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Obstructive Sleep Apnea and it's Relationship to Cardiovascular Disease

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Introduction

As the medical community continues to enrich its understanding of obstructive sleep apnea (OSA), it also expands its knowledge in OSA's tight connection to cardiovascular disease. OSA is a respiratory disorder recognized by repetitive closure of the upper airway during sleep and, consequently, causes a recurrent cycle of sleep disturbances and intermittent hypoxia (Sateia, 2014). OSA has demonstrated it's capability of increasing risk for cardiovascular diseases including: hypertension, ischemia heart disease, cerebral vascular accidents, arrhythmias, and congestive heart failure (Marin, Carnzo, Vicente, & Agusti, 2005). Signs and symptoms of this disease can be overlooked and the long term cardiovascular effects can be detrimental. It is important for advanced practitioners to recognize the severity of OSA and understand its relationship with cardiovascular disease. The purpose of this presentation is to educate current and future practitioners on the key components of OSA and its links to cardiac disorders. The pathophysiology of the disease, related signs and symptoms, and the implications for nursing care will be discussed.

Signs & Symptoms

OSA occurs during sleep, when the upper airway becomes blocked repeatedly and reduces or completely stops airflow. As a result, the following signs and symptoms are often detected.

Signs

- Reduced or absent breathing during sleep (apnea)
- Frequent loud snoring
- Gasping for air during sleep

Symptoms

- Excessive daytime sleepiness and fatigue
- Decreased attention, motor skills, vigilance
- Dry mouth or headaches especially when waking
- Sexual dysfunction or decreased libido

Due to the frequent absences of breathing, the patients experience intermittent hypoxia that causes the heart to work harder and blood vessel lining to break down or become inflamed. Chronic OSA patients may experience hallmark cardiovascular signs and symptoms such as:

- Bounding Pulse
- Heart Palpitations
- Shortness of breath
- Syncope
- Chest pain

(National Heart, Lung and Blood Institute, 2017)

