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 impeding upper airway closure

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 Normally
    - AHI = 5-14 Mild
    - AHI = 15-30 Moderate
    - AHI > 30 Severe

Prevalence of OSA
- Approximately 42 million American adults have SDB (Young 1993)
- 1 in 5 adults has mild OSA (Young 2004)
- 9% of middle-aged women, 25% of men in middle-aged work force suffer from OSA (Marshall 2008)
- Prevalence similar to asthma (20 million) and diabetes (23 million) (Am Academy of Allergy, Asthma & Immunology 2005; Am Diabetes Assoc 2007)
- 75% of severe SDB cases remain undiagnosed (Young 2008)

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

Comorbid Associations with OSA
- Hypertension
- Cardiovascular diseases (arrhythmias, myocardial infarctions, heart failure)
- Stroke
- Type II diabetes
- Mood disorders (anxiety and/or depression)
- Increased morbidity and mortality
- Obesity

Cardiovascular Links
- 4.7 million people in the US have heart failure
- Approximately 50% of HF patients have SDB (Javaheri 1999)
- HF is the most expensive disorder to treat (Medicare – $20.4 billion p.a.)
- Arrhythmias noted in 50–75% of OSA patients (Somers 2004), 30% in cardiovascular patients (Schafer 1999)
- OSA presents in 70% of heart attack patients with AHI ≥5 and 52% of heart attack patients with AHI ≥10 (Kuniyoshi 2008)
Hypertension Links
• Studies have shown that sleep apnea is an independent risk factor for hypertension
• 30–80% of patients with hypertension have sleep apnea (Logan 2001; Sjostrom 2002)
• 43% of patients with mild OSA and 49% of patients with severe OSA have hypertension (Young 2008)
• AHA guidelines on drug–resistant hypertension have shown treatment of sleep apnea with CPAP likely improves blood pressure control

Mortality Links
• SDB is associated with a 3-fold increase in mortality risk (Young 2008)
• There is an independent association of moderate to severe OSA with increased mortality risk (Marshall 2008)

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 (Kryger 1996)
• Prior to sleep apnea diagnosis, patients utilized 23–50% more medical resources (Smith 2002)
• Total economic cost of sleepiness = approximately $43–56 billion (Leger 1994)
• Undiagnosed moderate to severe sleep apnea in middle-aged adults may cause $3.4 billion in additional medical costs in the US (Kapur 1999)

Traffic Accidents
• 15-fold increase of being involved in traffic accident (Horstmann 2000)
• People with sleep apnea are at twice the risk of having a traffic accident (Teran-Santos 1999)
• Treating all US drivers suffering from sleep apnea would save $11.1 billion in collision costs and save 980 lives annually (Sassani 2004)

Links to Type II Diabetes
• 50% of diabetes sufferers have sleep apnea (Einhorn 2007)
• OSA may have a causal role in the development of diabetes (Reichmuth 2005)
• OSA is associated with insulin resistance (independent of obesity) (Punjabi 2002)
• 30% of patients presented to a sleep clinic have impaired glucose intolerance (Meslier 2003)
• Mild forms of SDB may be important in predicting risk of pre-diabetes (Stamatakis 2008)

Stroke Risk
• 65% of stroke patients have SDB (Dyken 1996)
• Up to 70% of patients in rehabilitation therapy following stroke have significant SDB (AHI > 10) (Good 1996)

Treatment of OSA with CPAP
• Treatment of OSA resulted in a 10 mmHg reduction in blood pressure which would reduce stroke risk by 35% and coronary heart disease risk by 20% (Becker 2003)
• nCPAP treatment reduces the need for acute hospital admission due to CVD in patients with OSAS (Peker 1997)
• One month of CPAP improves daytime blood pressure, heart rate and left ventricular function (Kaneko 2003)
• CPAP reduces blood glucose levels (Babu 2005)
• 2 nights of CPAP improves insulin sensitivity, sustained at the 3–month interval (Harsch 2003)
• For every dollar spent on CPAP, $3.49 would be saved in reduced collision costs (Sassani 2004)
• CPAP improved the prognosis of heart failure patients with OSA (Kasai 2008)

For more information please visit www.healthysleepanddiabetes.com