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# Sleep and a Healthy Heart

Dr. R. John Kimoff, MD, FRCP(C)

Professor of Medicine, Respiratory Division

Director, Sleep Laboratory, MCI-McGill University Health Centre

Montréal, Québec, Canada

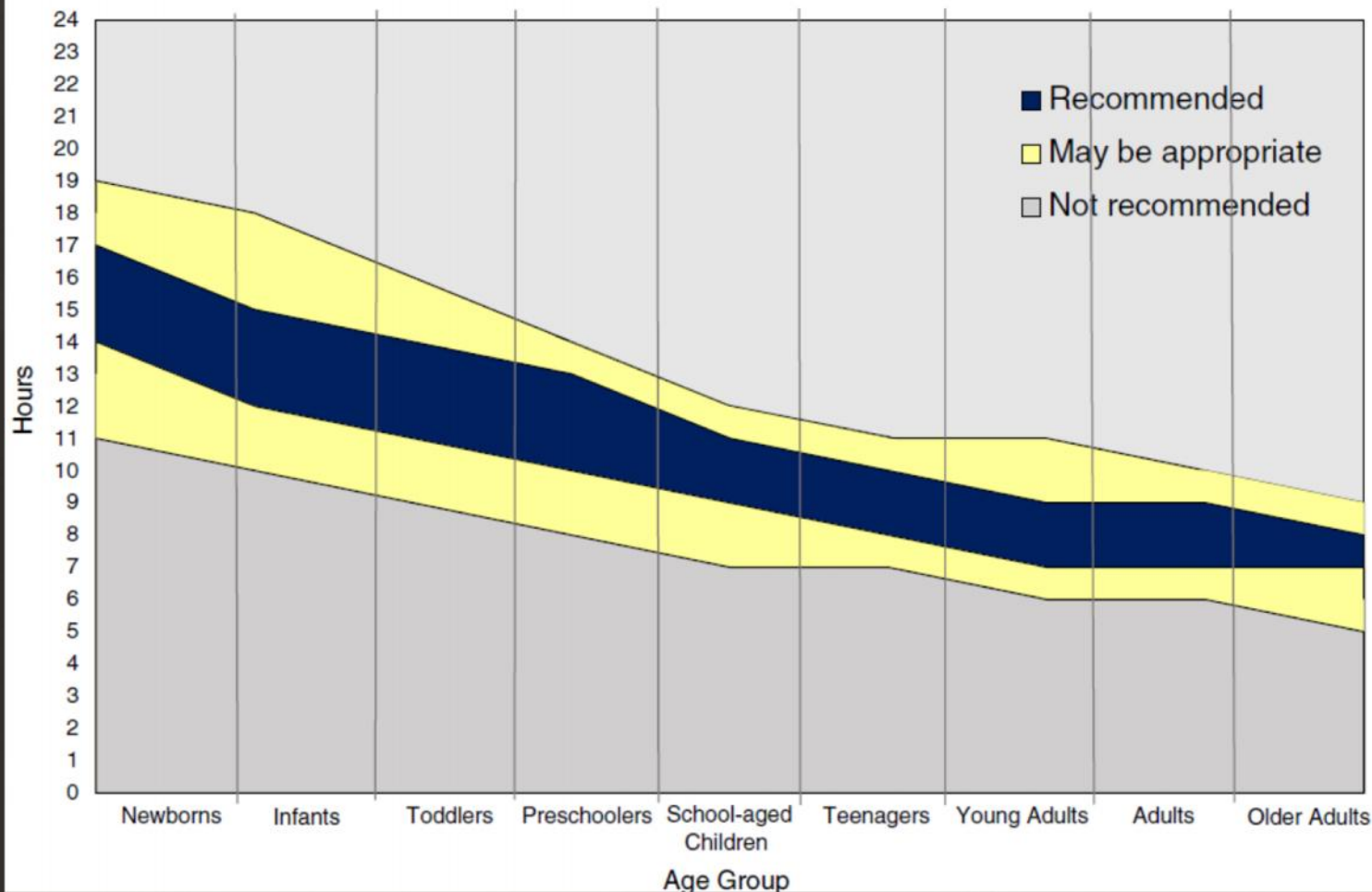
Women's Healthy Heart Initiative: February 2018

# Sleep and a Healthy Heart

- Sleep duration and heart disease
- Barriers to Good Sleep
  - Poor Sleep Hygiene
  - Insomnia
  - Menopause
  - Restless Legs Syndrome
  - Sleep-Disordered Breathing

# National Sleep Foundation's updated sleep duration recommendations: final report<sup>☆</sup>

Sleep Duration Recommendations Across the Life Span



26-64y: 7-9 h

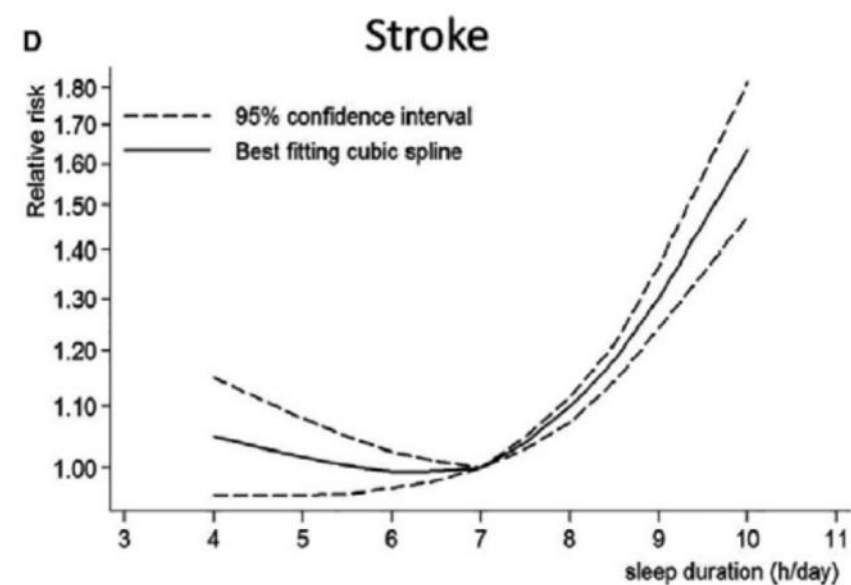
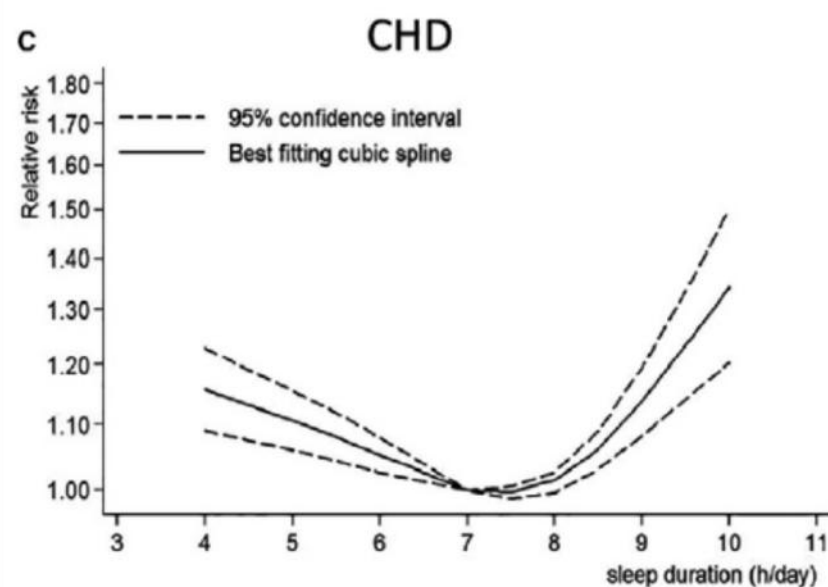
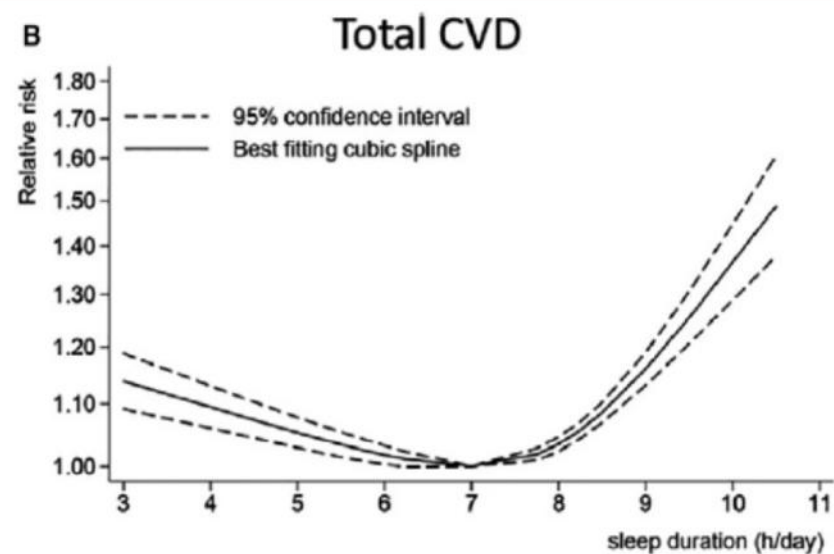
≥ 65y: 7-8 h