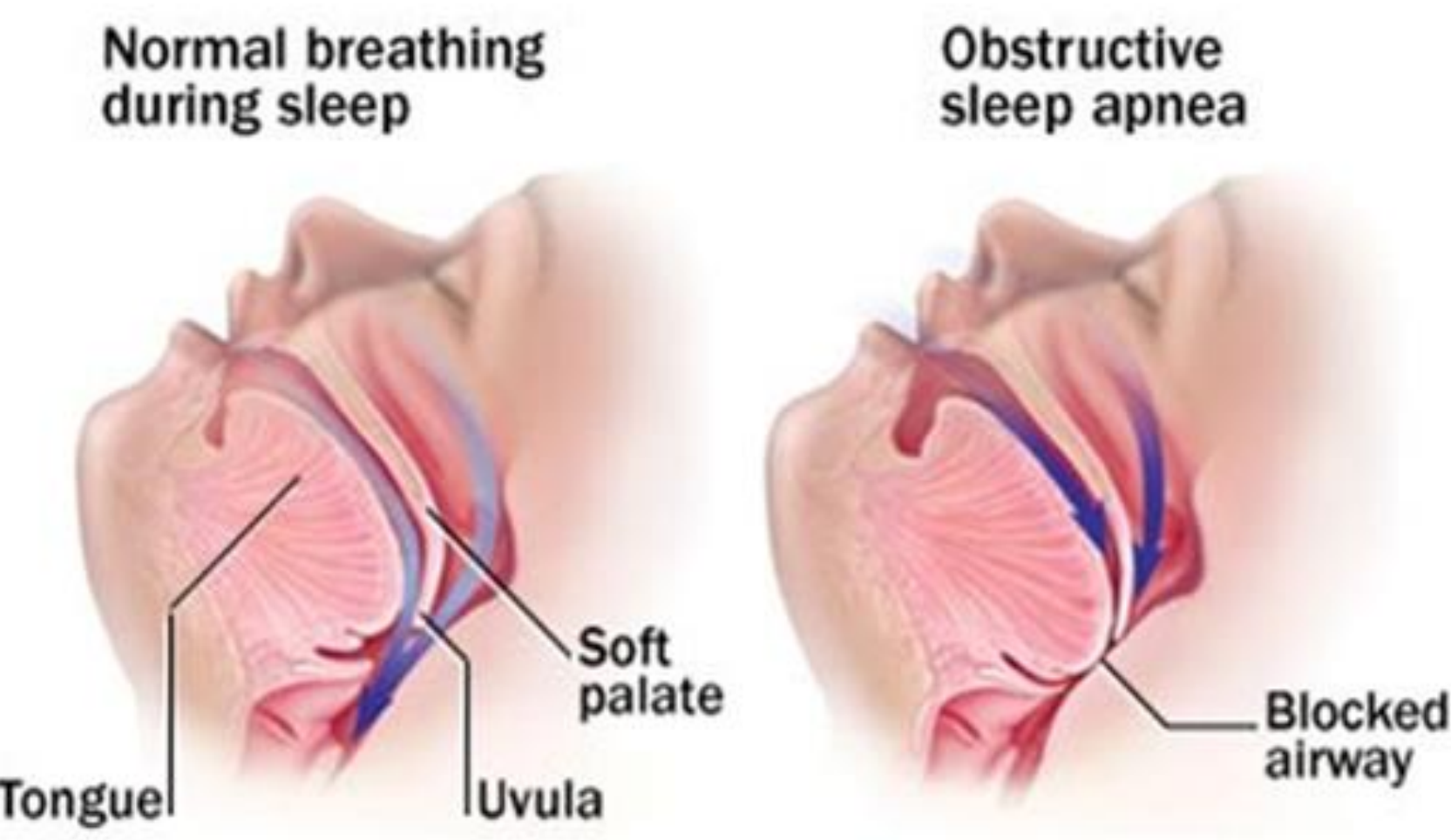


Diagram 1: (University of Nebraska Medical Center, 2018)

