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A NURSE PRACTITIONER'S GUIDE TO OBSTRUCTIVE SLEEP APNEA

by

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Associate Degree in Nursing, Anoka-Ramsey Community College, 2004

An Independent Study

Submitted to the Graduate Faculty

of the

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in partial fulfillment of the requirements

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## PERMISSION

Title        A Nurse Practitioner's Guide to Obstructive Sleep Apnea  
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*Sarah Hiltz*  
4/25/13

The following manuscript has been prepared for submission to *The Journal for Nurse Practitioners*

Dear Editor:

We have written a review that summarizes the current state of knowledge regarding obstructive sleep apnea. The literature supports that obstructive sleep apnea (OSA) is significantly underdiagnosed, hence not being treated and thereby contributing to other disease states. It is imperative that Nurse Practitioners are utilizing proper assessment and physical exam skills to aid in increased diagnosis of OSA and contributing to the prevention of it. This guide will review the pathophysiology, epidemiology, assessment, screening tools, treatment, prevention, and patient education. There is content surrounding what OSA is and the treatment in many textbooks and articles as well as in nursing curriculum, however there is a need for a general overview and guidance of how to screen these patients to help diagnose and prevent OSA and this article will aid NPs in accomplishing this.

The primary authors for this paper are Sarah Gustafson, RN, FNP-S and Jody Ralph, Ph.D., RN. Sarah is a graduate student at the University of North Dakota with an expected graduation date of May 2013 with a master of science in nursing. Jody Ralph is an Assistant Professor at the University of North Dakota (UND) College of Nursing and Professional Disciplines.

Please consider this manuscript for publication in *The Journal for Nurse Practitioners*. We look forward to peer review and comment.

A Nurse Practitioner's Guide to Obstructive Sleep Apnea

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## Abstract

Lack of awareness of the complication and symptoms of obstructive sleep apnea (OSA) among providers and their patients may lead to inadequate prevention, diagnosis, and treatment strategies. This article will evaluate and synthesize the evidence regarding the complications of OSA, raise awareness of the seriousness of this disease, and highlight the recommended clinical management of OSA by nurse practitioners. Data sources that were used include Cochrane Library, PubMed, and CINAHL. Clinical trials, systematic reviews, validation studies, and Meta analyses were reviewed. An in-depth search of the literature revealed very limited information geared toward nurse practitioners. Adequate screening for OSA can aid in diagnosis and treatment can be done to prevent further disease from occurring. Findings from this review may be used by nurse practitioners to promote evidence-based health promotion habits to improve sleep and quality of life.

key words: obstructive sleep apnea, screening, treatment, pathophysiology, and epidemiology.

## A Nurse Practitioner's Guide to Obstructive Sleep Apnea

Obstructive sleep apnea is a serious health threat that impacts 2-7% of adults and, left undiagnosed and untreated, can contribute to cardiovascular disease, traffic accidents, fatigue, obesity, and poor quality of life.<sup>1-3</sup> Many health care providers and scientists feel that assessment of sleep should be considered as important as evaluation of vital signs. OSA has been linked to many diseases to include and not limited to hypertension, obesity, heart disease, cerebrovascular disease, and other chronic diseases.<sup>4,5</sup> There has been a strong association with traffic and occupational accidents in people diagnosed with OSA.<sup>4,6</sup> These correlations make it necessary that OSA be on the list of differential diagnoses for all patients with the associated chronic diseases.<sup>7</sup>

The American Sleep Apnea Association (ASAA) estimates that 22 million Americans suffer from sleep apnea with 80 percent of the cases of moderate and severe obstructive sleep apnea (OSA) undiagnosed.<sup>8</sup> OSA affects approximately 3% to 7% of men and 2% to 5% of women in adulthood.<sup>3</sup> An executive summary released in 2010 by the American Public Health Association found the rates of preventable disease in the United States increasing, specifically those associated with OSA. It was found that 26.6 percent were obese, 8.2 percent of them had diabetes, and 27.8 percent of adult population had high blood pressure.<sup>9</sup> These numbers continue to rise with the increase of obesity in the United States. Evidence such as this solidifies the need for screening guidelines.

