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Identifying OSA Risk in the General Adult Primary Care Population

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A Capstone Scholarly Project

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Abstract

Purpose: The purpose of this project is to illustrate the need for the implementation of a novel screening tool for obstructive sleep apnea (OSA) in the primary care setting. *Background:* OSA has been associated with numerous comorbidities including hypertension, Diabetes Mellitus and stroke. Despite these associations, the condition continues to be widely underdiagnosed in the general adult population. *Methods:* Using the seven-step process outlined in the Knowledge to Action framework, a research translation project implementing the NAMES OSA screening tool in a community-based primary care setting was conducted. *Implications:* Implementation of a novel screening tool in the primary care setting consisting of patient history, symptoms and physical exam findings in the form of a paper questionnaire may increase the detection rate of OSA. *Conclusions:* The implementation of the NAMES2 assessment tool resulted in increased awareness of OSA risk presentation as evidenced by a 5% increase in OSA screening rates in the involved primary care practice site. Consequently, increased detection of OSA risk in the adult primary care setting can potentially increase treatment in those affected with this condition thereby decreasing the incidence of existing or developing comorbidities in this population.

Keywords: obstructive sleep apnea, undiagnosed obstructive sleep apnea, untreated obstructive sleep apnea, obstructive sleep apnea comorbidities, obstructive sleep apnea screening tools.

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Introduction and Background

In 2010, it was determined that more than 12 million American adults have obstructive sleep apnea (OSA) with most underdiagnosed and untreated (National Institutes of Health [NIH], 2010). Aside from causing daytime sleepiness, untreated OSA can be the cause of neurocognitive dysfunction, motor vehicle accidents, cardiovascular disease, reduced quality of life and consequently, increased healthcare use (Hwang et al., 2009). For the purpose of this paper, cardiovascular consequences of untreated OSA will be the focus.

A recent study conducted by Gami et al. (2013) has discovered a significant correlation between OSA and sudden cardiac death (SCD). Of 10, 701 adult subjects over the age of 18 who have previously been referred for sleep studies, 142 of them experienced resuscitated or fatal SCD during an average follow-up of 5.3 years (Gami et al., 2013). This translates to an annual occurrence rate of 0.27%. In a press release by the NIH (2010), it is reported that even mild sleep apnea can double the risk of stroke in men over the age of 40 and moderate to severe sleep apnea can leave men of the same age group nearly three times as likely of experiencing stroke. An increased risk of stroke was also found in women, though the incidence was less than that found in men, and mainly associated with more severe forms of sleep apnea (NIH, 2010). “The magnitude of risk that untreated OSA poses for stroke patients surpasses that due to conventional risk factors such as smoking and hypertension” (Srijithesh et al., 2011, p. 340).

In addition to being male, the National Heart, Lung, and Blood Institute [NHLBI] (2012) further identifies those at risk to be overweight. Because of the current obesity epidemic in Western populations, it is predicted that the scope of sleep apnea and its associated complications are going to increase (Mayo Clinic, 2013). Subramanian, Hesselbacher, Aguilar &

Surani (2011) state that despite the importance of recognizing and treating OSA, it remains underdiagnosed.

Problem Statement

Yang and Chung (2013) state that OSA may affect anywhere from 2% to 26% of the population with further estimation that 82% of men and 92% of women with moderate to severe OSA have not been diagnosed. Taking into account the inability to accurately estimate the affected population as seen in the aforementioned percentages, Yang and Chung (2013) go on to emphasize the necessity of a screening tool as a means of ascertaining patients at high risk for OSA who are in need of polysomnography (PSG). Subramanian et al. (2011) concur with these sentiments in their recommendation of introducing a screening tool in the primary care setting which they believe may prove to be useful in increasing detection and incidence of OSA diagnosis. Improved detection increases the rate of OSA treatment, thereby resulting in a risk reduction of the discussed cardiovascular complications.

Objectives and Aims

The aim of this project was to increase the rate of OSA screening in the adult primary care setting. The objective that supported this aim was to implement a novel, sensitive screening tool.

Review of the Literature

Upon completion of a comprehensive literature search regarding OSA and existing screening methods, six studies were selected for the purpose of this literature review. Inclusion criteria for these studies consisted of those that were conducted between 2009 and 2014. Additionally, only peer-reviewed articles written in the English language were considered. Based

on the evidence found, three commonly used OSA screening tools were identified in addition to a newly proposed tool.

Developed in 1996, the Berlin Questionnaire (BQ) is a tool utilized for identifying patients at risk for OSA in various settings. The questionnaire itself consists of three categories including snoring, wake-time sleepiness and presence of obesity or hypertension. In a study conducted by Kang et al. (2013), the usefulness of the BQ in identifying high-risk individuals in the general population was evaluated. In this door-to-door cross-sectional study, a random sampling of 1484 subjects between the ages of 20 and 69 from 824 different Korean households were interviewed utilizing the BQ. Of these 1484, 1305 subjects were selected for study participation and re-tested with the same questionnaire 2-3 weeks later. From the 1305, 140 participants were asked to undergo PSG based on their positive BQ assessment. Overnight PSG was eventually performed on 101 of these 140 subjects to validate the BQ results. Individuals grouped into a high risk level for OSA based on BQ evaluation showed a ≥ 5 apnea-hypopnea index (AHI) predictability with a sensitivity of 69% and a specificity of 83%. Because of the BQ's success, convenience and low cost, the study does suggest its utilization in targeting the general population for identification of high-risk OSA individuals. Study limitations include sampling of a relatively young population and failure to identify a reasonable method for implementation.