Underlying Pathophysiology

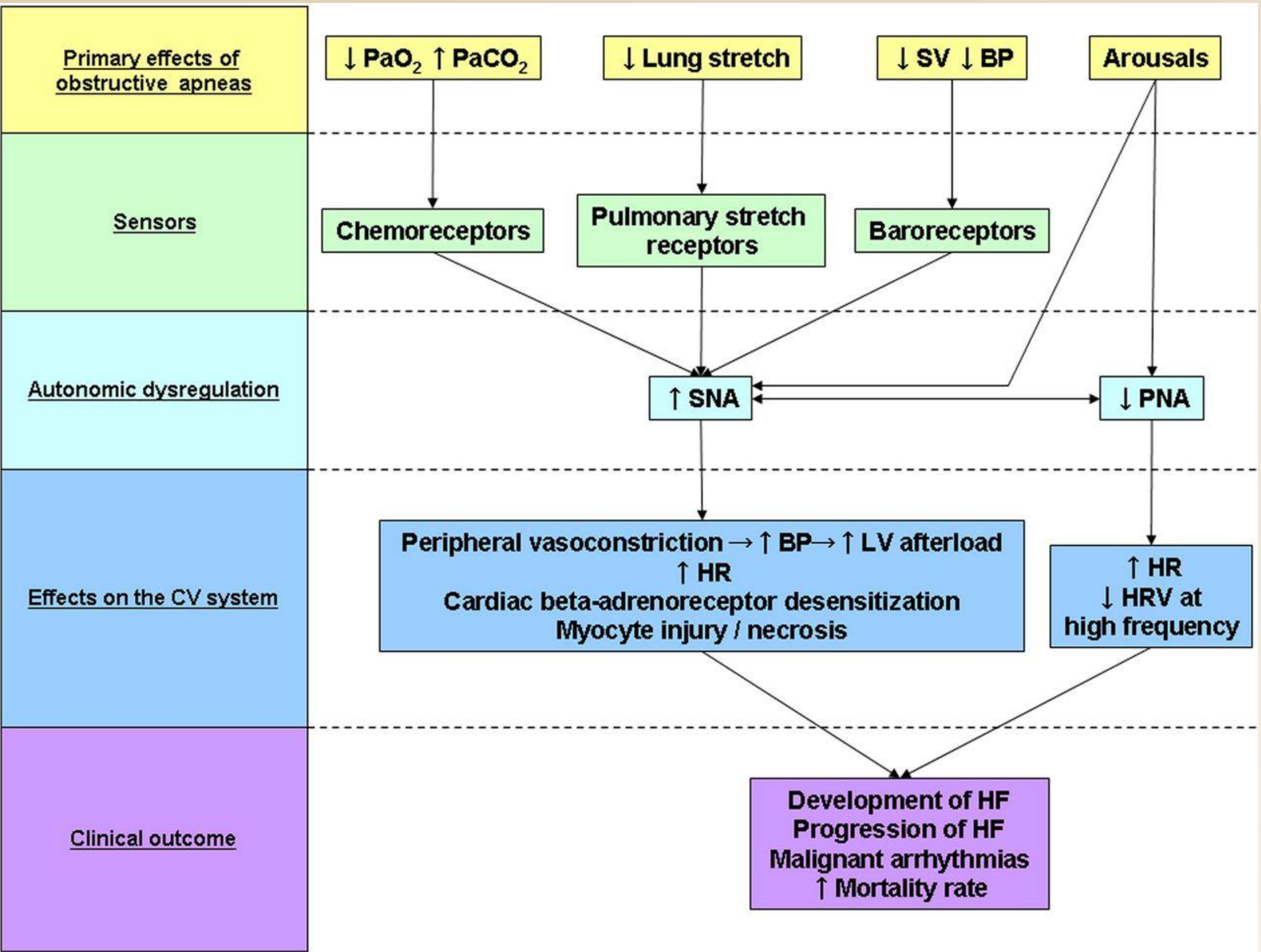


Diagram 2: (Kasai & Bradley, 2011)

1) Primary Effects of OSA, Sensors, and Autonomic Dysregulation

Intermittent hypoxia and increased PaCO2 activate central and peripheral chemoreceptors that stimulate the sympathetic nervous system (SNS). Pulmonary stretch receptors, which normally decrease the SNS, are hindered due to apnea. Stroke volume and blood pressure are reduced due to intrathoracic effects of OSA and trigger carotid sinus baroreceptors to activate the SNS. Finally, frequent arousals from OSA stimulate the SNS and also decrease the normal vagal (PNS) activity which accounts for post-apneic boosts of heart rate and blood pressure.

2) Effects on the Cardiovascular System and Clinical Outcomes

The over stimulation of the sympathetic nervous system ties into a number of cardiovascular issues. The release of catecholamines by the SNS including epinephrine and norepinephrine cause an increase in heart rate, inotropy, and vasoconstriction leading to tachycardia and hypertension. The heart continues to work hard even during times that it should be at rest which can lead to heart failure. The increase in SNS causes an increase in myocardial oxygen demand which leads to CAD and myocardial ischemia. The catecholamines that are stimulated by the SNS can irritate the conduction mechanisms of the heart and cause arrhythmias. Intermittent hypoxia and post-apneic reoxygenation lead to an increase in oxidative stress and provoke inflammation. This leads to endothelial damage, atherosclerosis, hypertension, and eventually, MI or stroke.

(Kasai and Bradley, 2011)

Significance of Pathophysiology

Over 18 million American adults suffer from sleep apnea and routinely snoring children have a sleep apnea prevalence as high as 20% . OSA increases the risk of heart failure by up to 140%, the risk of stroke by up 60% and risk of coronary heart disease by up to 30% (Jean-Louis, Clark, Brown, and McFarlane, 2008). Snoring is often overlooked by patients and their significant others as a natural sleeping habit, however, the habitual impendance of breathing causes a significant deficit in a patients oxygenation and, as previously explained causes a surge in SNS which leads to a number of cardiovascular diseases. Risk factors for OSA such as facial deformities, male gender, and large tonsils need to be carefully considered when differentiating normal snoring compared to OSA. Close to 40% of America is considered obese and nearly two-thirds of the people who have OSA are obese (Jean-Louis et al., 2008). It is well documented that obesity itself is significantly linked to cardiovascular disease and with the combination of OSA, the cardiovascular consequences can quickly become life threatening.