# Short sleep duration is common

TABLE 1. Percentage\* of employed civilian workers who reported short sleep duration (average  $\leq 6$  hours per 24-hour period), by demographic and employment characteristics and usual shift worked — National Health Interview Survey (NHIS), United States, 2010

Characteristic	No. <sup>†</sup>	All shifts <sup>§</sup>		Regular daytime shift		Regular night shift		Other shift <sup>¶</sup>	
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total	15,214	30.0	(29.2–30.9)	28.8	(27.8–29.9)	44.0	(38.8–49.4)	31.6	(29.7–33.6)
Sex									
Male	7,435	29.8	(28.6–31.0)	28.8	(27.4–30.2)	41.7	(34.6–49.2)	31.1	(28.5–33.8)
Female	7,779	30.3	(29.2–31.5)	28.9	(27.6–30.3)	46.6	(39.7–53.5)	32.2	(29.4–35.2)
Age group (yrs)									
18–29	3,367	26.5	(24.7–28.3)	24.6	(22.4–27.0)	37.4	(28.3–47.0)	27.9	(24.8–31.3)
30–44	5,366	31.6	(30.1–33.2)	29.4	(27.7–31.1)	51.1	(42.8–59.4)	36.2	(33.0–39.7)
45–64	5,752	31.8	(30.5–33.1)	31.1	(29.6–32.7)	46.4	(39.0–53.8)	32.8	(29.8–36.1)
≥65	729	21.7	(18.4–25.4)	21.1	(17.2–25.7)	0.0	—	23.7	(17.8–30.9)
Race/Ethnicity									
White, non-Hispanic	8,706	28.6	(27.5–29.6)	27.6	(26.4–28.8)	44.8	(38.8–49.4)	29.6	(27.3–32.1)
Black, non-Hispanic	2,211	38.9	(36.1–41.8)	38.1	(34.7–41.6)	45.6	(35.6–55.9)	39.5	(34.0–45.3)
Asian, non-Hispanic	1,008	33.2	(29.7–36.9)	32.7	(29.0–36.7)	42.6	(25.8–61.4)	32.7	(24.3–42.4)
Other, non-Hispanic	294	35.3	(29.0–42.2)	37.4	(29.4–46.1)	28.1	(13.0–50.6)	31.7	(21.9–43.6)
Hispanic	2,995	28.8	(26.9–30.7)	26.4	(24.2–28.8)	42.7	(33.3–52.7)	33.8	(29.5–38.3)
Marital status									
Married/Living with partner	8,209	29.4	(28.3–30.5)	28.2	(27.8–29.9)	47.0	(40.5–53.7)	31.3	(28.8–34.0)
Widowed/Divorced/Separated	3,032	36.4	(34.3–38.5)	35.0	(32.6–37.5)	42.7	(32.3–53.7)	40.0	(35.7–44.4)
Never married	3,947	28.2	(26.4–30.0)	26.7	(24.6–29.0)	39.1	(29.7–49.5)	28.8	(14.2–82.1)
Education									
Less than high school diploma	1,532	29.1	(26.4–31.9)	27.2	(24.0–30.6)	39.9	(27.5–53.9)	33.4	(27.5–39.8)
High school or GED diploma	3,219	33.7	(31.9–35.6)	32.2	(30.0–34.5)	39.9	(30.7–49.9)	37.0	(32.9–41.4)
Some college	4,051	33.8	(32.0–35.5)	32.5	(30.5–34.4)	54.1	(44.6–63.3)	34.7	(31.0–38.6)
College degree	4,773	26.7	(25.2–28.2)	25.8	(24.1–27.4)	44.6	(32.5–57.5)	29.7	(26.1–33.5)





# Sleep and a Healthy Heart

- Sleep duration and heart disease
- **Barriers to Good Sleep**
  - Poor Sleep Hygiene
  - Insomnia
  - Menopause
  - Restless Legs Syndrome
  - Sleep-Disordered Breathing

## GENERAL TIPS FOR HAVING HEALTHY SLEEP HYGIENE<sup>142</sup>



**Go to bed and wake up at the same time** every day (even on the weekends!)



**Don't go to bed feeling hungry**, but also don't eat a heavy meal right before bed



**Avoid caffeine consumption** (e.g., coffee, soft drinks, chocolate) starting in the late afternoon



**Develop a relaxing routine** before bedtime – ideas include bathing, music, and reading



**Expose yourself to bright light in the morning** – sunlight helps the biological clock to reset itself each day



**Reserve your bedroom for sleeping only** – keep cell phones, computers, televisions and video games out of your bedroom



**Make sure your bedroom is conducive to sleep** – it should be dark, quiet, comfortable, and cool



**Exercise regularly during the day**



**Sleep on a comfortable mattress and pillow**



**Don't have pets in your bedroom**

## INSOMNIA

IS THE MOST  
COMMON  
SLEEP  
DISORDER  
IN THE U.S.

