The heart of the matter

Sleep apnea and cardiovascular disease

PHILIPS

RESPIRONICS

The cardiologist's role

Obstructive Sleep Apnea (OSA) is a common breathing disorder that has been associated with an increased risk of hypertension, heart failure, stroke, atrial fibrillation, Type 2 diabetes and other conditions. Effective treatment of OSA not only results in better sleep, but also may decrease the risk of developing other potentially life-threatening conditions.

Early screening, identification and treatment of sleep apnea may help to prevent the development of these other conditions.

Key factors often associated with OSA include:

- BMI > 30
- Large neck girth
  - 17 inches for men
  - 16 inches for women
- Micronathia or crowded airway
- Daytime sleepiness or fatigue

Simple questions can help you better identify patients who may be at risk for OSA. Questions to ask may include:

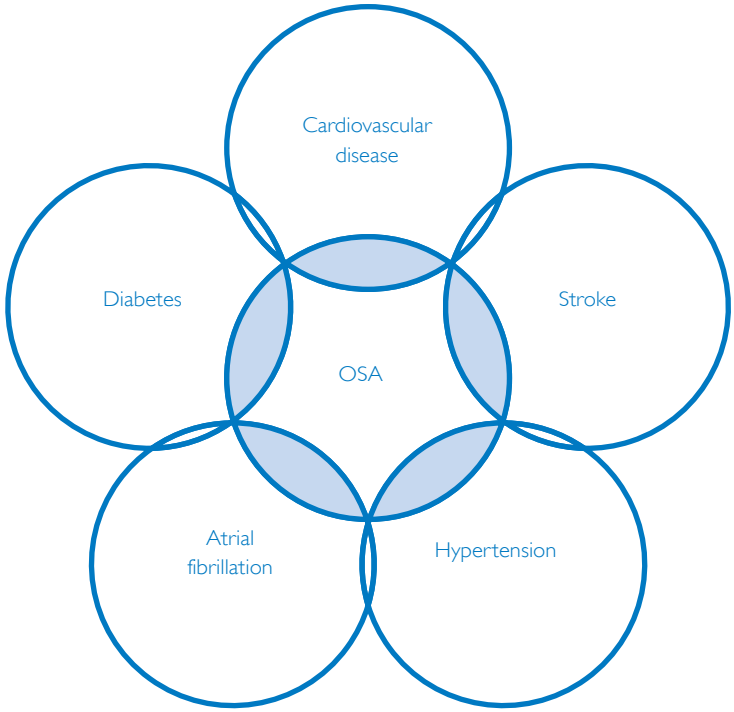
- Do you snore loudly while sleeping?
- Do you feel excessively tired during the day?
- Have you ever been told you stop breathing or choke loudly while you are asleep?
- Do you have a history of hypertension or Type 2 diabetes?

Once your patients have been diagnosed with sleep apnea and have begun therapy, close follow-up is important in order to ensure that they are receiving appropriate treatment for their sleep apnea.

Prevalence of OSA

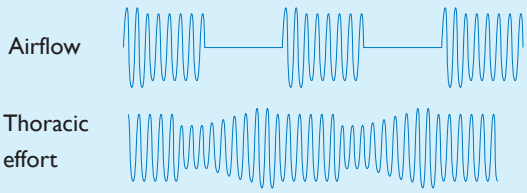
- As many as five to ten percent of adults in the U.S. have OSA.[1, 2]
  - Nine percent of men and four percent of women have an AHI >15.
  - Four percent of middle-aged men and two percent of middle-aged women have an AHI >5 and daytime sleepiness.
- Prevalence of OSA is higher in the following ethnic groups[3]:
  - Asians
  - Hispanic women
  - African-Americans
- 85 to 90 percent of patients have not been identified.[1]
- One in four patients is at risk for OSA.[2, 4]

Many of the 20 million people in the U.S. suspected of having OSA may have an increased risk for other serious health conditions.



