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Detecting Obstructive Sleep Apnea in an Adult Primary Care Population

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Walden University
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Abstract

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Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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May 2019

Abstract

Obstructive sleep apnea (OSA) is a sleep-related disorder that pauses or decreases air flow during sleep as a result of an obstructed upper airway. About 25 million people in the United States are affected by OSA. OSA has low identification and referral rates, especially in primary care facilities as indicated by the lack of patients' sleep histories. Screening tools such as questionnaires ensure an effective detection of OSA. The practice-focused question examined whether implementing the Epworth sleepiness scale (ESS) in an outpatient primary care setting would increase the number of referrals of high-risk patients. The purpose of the project was to improve the referral rates of high-risk patients for OSA evaluation through ESS in a primary care clinic. The plan-do-study-act model was used to guide and evaluate the intervention and analysis of outcomes to determine the success and failure rates of the intervention in relation to the project goal. The data were collected from an outpatient primary care clinic. Measures of central tendency were used to summarize the data, and a 2-proportion z test was employed to analyze the efficiency of the education procedure. The findings showed that the implementation of the ESS increased the number of referrals for high-risk patients ($z = 4.140$, $p = 0.000$), indicating that the ESS is an effective tool in facilitating the management of OSA. The findings of this project could be used to increase awareness of the positive benefits of the ESS, which can encourage the implementation of the tool in other clinical facilities and further education about the ESS. The project might contribute to positive social change and nursing practice through the increase of referrals for OSA, which improves the quality of life of patients.

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Section 1: Nature of the Project

Introduction

Obstructive sleep apnea (OSA) is a chronic disorder that contributes to cardiovascular-related morbidity and mortality. The disorder leads to perpetual episodes where breathing temporarily stops, which are called apnea, or the reduction in airflow caused by the constant collapse of the upper airway, which is called hypopnea (Spicuzza, Caruso, & Di Maria, 2015). OSA is indicated by various sleeping characteristics including loud snoring, lowered oxygen levels, and constant arousal from sleep that leads to poor daytime concentration levels and higher susceptibility to accidents (Dixit, Verma, & Pawar, 2018). OSA also has negative impacts on the health of a person, with the most affected organs being the brain and the heart (Darien, 2014).

Approximately 25 million adults in the United States are affected by OSA. The OSA prevalence estimates are a function of age, sex, and body mass index. Based on the apnea-hypopnea index, 10% among 30–49-year-old men, 17% among 50–70-year-old men, 3% among 30–39-year-old women, and 9% among 50–70-year-old women have sleep apnea (Peppard et al., 2013). The high prevalence of OSA has been indicated by the number of patients who visit sleep specialists or are booked for polysomnography (Chai-Coetzer et al., 2013). In the adult primary care population, high OSA reports have prompted the use of screening tools to detect the disorder early (Dixit et al., 2018). The benefit of screening for OSA is that it allows for earlier treatment, leads to improvements in breathing during sleeping, and reduces the chances of sleepiness during the day, so it

overall improves the quality of life associated with sleep (U.S. Preventive Services Task Force, 2017).

OSA tools identify high-risk patients among an adult primary care population, meaning the nurse practitioner may advise on the necessity of a polysomnographs or further treatment to prevent adverse consequences (Dixit et al., 2018). A polysomnograph is used as the standard tool for screening for OSA, but it is time-consuming, labor-intensive, and costly. Therefore, the Epworth sleepiness scale (ESS), which counters these disadvantages, is a better alternative for screening for OSA (Zou et al., 2013). The ESS is a screening tool for OSA used to measure the rate of sleepiness on eight conditions and helps determine whether a patient should undergo a polysomnograph or go to a sleep laboratory (Zou et al., 2013). The diagnosis of OSA can be achieved using the ESS that is followed up by complementary diagnosis done using a polysomnograph (Downey, 2018). But primary care nurse practitioners lack information on efficiently screening and diagnosing OSA and the follow-up procedure on diagnosed patients (U.S. Preventive Services Task Force, 2017), which creates a barrier to diagnosis and treatment of OSA (Frost & Sullivan, 2016). The referral of a patient to undergo a polysomnograph rarely occurs because of the lack of adequate information on procedures to be followed to ensure a proper diagnosis and treatment of OSA (Passamonte, 2015). The education curriculum of health care practitioners does not emphasize issues related to sleep, so OSA is not given the attention it requires.

Problem Statement

Research has shown that OSA contributes to deaths that occur due to cardiovascular-related diseases (Spicuzza et al., 2015). In the United States, the prevalence rates for OSA in adults is increasing and leads to poor quality of life due to the frequent episodes of apnea and hypopnea (Darien, 2014). OSA is prevalent in adult primary care populations because of the high-risk factors that are associated with the disorder such as obesity, menopause, the male gender, and oropharyngeal (mouth and throat) features (Spicuzza et al., 2015). The problem in the primary care facility for this project was that there are minimal referrals of patients for OSA evaluation because the primary care practitioners at the facility do not have knowledge on the proper use of tools for ensuring that OSA screening is done earlier.

In the identified primary care facility, OSA is prevalent including patients who are potentially undiagnosed, and screening for OSA is necessary to avoid the costs associated with late detection of the disorder. In the world, OSA has a prevalence rate of 2% to 26%, and approximately 93% of women and 82% of men with OSA are not diagnosed (Tantakul, 2017). ESS is an effective tool for identifying patients in need of a polysomnography (Downey, 2018), as screening is the best way to identify high-risk patients with OSA and determine whether to refer a patient to a sleep expert or to schedule a polysomnography (U.S. Preventive Task Force, 2017). Further, screening is a strategy to detect the presence of OSA that is cheaper, faster, and less costly when compared to polysomnography (Dixit et al., 2018). Early detection from screening can

ensure that the disorder is addressed earlier to improve the quality of life of the patient and lower mortality and morbidity rates.