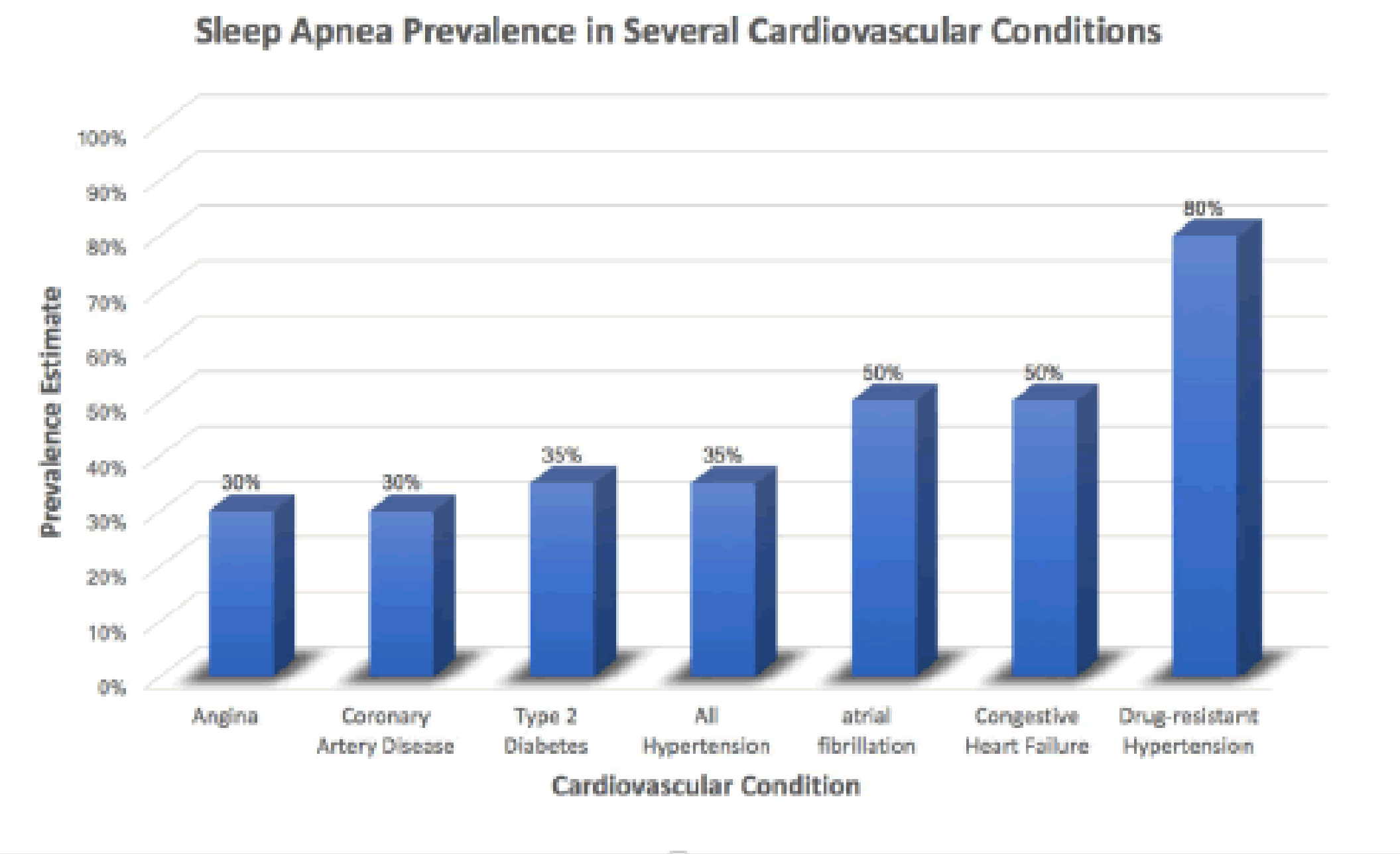


Figure 2: Prevalence estimates of sleep apnea in several cardiovascular conditions.

Diagram 3: (Yacoub, Youssef, Salifu & Mcfarlane, 2018)

