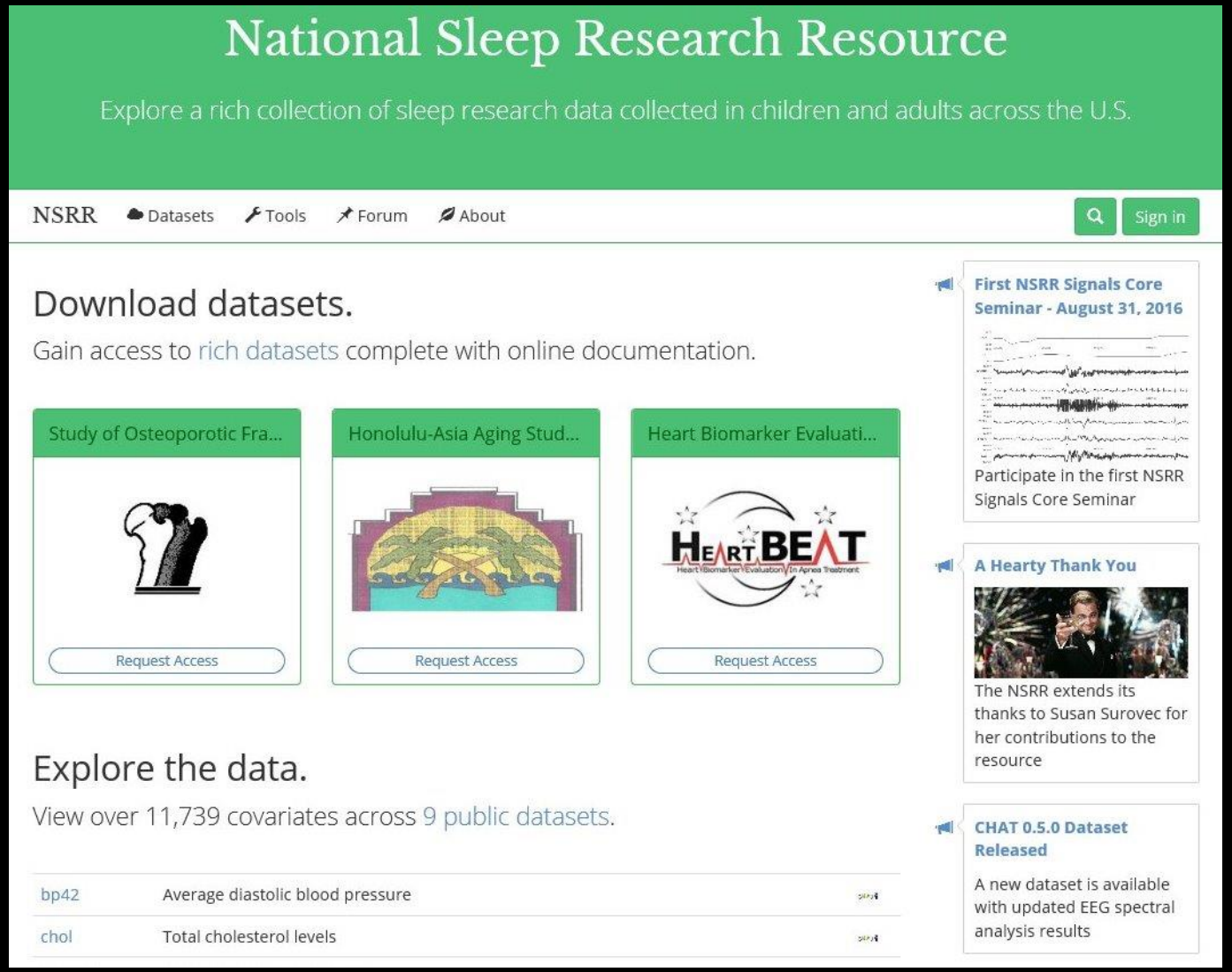


DATABASES

- International Sleep Genetic Epidemiology Consortium (ISGEC)
- National Sleep Research Resource (NSRR)
- The Sleep Heart Health Study (SHHS)
- Childhood Adenotonsillectomy Trial (CHAT)
- Heart Biomarker Evaluation in Apnea Treatment (HeartBEAT)
- Cleveland Family Study (CFS)
- Study of Osteoporotic Fractures (SOF)
- MrOS Sleep Study
- Cleveland Children's Sleep and Health Study (CCSHS)
- Hispanic Community Health Study / Study of Latinos (HCHS/SOL)

NSRR

- Offers free web access to large collections of de-identified physiological signals and clinical data elements collected in well-characterized research cohorts and clinical trials.



Datasets

Read documentation, download files, and view charts and statistics.

Sleep Heart Health Study	Childhood Adenotonsillec...	Heart Biomarker Evaluati...	Cleveland Family Study
Request Access	Request Access	Request Access	Request Access
Study of Osteoporotic Fra...	MrOS Sleep Study	Cleveland Children's Slee...	Hispanic Community Hea...
Request Access	Request Access	Request Access	Request Access
Honolulu-Asia Aging Stud...			
Request Access			

Community Tools

Name	URL	User
Data Chromatix	https://github.com/saramariani/Data-Chromatix	Sara Mariani
Heart Rate Variability Toolkit	http://physionet.org/tutorials/hrv-toolkit/	mrueschman
Multiscale entropy-based EEG artifact detector	https://github.com/saramariani/MSE-based-EEG-artifact-detector	Sara Mariani
Multiscale Poincare Plots	https://github.com/saramariani/Multiscale-Poincare-Plots	Sara Mariani
SpectralTrainFig	https://github.com/nsrr/SpectralTrainFig	Sara Mariani
XML Annotation Extractor (R)	https://gist.github.com/mrueschman/bef53b972a76a00748b8	mrueschman

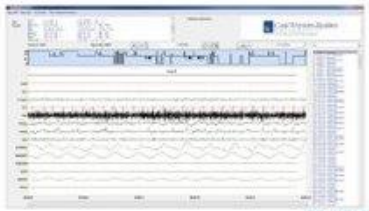
EDF Editor and Translator

Java

Block EDF Loader

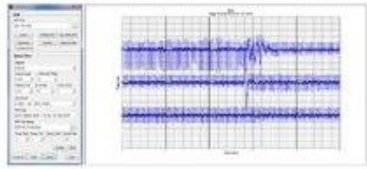
Matlab

EDF Viewer



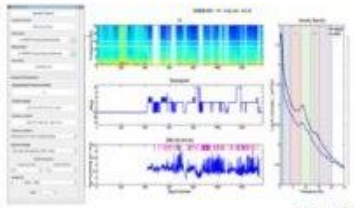
Matlab

Signal Raster View



Matlab

SpectralTrainFig



Matlab

Spout

Ruby

NSRR Cross Dataset Quer...

Web

Summary
we are almost
there

EPILOGUE

- Various apps and technology are available for the benefit of patients and healthcare workers alike.
- Technology evolves constantly, facilitating learning, research, collaboration and patient care.
- New solutions to old problems come with new questions to new problems.