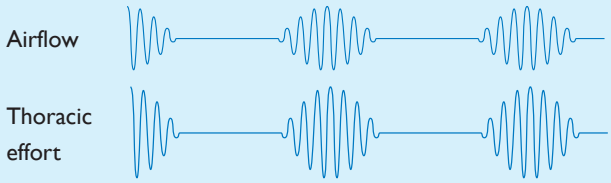
Sleep apnea

Obstructive Sleep Apnea (OSA)



OSA is the absence of airflow due to an occlusion in the upper airway that lasts at least 10 seconds in spite of continual effort to breathe. Severity is measured by the Apnea/Hypopnea Index (AHI) – the number of episodes per hour of sleep.

Central apnea and periodic breathing



Central apnea is the absence of airflow that lasts at least 10 seconds with no inspiratory effort. Periodic breathing is defined as alternating periods of hyperventilation with waxing/waning tidal volume and periods of central hypopneas or apneas. There are many forms of periodic breathing, one of which is Cheyne-Stokes Respiration (CSR).

Comorbidity – sleep apnea and cardiac disease

OSA has been independently associated with an increased risk of cardiac arrhythmias, hypertension, heart failure, stroke, Type 2 diabetes, and coronary artery disease. A large percentage of patients with OSA remain undiagnosed.

Sleep-disordered breathing (SDB) has been associated with various forms of cardiovascular (CV) disease.

- Individuals with severe SDB are two- to four-times more likely to develop complex arrhythmias than those without SDB.[5]
- Individuals with diagnosed OSA are between two and three times more likely to develop hypertension.[6]
- The prevalence of OSA in patients with heart failure is estimated at 40 to 70 percent.[7, 8]
- Individuals with diagnosed OSA are more likely to suffer a stroke than those without OSA.[9, 10]
- Type 2 diabetes is more prevalent in patients with SDB independent of other risk factors.[11]

Hypertension (HTN)

- Sleep apnea has been associated with the development of HTN in a dose response relationship.[6]
- NIH/NHLBI JNC7 recognizes OSA as an identifiable cause of HTN and recommends screening newly identified hypertensive patients or patients who develop refractory hypertension for OSA.[12]

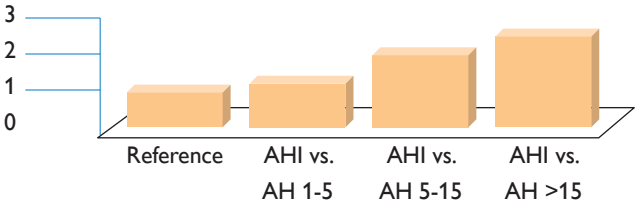
Heart failure

- ACC/AHA Heart Failure Guidelines recognize OSA as a possible cause of heart failure and recommend screening newly identified heart failure patients for OSA.[13]

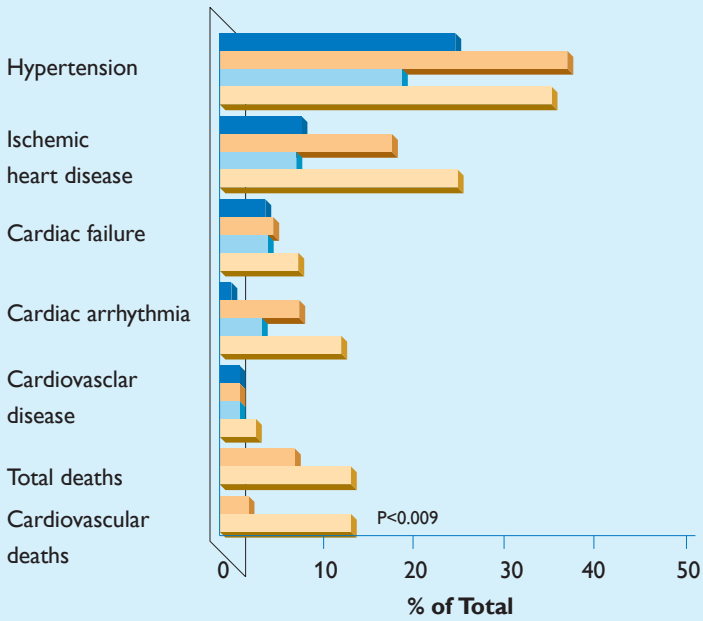
Arrhythmias

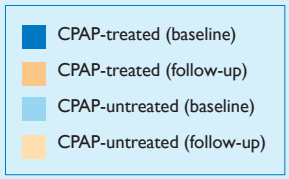
- OSA is associated with a significant risk of atrial fibrillation even after controlling for known confounding parameters.[14]
- 49 percent of patients with atrial fibrillation have OSA while 32 percent of the general cardiology practice have OSA.[14]

