



ResMed

Changing lives
with every breath

Sleep Apnea Facts and Figures

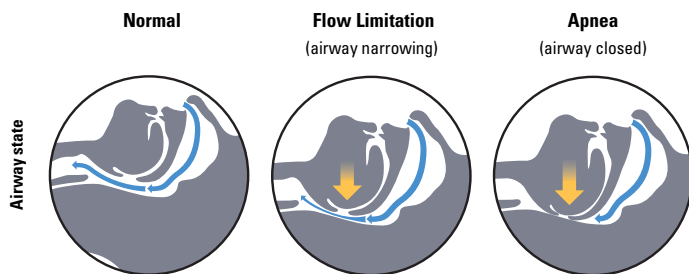
What is sleep-disordered breathing (SDB)?

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)?

- The most common form of SDB
- 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 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
- Excessive daytime sleepiness (EDS)
- Nighttime gasping, choking or coughing
- Gastroesophageal reflux (GE reflux)
- Irregular breathing during sleep (eg, snoring)

Classification of sleep apnea

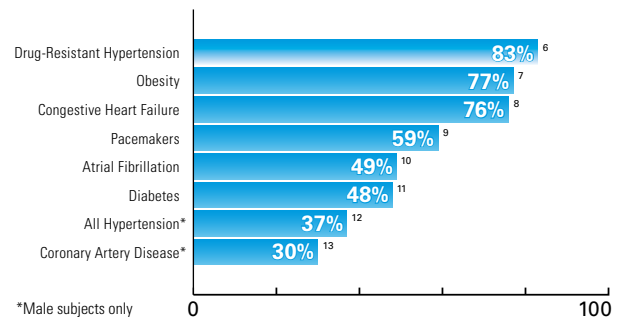
Apnea-Hypopnea Index (AHI)

- 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 in the US is similar to asthma (20 million) and diabetes (23.6 million)⁴
- 75% of severe SDB cases remain undiagnosed⁵

Prevalence of Sleep Apnea in Comorbidities



Increased risk factors for sleep apnea

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



ResMed

Changing lives
with every breath

Sleep Apnea Facts and Figures

Cardiovascular links

- 5.7 million people in the US have heart failure¹⁴
- Approximately 76% of congestive heart failure patients have SDB⁸
- Heart failure is the most expensive disorder to treat¹⁵
- OSA noted in 49% of atrial fibrillation patients¹⁰ and 30% of cardiovascular patients¹³
- OSA presents in 70% of heart attack patients with AHI ≥ 5 and 52% of heart attack patients with AHI ≥ 10 ¹⁶

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 that treatment of sleep apnea with CPAP is likely to improve blood pressure control



Type 2 diabetes links

- 48% of type 2 diabetes sufferers have sleep apnea¹¹
- OSA may have a causal role in the development of type 2 diabetes¹⁷
- OSA is associated with insulin resistance (independent of obesity)¹⁸
- 30% of patients presented to a sleep clinic have impaired glucose intolerance¹⁹
- Mild forms of SDB may be important in predicting risk of pre-diabetes²⁰
- 86% of obese type 2 diabetic patients suffer from sleep apnea²¹

Stroke risk

- 65% of stroke patients have SDB²²
- Moderate to severe sleep apnea triples stroke risk in men²³

Mortality links

- SDB is associated with a threefold increase in mortality risk⁵
- There is an independent association of moderate to severe OSA with increased mortality risk³
- Severe sleep apnea raises death risk by 46%²⁴

Health care costs (Economic consequences of untreated SDB)

- Patients with untreated OSA had 82% higher in-patient hospital costs than treated patients²⁵
- Patients with OSA have higher utilization rates and incur greater costs than non-OSA patients for up to 10 years prior to diagnosis²⁶
- OSA patients on PAP therapy have 31% lower total medical costs than patients not on PAP therapy²⁵

Traffic accidents

- In the year 2000, 810,000 US drivers were involved in a motor vehicle accident related to OSA — 1,400 involved fatalities²⁷
- Treating all US drivers suffering from sleep apnea would save \$11.1 billion in collision costs and save 980 lives annually²⁷

Treatment of OSA with CPAP

- CPAP treatment reduces the need for acute hospital admission due to cardiovascular disease in patients with sleep apnea²⁸
- CPAP reduces blood glucose levels²⁹
- Two nights of CPAP improves insulin sensitivity, sustained at the three-month interval³⁰
- For every dollar spent on CPAP, \$3.49 would be saved in reduced collision costs³¹

1 Young et al. *New Engl J Med* 1993
2 Peppard et al. *J Am Med Assoc* 2013
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'Keefe & 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 Potts et al. *Popul Health Manag* 2012
26 Albarak et al. *Sleep* 2005
27 Sassani et al. *Sleep* 2004

28 Peker et al. *Am J Respir Crit Care Med* 1997
29 Babu et al. *Arch Intern Med* 2005
30 Harsch et al. *Am J Respir Crit Care Med* 2004
31 Sassani et al. *Sleep* 2004