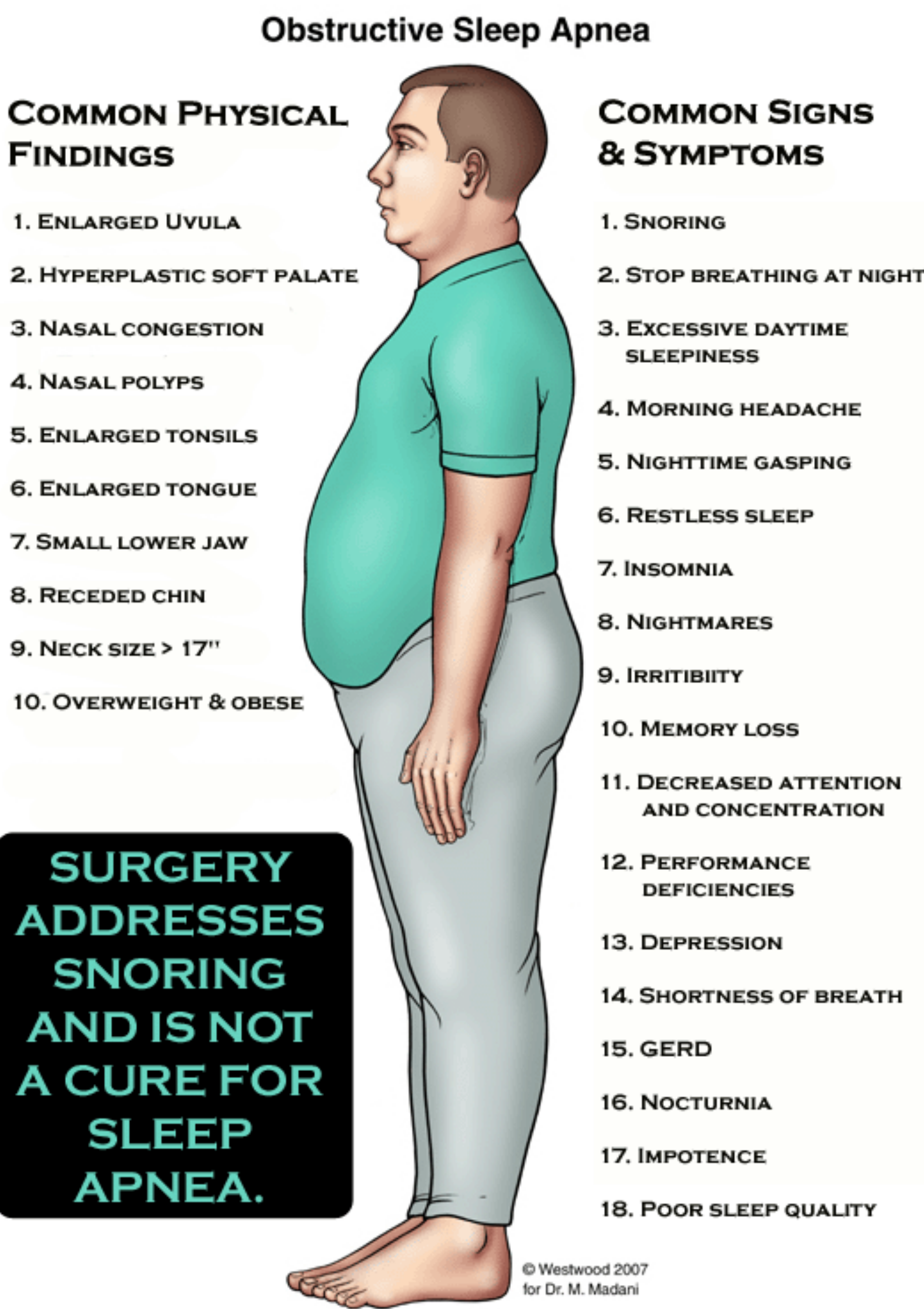


Diagram 4: (Snoring Treatment, 2007)

