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SLEEP APNEA Facts and Figures

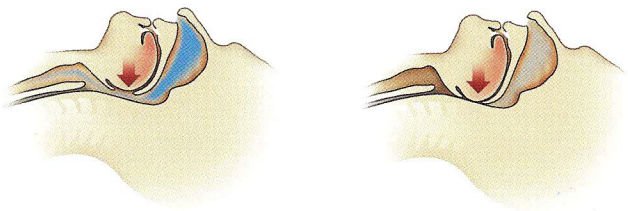
WHAT IS SLEEP-DISORDERED BREATHING (SDB)?

SDB describes a number of nocturnal breathing disorders

- Obstructive sleep apnea (OSA)
- Central sleep apnea (CSA)
- Nocturnal hypoventilation
- Cheyne–Stokes respiration (CSR)

WHAT IS OBSTRUCTIVE SLEEP APNEA (OSA)?

- Most common form of SDB
- A partial or complete collapse of the upper airway that causes muscles controlling the soft palate and tongue to relax
- Person experiences apneas, hypopneas and flow limitation
  - Apnea: a cessation of airflow for ≥10 seconds
  - Hypopnea: a decrease in airflow lasting ≥10 seconds with a 30% oxygen reduction in airflow and with at least a 4% oxygen desaturation from baseline
  - Flow limitation: narrowing of the upper airway and an indication of an impending upper airway closure



Partial Obstruction

Blocked Airway

Signs and Symptoms of Sleep Apnea

LACK OF ENERGY

MORNING HEADACHES

HYPERTENSION

FREQUENT NOCTURNAL URINATION

DEPRESSION

OBESITY

LARGE NECK SIZE

EXCESSIVE DAYTIME SLEEPINESS (EDS)

NIGHTTIME GASPING, CHOKING OR COUGHING

GASTROESOPHAGEAL REFLUX (GE REFLUX)

IRREGULAR BREATHING DURING SLEEP (IE, SNORING)

CLASSIFICATION OF SLEEP APNEA

AHI (Apnea–Hypopnea Index)

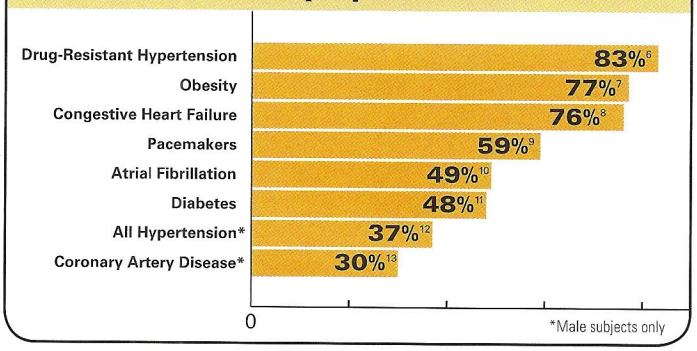
- Number of apneas and/or hypopneas per hour of sleep (or study time)
- Reflects the "severity" of sleep apnea

AHI = 0-4	Normal range
AHI = 5-14	Mild sleep apnea
AHI = 15-30	Moderate sleep apnea
AHI > 30	Severe sleep apnea

PREVALENCE OF SLEEP APNEA

- Approximately 42 million American adults have SDB[1]
- 1 in 5 adults has mild OSA[2]
  - 1 in 15 has moderate to severe OSA[2]
- 9% of middle-aged women and 25% of middle-aged men suffer from OSA[3]
- Prevalence similar to asthma (20 million) and diabetes (23.6 million) of US population[4]
- 75% of severe SDB cases remain undiagnosed[5]

Prevalence of Sleep Apnea in Comorbidities



INCREASED RISK FACTORS FOR SLEEP APNEA

- Male gender
- Obesity (BMI >30)
- Diagnosis of hypertension
- Excessive use of alcohol or sedatives
- Upper airway or facial abnormalities
- Smoking
- Family history of OSA
- Large neck circumference (>17" men; >16" women)
- Endocrine and metabolic disorders

CARDIOVASCULAR LINKS

- 5.7 million people in the US have heart failure[14]
- Approximately 76% of congestive heart failure patients have SDB[8]
- Heart failure is the most expensive disorder to treat[15]
- OSA noted in 49% of atrial fibrillation patients[10] and 30% of cardiovascular patients[13]
- OSA presents in 70% of heart attack patients with AHI ≥5 and 52% of heart attack patients with AHI ≥10[16]

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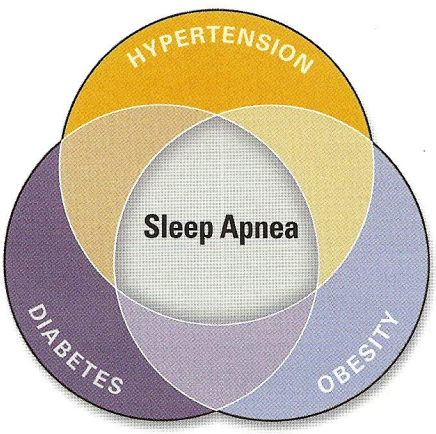
HYPERTENSION LINKS