The lack of adequate knowledge regarding identification and follow-up procedures of OSA patients is a significant hindrance to a diagnosis of OSA (Passamonte, 2015), which can lead to significant costs associated with OSA. Primary care practitioners also need to be educated on the effective use of ESS screening tool to ensure proper diagnosis and follow-up procedures (U.S. Preventive Services Task Force, 2017). Educating nurse practitioners in the adult primary care can help ensure that OSA is diagnosed and treated early before it leads to adverse and irreversible effects. The early detection of OSA in an adult primary care population contributes to a significant reduction in cardiovascular-related morbidities and mortalities (Spicuzza et al., 2015). Early detection can also reduce the impact of OSA on the health sector and the country from costs of diagnosis or costs of conditions that accompany OSA (Garvey, Pengo, Drakatos, & Kent, 2015). For example, the cost of undiagnosed OSA involves motor vehicle accidents, accidents at the workplace, the loss of productivity and the absence at the office, and costs related to health impacts of OSA such as hypertension and diabetes (Watson, 2016). Motor vehicle accidents in the United States have been estimated to involve 800,000 drivers with OSA with the cost of $15.9 million on an annual basis (Garvey et al., 2015). The direct costs associated with the OSA disorder have accumulated to a figure of $3.4 million in the United States (The Institute for Clinical & Economic Review, 2013). Achieving this project's goals can help decrease costs associated with the lack of treatment or late diagnosis of OSA.

Purpose Statement

OSA is a prevalent disorder in the world that has not been efficiently detected, which has led to the development of other diseases because of late treatment (Spicuzza et al., 2015). The treatment of OSA when it is not detected in its early stages is also low. Therefore, the purpose of this project was to address the practice-focused question "Will implementing the Epworth sleepiness scale (ESS) in an outpatient primary care setting increase the number of referrals of high-risk patients?" The strategy of educating primary care practitioners on how to detect OSA, especially in an adult primary care population greatly contributed toward reducing the rates and costs associated with OSA not being treated earlier.

Nature of Doctoral Project

This project was conducted in an adult primary care facility and was focused on increasing referrals of patients for OSA screening. The project entailed the use of recent articles documenting the positive effects of integrating the Plan-Do-Study-Act (PDSA) model with teaching nurse practitioners and the subsequent impact on the early recognition and referrals of OSA in primary care adult population. I used relevant databases such as Google Scholar, EMBASE, Medline, PubMed and EBSCO to find peer-reviewed journal articles that support the necessity to solve the identified problem. Screening for OSA leads to increased referrals and the improvement in the quality of life of patients.

The approach of the study included *planning*, which entailed gathering data from patients' charts by the quality improvement team to assess how many patients were

screened for OSA before implementing the ESS (see Agency for Healthcare Research and Quality, 2015). The next step was to *do* using the ESS to screen OSA in this setting and observing and *studying* the results. The final step, *act*, involved evaluating the results to determine whether the project goals were achieved. If the evaluation process indicated that the project goals were not achieved, the quality improvement team would have identified various improvement measures. However, the results indicated the positive effect of implementing the ESS on the number of referrals of high-risk patients, meaning that measures for applying the tool on a more significant scale were made.

Significance

One of the major objectives of the nursing practice is to provide quality care to patients. The detection of OSA can increase the referrals of patients for OSA evaluation by sleep specialist. This ensures that the screening for OSA is incorporated into the clinic's patient screening plan.

The OSA-related referrals done by primary care practitioners have been low at the clinic, which was related to the lack of knowledge and use of OSA screening tools among the nurse practitioners. Educating nurse practitioners on how to use screening tools and questionnaires to detect OSA and on proper follow-up mechanisms for OSA diagnosed patients increases detection of OSA and subsequent referrals for sleep study (Chai-Coetzer, 2013; Elton et al., 2017; Williams et al., 2013). Thus, completing this project in this clinic benefits high-risk patients who are screened for OSA using the ESS and receive referrals for a sleep study as appropriate (see Aurora & Quan, 2016).

The results of this project that ESS is an effective tool for early detection of OSA suggests that it may be beneficial to multiple stakeholders. The patients who visit the clinic can benefit from the early detections of OSA and the increase in the number of referrals for OSA evaluation. Costs can also be avoided that are associated with being readmitted to the facility because of the lack of detection or late diagnosis of OSA (U.S. Preventive Task Force, 2017). The primary care facility also benefited from this project because of the improvement to the quality of care provided to the patients due to early screening for OSA. The education of the nurses and caregivers on the use of ESS for screening for OSA also led to improvements in their theoretical and expertise regarding the disorder. Additionally, the project can be implemented on a wider scale in other clinics. Therefore, this project contributes to positive social change and nursing practice through the increase of the number referrals that can improve the quality of life of the patients and awareness of the ESS through education.

Summary

There has been a high prevalence of OSA, which can lead to cardiovascular-related morbidity and mortality as well as economic costs when diagnosed too late or not treated. One way of countering the effects of OSA is early detection, which can be done using the ESS. The education of nurse practitioners and physicians on the use of ESS and an adequate follow-up procedure on diagnosed patients can ensure early detection of OSA and increase OSA-related referrals. Section 1 highlighted the introduction to the problem, the nature of the project, and its purpose. Section 2 indicates the concepts, models, and theories that inform the project. Moreover, the relevance to the nursing

practice, local background and context and, the roles of the involved stakeholders are

described.

Section 2: Background and Context

Introduction

OSA is a prevalent disorder with many cases being recorded in adult primary care facilities (U.S. Preventive Task Force, 2017). However, the disorder has low levels of detections and referrals, which increases the cost of treating the diseases associated with OSA. The practice-focused question was "Will implementing the ESS in an out-patient primary care setting increase the number of referrals of high-risk patients?" The purpose of this project was to increase of referral rates of high-risk patients for OSA evaluation through the ESS in a primary care clinic. This section contains the concepts, models and theories; relevance to nursing practice; local background and context; role of the student; role of the project team; and a summary of the section.

Concepts, Models, and Theories

In the health care sector, there is a rising need for quality improvement (Knudsen Laursen, Elhers, & Mainz, 2017). But improvements in the quality and safety of the health care system are challenging and require quality improvement methods. A quality improvement approach should provide ways to test and evaluate interventions made in relation to health care with an aim of providing high-quality and efficient care with minimum costs (Taylor et al., 2013). Quality improvement methods are being adopted into the health care system because they help ensure that care is delivered safely, timely, effectively, efficiently, equitably, and cost-effectively (Reed & Card, 2015). In line with these characteristics of quality improvement, the PDSA cycle was used in this project.