## INSOMNIA IS ASSOCIATED WITH

- ▶ Excessive drowsiness
- ▶ Lack of energy
- ▶ Anxiety
- ▶ Irritability
- ▶ Difficulty with tasks, learning and remembering

## PEOPLE WITH INSOMNIA MAY HAVE ONE OR MORE SLEEP PROBLEMS



▶ **~40** **MILLION**  
Americans experience INSOMNIA annually



▶ **3x3** **CHRONIC INSOMNIA:**  
When INSOMNIA occurs at least  
3 nights a week for at least 3 months

There is an increased  
prevalence of insomnia in  
**women &  
older adults**



## COMMON FACTORS THAT CAN RESULT IN INSOMNIA

Stress,  
anxiety or  
depression

Changes in  
environment or  
work schedule

Medical  
conditions

Poor sleep  
habits





#### HOST FACTORS

- Age
- Cognitive impairments
- Response to stress
- Sleep related beliefs
- Sleep habits (daily sleep/activity cycle, napping)

#### ENVIRONMENT

- Inappropriate light and noise exposure
- Mismatched bedroom temperature
- Disruptive schedules (medical, personal care)
- Limited social interactions
- Partner's habits

#### MEDICATIONS

- Direct effect on sleep
- Indirect effects

#### HEALTH-RELATED SLEEP DISRUPTORS

- Pain
- Depression
- Nocturia
- Anxiety
- Dyspnea
- Heartburn
- Cough

#### PRIMARY SLEEP DISORDERS

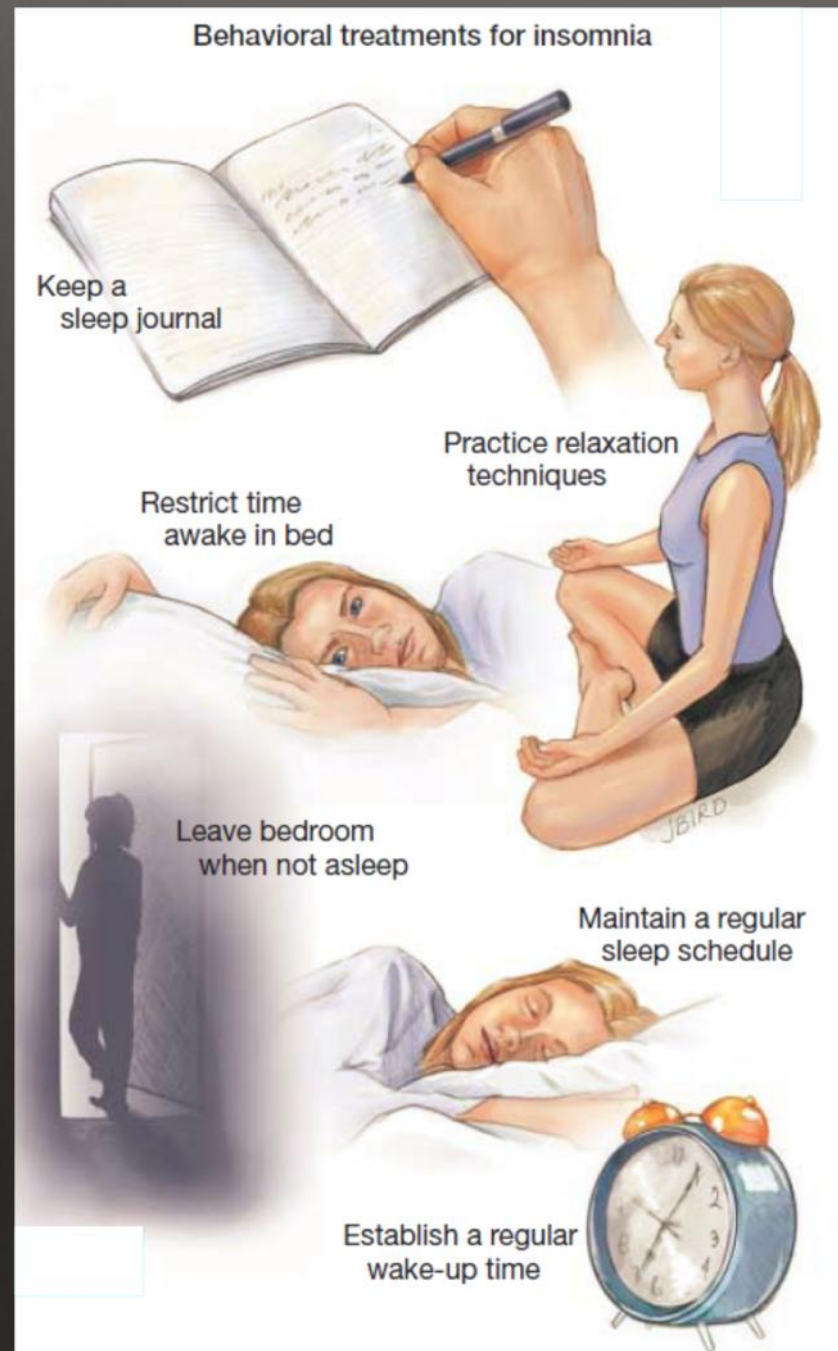
- Sleep-related breathing disorder
- Sleep-related movement disorders
- Circadian rhythm disorders

#### SUBSTANCE USE

- Alcohol
- Tobacco
- Caffeine

# Insomnia: Basic principles

JAMA 2013



# Non-Drug Insomnia treatment: CBT

**Table 3**  
**Nonpharmacologic therapies of insomnia**

Technique	Goal	Method
Stimulus Control Therapy <sup>a</sup>	Strengthen bed and bedroom as sleep stimuli	If unable to fall asleep within 20 min, get out of bed and repeat as necessary
Relaxation Therapies <sup>a</sup>	Reduce arousal and decrease anxiety	Biofeedback, progressive muscle relaxation
Restriction of Time in Bed (Sleep Restriction)	Improve sleep continuity by limiting time spent in bed	Decrease time in bed to equal time actually asleep and increase as sleep efficiency improves
Cognitive Therapy	Dispel faulty beliefs that may perpetuate insomnia	Talk therapy to dispel unrealistic and exaggerated notions about sleep
Paradoxical Intention	Relieve performance anxiety	Try to stay awake
Sleep Hygiene Education	Promote habits that help sleep; eliminate habits that interfere with sleep	Promote habits that help sleep; eliminate habits that interfere with sleep
Cognitive Behavioral Therapy <sup>a</sup>	Combines sleep restriction, stimulus control, and sleep hygiene education with cognitive therapy	Combines sleep restriction, stimulus control, and sleep hygiene education with cognitive therapy

## Drug treatment of Insomnia

- Avoid if possible due to side effects, dependency, loss of efficacy
- Best used short-term for acute insomnia or intermittently in conjunction with CBT
- Major classes:
  - Melatonin or Ramelteon (US only)
  - Benzodiazepines (Ativan, Rivotril, Dalmane, Serax)
  - BDZ-receptor agonists (Imovane, Sublinox)
  - Sedating anti-depressants (Silenor/Sinequan, Desyrel, Remeron)
  - Orexin receptor antagonists (Suvorexant)