In a randomized controlled trial, Hwang et al. (2009) chose to implement the BQ in the form of an email to 4700 members of an Internet weight-loss community, who had never been diagnosed with OSA in the past. The desired outcome was to instigate a discussion about OSA between identified at risk subjects and a healthcare provider within 12 weeks of the intervention. Of the 4700, 168 were equally divided and randomized into 2 groups, an intervention group and

a control group. Those in the intervention group were asked to complete the BQ and provided with feedback within 2-5 weeks of completion, encouraging a discussion with their healthcare provider about OSA testing if they demonstrated a positive evaluation. Those in the control group did not receive the BQ or any other form of intervention. Results showed that intervention subjects were more likely than control subjects to discuss OSA with their healthcare provider within 12 weeks ($P = .02$). The authors confirm the feasibility and low-cost of this online intervention suggesting that it may be a potential method in which to provoke online weight-loss community members to seek out further OSA testing. A limitation to this proposed screening method would be assurance that said email would be opened.

Sforza et al. (2011) evaluated effectiveness of OSA diagnosis amongst the elderly population by examining 643 healthy participants over 65.6 years of age via BQ and subsequent sleep study. The BQ category results demonstrated 54% reporting habitual snoring, 12% reporting daytime sleepiness and 42.1% having a BMI >30. These statistics illustrate that sleepiness is less likely to be a determining factor for OSA prediction. When compared to sleep study results, the BQ showed a sensitivity of 77% and a specificity of 39% in predicting an AHI > 15 with an overall correct classification of 61% of the population. Conclusively, the study categorizes the BQ as having a moderate level of accuracy, insufficient for identifying elderly subjects with OSA in the general population.

It is well known that excessive daytime sleepiness (EDS) has been associated with OSA. The Epworth Sleepiness Scale (ESS) is a widely used tool in the assessment of daytime sleepiness. In a cross-sectional observational study conducted by Onen et al. (2013), the limits of the Epworth Sleepiness Scale among adults over the age of 65 are explored. In the study, 104 independently living non-demented older adults complaining of daytime sleepiness were asked

to complete the ESS. Results showed that nearly 60% of subjects were not able to answer all of the ESS items thereby potentially underestimating sleepiness severity in this population. In fact, of the subject complaining of EDS, only 24% demonstrated an abnormal ESS score. Though commonly used as such, the ESS was not originally designed for OSA screening and furthermore, the scale is highly dependent on accurate patient recall (Vana, Silva, & Goldberg, 2013).

The STOP-Bang OSA screening tool incorporates eight risk factors into its questionnaire. These factors include *S*noring, *T*iredness, *O*bserved apneas, blood *P*ressure, *B*ody mass index > 35, *A*ge > 50, *N*eck circumference > 40 cm and male *G*ender (Vana et al., 2013). Lakdawala (2011) examines the effectiveness of the STOP-Bang Model in a study conducted amongst surgical patients. After a one month pilot involving 143 preoperative patients, 17% were identified as high risk for OSA in comparison to only 3% in the preceding month, representing a 14% increase in OSA risk identification. Of this population, over 80% were unaware of their OSA potential. Additionally, among these patients no respiratory or cardiac arrest, near arrest or naloxone use occurred. As a result of the study, the risk management department of the involved hospital implemented the use of STOP-Bang for all of its surgical patients.

In the study by Subramanian et al. (2011), a cross-sectional design is followed in which a data collection instrument in the form of the NAMES assessment tool was implemented in 659 subjects who had at some point been referred to a particular sleep center. The tool incorporates historical components such as comorbidities, ESS, snoring, and gender with physical exam findings such as neck circumference, modified Friedman grade and BMI. Results showed a high sleep study respiratory disturbance index (RDI) correlation with a $P < 0.0001$. A sensitivity of 85% and specificity of 42% were also reported.

In summary of the existing literature, trends among the screening tools indicate that OSA screening tools that incorporate physical exam findings such as neck circumference and BMI yielded greater statistically significant results. In fact, when combined with BMI, age, neck circumference and gender (Bang), the STOP questionnaire sensitivities increased to 79.5% to 100% (Lakdawala, 2011). Comparatively, the NAMES assessment, which incorporated similar physical characteristics showed higher specificity and sensitivity than that shown by the BQ in older adults. In agreement with Sforza et al. (2011), this comparison would suggest that sleepiness alone would not be a good predictor of OSA thereby eliminating ESS as a reliable screening method. A common gap shared by all of the studies includes their lack of implementation in primary care. Considering that such a diagnostic tool should be used as a means of screening and prevention, future study recommendations are to focus implementation of a screening tool incorporating physical exam findings as well as symptoms in primary care practice settings (Subramanian et al., 2011).

In making a decision regarding which diagnostic tool to utilize for the purpose of this capstone project and its implementation into the primary care setting, all of the aforementioned information was taken into account. Based on evidence found in the literature that demonstrates increased detection rates when physical exam features were integrated into OSA screening, the NAMES assessment tool was chosen. Though the STOP-Bang screening method showed similar qualities, the NAMES tool displayed greater primary care appropriateness, whereas the STOP-Bang method has to this point, only been utilized in the perioperative setting. Additionally, the NAMES tool goes one step further than the STOP-Bang by incorporating a patient's past medical history into the collection data. It was therefore determined that this would be the most

appropriate tool for the project as it provides the most detailed picture of the patient's potential OSA status.

Theoretical Framework

The theoretical framework identified for the implementation of OSA screening in the selected primary care setting was that of the Knowledge to Action (KTA) model. The KTA model is a research translation process consisting of seven phases (Graham et al., 2006). According to Graham et al. (2006), the phases are as follows:

1. Identify a problem that needs addressing and select the knowledge or research relevant to the problem.
2. Adapt the identified knowledge to the local context.
3. Assess barriers to using the knowledge.
4. Select, tailor, and implement interventions that promote the use of this knowledge.
5. Monitor knowledge use.
6. Evaluate outcomes of knowledge use.
7. Sustain ongoing knowledge use.