The PDSA model is a quality improvement strategy for the health care sector with various advantages and positive impacts. The PDSA model was designed to critique whether an intervention has been applied successfully. The PDSA cycle is an interactive, four-stage problem-solving model used for improving a method or carrying out modification (Agency for Healthcare Research and Quality, 2015). The PDSA process provides an output that enable users to achieve their goals in addition to learning and informed action (Reed & Card, 2015). It can either be used independently or in conjunction with other approaches like total quality management or lean six sigma or continuous quality improvement (Taylor et al., 2013). The PDSA is easily applicable by anyone; however, using the model requires knowledge to achieve the desired objectives, which may require training (Reed & Card, 2015).

Edward Deming came up with the PDSA cycle that has four key components: Plan, Do, Study and Act (see Figure 1; Donnelly & Kirk, 2015). In the PDSA cycle, the *plan* phase is where a change that contributes to improvement is identified. The *do* phase is where the identified change is tested. The *study* phase is the point that determines the success rate of the change. The final phase is the *act* phase that entails various adaptive measures and steps relevant to create an adequate and efficient new cycle (Taylor et al., 2013).
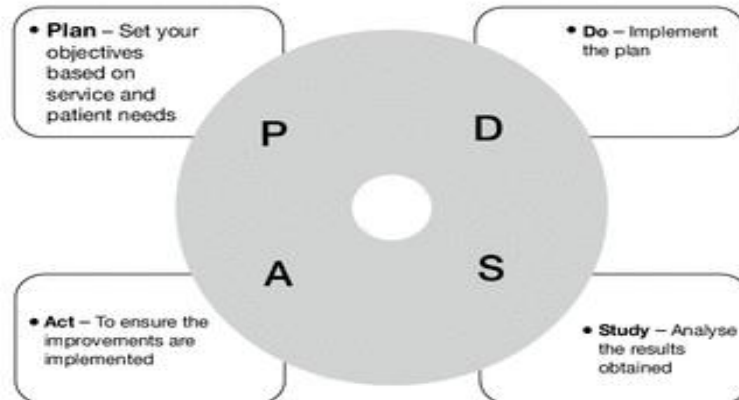
Figure 1. PDSA model. Adapted from "Use the PDSA Model for Effective Change Management," by P. Donnelly and P. Kirk, 2015, *Education for Primary Care, 26*, p. 279.

A successful PDSA ensures that project goals are achieved in addition to saving on costs involved in implementing unrealistic interventions (Reed & Card, 2015). The model is useful for the health care sector because of its easy application and adaptability to various functions and processes in a health care facility (Reed & Card, 2015). The PDSA is used to test the trialability of interventions because health-related interventions need knowledge of the health care facility's procedures to avoid fatalities (Coury et al., 2017). Studies have shown that the PDSA model is an effective quality improvement strategy for the evaluation of health care inventions such as evaluating interventions that were implemented to prevent colon cancer (Coury et al, 2017). This has helped discover difficulties in the implementation process and guided health care facilities in integrating a successful intervention (Coury et al., 2017). The use of PDSA model in the health care sector ensures interventions are effective (Taylor et al., 2013). Therefore, the PDSA model was suitable for this study.

The project team a nurse practitioner and supervisor in addition to the quality improvement team and I used the PDSA model to evaluate the effectiveness of the project. The model involved planning, doing, studying, and acting activities of the project to assess whether the goal of increasing referrals for OSA evaluations would increase. Moreover, the model helped the team to identify areas of improvement in the scenario where the purpose of the project is not attained. In addition to the PDSA model, the study involved the education of primary care practitioners on how to use the ESS to screen for OSA. The evidence from the clinic's system and information from previous research helped meet the purpose of the project of determining whether the education of primary care health care practitioners on the ESS can increase the referral rates of high-risk patients for OSA evaluation.

Various risk factors are associated with OSA. Obesity, menopause, the male gender, and oropharyngeal features as some of the risk factors that lead to the prevalence of OSA (Spicuzza et al., 2015). Similarly, OSA is a risk factor for stroke with patients who have OSA during an acute post-stroke period (Ifergane et al., 2016). There is also evidence that OSA is a growing risk factor related to hypertension, COPD, asthma, obesity, and diabetes, thus raising morbidity and mortality rates (U.S. Preventive Services Task Force, 2017).

The economic aspect or costs associated with the lack of treatment and early diagnosis of OSA affect health care and individuals and their communities. For instance, motor vehicle accidents in the United States are caused by 800,000 drivers with OSA (Garvey et al., 2015). The cost of undiagnosed OSA also leads to cost burdens associated

with motor vehicle accidents, accidents at the workplace, the loss of productivity and the absence at the office, and costs related to health impacts of OSA like hypertension and diabetes (Watson, 2016). Early detection of OSA can significantly minimize costs because detecting the disease early ensures that treatment is done before risk factors of OSA are worsened (Faust, Acharya, Ng, & Fujita, 2016). The early detection of OSA in a primary care facility and appropriate referrals and follow-up procedures done on high-risk patients can reduce the number of cases of undiagnosed OSA, improves a patient's quality of life and health, and reduce the overall costs associated with undiagnosed and untreated OSA (Aurora & Quan, 2016). Early detection of OSA is also important because sleep-related disorders increase with the increase in age of a person (Faust et al., 2016). The detection of OSA at an earlier stage can lower the number of cardiovascular-related mortalities and morbidities associated with OSA (Faust et al., 2016; Ifergane et al., 2016).