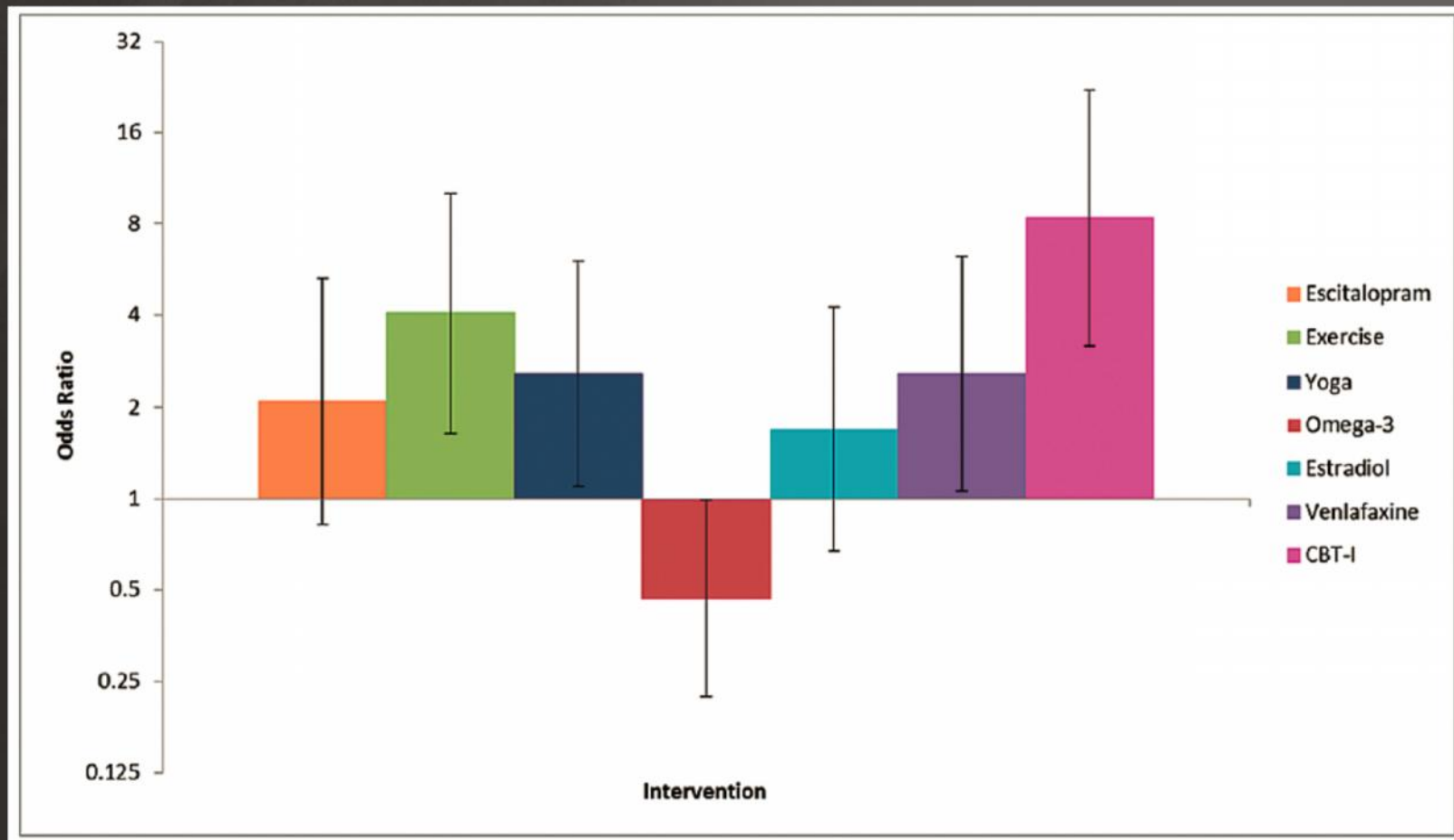


## Symptoms of early onset menopause:

- Hot flashes & night sweats
- Irregular periods
- Vaginal dryness
- Mood swings
- Reduced libido
- Disrupted sleeping patterns
- Heart palpitations
- Dry skin
- Hair loss
- Incontinence



# Effects of Pharmacologic and Nonpharmacologic Interventions on Insomnia Symptoms and Self-reported Sleep Quality in Women With Hot Flashes: A Pooled Analysis of Individual Participant Data From Four MsFLASH Trials



**Figure 3**—Odds ratio (95% confidence interval) of insomnia symptoms remission ( $ISI < 8$ ) relative to control at end of treatment by intervention,  $N = 503$ . CBT-I = cognitive behavioral therapy for insomnia; ISI = Insomnia Severity Index.

## HOW TO ASSESS INSOMNIA IN MIDLIFE WOMEN?

- Sleep history<sup>163</sup>: current and past sleep patterns
  - Frequency of sleep difficulties (number of nights/week)
  - Duration of sleep difficulties
  - Impact on daytime function
  - Timing of sleep difficulties in relation to menopausal symptoms
- Medical and psychiatric history and recent stressful life events
- Menopausal factors (changes in bleeding patterns, menopausal symptoms like HFs)
- Sleep diary<sup>164</sup>: include question about frequency/bother from HFs/night sweats
- Screen for sleep breathing and movement disorders (eg, Stop-bang questionnaire<sup>165</sup>)\*

\*women may present with atypical symptoms.<sup>127</sup>

## WHEN SHOULD HORMONE THERAPY BE CONSIDERED?

Hormone therapy improves sleep quality in women with concomitant HFs. Independent effects of estrogen vs progesterone/progestin compounds need further evaluation<sup>147</sup>

- Hot flash-related sleep disruption
- No contraindications
- Follow guidelines, ie, when the balance of potential benefits and risks is favorable for the individual.<sup>167</sup>

Note: Abrupt discontinuation of HT is associated with hot flash relapse, which could lead to insomnia.<sup>54</sup>

## WHAT ARE THE NON-HORMONAL PHARMACOLOGICAL OPTIONS?

Non hormonal options for treating HFs are available. A small number of trials have investigated their efficacy for insomnia symptoms<sup>146</sup>

- Low-dose selective serotonin/serotonin norepinephrine reuptake inhibitors reduce HFs and modestly reduce insomnia symptoms in women with HFs. \* (eg, 168–170)
- Gabapentin improve sleep quality in perimenopausal women with HFs and insomnia.<sup>171</sup>
- Sedative hypnotics should be used with caution in the short term.<sup>146</sup>

\*Insomnia is a common adverse event of higher dose/SNRIs in patients with depression; however, it was not common in a trial in healthy women with HFs.<sup>168</sup>

Note: Discontinuation of SSRIs is associated with HF relapse, which could lead to insomnia.<sup>172</sup>

## COMORBIDITIES AND DIFFERENTIAL DIAGNOSES

Insomnia symptoms can coexist with, or be better accounted for, by mental/physical health conditions and medication use.

- Mood and anxiety disorders\*
- Sleep disordered breathing\*
- Periodic limb movement disorder
- Disorders associated with chronic pain
- Substance-use disorder\*

\*There is a high prevalence of comorbid insomnia/sleep disordered breathing in midlife women, with bidirectional causal pathways.<sup>166</sup>

\*Adjunctive treatment of sleep difficulties in these cases should be considered.