Though there is much knowledge amongst clinicians regarding the possible complications associated with OSA, the condition continues to be underdiagnosed (Subramanian et al., 2011). The KTA model facilitated the conversion of this knowledge into action. In this instance, the action constituted implementation of an effective OSA screening tool in the primary care setting. Implementing the seven phases in the KTA cycle began with the identification of a problem that needs to be addressed. Here, that problem was the underdiagnosis of OSA. In the next phase, the knowledge was adapted to local context, as it was introduced into the primary

care setting. In phase 3, barriers to knowledge use were assessed. Barriers in OSA knowledge use here derived from practitioners and their compliance with its use. Phase 4 requires the selection of an intervention and its implementation in order to promote the use of this knowledge. This intervention was the implementation of a screening tool, in the form of a questionnaire utilized by the primary care provider, to identify potential OSA sufferers. Monitoring knowledge use occurred in phase 5. This step ensured that the tool was being sufficiently distributed to the targeted population. In phase 6, the outcomes of knowledge use were evaluated. This entailed evaluation of results such as how many subjects were identified as being at an increased risk for OSA as a result of the screening tool's use. Finally, phase 7 calls for sustenance of the knowledge use which would mean adoption of the OSA screening tool by the provider into the annual exam routine.

Methods

I. Identify the Problem

In accordance with the proposed theoretical framework, method implementation began with identification of a problem which needed to be addressed, in addition to the discovery of literature which supports this problem. The preceding segments have successfully fulfilled both of these initial steps. By means of the literature review, it has been determined that the problem at hand is the lack of an effective, sensitive OSA screening tool that allows for an increase in OSA detection in the primary care setting.

II. Adapt Knowledge to Local Context

The intervention was introduced within a primary care office setting in Revere, Massachusetts. Revere is a city with an estimated population of 53,179 residents (United States Census Bureau, 2014). The predominant race is white, making up 74.1% of the population total.

Hispanic residents are the second largest part of population at 24.4% followed by Asian at 5.6%, Black or African American at 4.9%, and American Indian and Alaska Native at 0.4%. (United States Census Bureau, 2014). Native Hawaiian or other Pacific Islander population is very close to zero. Persons over the age of 65 comprise 14.5% of the population and gender division is nearly equal as the female population is reported by the United States Census Bureau (2014) at 51%. Patients seen within this urban community primary care setting are both male and female adult patients of various ethnicities, with the majority being white Caucasian. According to practitioner feedback, there were no known cases of transgendered patients within this practice setting at the time in which this project was conducted.

The patient population in this clinical setting is not limited to its housing city but instead, is composed of residents from several surrounding cities as well. These cities possess demographic attributes comparable to those reported for Revere and include Chelsea, Everett, Lynn, Malden and Saugus. Many patients seen are complex in nature, possessing numerous comorbidities including obesity, HTN and DM. It is noteworthy that the preceding paragraphs have determined that obesity has been identified as a risk factor for OSA, according to the NHLBI (2012). Additionally, numerous studies have tied OSA to Diabetes Mellitus and various forms of cardiovascular disease, including hypertension (Vana et al., 2013). In identifying an appropriate study setting, these patient characteristics were sought out and considered as determining factors for setting selection.

The sample consisted of patient subjects limited to those over the age of 40, as the highest risk for OSA is seen within this patient population (American Sleep Apnea Association, 2013). In an effort to adapt the identified knowledge to the local context, sixty patient charts were audited. In order for the auditing process to be without study conductor bias, patient chart

selection was randomized. The randomization technique utilized consisted of selecting the first ten patients of a given clinical day for audit, over the course of six days. This six day timeframe was determined by the DNP student and mentoring physician to begin three weeks prior to the NAMES2 implementation date of February 17, 2015. Within this auditing process, patient gender, BMI, comorbidities and previously reported symptoms consistent with OSA were recorded. Any history of sleep study referral or confirmed diagnosis of OSA was also documented. In addition to providing a baseline for the current state of OSA screening processes in this practice setting, this step also served as a confirmation of suitability of the proposed screening tool within this population.

III. Barriers to Using the Knowledge

Prior to screening tool implementation, barriers to knowledge use in this particular setting predominantly included the lack of any OSA screening tool adoption. Additionally, referral for polysomnography only occurred under two circumstances: 1) if a patient's loved one voiced any concern of the patient's amplified snoring or 2) if the patient reported excessive daytime sleepiness. Though both of these are considered symptoms of OSA, they are likely only reported if the patient has a sleeping partner or if the patient perceives their daytime sleepiness to be excessive or problematic. As this data is highly subjective, improved diagnosis was determined to warrant implementation of an objective component to OSA assessment, similarly to that of routine history and physical examinations. Selection of an appropriate intervention for implementation took the need for the incorporation of that objective component into account. Meeting these criteria, the NAMES screening tool was selected as the screening tool of choice for the intervention. In the following paragraphs, implementation methods and design are discussed in further detail.

IV. The Intervention

An evidence based program in the form of the NAMES screening tool was implemented and evaluated. The NAMES screening tool incorporates past medical history, current symptoms, and physical exam into a single risk assessment for OSA (Subramanian et al., 2011). To this point, the NAMES assessment has only been implemented to a population of patients who had been formerly referred to a community sleep center with suspected OSA. For the purpose of this capstone project, the NAMES assessment was introduced to the history and physical exam portion of the primary care visit as recommended by Subramanian et al. (2011) at the conclusion of their study.