Early detection of OSA can be achieved through polysomnography (Uddin, Chow, & Su, 2018), but performing a polysomnograph requires a lot of time, approximately the whole night. The process also requires constant supervision and is labor intensive. These factors contribute to the overall costs associated with detecting and diagnosing OSA (Faust et al., 2016). Additionally, Figure 2 indicates the management process of OSA and indicates that nurse practitioners as well as physicians are essential in ensuring early detection of OSA in an adult primary care population. The figure indicates how OSA management is done in the past (a), present (b) and in the future (b). A family care physician or specialist is always the source of suspicion on whether a patient has OSA or not (Suárez, Osorio, Torres, & Montserrat, 2016).
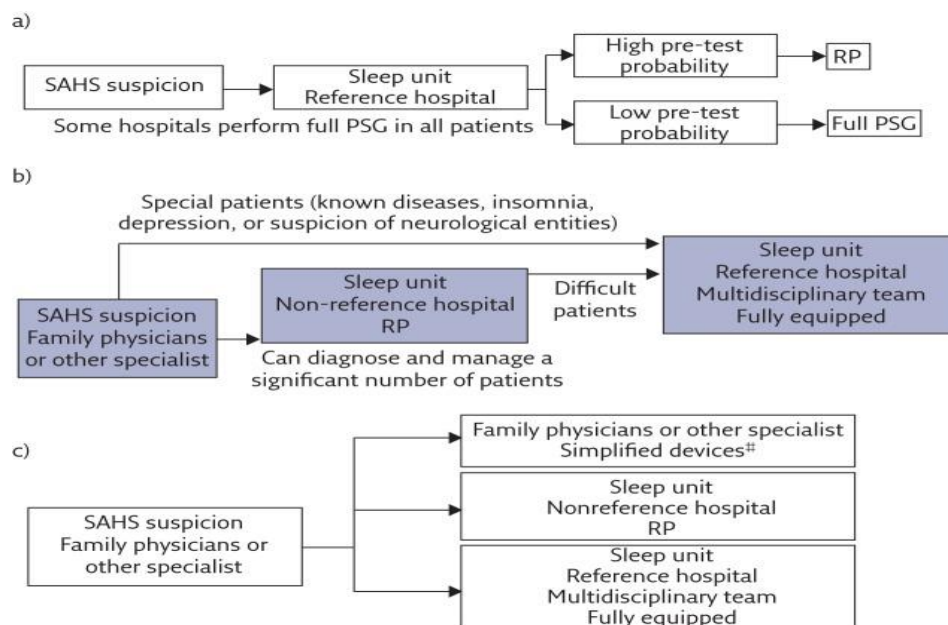
Figure 2. Management of OSA. Adapted from "Should the Diagnosis and Management of OSA move into General Practice?," by M. Suárez, J. Osorio, M. Torres, and J. M. Montserrat, 2016, *Breathe, 12*, p. 246.

In addition to polysomnography, among high-risk patients the best way to lower the effects of undiagnosed OSA is by screening them (Aurora & Quan, 2016). The main benefit of screening for OSA is that it enables an early treatment of the disorder (Sharma et al., 2015), curtailing the associated consequences that come with the late diagnosis or treatment of OSA. The questionnaire used for screening for OSA in a primary care setting is a useful tool to increase the referral rates for OSA evaluation (Jin, 2017; Suárez et al., 2016). The questionnaire is used on high-risk patients in a primary care facility, who have the following characteristics: snoring, sleeping during daytime, obesity, short necks, and are male (Suárez et al., 2016). Screening tools can help reduce OSA-related morbidity and mortality rates, but there are various challenges of screening such as lack

of knowledge with regard to how to identify OSA, the best OSA screening tool, how to diagnose OSA, and follow-up procedures for OSA-diagnosed patients (U.S. Preventive Task Force, 2017). For the screening procedures for OSA to be effective, the training process and curriculum of nurses and physicians should involve sleep-related disorders together with the OSA screening tools. The training sessions should equip the health care practitioners with knowledge on the importance of screening for OSA and on the use of screening tools (Aurora & Quan, 2016).

In an adult primary care center, the primary care nurse practitioner or physician is the best-placed person to identify the symptoms of OSA among high-risk patients and make referrals for evaluation (Aurora & Quan, 2016). However, OSA is rarely reported, and there are low referrals for OSA evaluation done by primary health care providers in addition to a lack of data on sleep history (Chai-Coetzer et al., 2013; Williams et al., 2015). Further, the knowledge deficit of primary care nurses and physicians has caused a lack of diagnosis of OSA, with 82% men and 93% women undiagnosed (Williams et al., 2015). For assessment of OSA, health care practitioners need to be educated on the proper use of screening tools and follow-up procedures, which can lower the effects of late detection of OSA (Chai-Coetzer et al., 2013). The education of primary caregivers has a significant impact on the early detection and referrals for OSA evaluation of high-risk patients in a primary care facility (Epton et al., 2017). For example, in Canterbury, New Zealand, the procedures of training nurse practitioners have involved a general overview of OSA, pulse oximetry, and training on the screening tools for OSA, which impacted the number of referrals for OSA evaluation (Epton et al., 2017).

The tools that are used for screening for OSA include the ESS, Stop, STOP-BANG, and the 4-variable screening tool among others (Singh & Mims, 2015). STOP has four questions whereas STOP-BANG has eight questions about the STOP covering snoring, tiredness, observed apneas, and high blood pressure whereas the BANG portion covers BMI, age, neck circumference, and gender. ESS, on the other hand, indicates how severe the sleepiness levels are with reference to a scale of zero-eight. 4-variable screening tool consists of four variables as indicated in the following equation: OSA = (gender * 4) + (BMI category value) + (BP value) + (snoring*4); Singh & Mims, 2015). Berlin questionnaire is another screening tool for OSA. Berlin questionnaire has questions organized into three categories, that is, category one-questions about snoring, category two-excessive daytime sleepiness questions, and category three- BMI and blood pressure questions (Sharma et al., 2015).

The ESS is a tool that measures the rate of sleepiness in a person during the day. It has eight questions with higher values indicating increased chances of sleeping while engaging in day-to-day activities while lower values indicate the lack of dozing while doing daily activities (Liu, Hu, Streelman, & Guthrie, 2015). ESS can be used for screening for OSA in adults on the basis of sleep levels when compared to a given scale. ESS is preferred for screening for OSA because it is reliable, consistent, and easy to use (Liu et al., 2015). Drakatos et al. (2015) argued that ESS is the most self-administered questionnaire and suggested that an online ESS should be adopted to make people more aware of OSA and its adverse associative consequences. The use of ESS to measure the rate of dozing off of a patient while performing daily activities may produce inefficient

results because of various reasons (Li et al., 2014). The patient using the ESS tool may ignore or assume various sleep behaviors indicative of OSA to be normal. Similarly, the patient, nurse practitioner or caregiver may lack the education on the effective use of the ESS tool. Moreover, the age and relation between a patient and a caregiver may also be a major driver towards the inefficiencies in results obtained from using the ESS tool to detect for OSA (Li et al., 2014). Zou et al. (2013) also argued that ESS is a better tool for measuring the effective sleepiness levels. The standard tool that is used is the polysomnograph; however, it is costly, labor-intensive, and time-consuming. Therefore, ESS is a better option when compared to polysomnograph because it has less associative costs, requires less labor, and is faster (Zou et al., 2013). Laratta, Najib, Marcus, and Sachin (2017) also support the use of ESS as a screening tool for OSA by indicating that it is a useful tool in primary care settings. This is because it can be used to effectively and efficiently measure sleepiness in clinical situations in the high-risk patient populations such as patients with diabetes, hypertension, COPD, obesity, and asthma (Laratta et al., 2017).