There remains no recommended routine screening for sleep disorders in adults by either the United States Preventative Task Forces or the Center for Disease Control.<sup>1</sup> At a time when prevention is key in primary care it is crucial that screening for OSA be occurring consistently. There is a lack of screening guidelines for OSA because there has been limited evidence that

supports that screening will aid in prevention and treatment of OSA. As nurse practitioners there is a need for increased screening as well as research associated with this so that guidelines can be established and followed. The American Academy of Pediatrics (AAP) did take a lead with this and issued new guidelines in screening for sleep apnea in children and adolescents to include screening for snoring at all routine health visits.<sup>10</sup> This was supported by the evidence with 20% to 30% of all children experiencing some type of sleep disturbance during childhood.<sup>11</sup>

This article aims to provide an overview of obstructive sleep apnea in adults so that nurse practitioners are aware of the importance of screening and assessment of sleep apnea. This will create awareness with the intention and hope that OSA can be diagnosed and treated to prevent further disease development. This can have an impact on the prevalence of OSA by providers' retention of this information when treating other associated co-morbidities.<sup>4</sup>

A search was completed by using CINAHL, PubMed, and Cochrane library through the Harley E. French Library of Health Sciences at the University of North Dakota. Key words that were used in the search included obstructive sleep apnea, screening, pathophysiology, epidemiology, and treatment. The search was limited to the last 5 years and adults aged 18 and older.

Sleep apnea is defined as a temporary pause in breathing during sleep that can last 10 to 90 seconds.<sup>12,13</sup> The three patterns of sleep apnea are obstructive, central, and mixed.<sup>12,14</sup> Central sleep apnea is defined as apnea that occurs when both respiratory effort and airflow are absent. This differs from obstructive sleep apnea in that there is decreased response to elevated levels of carbon dioxide and often coincides with other disease processes (i.e. tumors, hemorrhage, encephalitis).<sup>12</sup> In OSA, obstruction occurs because of the natural mechanism of the tongue and soft palate falling back in the oral cavity during sleep, which can obstruct the



pharynx.<sup>12</sup> Individuals with OSA usually experience a period of time of sleep until they encounter an episode of apnea which will awaken them and then there is an attempt to return to sleep. This can happen 200 to 400 times within a 6 to 8 hour time period.<sup>12</sup> These periods of apnea contribute to the many effects associated with sleep apnea.

### Epidemiology & Causes

OSA is relatively common and is associated with 38,000 cardiovascular deaths annually. It is most prevalent in men over 50 and in post menopausal women.<sup>12</sup> With the increasing rate of obesity and an aging population the prevalence of OSA most likely will increase. In a cross sectional analysis there was evidence of obesity, medical comorbidities, asthma, depression, and hypertension linked to OSA.<sup>4,6</sup> Pharyngeal resistance is a contributing factor to OSA and is the main reason why men have OSA at a higher rate than women. There are many potential causes for OSA although none have been clearly defined. There is strong evidence that OSA contributes to morbidity and mortality related to coexisting conditions. Some of the contributing factors or risk factors of OSA include the following:<sup>8,12,14</sup>

- Certain shapes of the palate or airway that cause the airway to be narrower or readily collapse
- Large tongue, tonsils, adenoids, or uvula
- Obesity BMI greater than 30
- Recessed chin
- A short lower jaw when compared to upper jaw (retrognathia)
- Large overbite
- Large neck size (17 inches or greater in males or 16 inches or greater in women)
- Smoking
- Age 40 or older
- Genetics
- Ethnicity ((African American, Pacific Islanders, and Hispanic)

Many of these risk factors are supported by the literature, although the mechanism of each is still not completely understood. Obesity contributes to OSA most likely because of the amount of fat surrounding the pharyngeal airway and men tend to have increased fat around the airway compared to women.<sup>13</sup> A clinical review was conducted looking at the relationship of obesity and sleep apnea and a key point made was that obesity is one of the strongest risk factors for sleep apnea.<sup>15</sup> The aging process can also lead to many sleep problems in this age group.<sup>16</sup> There has also been more evidence linking the role of genetics with OSA. It is very likely that a genetic portion of this exists because of the other conditions one may have inherited i.e. obesity, heart disease.