A data collection sheet depicted in Appendix A, was made available in the form of a paper document, to the acting stakeholders who are the primary care providers associated with the selected primary care setting. Patient gender and BMI, which was later added to form a NAMES2 assessment, were also added to the data collection tool offered. The assessment was incorporated into a routine history and physical, at which time the data was collected. Upon completion of the assessment, a notation was made to the tool indicating whether or not sleep study referral was warranted. Prior to implementation, information demonstrating the need for this intervention as well as instruction on the screening tool's usage was provided to the primary care providers by the DNP student in the form of an in-service. Please refer to the Capstone Intervention Protocol depicted in Appendix B for a detailed step-by-step process of the performed intervention.

V. Monitoring

Monitoring of the screening tool's utilization was conducted by the DNP student. This was conducted by means of comparing the day's scheduled patients to the number of completed

assessments received. Lack of participation resulted in staff re-education and reminders. Completed screening tools were routinely reviewed for accuracy of completion and correct use. Measurable outcomes were defined by an increase in the percentage of patients screened for OSA in this practice setting.

VI. Evaluation

The plan for data collection was by means of paper documentation in which the assessment tool described was completed by the primary care provider and referral made if warranted. This data was then entered into an Excel spreadsheet by the DNP student. Columns designated to each risk factor were created and reflected each individual patient's status. The final column notated whether or not an OSA risk was observed. Cutoff values for the results collected were evaluated as they were in the original NAMES assessment study in which they were based on established literature. For example, a neck circumference $\geq$ 16 cm in females and $\geq$ 17 cm in males was allotted a positive value in the form of 1 point (Subramanian et al., 2011). A score totaling $\geq$ 4 points was considered a positive assessment signifying an increased risk for OSA, thereby warranting sleep study referral (see Appendix C). This helped determine any changes in OSA screening rates upon final analysis. At study conclusion, another sixty patient charts were reviewed. The percentage of patients screened for OSA after screening tool implementation was noted. These percentages were compared to the percentage of patients screened for OSA prior to implementation of the NAMES2 assessment tool. An increase in this percentage was indicative of an increase in OSA screening of the adult patient population amongst the involved primary care providers in this practice setting.

VII. Sustaining Ongoing Assessment

Sustaining ongoing screening tool use is hoped to be achieved via the presentation of implementation outcomes. These outcomes are defined by assessment findings which resulted in an increased rate of sleep study referral. This number was compared to the number of sleep study referrals noted by the setting's primary care providers within the initial sixty patient chart review. Any increase in the identification of risk factors with subsequent sleep study referral produced by this assessment tool is the evidence that was sought after for the purpose of sustaining knowledge use in this primary care clinical setting. The intent is that, once presented in a formal report to the involved practitioners, the collected data provide enough evidence to support the need for the screening tool's continued use. An increase in sleep study referrals would be indicative of increased screening rates for OSA, potentially resulting in an increase of OSA treatment and reduction in comorbidities.

Protection of Human Subjects

Because this is a site specific research translation project, results would not be generalizable thus an IRB was not required. The goal was to implement an evidence-based screening tool in this setting as part of the usual plan of care. Though the project involved human subjects, there was no risk to the subjects. Subject identity was protected as patient names were not revealed within the assessment tool, nor were they required for project evaluation.

Budget

The NAMES2 screening tool was submitted to an office supply company for copying purposes. The clinical setting was supplied with 500 total copies of the assessment tool upon program initiation. Supply stock and any needed replenishment were provided by the DNP student. DNP student time and primary care physician time requirements were calculated and

factored into implementation cost. A primary care physician in the selected facility typically has three clinical days each week and conducts approximately sixty patient visits within this timeframe. Dividing the workload equally between the physician and DNP, this resulted in thirty patients per week each. The completion time for the NAMES2 assessment form was estimated to be five minutes. Five minutes spent on a total of thirty patients resulted in an implementation time of 2.5 hours per week for each clinician. Multiplying 2.5 hours a week over a total of six weeks resulted in a complete implementation time of 15 hours per provider. After factoring in all of the aforementioned information, the total cost for capstone implementation was determined to be $9,177. A complete breakdown of this total is provided in Appendix D. Physician time was donated at no additional cost. All additional funding for creation, dissemination, and evaluation of the program was provided by the DNP student.

Numerous direct and indirect medical costs are associated with OSA. These costs are related to the disease itself, comorbidities, traffic accidents, industrial accidents, loss of productivity and absenteeism (Perraudin, Le Vaillant, & Pelletier-Fleury, 2013). A study by AlGhanim, Comondore, Fleetham, Marra, & Ayas (2008) revealed that patients with OSA consumed 1.7 times more healthcare resources than control subjects matched by age, gender, area of residence, and family physician. It was in fact approximated that these patients accumulated an annual health maintenance cost of $948 per year in comparison to $571 for those unaffected. These findings provide supportive evidence for the cost-benefit associated with the implementation of this capstone project.

Timeline

The timeline for the program's implementation began in January 2015. At that time, creation of the assessment tool was finalized and copies needed in preparation for dissemination

were obtained. Beginning on February 17, 2015, the assessment tool implementation was initiated and took place over the course of six consecutive weeks. Immediately after program completion on March 31, 2015, results were analyzed. In the subsequent paragraphs, these results are discussed in greater detail.