— Studies have shown that sleep apnea is an independent risk factor for hypertension

— 30–83% of patients with hypertension have sleep apnea[6,12]

— 43% of patients with mild OSA and 69% of patients with severe OSA have hypertension[5]

— AHA guidelines on drug-resistant hypertension have shown treatment of sleep apnea with CPAP likely improves blood pressure control



TYPE 2 DIABETES LINKS

— 48% of type 2 diabetes sufferers have sleep apnea[11]

— OSA may have a causal role in the development of type 2 diabetes[17]

— OSA is associated with insulin resistance (independent of obesity)[18]

— 30% of patients presented to a sleep clinic have impaired glucose intolerance[19]

— Mild forms of SDB may be important in predicting risk of pre-diabetes[20]

— 86% of obese type 2 diabetic patients suffer from sleep apnea[21]

STROKE RISK

— 65% of stroke patients have SDB[22]

— Moderate to severe sleep apnea triples stroke risk in men[23]

MORTALITY LINKS

— SDB is associated with a threefold increase in mortality risk[5]

— There is an independent association of moderate to severe OSA with increased mortality risk[3]

— Severe sleep apnea raises death risk by 46%[24]

HEALTH CARE COSTS

(Economic consequences of untreated SDB)

— Undiagnosed patients used $200,000 more in the two-year period prior to diagnosis than matched controls[25]

— Prior to sleep apnea diagnosis, patients utilized 23–50% more medical resources[26]

— Total economic cost of sleepiness = approximately $43–56 billion[27]

— Undiagnosed moderate to severe sleep apnea in middle-aged adults may cause $3.4 billion in additional medical costs in the US[28]

TRAFFIC ACCIDENTS

— People with moderate to severe sleep apnea have up to 15 times higher risk of being involved in a traffic accident[29]

— Treating all US drivers suffering from sleep apnea would save $11.1 billion in collision costs and save 980 lives annually[30]

Treatment of OSA with CPAP

- Treatment of OSA resulted in a 10 mmHg reduction in blood pressure, which would reduce stroke risk by 56% and coronary heart disease risk by 37%[31]
- CPAP treatment reduces the need for acute hospital admission due to cardiovascular disease in patients with sleep apnea[32]
- One month of CPAP improves daytime blood pressure, heart rate and left ventricular function[33]
- CPAP reduces blood glucose levels[34]
- Two nights of CPAP improves insulin sensitivity, sustained at the three-month interval[35]
- For every dollar spent on CPAP, $3.49 would be saved in reduced collision costs[30]
- CPAP improved the prognosis of heart failure patients with OSA[36]

1. Young et al. *New Engl J Med* 1993 2. Young et al. *J Am Med Assoc* 2004 3. Marshall et al. *Sleep* 2008 4. US Department of Health and Human Services, Centers for Disease Control and Prevention 2008 5. Young et al. *Sleep* 2008 6. Logan et al. *J Hypertens* 2001 7. O'Keeffe & Patterson. *Obes Surg* 2004 8. Oldenburg et al. *Eur J Heart Fail* 2007 9. Garrigue et al. *Circulation* 2007 10. Gami et al. *Circulation* 2004 11. Einhorn et al. *Endocr Pract* 2007 12. Sjostrom et al. *Thorax* 2002 13. Schafer et al. *Cardiology* 1999 14. American Heart Association 15. Medicare - $20.4 billion p.a. 16. Kuniyoshi et al. *J Am Coll Cardiol* 2008 17. Reichmuth et al. *Am J Respir Crit Care Med* 2005 18. Punjabi et al. *Am J Respir Crit Care Med* 2002 19. Meslier et al. *Eur Respir J* 2003 20. Stamatakis et al. *Sleep* 2008 21. Foster et al. *Diabetes Care* 2009 22. Dyken et al. *Stroke* 1996 23. Redline et al. *Am J Respir Crit Care Med* 2010 24. Punjabi et al. *PLoS Medicine* 2009 25. Kryger et al. *Sleep* 1996 26. Smith et al. *Chest* 2002 27. Leger et al. *Sleep* 1994 28. Kapur et al. *Sleep* 1999 29. Horstmann et al. *Sleep* 2000 30. Sassani et al. *Sleep* 2004 31. Becker et al. *Circulation* 2003 32. Peker et al. *Am J Respir Crit Care Med* 1997 33. Kaneko et al. *New Engl J Med* 2003 34. Babu et al. *Arch Intern Med* 2005 35. Harsch et al. *Am J Respir Crit Care Med* 2004 36. Kasai et al. *Chest* 2008