#### Pathophysiology

OSA is a common disorder that can have many mechanisms of physical dysfunction that contribute to the damage associated with it. OSA is best defined as repetitive narrowing or collapse of the pharyngeal airway during sleep.<sup>5,13</sup> This narrowing and collapse occurs for multiple reasons and is specific to the individual. The airway is made up of muscles and soft tissue with no bony support; this with a collapsible portion contribute to the possibility of obstruction.<sup>13</sup> The flow of air is delayed or trapped during breathing while a person is asleep.<sup>14</sup> A narrow airway will predispose an individual to OSA because this type of an airway is more susceptible to collapse.<sup>5,13</sup> The obstruction that results from this collapse results in a hypoxic and hypercapnic state which then leads to increased inspirations. During the ventilation, the PO<sub>2</sub> rises and PCO<sub>2</sub> falls to help resume sleep. This is the cycle that can continue over and over again in one night, hence the potential of hundreds of awakenings in a night.<sup>12</sup> This would explain why many individuals with undiagnosed OSA may appear tired throughout the day as they are

not achieving the full sleep cycle. Mental and physical health will decline as a result of this.

Long term complications that occur with OSA when left untreated include the following:<sup>14,17</sup>

- Sleep pattern disturbance
- Sleeping excessive amounts during the day
- High blood pressure
- Myocardial Infarction (MI)
- Congestive Heart Failure (CHF)
- Cardiac Arrhythmias
- Stroke
- Depression
- Erectile Dysfunction
- Increase in anxiety or depression

#### Screening & Assessment

All patients should be screened for snoring and excessive sleepiness.<sup>18</sup> Screening for OSA is also not as easy for certain individuals as it is more than just asking a simple question but rather a process of gathering a full sleep history.<sup>19</sup> A complete sleep history includes asking patients about snoring, if they have ever stopped breathing when they snore, and if they feel rested.<sup>3</sup> The symptoms that occur as a precursor to the diagnosis of sleep apnea are also something to be aware of. Many patients may not be aware that they have sleep apnea so picking up on the symptoms of OSA is key in proper diagnosis.<sup>6,14</sup> An important aspect here is inclusion of input from the spouse in the screening because they may be the one that is aware of possible snoring or other symptoms.<sup>16</sup> The symptoms can range from subtle to apparent so when interviewing the patient these are some questions to include:<sup>7,8,20</sup>

- Do you snore or has anyone ever told you that you snore with episodes of apnea?
- Do you feel rested when you wake for the day?
- Do you have difficulty concentrating?



- Have you had any feelings of depression?
- Do you feel that you are irritable?
- Have you have any signs of sexual dysfunction?
- Do you have difficulty with learning or memory?
- Do you fall asleep at work, on the phone, or while driving?

Patients that present with excessive daytime sleepiness should make you consider OSA as a potential diagnosis. Some of the daytime symptoms associated with this include morning headaches and falling asleep while doing activities such as at work or driving. There may also be concerns about feelings of restlessness at night, enuresis, impaired intellectual performance, decreased concentration, and memory loss.<sup>3,12,13</sup> It is important to exclude other sleep disorders when looking at the possibility of OSA (i.e. insomnia, narcolepsy, and insufficient sleep). Proper examination and measurement of the neck circumference and airway patency are important when OSA is suspected. Other pathologic reasons for symptoms such as sleepiness should be ruled out i.e. hypothyroidism or anemia.<sup>6</sup> There are many widely used screening tools for OSA that can help assist in diagnosis and proper referral (STOP Questionnaire, Epworth Sleepiness Scale). One common screening tool used in the primary care setting for measuring sleepiness is the Epworth Sleepiness Scale.<sup>2,3,6</sup> This tool allows patients to self assess their levels of sleepiness or likelihood of falling asleep during certain times or specific activities.<sup>2</sup> This is a validated questionnaire that consists of eight questions.<sup>3</sup> Table 1 demonstrates what the Epworth Sleepiness Scale looks like.