Results

Prior to the implementation of the NAMES2 OSA screening tool in the selected adult primary care practice setting, sixty patient charts were reviewed as described in the methods section of this paper. The primary purpose of this review was to confirm the suitability of the proposed screening tool by means of identifying an abundance of OSA risk factors within the selected patient population. Findings revealed that 48.3% of the sixty audited patients had a BMI $\geq$ 30 and 93.3% had at least one comorbidity. These results did indeed confirm patient population appropriateness. The secondary purpose of the chart review was to establish a baseline for the practice's current state of OSA screening processes. Within the sixty patient chart review, 4 patients (6.6%) were noted to have a confirmed diagnosis of OSA by PSG and 6 patients (10%) were suspected to have OSA due to reports of sleep disturbance in the form of loud snoring. A completed formal OSA screening tool was not found in any of the sixty patient charts reviewed. It was confirmed within this initial review that in this practice setting, OSA risk identification was strictly based on patient symptom reports. No form of OSA screening tool had been consistently utilized or adopted by the practice group.

The next step addressed staff education needs by conduction of an informational in-service. Nine staff members from the selected primary care setting were in-serviced, 4 of which were primary care physicians, 2 residents, 1 nurse manager, and 2 medical assistants. Though not performing any of the OSA screening, it was felt by the mentoring physician that medical

assistants be included in the training. The purpose for this was that the medical assistants would obtain patient permission for study participation when preparing the patient for the primary care provider's visit. Having been in-serviced, it was believed that this would allow them to better speak to the study subject matter. In-service content included an OSA background which spoke to such facts as how OSA can be contributory to hypertension, Diabetes Mellitus, stroke, motor vehicle accidents, reduced quality of life, and ultimately increased health care costs. Furthermore, the background content also discussed projected prevalence amongst the American adult population in addition to how the current literature continues to demonstrate that the condition is underdiagnosed and consequently vastly untreated. Having identified OSA underdiagnosis and its lack of treatment as the problem, the proposal to implement a novel screening tool to help increase detection rates in the primary care setting was presented.

A synopsis of the screening tools which are currently available was given, as was the reasoning behind the selection of the NAMES2 method. The NAMES2 screening method was then discussed in detail and a sample tool was distributed. Information regarding the implementation process and its expected timeframe was provided. Finally, outcome evaluation methods were discussed. The in-service was then concluded with the provision of the project rationale which was defined by an increased detection rate of OSA in the adult primary care setting in order increase OSA treatment rates in those affected. The hope that this would consequently decrease the incidence of existing or developing comorbidities in this population was conveyed to the audience.

An interest in the topic was evident amongst the involved staff members and observable through questions presented with subsequent periods of discussion. Knowledge deficits regarding OSA were noted particularly when prevalence was discussed. Staff members

expressed both verbal and non-verbal expressions of astonishment when they learned that the NIH (2010) reported that more than 12 million Americans are affected. Similar expressions were witnessed when the group became aware that OSA can double or even triple the risk of stroke in men over 40 years of age, depending on the severity of their condition. It was evident that this educational intervention was successful in raising the level of OSA awareness in this professional practice group. This increase in awareness was pivotal in capturing stakeholder interest with ensuing agreement to the participation of this practice setting for the proposed capstone project.

One week after in-servicing, the implementation process began. Arriving 30 minutes prior to the commencement of patient visits on roll-out day 1, the DNP student met with the office's nurse manager and medical assistants to discuss last minute details pertaining to roll-out processes. As the mentoring physician had recommended, patient permission for study participation was obtained by the medical assistant when accompanying the patient into the exam room and preparing them for the primary care provider's visit. If permission was granted by the patient, the medical assistant would then attach a copy of the NAMES2 form to the face sheet of each patient's chart. The face sheet with the screening tool attached is what was then placed in the bin outside of each exam room and reviewed by the primary care provider prior to their entrance. A supply of NAMES2 screening tool copies were placed in a centralized location within the office, easily accessible to the involved medical assistants. In total sixty-seven patients were asked by the medical assistants to participate in the trial. The end result was seven declinations and sixty acceptances.

Within the exam room, each primary care provider conducted the NAMES2 assessment during the patient visit. In the review of systems portion, data was obtained relating to any

current OSA symptoms the patient may be experiencing such as snoring or daytime sleepiness. Their daytime sleepiness levels were evaluated at this time via the use of the ESS. An ESS score $\geq$ 11 was allotted 1 point on the NAMES2, as was a report of loud snoring. Information related to comorbidities was obtained within the patient's past medical history, allotting 1 point for each patient that possessed either 1 or more comorbidities such as hypertension, diabetes, heart disease, and/or prior stroke. Finally, it was within the physical exam portion that the provider would assess the patient's modified Friedman score and neck circumference. A positive OSA risk finding was demarcated with a plus sign in the upper right hand corner of the form. The patient was then informed of the result of the screening. Patients with positive findings were informed that they could potentially be at higher risk for the presence of OSA and subsequently a sleep study was recommended. Completed screening tools were accompanied with the patient to the receptionist's desk where the administrative assistant would then place them within a designated collection bin to later be collected by the DNP student.

Monitoring by the DNP student was conducted by counting the scheduled patients of a given clinical day and comparing that number to the amount of completed screening tools collected. The majority of missed patients were identified to be due to the fact that the assigned medical assistants would sometimes fail to remember screening tool inclusion. Reminders to incorporate this into the patient preparation process were given and it was suggested by the medical assistants that perhaps a supply of the forms be kept on their respective desks to serve as reminders. This modification was addressed and facilitated by the DNP student. During the monitoring phases of this intervention, the DNP student had discovered that the usage rate of the NAMES2 screening tool was highest when the student was present to encourage its use. As a strategy to increase usage, a sixty NAMES2 screening tool completion goal was created by the

DNP student. This was conveyed to the involved staff members and updates to target attainment were provided weekly. The rationale behind the sixty NAMES2 completion mark given to the participating primary care providers was that it would take at least this amount of completed tools to allow for adequate comparison between the tested population and the population within the initial sixty patient chart review. As a realization that the presentation of results depended heavily on obtaining a sufficient amount of completed screening tools was elicited, motivation for its usage increased. This was evidenced by questions posed to the DNP student by the staff members, asking whether or not the practice had yet reached their set goal.

