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Cody Steffes
Otterbein University, cody.steffes@otterbein.edu

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Obstructive Sleep Apnea and its Relationship to Cardiovascular Disease

Cody Steffes BSN, RN, CCRN
Otterbein University, Westerville, Ohio

As the medical community continues to enrich its understanding of obstructive sleep apnea (OSA), it also expands its knowledge in OSA’s impact on 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 (Salek, 2014). OSA has demonstrated its capacity for increasing risk for cardiovascular diseases including: hypertension, ischemia, heart disease, cerebral vascular accidents, arrhythmias, and congestive heart failure (Marin, Carreno, Vinicius, & 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 airways become blocked repeatedly or completely stops airflow. As a result, the following signs and symptoms are often detected:

Sleepiness or fatigue:
- Frequent loud snoring
- Gasping for air during sleep
- Dry mouth or headaches especially when waking
- EXcessive daytime sleepiness and fatigue

Cognitive dysfunction:
- Decreased attention, motor skills, agility
- Dry mouth or headaches especially when waking
- Science of Sleep has estimated 1 in 3 adults have OSA

Due to the frequent absences of breathing, the patients experience intermittent hypoxia that causes the heart to work harder and blood vessels tend to become larger and have a reduced blood flow. Chronic OSA patients may experience hallmark cardiovascular signs and symptoms such as:

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

(National Heart, Lung and Blood Institute, 2017)

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 proinflammatory inflammation. This leads to endothelial damage, atherosclerosis, hypertension, and eventually, MI or stroke.

(Kasai and Bradley, 2011)

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 patient awake and breathing.
• Nurses need to be aware that CPAP is an effective tool, however, it is uncomfortable and patient adherence is a problem. Nurses need to truly investigate OSA treatment for patients.
• If there is failure to comply or failure to improve symptoms, nurses may advocate for surgical treatment such as an implantation of a peripheral nerve stimulator.

(Kasai and Bradley, 2011)

References

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 should inform patients of the potential complications 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 and treatment strategies and recognize the potential cardiac risks of OSA.

Diagrams used in this presentation include:
- Diagram 1: University of Nebraska Medical Center, 2018
- Diagram 2: Kasai & Bradley, 2011
- Diagram 3: Yaccub, Yaccub, Salty & McFarlane, 2018
- Diagram 4: Snoring Treatment, 2007
- Diagram 5: (Obstructive Sleep Apnea Symptoms, Causes, Treatments, and Natural Remedies, 2018)