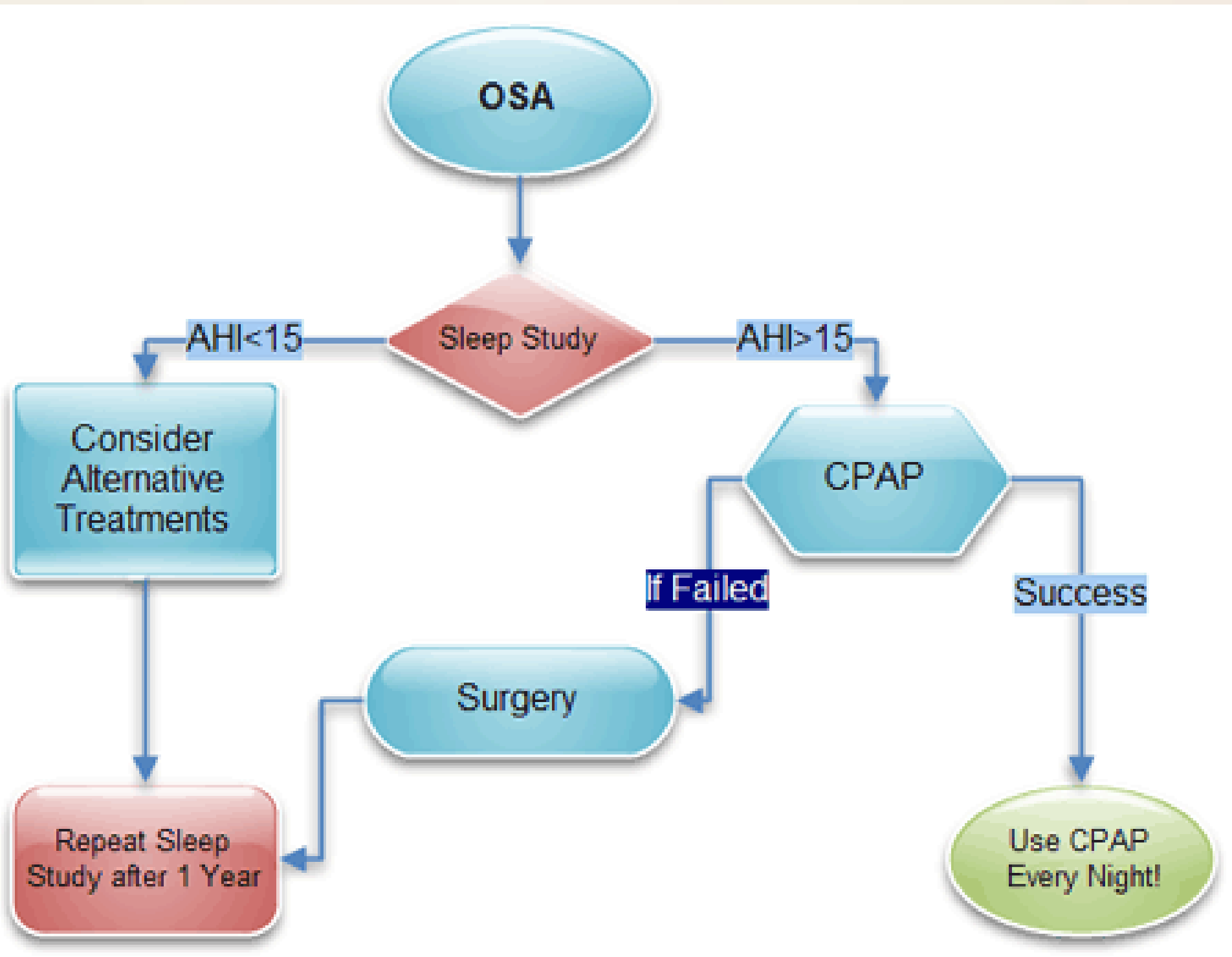


Diagram 5: (Obstructive Sleep Apnea Symptoms, Causes, Treatments, and Natural Remedies, 2018)

Implications for Nursing Care

- Nurses can positively impact the outcomes of patients with OSA by first educating the importance of modifying their risk factors of OSA: losing weight, limiting alcohol before bed, not sleeping back-side down.
- Nurses are at the forefront in healthcare and have a significant amount of patient contact. Nurses need to be vigilant when monitoring for S&S of OSA and especially with differentiating snoring from OSA. If sleep apnea is suspected, nurses need to advocate for a diagnostic sleep study
- Early treatment for OSA involves losing weight, changing sleeping positions, and monitoring sleep patterns
- If OSA persists, a CPAP machine may be necessary to keep a patients airway open while sleeping
- Nurses need to be aware that CPAP is an effective tool, however, it is uncomfortable and patient adherence is suboptimal. Nurses need to truly investigate CPAP compliance for nightly use
- If there is failure to comply or failure to improve symptoms, nurses may advocate for surgical treatment such as implantation of a phrenic nerve stimulator
- Perhaps most importantly, when nurses are caring for a patient with OSA, they need to be aware of the frequent and severe cardiovascular complications that these patients have and trend their progress overtime. Cardiovascular complications of OSA can effect the plan of care and needs to be monitored carefully

(Jean-Louis et al., 2008)

Conclusion

- In conclusion, OSA is a common respiratory disorder that leads to significant cardiovascular disease
- Being aware of the importance of early recognition and treatment can help to reduce the complications associated with OSA
- By understanding the pathophysiology surrounding sleep apnea, healthcare providers can work to ensure they are practicing in a way that is evidenced based and precise.
- Nurses alone have many responsibilities that can positively impact outcomes associated with OSA. It is the responsibility however, of all healthcare providers to ensure they are following evidence based diagnosis's and treatment strategies and recognize the potential cardiac risks of OSA.

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