At the conclusion of the project implementation timeframe, exactly sixty completed NAMES2 assessment tools were collected with trial participation from four primary care providers. The data collected within these completed forms was then analyzed by the DNP student. An Excel spreadsheet was created designating each of the seven columns to the seven components within the NAMES2 screening tool. A final eighth column was added in which OSA risk was noted as either “yes” or “no”. This spreadsheet served to house all of the collected data in one easily visualized place to allow for facilitated data analysis. In the following paragraphs, the results that were able to be extrapolated from this collected data are discussed.

With OSA screening now being based on the triad of past medical history, patient symptoms and physical exam, results showed that 34 of the 60 patients screened (56.6%) were suspected to be at risk for OSA. Combining those found to have a confirmed OSA diagnosis with those suspected to have OSA in the initial review, this revealed a 40% risk identification and sleep study referral increase within sample populations of similar medical demographics (see Appendix E). Immediately after the six week implementation period, a second sixty patient chart audit was conducted using the same randomization technique that was utilized in the initial sixty

patient audit. The purpose of this was to determine how many patients within that sample had been screened for OSA utilizing the NAMES2 tool. The percentage of patients screened post-implementation was compared to the percentage screened pre-implementation. Within this sixty chart audit, 3 correctly completed NAMES2 OSA assessment tools were found. This revealed a 5% increase in OSA screening rates when compared to the initial sixty chart audit in which zero completed screening tools were observed.

For the purpose of sustaining screening tool usage, the following results were also analyzed and will be presented to the practice group as evidence which supports the need for ongoing screening. Of the 34 patients that had a positive screening for OSA according to the NAMES2 assessment tool, 7 of them were discovered to have a confirmed past medical history of OSA. One hundred percent of these 7 patients had a positive NAMES2 assessment. Comparatively, a past medical history of OSA was not found in any patient record in which the NAMES2 screening tool demonstrated a negative result. While the NAMES2 demonstrated a 100% detection rate in the OSA confirmed group, it should also be of note that only 3 (42.8%) of the 7 confirmed OSA patients would have tested positive had the ESS alone been employed. The ability for this number to be obtained is entirely due to the fact that the “daytime sleepiness” component of the NAMES2 is derived from the patient’s ESS score. This result clearly demonstrated NAMES2 superiority over the traditional ESS method, which is commonly utilized in a variety of primary care settings.

Though an overall OSA screening increase was noted, it can also be said that a 5% increase is hardly indicative of knowledge use sustenance. It was suspected that the reason for this present, yet minimal evidence of post-implementation participation was due to the fact that the DNP student was no longer on site to reinforce consistent usage of the NAMES2 tool. In

retrospect, the sixty patient goal may also have been detrimental as providers likely felt that once the goal was reached, objectives had been met. Further inquiry by the DNP student uncovered another potential reason for the lack of continued NAMES2 usage. In an investigational conversation with the mentoring physician, it was conveyed that validation of the NAMES2 tool results would be vital in providing the tool the credibility it needs for assimilation into practice. It was felt that this would be highly instrumental in allowing for sustained usage amongst the clinic's primary care providers.

In an effort to achieve validation and consequent sustenance in tool usage, it was suggested by the mentoring physician that a second phase to this project be initiated. In this phase, each patient identified to have an increased risk of OSA based on NAMES2 findings would be revisited. Within this follow-up visit, the NAMES2 findings would be discussed in greater detail with the patient as would be the risks posed by untreated OSA. Polysomnography referral would then be recommended. Results of PSG testing are to be gathered and a subsequent comparison between the number of patients with a positive OSA diagnosis according to PSG to the number of patients who tested positive for OSA risk according to NAMES2 is to be conducted. According to the mentoring physician, the result being sought after on behalf of the NAMES2 is that of a high percentage of true positive findings. Final analysis with comparison data and reports of PSG findings for each of the patients in the study population is to be provided to the staff of the involved practice setting. Pending results that support the NAMES2 as an accurate measure of OSA risk, the mentoring physician, who is also the site's medical director, feels that this would be sufficient evidence to mandate NAMES2 screening tool usage. This has been requested by the mentoring physician to be a post-graduate collaboration between the DNP

student and the practice's resident physicians. This was agreed upon by all parties and a tentative initiation date of May 2015 was identified.

Discussion

Current literature shows that a correlation between OSA and comorbidities such as hypertension, Diabetes Mellitus and obesity exists. Herrscher, Overland, Sandvik, Westheim, and Akre (2014) found that among patients who had been diagnosed with OSA but previously undiagnosed with hypertension, only 11% demonstrated normal blood pressures. Cass, Alonso, Islam, and Weller (2013) examined the potential presence of OSA in 296 adults with type 2 Diabetes Mellitus and found an approximate 50% prevalence rate of OSA within the population of diabetic patients studied. Though it affects both genders, OSA is most common in males, affecting up to 24% of men and 9% of women (Kendzerska et al., 2014). In addition to being male, the NHLBI (2012) states that those at risk also tend to be overweight. The gender chart depicted in Appendix F and the patient characteristic chart depicted in Appendix G illustrate these patient characteristics and the frequency in which they occurred in the NAMES2 positive population. Results clearly demonstrated an increased incidence in men, just as the literature suggests. Additionally, the incidence of obesity in this population is 58.8% and the presence of comorbidities is staggering at 91.1%. These charts show that the characteristics illustrated by the NAMES2 positive assessment findings support the patient profile described in existing OSA literature.