All patients that you suspect could have OSA should have a polysomnography ordered along with a referral to a sleep specialist if possible.<sup>6,20</sup> This will involve an overnight sleep evaluation in a designated sleep laboratory. There are individuals that may have sleep patterns

assessed at home utilizing a home oximetry monitor. Some of the many contraindications to having a home diagnostic sleep study include congestive heart failure, stroke, cor pulmonale, chronic obstructive pulmonary disease, and hypoventilation.<sup>18</sup> A polysomnography is a requirement for patients to have CPAP treatment covered by their insurance in the majority of cases.<sup>6</sup> Results from these diagnostic tools classify OSA into mild, moderate or severe OSA based on how many episodes of apnea occur in one hour of sleep.<sup>21</sup> This is referred to as the apnea-hypopnea index and this measures the frequency of reduced airflow that is occurring with the airway obstruction.<sup>22</sup> Table 2 illustrates the Apnea-Hypopnea Index (AHI). These results along with symptoms the patient is experiencing will guide appropriate treatment decisions.<sup>22</sup> The AHI results can have an impact on what treatment modalities will be covered by insurance so lifestyle changes are a treatment used for all patients.<sup>22</sup> Medicare will cover a CPAP with an AHI score of 5 or greater with at least one comorbid condition.

#### Treatment & Management

Traditionally patients with sleep disorders were referred to specialist sleep centers but there is recent evidence that with training and appropriate diagnostic tools comparable outcomes can be provided by primary care providers as well.<sup>23</sup> Treatment of OSA can range from lifestyle changes, continuous positive airway pressure (CPAP), mandibular advancement devices,<sup>18</sup> and surgical interventions.

Lifestyle changes are the first line treatment for all types of OSA, specifically when looking at associated co-morbidities. Lifestyle changes include weight loss,<sup>15</sup> avoiding alcohol and sedatives at bedtime,<sup>2,3,6,14</sup> sleeping in a more upright or side-lying position, use of nasal dilation,<sup>6</sup> and avoidance of caffeine.<sup>2,16</sup> There is focus on obesity prevention, which remains more cost effective than the actual costs that come with diagnosis and treatment of OSA.<sup>4,15</sup>



Achieving a healthy BMI (20-25) is the overall goal for these patients, although studies show that even some decrease in weight contributes to less time needed on CPAP.<sup>15,22</sup> An important part of healthy sleep is developing sleep hygiene,<sup>16</sup> which includes having a regular sleep-wake cycle,<sup>2</sup> and patients should work to create an environment conducive for sleeping and limit things such as television watching and reading in bed.<sup>2</sup>

Tonsillectomy does have its place in treatment of OSA specifically with improving nasal resistance, thereby improving compliance with CPAP.<sup>24</sup> CPAP does remain the "gold standard" for treatment of OSA.<sup>3,6</sup> CPAP is the utilization of a properly fitted facial or nasal device that delivers positive airway pressure.<sup>14</sup> A major barrier that exists with the use of CPAP is that of compliance which can be caused by many factors, to include improper fitting of the mask or nasal device and incorrect pressure delivery.<sup>6,7</sup> Because of the risk for noncompliance, it is crucial to provide follow up for these patients to include assessment of CPAP settings and the amount of time it is being used as well as calculating a new Epworth Sleepiness Scale score at each visit.<sup>7</sup> CPAP use during the first few weeks impacts long term compliance.<sup>6</sup> To help aid in compliance with the CPAP look for resources to help the patient such as support groups. A recent randomized control trial demonstrated that specific demographic factors such as race, ethnicity, and socioeconomic status may contribute to CPAP adherence.<sup>25</sup> Key points were made discussing the correlation of lower socioeconomic status and minorities and the decrease in medication compliance that contributes to a decrease in CPAP compliance.<sup>25</sup>

Some individuals may choose to have a mandibular or oral device placed. In this case it would be appropriate to consult with a dentist who is able to fit a patient for this. The oral devices are worn during the night and work to pull the tongue or mandible forward.<sup>7</sup> There is more research being done looking at the effects of pharmacotherapy (i.e. serotonergic agents,