Relevance to Nursing Practice

Williams et al. (2015) depicted that OSA is a disorder that has become prevalent and has adverse effects associated with it. However, the referral rates because of detections of OSA in patients are still on the lower side. This means that the late diagnosis and treatment of OSA has become a significant issue with 82% of men and 93% of women remaining undiagnosed (William et al., 2015).

Passamonte (2015) conducted a study on identifying OSA risk in the general adult primary care population. The study indicated that the primary care practitioners lack adequate knowledge on the proper use of detection tools and follow-up procedures for after OSA diagnosis. The lack of knowledge makes the number of referrals for polysomnography or to a sleep specialist to be on the lower end hence making OSA one of the disorders that are not efficiently identified and treated (Passamonte, 2015). This motivates the need for the study as the lack of awareness of OSA detection and referrals for treatment among nurse practitioners is alarming.

This project enabled the screening for OSA in an adult primary care population to reduce the effects of late detection of the disorder. Moreover, the project increased the awareness of primary care nurse practitioners on OSA detection by educating them on the use of OSA screening tools and the follow-up procedures for patients diagnosed with the condition. In a primary care setting, the Epworth screening tool is appropriate for detecting OSA among high-risk patients (Laratta et al., 2017). Chai-Coetzer (2013) mentioned that nurse practitioners as well as physicians need to be educated on the effective use of screening tools to ensure efficient and early diagnosis and referrals of patients with OSA. Williams et al. (2015) placed the nurse practitioners and physicians as the best-placed person to indicate the sleep history of a person and to initiate referrals for treatment or to see a sleep specialist.

<center>**Local Background and Context**</center>

OSA is a disorder common among adults in a primary care setting. However, OSA is rarely reported with high-risk patient referrals for OSA evaluation done by

primary health providers (Williams et al., 2015). Sleep history and referrals for OSA

evaluations are always insufficient. This is attributed to the fact that in primary care

settings, physicians and nurse practitioners lack adequate knowledge regarding the

disorder (Williams et al., 2015). Among primary care nurse practitioners and physicians,

the awareness of the risk factors associated with OSA is available, but the challenge that

remains is that the nurse practitioner does not have adequate knowledge for proper

diagnosis of OSA (Passamonte, 2015).

The study was conducted at an outpatient primary care clinic in Maryland. The

average number of patients seen at the clinic per year is about 5,600 to 7,000. The

average patient population in the clinic includes patients with acute and chronic

problems, as well as visits for health promotion and disease prevention. The chronic

cases include hypertension, diabetes mellitus, asthma, obesity, and COPD. Currently,

there is no guideline to screen the high-risk patients for OSA at the clinic. Undertaking

the project on this site benefited the high-risk patients who were screened for OSA using

the ESS and receive referrals for sleep study as appropriate (Rashmi & Stuart, 2016).

Role of the DNP Student

The role of the DNP student was project team leader. The DNP Student guided

the project team during the PDSA cycle. Moreover, the DNP student ensured that the

project team conducted the project in line with existing ethical principles and compliance

with project requirements. Similarly, the DNP Student continuously checked on the

progress of the project team to ensure that the team is working on the project goals. Also,

the DNP Student, as the project team leader, was responsible for addressing any mistakes

done by any team member. The team leader was responsible for communication and collaboration with the doctoral chair to organize and schedule project activities such as presentations and for advice. The team leader ensured all project team members consent to participating in the project.

I chose this topic based on the interaction I had with a patient at the outpatient primary care clinic in Maryland. The patient suffered from hypertension but despite being treated, the symptoms he had kept on recurring. The patient was later diagnosed with OSA which was quite late as he had incurred a lot of costs searching for a solution to the problem. In addition, I value the quality of care that a patient receives when they visit a health care facility. Hence, implementing the project ensures that the quality of care provided to the adults visiting the clinic in Maryland improved while avoiding situations like the one faced by the patient that I had interacted with from reoccurring.

Role of the Project Team

The project team was responsible for the design and evaluation of the steps in the PDSA cycle. Participants include two nurse practitioners including the manager of the clinic. It is important to have three participants because collection and analyzing data is time and energy demanding task. The nurse practitioners have been working there for more than 3 years so they are familiar with demography of the patents. The participants are volunteers who understand the importance of the project. Having primary care facility workers helping in outlining the facility's quality requirements concerning the project created higher chances of the acceptance of the results (Minnesota Department of Health, 2016).The project team evaluated the results of the project to check whether the goals of

the project are attained. The team was also responsible for suggesting improvement measures on the project in case the project goals are not achieved.

Summary

The section highlighted the concepts, models, and theories that informed the project. In addition, the relevance of the project to nursing practice was depicted. Similarly, the local background and context were supported by providing local evidence that proves the problem identified exists and to support the practice focused question. The role of the student and project team was outlined. The student, in this case, was the project team leader of a quality improvement project team.

Section 3: Collection and Analysis of Evidence

Introduction

Despite the high prevalence of OSA, especially in primary care settings, the report and referral rates for OSA are relatively low (Williams et al., 2015). In this section, I present the procedures to address the local problem. The practice-focused question that guided the project is also discussed in this section. Similarly, this section outlines the sources of evidence where data were obtained from. Then the data analysis techniques and procedures are presented, followed by a summary of the section.