Barriers to ongoing screening tool implementation in the adult primary care practice setting must be examined, as it was noted in the preceding paragraphs that the rate of screening tool use decreased after the implementation timeframe. According to primary care provider feedback, it was believed that this is likely due to the need for the NAMES2 screening tool to

gain credibility in the primary care practice setting through validation. Measures in the form of post-graduate work to address this potential barrier have been put into place. Other identified barriers may also include screening tool accessibility and cost for integration, particularly related to primary care provider time. In terms of accessibility, incorporation of the NAMES2 into the electronic medical record (EMR) may be an option worth exploring. Because the NAMES2 is designed to identify patients with atypical OSA presentation, it would not likely be possible to send the provider an alert reminder strictly based on the presence of obesity or daytime sleepiness. The tool is meant to be utilized on each patient within the adult primary practice setting as a component of their annual physical exam. Perhaps a portion of the EMR can consist of a section that asks the provider if the patient has been screened for OSA. If not, a link can be provided connecting the provider to an electronic form of the NAMES2 assessment. These are suggestions that would be subject to ongoing improvement and refinement as integration of the screening process becomes accepted into primary care. Feedback from various users can assist in tailoring the OSA screening process to meet the needs of the individual practice setting.

With cost being identified as another potential barrier, methods to streamline screening time should be explored. Streamlined screening should seek to decrease the use of provider time in order to result in an overall decrease in cost of implementation. It was discussed in the previous portions of this paper that the ESS is a component of the NAMES2 screening tool. It was suggested by a provider at the site of project implementation that the NAMES2 screening tool initially be completed without filling out the ESS. If the patient still scores 4 out of 7 points on the NAMES2 tool without having been evaluated for daytime sleepiness, the ESS component no longer becomes a factor as the score requirement for a positive OSA risk determination has been satisfied. Another possibility would be to have the patient fill out the ESS questionnaire

prior to their visit while they wait to be seen, either in the waiting room or the exam room setting. Each of the two methods would consequently result in a 2 minute decrease in screening time if the task of ESS completion is removed from the provider. Completion of the ESS with the medical assistant could also be considered though it should be noted that this option would incur a decreased, yet still present cost. The aforementioned suggestions to help overcome the barriers identified may facilitate sustained implementation and should be considered in any future work in this area.

Plan for Dissemination of Results

The DNP student's plan for dissemination of results includes posting of this document into the University of Massachusetts, Amherst ScholarsWorks digital repository of research and scholarly projects. Other dissemination plans include incorporation of the NAMES2 screening process into the professional practice regimen of the DNP student upon graduation and independent practice as an FNP. Further, the screening process will then be introduced by the DNP to her primary care provider colleagues at the site in which independent practice is set to take place. Sustenance of NAMES2 usage within the project site is hoped to be achieved via the presentation of the aforementioned results as discussed in the paragraphs above.

Conclusions

Surmounting evidence continues to link OSA to many public health concerns including obesity, diabetes, depression, cardiovascular disease and accidents (Leger, Bayon, Laaban, & Philip, 2012). Despite this evidence, OSA continues to remain underdiagnosed. This results in a decrease in opportunity for OSA treatment and consequently, a hindrance in the potential reduction of the risk or severity of its correlated conditions (Hwang et al., 2009). This project sought to make a move toward increasing the identification of those which may be affected by

this disorder and it effectively did so. Results consisting of a 5% increase in OSA screening rates within the selected practice setting provided evidence that this project's intended aim of increasing the rate of OSA screening in the adult primary care setting was successful, particularly in light of the fact that no formal screening tools were noted upon the initial sixty patient chart review. Additionally, other non-measurable behaviors were witnessed that also suggested an increase in OSA risk awareness. For example, during the implementation period, prior to commencing a patient visit, some of the involved primary care providers would attempt to guess whether or not their upcoming patient would demonstrate a positive NAMES2 assessment. They based this prediction on their knowledge of the patient and the patient's physical characteristics, and then subsequently utilized the NAMES2 screening tool to validate their suspicions. Having performed clinical practicum work within this practice site prior to capstone project implementation, this was the first time that the DNP had observed this degree of conversation surrounding OSA risk in relation to the practice's patient population.

With definitive diagnosis and treatment, the negative impacts of OSA can be significantly reduced or even averted. Treatment of OSA has shown to produce a decrease in comorbidities as well as a decrease in the direct and indirect costs associated with them (Leger et al., 2012). Furthermore, increases in patients' work productivity as well as quality of life have also been reported. As primary care is defined by disease prevention and health promotion, it behooves caregivers to adopt a practice related to OSA which would address this issue. That suggested practice would be the integration of the NAMES2 screening tool discussed within this paper.

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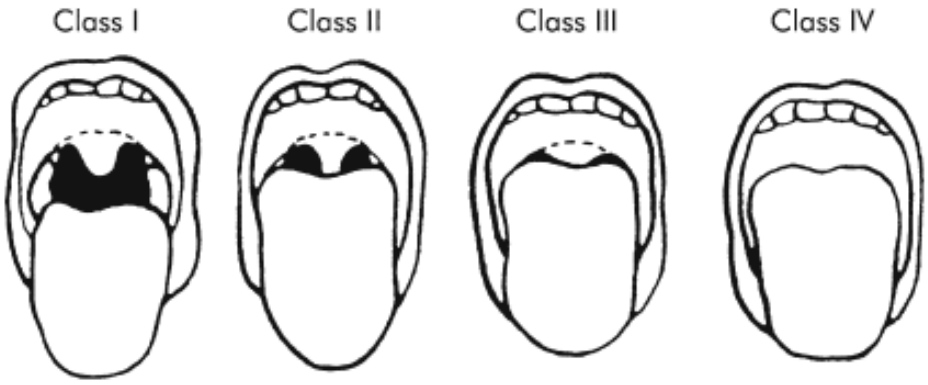
Appendix A

The NAMES assessment data collection sheet (Subramanian et al., 2011).