REM suppressants, ventilator stimulants) along with CPAP use and its place in the treatment of OSA.<sup>17</sup>

Other surgical options include uvulopalatopharyncoplasty (UPPP) which is done to remove the uvula, tonsils, and part of the soft palate.<sup>3,14</sup> Surgical options are not as effective as CPAP with the exception of tonsillectomy/adenoidectomy in children.<sup>6</sup>

### Conclusion

The importance of screening for OSA and the need for guidelines is evident in the literature. Increasing the research in this area will likely support that screening can help to prevent OSA and thereby slow progression of related disease states. Many providers are aware of the importance of screening yet limitations remain with awareness of how common sleep disorders like OSA are.<sup>1</sup> The limited time spent with patients during visits also has an impact on completion of screening for OSA.<sup>1</sup> It is crucial that NPs understand the impact they have on diagnosing and treating patients at risk for OSA. Treating the co-morbid conditions will aid in prevention of OSA. It is imperative that we look at ways of preventing OSA and treating it appropriately. The prevalence may only increase as many of the co-morbid conditions increase in prevalence. This alone is enough to make one decide that screening for OSA is as important as obtaining a vital sign.

## Appendix

**Table 1 Epworth Sleepiness Scale**

Use the following scale to choose the most appropriate number for each situation

0=no chance of dozing or sleeping

1=slight chance of dozing or sleeping

2=moderate chance of dozing or sleeping

3=high chance of dozing or sleeping

**Situation****Chance of Dozing or Sleeping**

Sitting and reading

\_\_\_\_\_

Watching television

\_\_\_\_\_

Sitting inactive in a public place

\_\_\_\_\_

Being a passenger in a car for an hour or more

\_\_\_\_\_

Lying down in the afternoon to rest

\_\_\_\_\_

Sitting and talking to someone

\_\_\_\_\_

Sitting quietly after lunch

\_\_\_\_\_

Stopped for a few minutes in traffic while driving

\_\_\_\_\_

**Total Score (add the scores up)**

(This is your Epworth Scale)

\_\_\_\_\_

**Score Results**

1-6: You are getting enough sleep.

7-8: Your score is within the average range, however you tend to be sleepy

> or equal to 9: You are very sleepy and should see your primary healthcare provider or a sleep specialist as soon as possible

**Table 2.0 Apnea-hypopnea index**

AHI events per hour	OSA severity
0-4	Normal
5-14 + symptoms	Mild OSA
15-30	Moderate OSA
>30	Severe OSA

### References

1. Senthivel E, Auckley D, Dasarathy J. Evaluation of sleep disorders in the primary care setting: History taking compared to questionnaires. *Journal of Clinical Sleep Medicine* 2011;7(1):41-48.
2. Schwartz RL, Roth T, Hirshkowitz M, Wright KP. Recognition and management of excessive sleepiness in the primary care setting. *Prim Care Companion J Clin Psychiatry* 2009;11(5):197-204 doi:10.4088/PCC.07r00545
3. Lamm, J, Poeschel, J, Smith, S. Obtaining a thorough sleep history and routinely screening for obstructive sleep apnea. *Journal of American Academy of Nurse Practitioners* 2008;20:225-229 doi:10.1111/j.1745-7599.2008.00308.x
4. Bhattacharyya N, Kepnes, LJ. Ambulatory office visits and medical comorbidities associated with obstructive sleep apnea. *Otolaryngology-Head and Neck Surgery* 2012;147 volume 6 1154- 1157 doi: 10.1177/0194599812459850
5. Carlucci M, Smith M, Corbridge SJ. Poor sleep, hazardous breathing: An overview of obstructive sleep apnea. *Nurse Pract.* 2013 Mar 10; 38(3):20-8. doi: 10.1097/01.NPR.0000426409.62476.fa.
6. Culpepper L, Roth R. Recognizing and managing obstructive sleep apnea in primary care. *Prim Care Companion J Clin Psychiatry* 2009;11(6):330-338 doi:10.4088/PCC.08m00725
7. Krabill, SL. Obstructive sleep apnea. *Advance for Nurse Practitioners* 2006; 71-74.
8. American Sleep Apnea Association (ASAA). 2012. Retrieved from <http://www.sleepapnea.org/i-am-a-health-care-professional.html>