## Are there effective non-pharmacological options?

CBT-I is the first-line treatment for insomnia. Some other non-pharmacological options have modest benefits.<sup>146</sup>

- Cognitive behavioral therapy for insomnia
- High-intensity exercise
- Yoga
- Soy isoflavones

Note: While poor sleep hygiene can exacerbate insomnia, limited data indicate that insomnia in midlife women is not associated with negative sleep hygiene behaviors.<sup>166</sup>



# Restless Legs Syndrome

Urge to move the legs accompanied or thought to be caused by uncomfortable and unpleasant sensations in the legs

- ▶ Begin or worsen during rest or inactivity
  - ▶ relieved partially or completely by movement
  - ▶ Sx are most pronounced, or only occur in the evening or at bedtime
- 
- ▶ Urge to move the legs
  - ▶ Rests worsens Sx
  - ▶ Gets better with movement
  - ▶ Evening / bedtime accentuation



# Restless Legs Syndrome

## Predisposing Factors :

- ▶ Idiopathic
- ▶ Familial
- ▶ Deficiency: Iron, Vitamin B<sub>12</sub>
- ▶ Diet (caffeine, chocolate)
- ▶ Chronic medical conditions: CKD, neuropathy
- ▶ Rx: stimulants, anti-depressants

# Restless Legs Syndrome

## Treatment:

- ▶ Correct/Remove predisposing factors
- ▶ Iron replacement if Ferritin < 50
- ▶ Drug treatment:
  - ▶ Dopamine agonists (Pramipexole, Ropirinol)
  - ▶ Alpha-2-delta blockers (Pregabalin, Gabapentin)
  - ▶ Benzodiazepines

# Symptoms of OSA

## Nighttime

- Patient typically unaware
- Heavy snoring
- Witnessed apneas
- Restless sleep
- Nocturnal choking
- Nocturia, rarely enuresis
- Diaphoresis
- Sexual dysfunction
- a.m. headache
- Non-restorative sleep

## Daytime

- Excessive daytime sleepiness
- Fatigue
- Impaired concentration
- Cognitive impairment
- Memory loss
- Irritability
- Depressive symptoms



## Differences between Men and Women in the Clinical Presentation of Patients Diagnosed with Obstructive Sleep Apnea Syndrome

**Table 2a**—Entrance Complaints and Symptoms Present for at Least once per Month in Matched Men and Women with OSAS

	Women, %	Men, %	Odds Ratio for Women
<b>Main presenting complaints</b>			
Complaint of snoring	89	82	1.64 (0.81-3.43)
Witnessed apneas	52	63	0.66 (0.38-1.12)
Excessive daytime sleepiness	42	42	1.00 (0.59-1.69)
Insomnia	17	5	4.20 (1.54-14.26)*
<b>Sleep symptoms</b>			
Knows of snoring	91	88	1.36 (0.59-3.28)
Knows of witnessed apneas	55	70	0.55 (0.31-0.97)*
ESS $\geq 10$	68	71	0.88 (0.52-1.49)

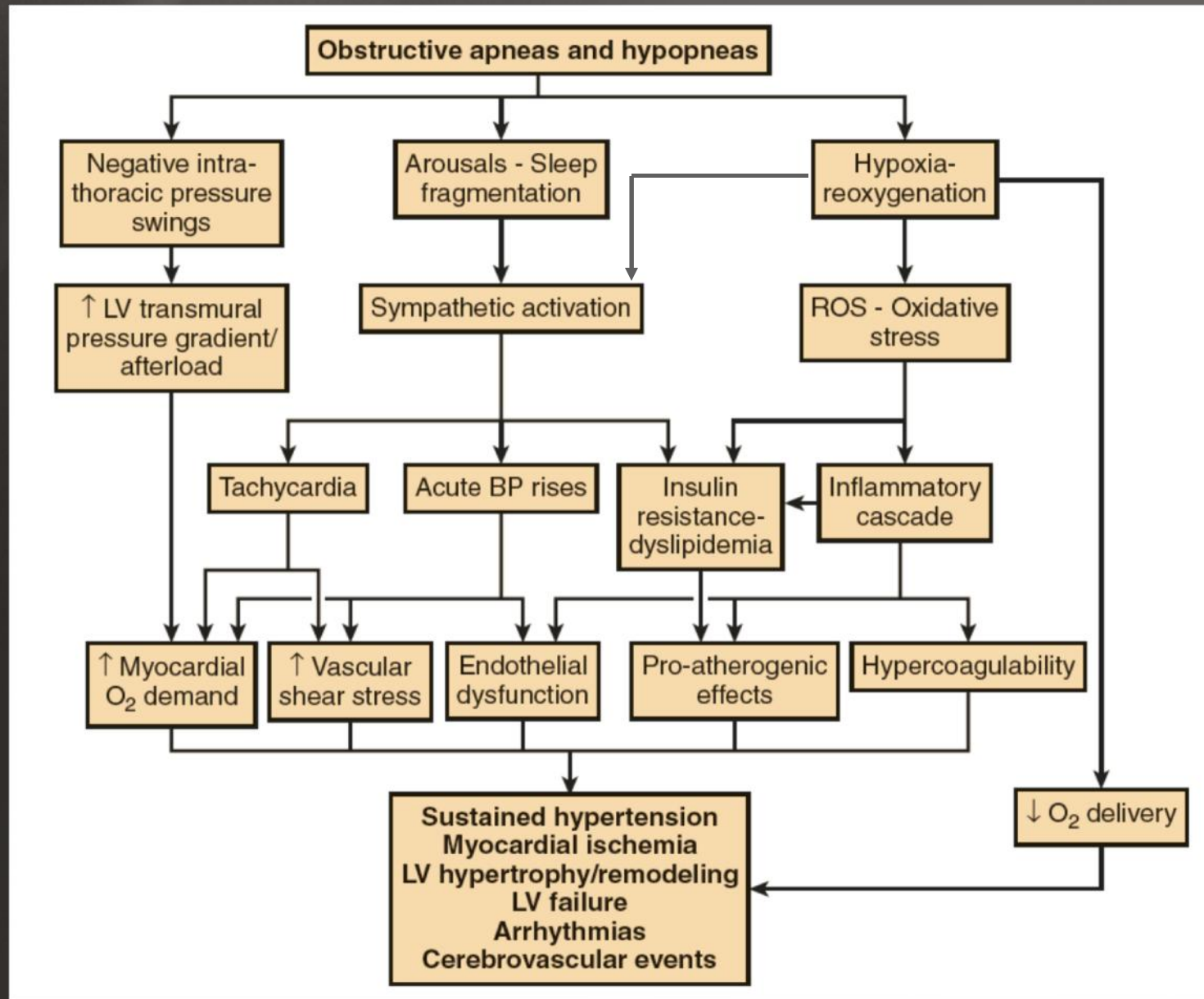


## Differences between Men and Women in the Clinical Presentation of Patients Diagnosed with Obstructive Sleep Apnea Syndrome

**Table 3**—Medical Diagnoses Present in Women and Men Diagnosed with Obstructive Sleep Apnea Syndrome

	<b>Women, %</b>	<b>Men, %</b>	<b>Odds ratio</b>
Hypothyroidism	22	4	5.60 (2.14-18.57)*
Diabetes mellitus	17	9	1.91 (0.88-4.39)
Cardiac disease	12	15	0.77 (0.34-1.67)
Hypertension	35	42	0.74 (0.41-1.31)
Asthma/allergies	35	22	1.90 (1.06-3.50)*
Depression	21	7	4.60 (1.71-15.49)*

# Mechanisms of Cardiovascular Dysfunction in OSA



## OSA – CVS complications

- Hypertension
- Arrhythmia: A Fib, Brady, VT
- Myocardial infarction
- Congestive heart failure
- Transient ischemic attack
- Stroke
- Pulmonary hypertension

## Ambulatory Diagnosis of OSA: Level III Recording



“Embletta Gold



Alice PDX



# Treatment of OSA

- Weight loss
- Positioning treatment
- Upper airway surgery
- Pharmacotherapy
- Expiratory negative airway pressure
- Upper airway muscle training
- Hypoglossal nerve stimulation
- Mandibular advancement prosthesis
- Positive Airway Pressure

# Positioning Prosthesis for OSA



“REMATEE”