Patient initials		**Date of study** __/__/___		
Neck Circumference	_____			
M.Firedman	1	2	3	4
Co-morbid	HTN	DM	Heart dz	Stroke
Daytime Sleepiness	Y	N		
Snoring	Y	N		
Comments	_____			



Modified Fiedman system for UA

Appendix B

Capstone Intervention Protocol

Step 1:

Conduct a review of sixty randomized patient charts.

- Confirm suitability of proposed screening tool to patient population.
- Determine present OSA screening processes and current screening rates.

Step 2:

Provide an informational in-service to the primary care providers of the selected practice setting.

- Illustrate the need for a novel screening tool.
- Introduce the NAMES2 assessment form and provide instructions for use.

Step 3:

Implement the screening tool into scheduled patient visits over the course of a six week time span.

- Make screening tool available.
- Monitor use and accuracy of completion.

Step 4:

Collect and analyze data.

- Perform another sixty patient chart audit at the end of the six week implementation period.
- Compare percentage of patients screened post-implementation to the percentage screened pre-implementation.
- Compare rate of sleep study referral post-implementation to those prior to implementation.

Step 5:

Present findings to clinical group.

- Demonstrate any differences in percentages in screening rates.
- Demonstrate any differences in rate of sleep study referral.
- Pending findings, reinforce the need for sustained screening tool use with data collected.

Appendix C

Components of the NAMES and NAMES2 screening tools (Subramanian et al., 2011).

	NAMES	NAMES2
Component	Points assigned	
Historical		
Comorbidities (≥1)	1	1
Epworth Sleepiness Scale (≥11)	1	1
Loud snoring (yes)	1	1
Gender (male)	0	1
Physical examination		
Neck circumference (males ≥17; females ≥16)	1	1
Modified Friedman grade (≥2)	1	1
Body mass index (≥30)	0	1
Positive score/total possible	3/5	4/7

Appendix D

Capstone Budget Table

Category:	**Item:**	**Quantity:**	**Cost:**	**Subtotal:**
Preparation				
	Screening Tool	500 copies	$0.39/copy	$195.00
	DNP Student Time (Includes In-service)	75 hours	*$46.44/hour	$3,483.00
†Implementation				
	Primary Care Physician Time	15 hours	*$87.96/hour	$1319.40
	DNP Student Time	15 hours	$46.44/hour	$696.60
Final Analysis/Staff Presentation				
	DNP Student Time	75 hours	$46.44/hour	$3,483.00
				Total: **$9,177.00**

*Based on salary reports for national averages (Salary.com, 2015).
†Screening tool completion time estimated to add 5 minutes/office visit.

Appendix E

Patient Sample Comparison

Initial 60 patient chart review population:

48.3% had a BMI $\geq$ 30

93.3% had $\geq$ 1 comorbidity

38.3% were female

---

60 patient NAMES2 population:

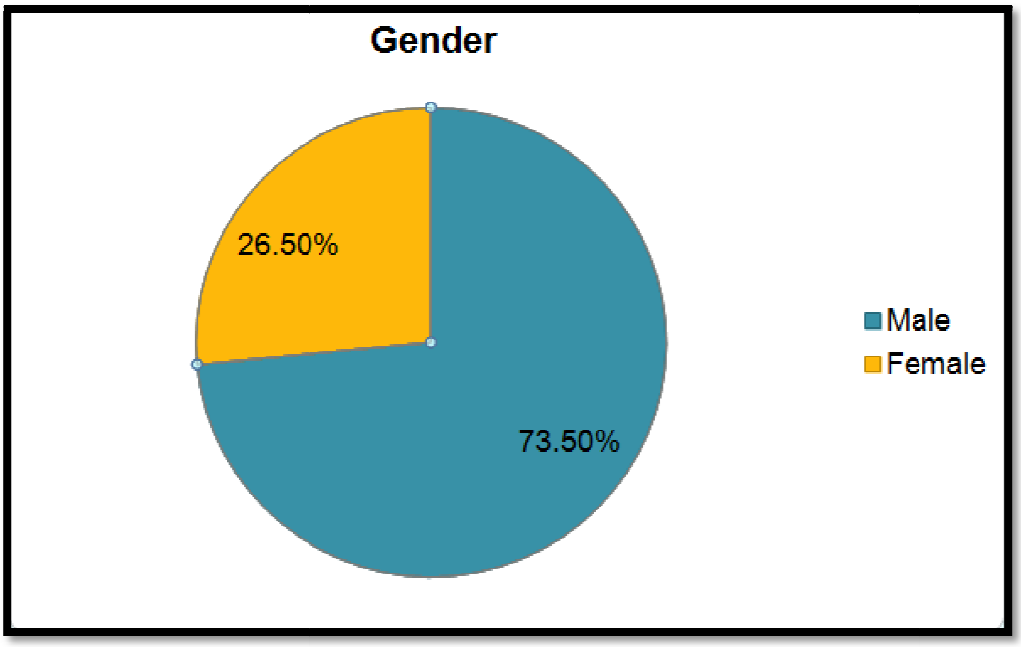
40% had a BMI $\geq$ 30

76.6% had $\geq$ 1 comorbidity

41.6% were female

Appendix F

NAMES2 Positive Gender Percentage Chart



Appendix G

Characteristics of the NAMES2 Positive Population