Practice-Focused Question

Despite the high prevalence rates of OSA, there is a lack of early detection and a lack of the sleep history of patients, leading to low referral rates of high-risk patients for OSA evaluation (Chai-Coetzer et al., 2013). In the primary care facility for this project, there is no tool for screening for OSA. The patients who visit the clinic have no indication of sleep information on their medical records. Additionally, the nurse practitioners who work at the primary care facility lack education on OSA screening tools, so the referrals for OSA evaluation are relatively low. Thus, the following practice-focused question was used in this project: Will implementing the Epworth sleepiness scale (ESS) in an outpatient primary care setting increase the number of referrals of high-risk patients?

Sources of Evidence

Data for the project were collected from an outpatient clinic. The average number of patients who visit the clinic per year is 5,600 to 7,000. The quality improvement team

gathered information from patients' charts for the project. However, patient identity was protected, as patient names and personal information were not revealed in the assessment tool and were not required for project evaluation. Data were collected from the clinic after Walden University's IRB approval (approval no. 10-12-18-0386630).

From the patient population in the clinic, patients with acute and chronic illnesses and those in need for health promotion and disease prevention were included. Acute or chronic diseases such as hypertension, diabetes, stroke, and asthma are risk factors associated with OSA that lead to high-risk of having OSA (Faust et al., 2016). However, the clinic did not have guidelines for screening the high-risk patients for OSA. Based on communication with the clinical staff, the clinic had a reporting structure that allowed the facility to track 1-month referrals of high-risk patients for OSA evaluation.

I also used relevant databases such as Google Scholar, EMBASE, Medline, PubMed, and EBSCO to find peer-reviewed journal articles that support the necessity to solve the identified problem. The key terms used included *OSA, Early detection of OSA, Screening for OSA,* and *ESS*. The articles that were considered were those published within the last 5 years from 2013 to 2018. The articles were identified, analyzed by reading their abstracts, full text, and analysis of the contents including figures and tables. The articles were used as reference by me and the project team while implementing the project at the outpatient clinic at Maryland.

Analysis and Synthesis

The project team collected data on the number of referrals of high-risk patients for OSA evaluation before the implementation and education of the ESS screening tool.

Referral rates for OSA evaluation were also retrieved after a 2-month period from the time the ESS tool had been implemented at the clinic and education had been given to nurse practitioners.

With regard to data analysis, the project team obtained data from the clinic's health care system before and after the project's intervention, creating the need for descriptive and inferential statistics. The number of patients sent to see sleep specialists was an indication that the education procedure was efficient. The project team created a summary of the project's findings using mean and frequency. The mean changes in the referral rates during the preimplementation of the ESS tool and education and postimplementation whether were used to assess the quality improvement goals were attained. To compare how effective the implementation of the ESS tool and education of primary care nurse practitioners was to the number of referrals for the male and female high-risk patients in the clinic, a two-proportion z test was used. The test was appropriate because of the large population numbers of the average patients visiting the clinic being between 5,600-7,000 (Afthanorhan, Nazim, & Ahmad, 2015).

Summary

This section highlighted practice-focused questions that guided the project with the sources of evidence. This project was focused on educating the primary care health care practitioners on how to use the ESS to increase the number of referrals of high-risk patients for OSA evaluation. The data were collected from the clinic; referral rates before and after the education were extracted from patient records. Analysis and synthesis was done using descriptive and inferential statistics. Means and frequencies were used to

summarize the data, whereas the two-proportion z test was used to explore the

intervention's efficiency.

Section 4: Findings and Recommendations

Introduction

This section addresses the project question and presents the results and data analysis findings. The practice-focused question was "Will implementing the Epworth sleepiness scale (ESS) in an outpatient primary care setting increase the number of referrals of high-risk patients?" Data were collected from the outpatient clinic of patients with acute and chronic illnesses and those needing health promotion and disease prevention. The process included gathering data from the patients' charts by the quality improvement team. The clinic had observed that low referrals were related to the lack of knowledge and us of OSA screening tools among the nurse practitioners. Nurse education and quality improvement in the primary care facility was facilitated by the PDSA framework. The referral rates for OSA evaluation or study were retrieved after 2 months from the time the ESS tool had been implemented at the clinic and education had been given to the nurse practitioners.

Findings and Implications

This section presents the descriptive statistics and inferential statistics based on the clinical question. Descriptive statistics include demographic characteristics of the patients, which are presented frequency tables with means and standard deviations. Inferential statistics involved the use of a two-proportional proportion z test to compare the number of referrals for the male and female high-risk patients in the clinic following the implementation of the ESS and the education of primary care nurse practitioners. Inferences were made at 0.05 level of significance.

Descriptive Statistics

Descriptive statistics involved describing the demographic characteristics for the patients before and after the implementation of the ESS. The demographic information at preintervention and postintervention according to gender revealed that there were more males ($N = 35$, 58.4%) than females ($N = 25$, 41.6%) at preintervention of the OSA tool. However, at postintervention of the OSA tool, more than half of the respondents ($N = 33$, 55%) were males compared to females ($N = 27$, 45%).

The respondents with BMI > 30 were examined in both at preintervention and postintervention of ESS (see Table 1). The results showed that there were more males (63.2%) than females (36.8%) with BMI > 30 at preintervention of ESS. Additionally, more than two-thirds (71.4%) with BMI > 30 at postintervention of ESS were males compared to less than a third (28.6%) females. The results also revealed that overall, most respondents (52.5%) with BMI > 30 were in postintervention compared to respondents (47.5%) at preintervention.

Table 1

BMI of Respondents Pre- and Post-Intervention of OSA Tool

Intervention	BMI > 30	N	%
Preintervention	Male	12	63.2
	Female	7	36.8
	Total	19	47.5
Postintervention	Male	15	71.4
	Female	6	28.6
	Total	21	52.5

I also examined patients' comorbidity at preintervention and postintervention. The results as depicted in Table 2 revealed that most of the respondents with comorbidity > 1

at preintervention were males (64.7%) compared to females (35.3%). Additionally, most

respondents at postintervention were males (60%) compared to females (40%). Overall,

there were more patients with comorbidity > 1 at preintervention (53.1%) compared to

postintervention (46.9%).