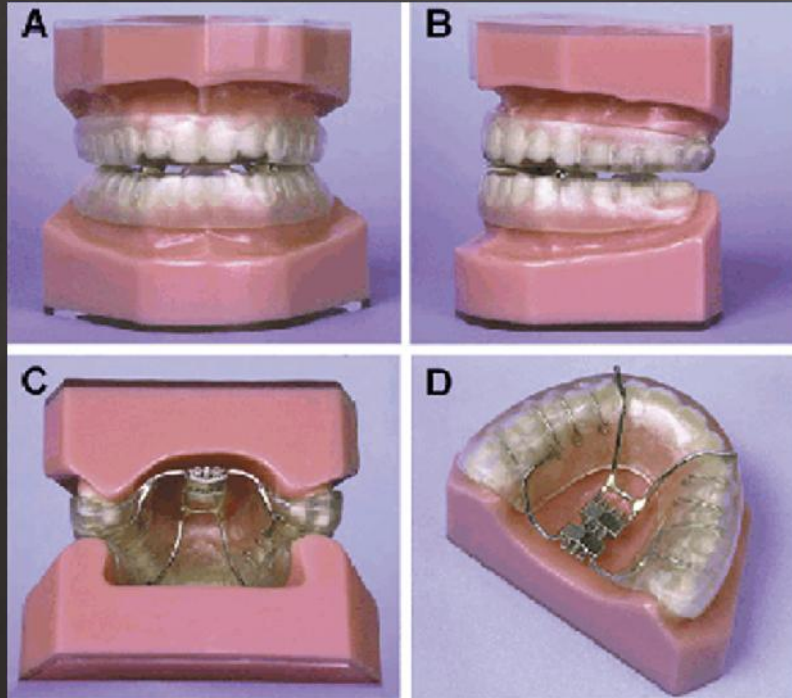
“Slumberbump”



**left:** Rematee® (tennis ball technique) with extra pocket for sleep position trainer (in non-vibrating mode) to measure daily compliance.  
**middle:** 0–10 cm scale. **right:** normal sleep position trainer.

# Mandibular advancement prostheses

Klearway



Somnodent

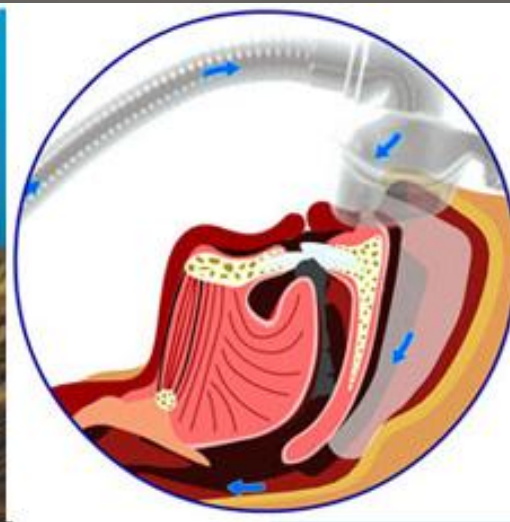


Narval

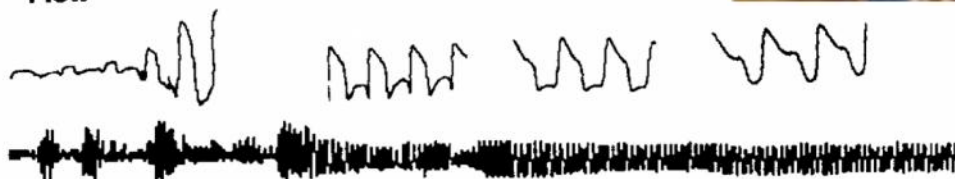




# CPAP titration



Flow



Esophageal Pressure (cmH<sub>2</sub>O)



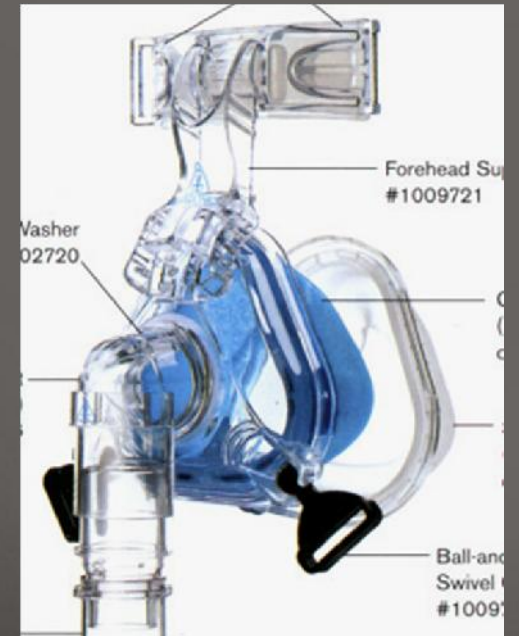
CPAP (cmH<sub>2</sub>O)



T-A Paradox	Yes	Yes	Yes/no	No
Arousals	Yes	Yes	No	No

Montserrat et al. AJRCCM 1995;  
152:1854-9.







## Choices **for Her**

Unique choices for women  
on the journey to healthy sleep



“Dreamstation”



**NEW RELEASE!**

AirSense™ 10 AutoSet™



**For Him & for Her**

Sleep therapy for Male and  
Female sleeping patterns



**ResMed**  
Changing lives  
with every breath

# OSA and Maternofetal Outcomes

- OSA increases in prevalence and severity during the course of pregnancy
- OSA in the general population is associated with adverse cardiovascular and metabolic outcomes
- OSA is associated with:
  - Hypertensive disorders of pregnancy
  - Gestational diabetes
  - Low infant birth weight

