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Sleep Apnea Facts and Figures

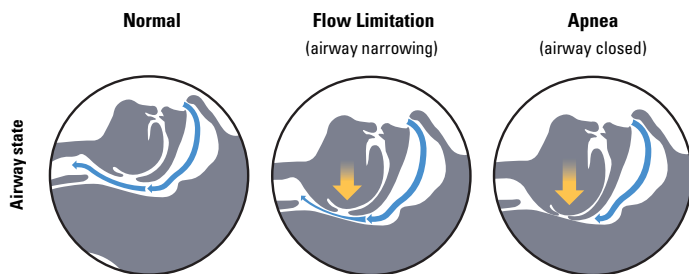
What is sleep-disordered breathing (SDB)?

SDB describes a number of breathing disorders that occur during sleep

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

What is obstructive sleep apnea (OSA)?

- A partial or complete collapse of the upper airway caused by relaxation of the muscles controlling the soft palate and tongue
- 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



Signs and Symptoms of Sleep Apnea

- Lack of energy
- Morning headaches
- Frequent nocturnal urination
- Depression
- Large neck size
- Excessive daytime sleepiness
- Nighttime gasping, choking or coughing
- Gastroesophageal reflux (GE reflux)
- Irregular breathing during sleep (eg, snoring)

Classification of sleep apnea

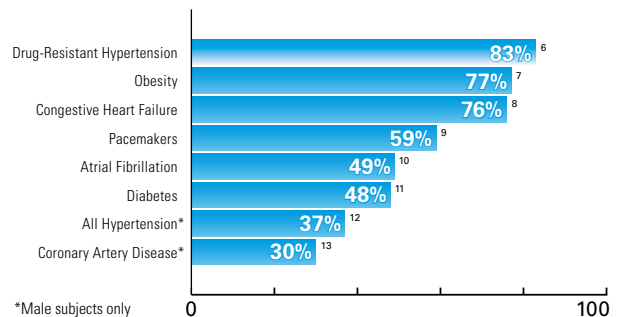
Apnea–hypopnea index (AHI)

- Number of apneas and/or hypopneas per hour of sleep (or study time)
- Reflects the severity of sleep apnea
 - AHI: < 5** Normal range
 - AHI: 5 to < 15** Mild sleep apnea
 - AHI: 15 to < 30** Moderate sleep apnea
 - AHI: ≥ 30** Severe sleep apnea

Prevalence of sleep apnea

- Approximately 42 million American adults have SDB¹
- An estimated 26% of adults have at least mild SDB²
- 9% of middle-aged women and 25% of middle-aged men suffer from OSA³
- Prevalence is similar to asthma (20 million) and diabetes (23.6 million) of US population⁴
- 75% of severe SDB cases remain undiagnosed⁵

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



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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 hypertension⁵
- AHA guidelines on drug-resistant hypertension have shown treatment of sleep apnea with continuous positive airway pressure (CPAP) likely to improve blood pressure control



Stroke risk

- 65% of stroke patients have SDB¹⁴
- Up to 70% of patients in rehabilitation therapy following stroke have significant SDB (AHI >10)¹⁵

Health care costs (Economic consequences of untreated SDB)

- Undiagnosed patients used \$200,000 more in the two-year period prior to diagnosis than matched controls¹⁶
- Prior to sleep apnea diagnosis, patients utilized 23–50% more medical resources¹⁷
- Total economic cost of sleepiness = approximately \$43–56 billion¹⁸
- Undiagnosed moderate to severe sleep apnea in middle-aged adults may cause \$3.4 billion in additional medical costs in the US¹⁹

Traffic accidents

- People with moderate to severe sleep apnea have an up to 15-fold increase of being involved in a traffic accident²⁴
- People with sleep apnea are at twice the risk of having a traffic accident²⁵
- Treating all US drivers suffering from sleep apnea would save \$11.1 billion in collision costs and save 980 lives annually²⁶

Treatment of OSA with MRD

- A mandibular repositioning device (MRD) is a custom-made, adjustable oral appliance (available from a dentist) that maintains the lower jaw in a forward position during sleep. This mechanical protrusion widens the space behind the tongue and reduces the vibration and physical obstruction to breathing and the tendency to snore.
- MRD treatment offers significant improvement of sleep apnea symptoms including sleepiness, quality of life, systolic or diastolic blood pressure and cognitive performance²⁰
- MRDs offer an equally efficacious alternative in mild to moderate OSA patients who are not compliant or refuse CPAP therapy²¹
- MRDs are indicated as primary treatment for patients with mild to moderate OSA²²
- Mandibular advancement can increase upper airway capacity by 50-75% with maximum mandibular protrusion²³
- OSA is a chronic condition; MRD or CPAP treatment must be used nightly

Untreated OSA patient



Patient treated with Narval™ CC



1 Young et al. *New Engl J Med* 1993
 2 Peppard et al. *J Am Med Assoc* 2013
 3 Marshall et al. *Sleep* 2008
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 7 O'Keefe & Patterson. *Obes Surg* 2004
 8 Oldenburg et al. *Eur J Heart Fail* 2007
 9 Garrigue et al. *Circulation* 2007
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13 Schafer et al. *Cardiology* 1999
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24 Horstmann et al. *Sleep* 2000
 25 Terán-Santos et al. *New Engl J Med* 1999
 26 Sassani et al. *Sleep* 2004