Table 2

Comorbidity of Respondents at Pre- and Post-Intervention of OSA Tool

Intervention	Comorbidity > 1	N	%
Preintervention	Male	11	64.7
	Female	6	35.3
	Total	17	53.1
Postintervention	Male	9	60.0
	Female	6	40.0
	Total	15	46.9

The descriptive statistics for the patients with BMI > 30, comorbidity > 1, and the

number of referrals for males and females are represented in Figure 3. The figure shows

that there were no referrals at preintervention, whereas there were 15 referrals for both

male and females at postintervention. The results also showed that most of the patients

(44%) reported 1-6 normal sleepiness, whereas a significant number of patients (33%)

reported 9-24 abnormal sleepiness. Few patients (23%) indicated that they experience 7-8
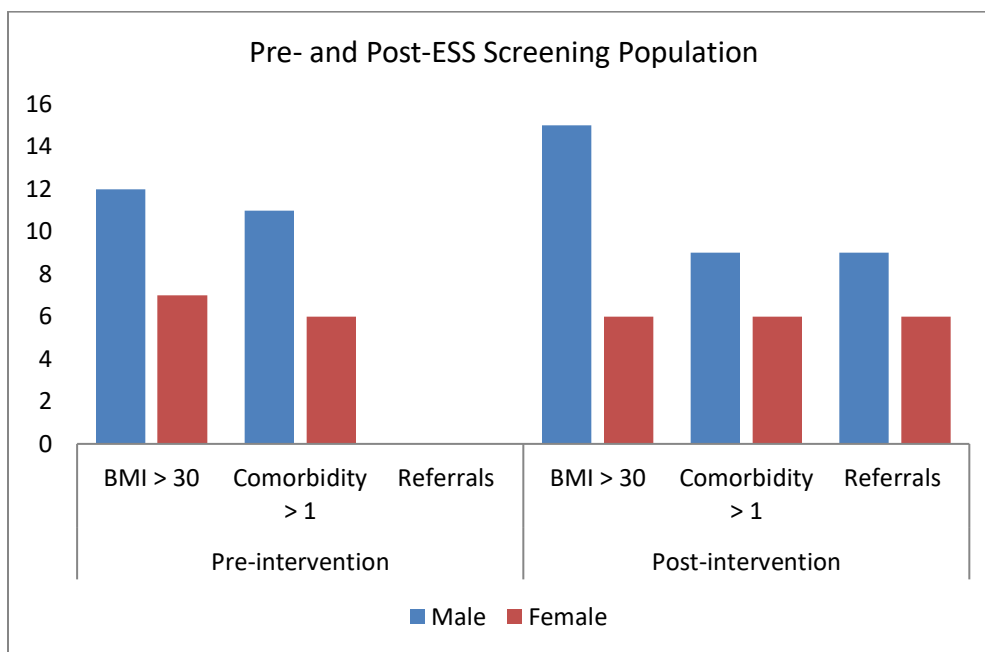
average sleepiness.

Figure 3. Pre- and post-ESS screening population.

Data Analysis Findings

The goal of this project was to examine the effect of implementing the ESS in an outpatient primary care setting on the number of referrals of high-risk patients. In addition, I examined the importance of educating primary care nurse practitioners on quality improvement measures. I conducted a two-proportion z test to examine the difference between preintervention and postintervention of the ESS on referrals of high-risk patients.

The results revealed that the findings were significant ($z = 4.140$, $p = 0.000$) at 0.05 level of significance. This revealed that implementing the ESS in an outpatient primary care setting increased the number of referrals of high-risk patients. Notably, the number of referrals increased from zero referral at preintervention to 15 referrals at

postintervention. The findings also revealed that educating primary care nurse practitioners has positive effects on quality improvement measures.

Implications for Practice

The aim of this project was to explore the effect of implementing the Epworth OSA screening tool in an outpatient primary care setting on the number of referrals of high-risk patients. The findings revealed that implementing the ESS in an outpatient primary care setting and providing education to primary care nurse practitioners on quality improvement measures increased the number of referrals of high-risk patients. This reveals the importance of continuous learning to primary care nurse practitioners who have the potential of improving the quality of care among patients. The implications of findings are relevant to institutions to enhance the quality of education to primary care nurse practitioners as well as provide quality and enough materials that could be used by practitioners to improve the quality of care. Primary care nurse practitioners should have professional development that is an integral part of quality improvement. Institutions should ensure that nurse practitioners have access to medical information, evidence-based guidelines, and increasing the morale or motivation of staffs through improving resources and facilities.

Implications for Positive Social Change

The findings from this project are essential to nurse practitioners as well as physicians by providing education that improves skills, abilities, and knowledge with regards to a lifestyle change that leads to improved quality of care. The nurse practitioners implemented the knowledge and skills learned from the educational

intervention program to detect and refer patients with OSA as well as help the patients overcome the disorder. Physicians can provide therapy to the affected patients to ensure improved quality of care. Also, the findings of this project contribute to positive social change by informing patients about activities that lead to OSA and the importance of enough sleep and disadvantages of overworking. Patient and nurse practitioner interaction is essential as it encourages continuous medical intervention.

<div align="center">**Recommendations**</div>

The recommendations are that nurse practitioners have an obligation of providing patients with training and guidance to live healthy habits. Nurse practitioners and institutions should provide awareness and education to patients on the importance of exercising, healthy and balanced diet, and having an adequate sleep to improve the quality of care.

The findings revealed that the implementation of Epworth obstructive screening tool helped to increase the number of referrals and the management of OSA. With the increasing importance of sleep apnea in mortality and morbidity, this project recommends continuous implementation of the ESS tool to increase the number of referrals. Recommendations include advocating other clinical facilities and nurse practitioners to adopt the ESS tool as it exhibits qualities that would help to manage OSA. Through the implementation of the ESS tool, nurse practitioners are able to direct patients to seek further medical treatment for OSA.

Further, the findings revealed the effectiveness of educational intervention on OSA referral. It is evident that providing education and training and providing an

appropriate screening tool to nurse practitioners has a positive effect on the quality of

care improvement. Recommendations are that institutions and primary care centers aim to

train and educate their staffs as well as provide professional development. Institutions

should strive to provide standard materials and quality education to nurse practitioners.

Medicare care centers should aim to motivate their staff members by giving practice

guideline materials, training and development, and scholarships to advance their skills

and knowledge. Increased training and professional development among nurse

practitioners indicate improved primary care for patients.