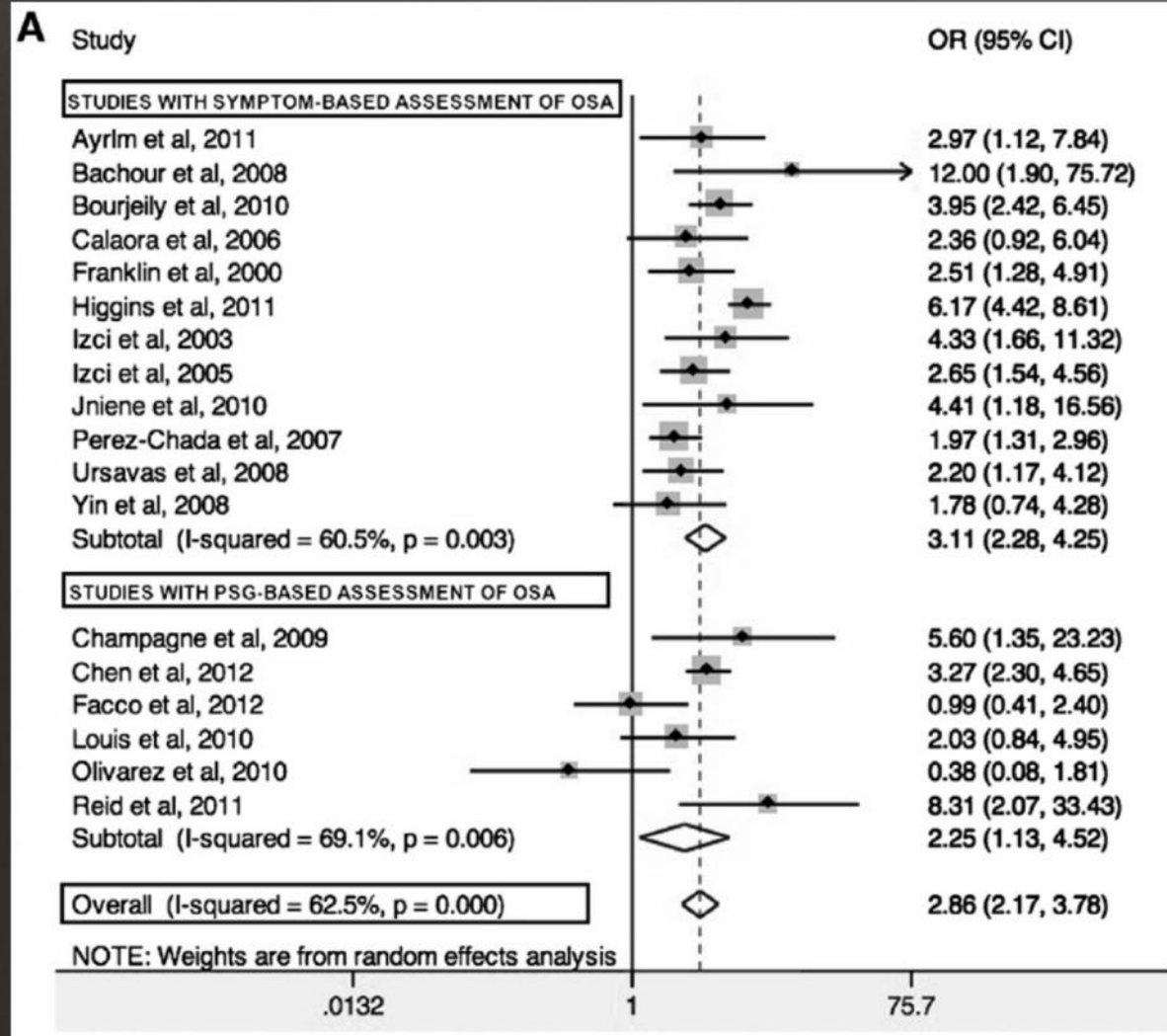


# Maternal sleep-disordered breathing and adverse pregnancy outcomes: a systematic review and metaanalysis

Sushmita Pamidi, MD; Lancelot M. Pinto, MD, MSc; Isabelle Marc, MD; Andrea Benedetti, PhD;  
Kevin Schwartzman, MD, MPH; R. John Kimoff, MD

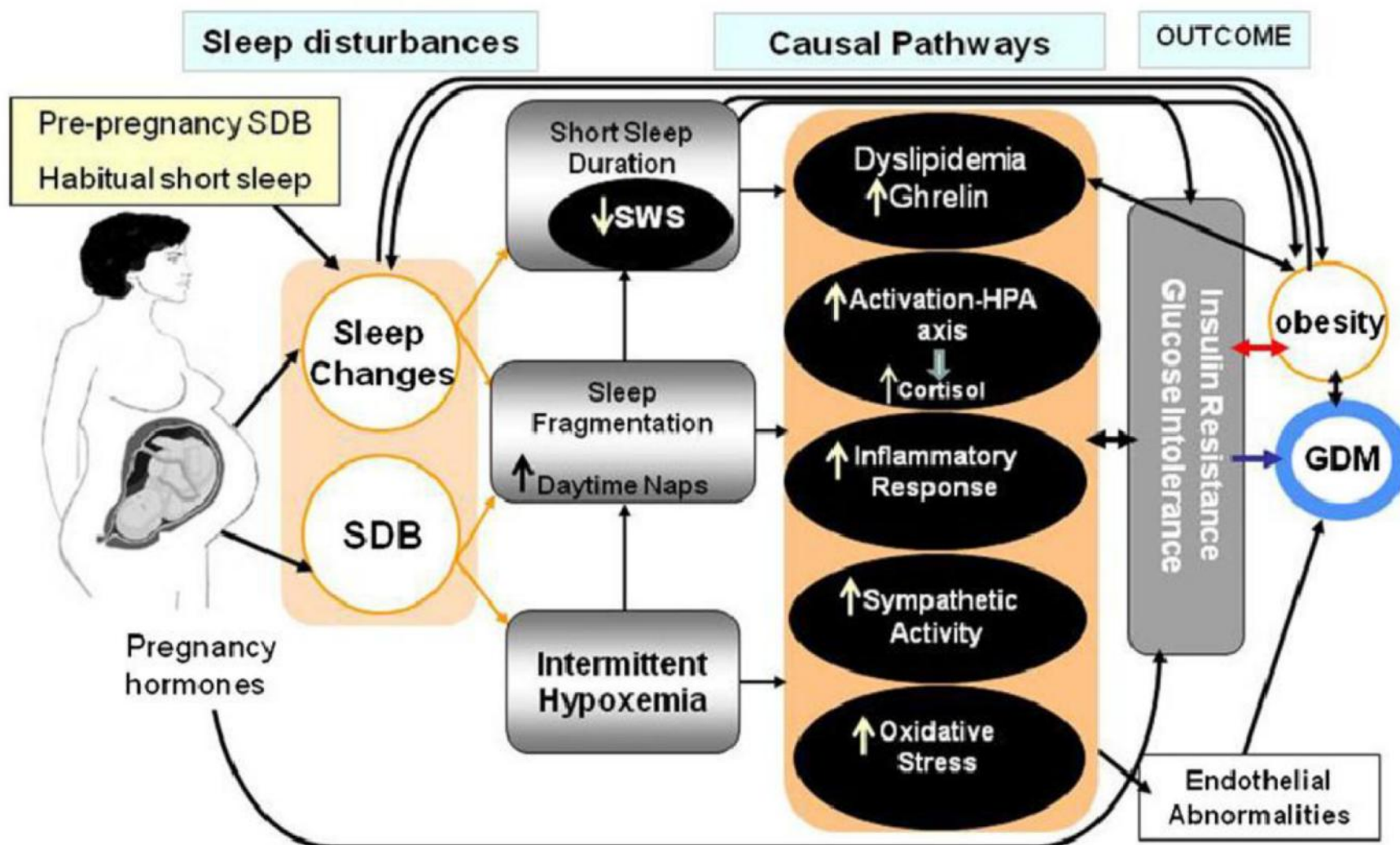
Am J Obstet Gynecol. 2014 Jan;210(1):52.e1-52.e14. doi: 10.1016/j.ajog.2013.07.033