Relative risks for HTN (dx, BP) – Adjusted, P<.002[6]



Cardiovascular outcomes with treated vs. untreated OSA





[16]Reprinted with permission.

Results of effective treatment of OSA

Cardiovascular outcomes in patients treated for OSA vs. patients with untreated OSA

- Patients with untreated OSA were 2.68 times more likely to suffer a non-fatal CV event compared to those whose OSA was effectively treated with CPAP.[15]
- Patients with untreated OSA were 2.5 times more likely to suffer a fatal CV event compared to those whose OSA was effectively treated with CPAP.[15]

Treatment of OSA can positively impact hypertension

- Reduced daytime blood pressure in patients whose OSA is effectively treated[17, 18, 19, 20]
- Effective treatment of OSA resulted in reduced systolic blood pressure in refractory hypertension patients with OSA (avg. BP sys from 138.3 mm Hg to 126.0 mm Hg)[21]
- Normalized nocturnal blood pressure pattern (restored dipper status) in a non-dipper OSA population whose OSA was effectively treated[22]

Treatment of OSA can positively impact heart failure (HF)

- Effective treatment of OSA resulted in improved Left Ventricular Ejection Fraction percent (from 25% to 34%), Left Ventricular End Systolic Diameter (from 55 mm to 52 mm), and systolic blood pressure (from 126 mm to 116 mm Hg) in HF patients with OSA[23]
- Significantly improved quality of life for HF patients whose OSA was effectively treated[24]

Treatment of OSA can positively impact arrhythmias

- Appropriate treatment of OSA was associated with a reduction in atrial fibrillation recurrence after cardioversion.[25]
- Untreated OSA is associated with an increased rate of recurrence of atrial fibrillation and severity of nocturnal oxygen desaturation.[25]

Treatment of OSA with CPAP therapy

Continuous Positive Airway Pressure (CPAP) treats OSA by providing a pneumatic splint to keep the patient's airway open during sleep. Treatment of OSA with CPAP therapy improves sleep-related breathing. Adequately treated OSA also has been associated with improved cardiovascular outcomes.

Philips Respironics' goal is to provide the most up-to-date information on clinical research with respect to the relationship between OSA and other disease states. While research has established a comorbidity relationship between OSA and the disease states discussed in the literature below, research is ongoing to identify potential causative relationships between OSA and other disease states.

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[4]Hiestand, D.M., et al., *Chest* 2006;130:780-786
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[6]Peppard, P., et al., *NEJM* 2000;342:1378-1384
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[8]Sin, D., et al., *AJRCCM* 1999;160:1101-1106
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[13]Hunt, S.A., et al., *Circulation* 2005;112:1825-1852
[14]Gami, A.S., et al., *Circulation* 2004;110:364-367
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[16]Doherty, L.S., et al., *Chest* 2005;127:2076-2084
[17]Hla, K.M., et al., *Chest* 2002;122:1125-1132
[18]Faccenda, J.F., *AJRCCM* 2001;163-344-348
[19]Pepperell, J.C., *Lancet* 2002;359:204-210
[20]Heinrich, F., et al., *Circulation* 2002;107:68-73
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[23]Bradley, T.D., et al., *NEJM* 2003;348:1233-1241
[24]Naughton, M.T., et al., *AJRCCM* 2004;169:361-366
[25]Kenaglala, R., et al., *Circulation* 2003;107:2589-2594

Hoech KW 04/06/09 MCI 4101396 PN 1041128

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