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# Sleep Apnea Facts and Figures

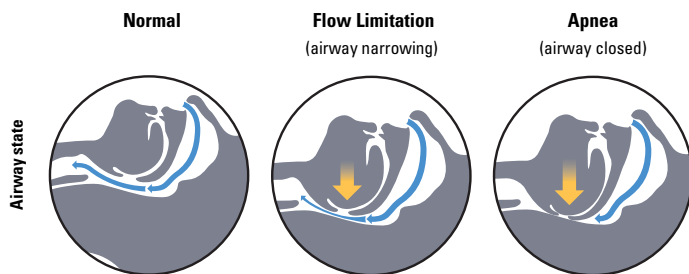
## What is sleep-disordered breathing (SDB)?

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  $\geq 10$  seconds
  - Hypopnea: A decrease in airflow lasting  $\geq 10$  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

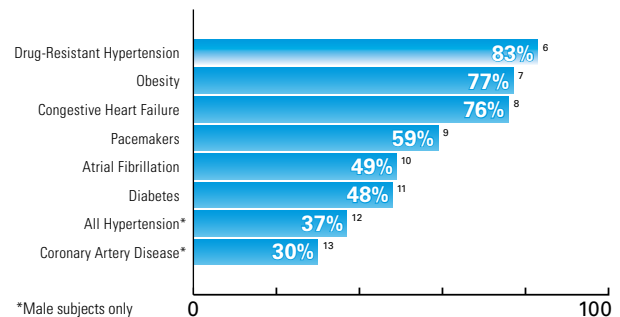
Apnea–hypopnea index (AHI)

- 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:  $\geq 30$**  Severe sleep apnea

## Prevalence of sleep apnea

- Approximately 42 million American adults have SDB<sup>1</sup>
- An estimated 26% of adults have at least mild SDB<sup>2</sup>
- 9% of middle-aged women and 25% of middle-aged men suffer from OSA<sup>3</sup>
- Prevalence is similar to asthma (20 million) and diabetes (23.6 million) of US population<sup>4</sup>
- 75% of severe SDB cases remain undiagnosed<sup>5</sup>

## 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<sup>6,12</sup>
- 43% of patients with mild OSA and 69% of patients with severe OSA have hypertension<sup>5</sup>
- AHA guidelines on drug-resistant hypertension have shown treatment of sleep apnea with continuous positive airway pressure (CPAP) likely to improve blood pressure control



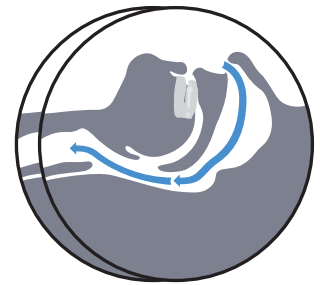
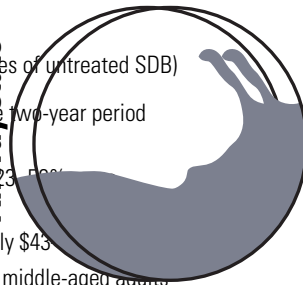
## Stroke risk

- 65% of stroke patients have SDB<sup>14</sup>
- Up to 70% of patients in rehabilitation therapy following a stroke have significant SDB (AHI >10)<sup>15</sup>

## 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<sup>16</sup>
- Prior to sleep apnea diagnosis, patients utilized 13–50% more medical resources<sup>17</sup>
- Total economic cost of sleepiness = approximately \$43 billion annually<sup>18</sup>
- Undiagnosed moderate to severe sleep apnea in middle-aged adults may cause \$3.4 billion in additional medical costs in the US<sup>19</sup>

Airway state



## Traffic accidents

- People with moderate to severe sleep apnea have an up to 15-fold increase of being involved in a traffic accident<sup>24</sup>
- People with sleep apnea are at twice the risk of having a traffic accident<sup>25</sup>
- Treating all US drivers suffering from sleep apnea would save \$11.1 billion in collision costs and save 980 lives annually<sup>26</sup>

## 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 performance<sup>20</sup>
- MRDs offer an equally efficacious alternative in mild to moderate OSA patients who are not compliant or refuse CPAP therapy<sup>21</sup>
- MRDs are indicated as primary treatment for patients with mild to moderate OSA<sup>22</sup>
- Mandibular advancement can increase upper airway capacity by 50-75% with maximum mandibular protrusion<sup>23</sup>
- OSA is a chronic condition; MRD or CPAP treatment must be used nightly

Healthy patient (airway open)    Untreated OSA patient (airway closed)    Narval CC™  
 Patient treated with Narval CC

1 Young et al. <i>New Engl J Med</i> 1993	6 Logan et al. <i>J Hypertens</i> 2001	13 Schafer et al. <i>Cardiology</i> 1999	20 Li et al. <i>Cochrane Database of Systematic Reviews</i> 2009	24 Horstmann et al. <i>Sleep</i> 2000
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3 Marshall et al. <i>Sleep</i> 2008	8 Oldenburg et al. <i>Eur J Heart Fail</i> 2007	15 Good et al. <i>Stroke</i> 1996	22 Practice Parameters for the Treatment of Snoring and Obstructive Sleep Apnea with Oral Appliances: An Update for 2005, AASM report, <i>Sleep</i> 2006	26 Sassani et al. <i>Sleep</i> 2004
4 US Department of Health and Human Services, Centers for Disease Control and Prevention 2008	9 Garrigue et al. <i>Circulation</i> 2007	16 Kryger et al. <i>Sleep</i> 1996	23 Aarab et al. <i>Clin Oral Invest</i> 2010	
5 Young et al. <i>Sleep</i> 2008	10 Gami et al. <i>Circulation</i> 2004	17 Smith et al. <i>Chest</i> 2002		
	11 Einhorn et al. <i>Endocr Pract</i> 2007	18 Leger et al. <i>Sleep</i> 1994		
	12 Sjostrom et al. <i>Thorax</i> 2002	19 Kapur et al. <i>Sleep</i> 1999		

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