9. American Public Health Association Executive summary. Retrieved from  
[http://www.apha.org/NR/rdonlyres/8FA13774-AA47-43F2-838B-1B0757D111C6/0/APHA\\_PrevFundBrief\\_June2012.pdf](http://www.apha.org/NR/rdonlyres/8FA13774-AA47-43F2-838B-1B0757D111C6/0/APHA_PrevFundBrief_June2012.pdf)
10. Marcus L, Brooks LJ, Draper, KA, et al. Diagnosis and management of childhood obstructive sleep apnea syndrome. *Pediatrics: Official journal of the American Academy of Pediatrics (AAP)*. 2012 130 576-585 doi:10.1542/peds.2012-1671.  
 Retrieved from <http://pediatrics.aappublications.org/content/130/3/576.full.pdf+html>
11. Ward TM, Rankin S, Lee KA. Caring for children with sleep problems. *Journal of Pediatric Nursing* 2007;22(4):283-296. doi: 10.1016/j.pedn.2007.02.006
12. Dunphy LM, Winland-Brown JE, Proter, BO, Thomas DJ. Primary care: The art and science of advanced practice nursing. 3<sup>rd</sup> ed. Philadelphia, PA: F.A. Davis Company.
13. Eckert DL, Malhotra A. Pathophysiology of adult obstructive sleep apnea. *Proc Am Thorac Soc* 2008;5(2):144-153 doi 10.1513/pats.200707-114MG
14. A.D.A.M. Medical Encyclopedia. Obstructive sleep apnea. 2011. Retrieved from  
<http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001814/?report=printable>
15. Tuomilehto H, Seppa J, Uusitupa M. Obesity and obstructive sleep apnea-Clinical significance of weight loss. *Sleep Medicine Review* 2012;1-9.  
 doi:<http://dx.doi.org/10.1016/j.smr.2012.08.002>
16. Vance DE, Heaton K, Eaves Y, Fazeli PL. Sleep and cognition on everyday functioning in older adults: Implications for nursing practice and research. *Journal of Neuroscience Nursing* 2011;43(5):261-273. doi: 10.1097/JNN.ob013e318227etb2

17. Jayaraman G, Sharafkhaneh H, Hirshkowitz M, Sharafkhaneh A. Pharmacotherapy of obstructive sleep apnea. *Ther Adv in Respir Dis* 2008;2(6):375-386. doi: 10.1177/1753465808098225
18. Skjodt NM. Approach to outpatient management of adult sleep apnea. *Canadian Family Physician* 2008;54:1408-1412
19. Sorscher AJ. How is your sleep: A neglected topic for health care screening. *Journal of American Board of Family Medicine* 2008;21(2):141-148 doi: 10.3122/jabfm.2008.02.070167
20. Pang KP, Terris DJ. Screening for obstructive sleep apnea: An evidence-based analysis. *American Journal of Otolaryngology* 2006;27:112-118. doi: 10.1016/j.amjoto.2005.09.002
21. Ho ML, Brass SD. Obstructive Sleep Apnea. *Neurology International* 2011; 3:e15: 60-67.
22. Seetho IW, Wilding JPH. Screening for obstructive sleep apnoea in obesity and diabetes-potential for future approaches. *Eur J Clin Invest* 2013 Mar 27. doi: 10.1111/eci.12083
23. Chai-Coetzer CL, Antic NA, Rowland LS, et.al. Primary care vs specialist sleep center management of obstructive sleep apnea and daytime sleepiness and quality of life: A randomized trial. *JAMA* 2013;309(10):997-1004.
24. Stow NS, Sale PJ, Lee D, Joffe D, Gallagher RM. Simultaneous tonsillectomy and nasal surgery in adult obstructive sleep apnea: A pilot study. *Otolaryngology-Head and Neck Surgery* 2012;147(2):387-391 doi:10.177/0194599812444256
25. Billings ME, Auckley DA, Benca R, et al. Race and residential socioeconomic status as predictors of CPAP adherence. *Sleep* 2011;34(12):1653-1658.