SDB and  
Gestational  
HTN - PET



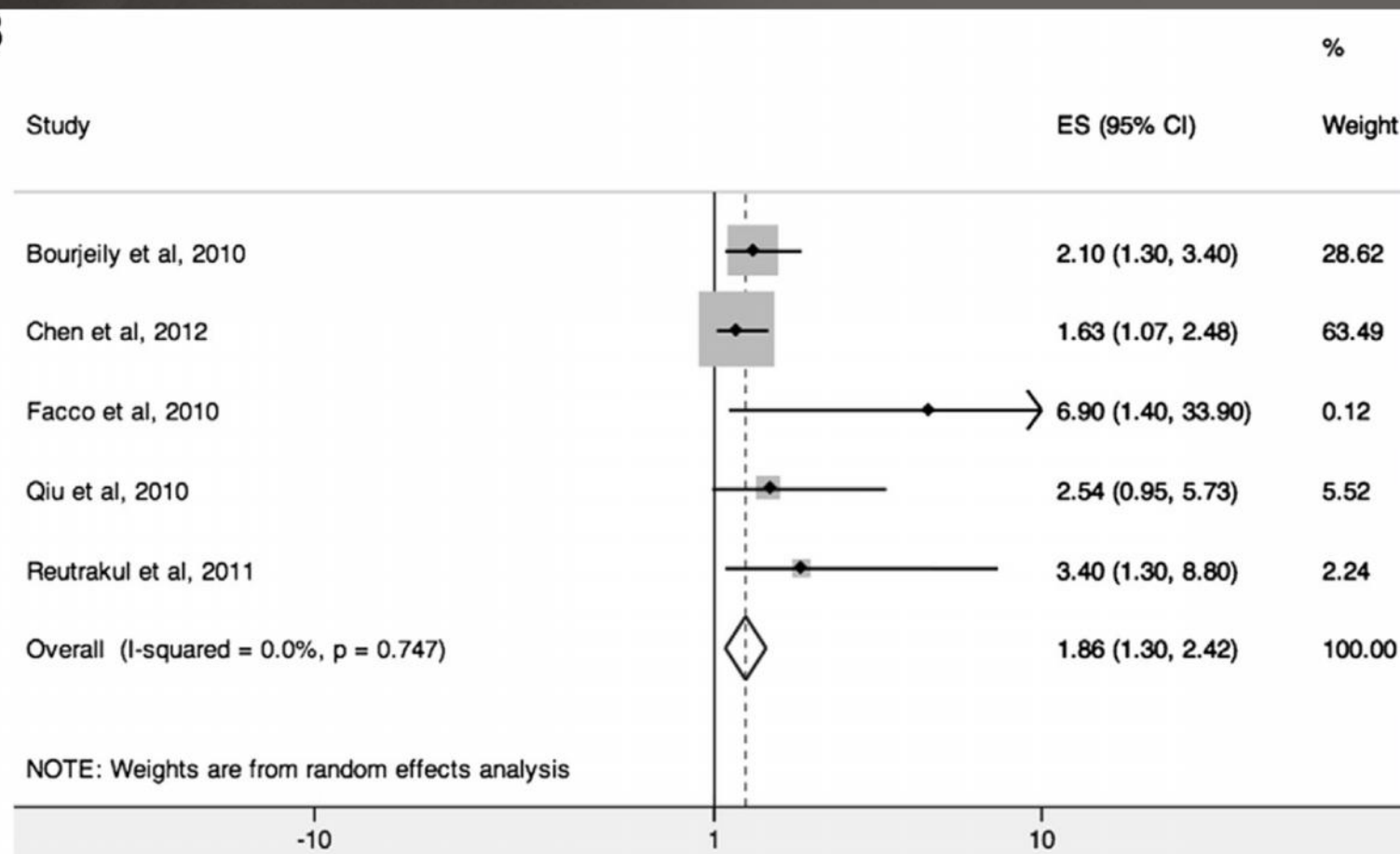


# Potential Causal Pathways Linking Maternal Sleep-Disordered Breathing and Gestational Diabetes



# Maternal sleep-disordered breathing and adverse pregnancy outcomes: a systematic review and metaanalysis

**B**



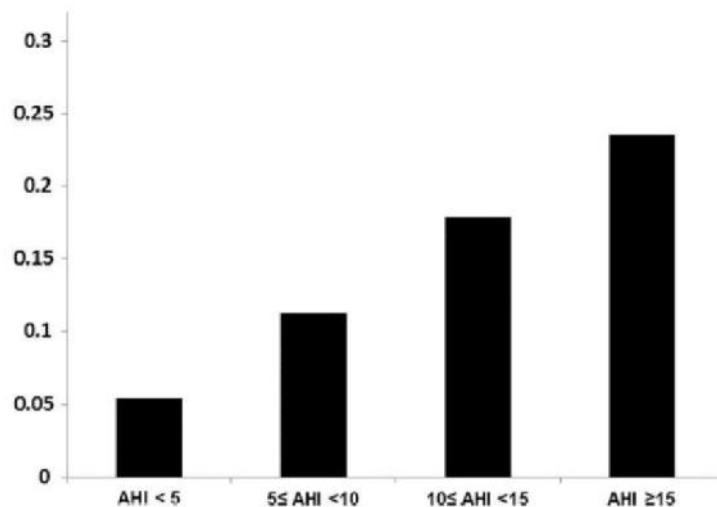
A, Unadjusted and B, adjusted ORs for the association between SDB and gestational diabetes.

Pamidi et al: AJOG: 2014;Jan;210(1):52.e1-52.e14 6/j.ajog.2013.07.033

# Maternal sleep-disordered breathing and the risk of delivering small for gestational age infants: a prospective cohort study

Sushmita Pamidi,<sup>1</sup> Isabelle Marc,<sup>2</sup> Gabrielle Simoneau,<sup>3,4</sup> Lorraine Lavigne,<sup>1</sup> Allen Olha,<sup>1</sup> Andrea Benedetti,<sup>3,4</sup> Frédéric Sériès,<sup>5</sup> William Fraser,<sup>6</sup> François Audibert,<sup>6</sup> Emmanuel Bujold,<sup>2</sup> Robert Gagnon,<sup>7</sup> Kevin Schwartzman,<sup>1,3,4</sup> R John Kimoff<sup>1</sup>

Proportion of SGA births



Pamidi S, et al. *Thorax* 2016;**71**:719–725.

**Table 5** ORs of maternal SDB for the delivery of an SGA infant versus a non-SGA infant

Predictor	OR (95%CI)	p Value
SDB symptoms		
Any snoring or witnessed apnoeas in the first trimester (ref: no snoring)	1.10 (0.35 to 3.38)	0.87
Any snoring or witnessed apnoeas in the third trimester (ref: no snoring)	2.36 (0.85 to 6.54)	0.10
New or incident snoring by the third TM (ref: no new snoring by 3rd TM)	3.78 (0.84 to 17.01)	0.08
PSG-based measurements of SDB		
AHI ≥ 5 events/h	3.07 (1.01 to 9.26)	0.047
AHI ≥ 10 events/h	2.65 (1.15 to 6.10)	0.022
AHI ≥ 15 events/h	2.57 (1.02 to 6.48)	0.045
AHI, 10 events/h	1.48 (1.01 to 2.18)	0.043
Obstructive apnoea index, 1 event/h	1.18 (0.69 to 2.01)	0.55
Obstructive hypopnoea index, 10 events/h	1.56 (1.04 to 2.34)	0.03
Hypopnoea-arousal index, 10 events/h	2.07 (1.15 to 3.75)	0.016
4% oxygen desaturation index, 1 event/h	1.17 (1.03 to 1.34)	0.016



## **AHA SCIENTIFIC STATEMENT**

# **Sleep Duration and Quality: Impact on Lifestyle Behaviors and Cardiometabolic Health**

**A Scientific Statement From the American Heart Association**

### **STATEMENT SUMMARY**

Our review of the epidemiological data on the impact of sleep duration and disorders on cardiovascular health suggests the following:

1. Both short- and long-duration sleep and sleep disorders such as SDB and insomnia are associated with adverse cardiometabolic risk profiles and outcomes.
2. Sleep restriction has a negative impact on energy balance, but it is less clear whether treating sleep disorders has a positive impact on obesity risk.
3. Treating those with sleep disorders may provide clinical benefits, particularly for blood pressure.

*Circulation.* 2016;134:e367–e386.



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- Sleep duration and heart disease
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