Awareness of the OSA diagnosis is essential in increasing the number of referrals

and the treatment of OSA. Recommendations entail educating patients to visit primary

care centers frequently for diagnosis. The early diagnosis and detection of OSA and

cardiovascular disorders are vital as it increases the chances of treatment. Passamonte

(2015) found that early detection and diagnosis of OSA have led to significant referrals to

sleep specialists and a majority has received treatment regarding the disorder. Continuous

collaboration between patients and nurse practitioners will ensure that OSA is managed

by promoting early diagnosis as well as medication.

<div align="center">**Contribution of the Doctoral Project Team**</div>

As the project team leader, the DNP student found that working with the project

team was a good experience. The roles of the DNP student were to ensure the project

team followed the guidelines provided to ensure the successful completion of the project.

The primary care center collaboratively provided the DNP student with the right

materials to conduct the project. The DNP student acquired patient referral records from

the primary care facility through informed consent. The nurse practitioners from the selected primary care center facilitated the project and collaborated by taking part in the training and education intervention. The nurse practitioners facilitated the synthesis of evidence and obtaining of the outcomes of the project. Also, the project team facilitated obtaining of the project outcomes that led to the development of project recommendations.

The DNP student aims to extend the project beyond the DNP doctoral project by developing a scholarly article that can be published in a recognized journal. The DNP student seeks to disseminate the outcomes to the larger community. The DNP student aims to provide a summary of the DNP project by including key outcomes, project recommendations, and future project development that can be published in recognized journals.

Strength and Limitations of the Project

The strength of this project is the use of evidence-based practice approach to answer the clinical question pertaining to the management of OSA through the implementation of ESS tool. The use of evidence-based practice enabled the DNP student to facilitate quality care improvement among patients with OSA. The DNP student implemented the ESS tool that led to referrals of patients with OSA risk. Knowledge and skills of evidence-based practice among nurses is a key factor to consider while promoting quality care improvement in the community.

The strength of this project is the use of pre- and post-intervention strategy to answer the clinical question. The use of pre- and post-intervention is advantageous as it is

quick and simple to administer and is considered as convenient (Marsden & Togerson, 2012). Low costs were encountered when implementing this project which only required the education of nurse practitioners and minor printing costs associated with the screening too. The strength of this project was the implementation of a Plan-Do-Study-Act model that encourages evidence-based study. The model used in this project encourages quality improvement by collecting evidence-based data and information from patients and using the evidence-based findings to make positive and practical implications. The PDSA model created an avenue for training nurse practitioners on how to detect, diagnose, and document patient care and chronic disease management in an organized and standardized process. Moreover, the collaboration between the project stakeholders including nurse practitioners was the strength of the project to ensure increased referral and management of OSA.

The project limitation was the use of pre-post intervention associated with short implementation and evaluation period that might affect the outcomes. The implementation period should, therefore, be increased to obtain desirable results. In addition, the project limitation was linked to a small sample size. The small sample hinders generalization whereby referrals of patients with OSA after the implementation of ESS tool will only be limited to one primary care facility.

Future project recommendations include replicating similar projects in other clinics. Replicating the process in other clinics is an added advantage that ensures a different setting and population. Also, it will aim to determine whether implementing the ESS tool and educating patients will help to manage OSA.

Section 5: Dissemination Plan

Disseminating the findings is an essential part of the project that details the sharing of findings to the larger community. Nurse practitioners are expected to contribute to the development of quality service through sharing and disseminating their findings and reporting the results of their clinical innovation at their best practice. Disseminating findings requires considering aspects such as target audience and venue or organization. I disseminated the findings by presenting project outcomes and recommendations to organizational stakeholders that allowed this project to proceed at the practice setting in which the project was conducted. I may also seek further opportunities to disseminate project findings and outcomes in appropriate conferences and summary that can be published in recognized journals.

The target audience for this project is the scholarly community, nurse practitioners and physicians, and patients with chronic health disorders such as sleep apnea disorder and cardiovascular diseases. The scholarly community will benefit from numerous channels to disseminate the outcomes such as the university and journal publications. Additionally, the patients will benefit from this project following the evidence-based and quality improvement outcomes. The outcome dissemination will be carried out in the outpatient primary care included in this project to benefit patients and nurse practitioners.

Analysis of Self

An analysis of self is significant in the DNP projects as it helps to build relationships with the target audience. Self-analysis helped me to be informed how to

transfer written evidence from the DNP program to the audience to help in the practical use of findings implications. My role as a project manager was to ensure the completion of this project in honesty and without bias so that other stakeholders can benefit from the outcomes. My ability to encourage collaboration and interaction facilitated the completion of the project. As a nurse practitioner, I also ensured adherence to nurse practitioner ethics by maintaining the anonymity of the respondents and treating them with respect.

As a project leader, I encountered a lack of cooperation from some of the workers at the clinic, but continuous interaction with the team members and patients ensured cooperation. I understood the importance of training and education of nurse practitioners, which aligns with my long-term goals of becoming a health educator/nursing educator. The insights gained from this project reinforced that interaction with various stakeholders is important to know the steps required in completing the project.

Summary

I evaluated the efficacy of the educational intervention and ESS in increasing the number of referrals. The outcomes revealed that education and the ESS increases the number of referrals for high-risk patients with chronic disorders. This indicated the importance of nurse practitioner education in improving the quality of care in primary care facilities. Health care organizations should learn to promote professional development to their staff as well as motivate them to ensure quality patient care outcomes. Further, patients should be aware of early detection and diagnosis of chronic diseases to increase life expectancy. Moreover, the dissemination of the project to the

target audience is essential in helping to transfer knowledge, improve social relations as

well as encourage professional development.

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Appendix: ESS Questionnaire Sample

Epworth Sleepiness Scale Questionnaire.

The patient should choose one of the 0–3 numbers as described below in the recent two weeks. Scores greater than 10 out of 24 are regarded as presence of daytime sleepiness

0 = would *never* doze or sleep.

1 = *slight* chance of dozing or sleeping

2 = *moderate* chance of dozing or sleeping

3 = *high* chance of dozing or sleeping

    Sitting and reading

    Watching TV

    Sitting inactive in a public place

    Being a passenger in a motor vehicle for an hour or more

    Lying down in the afternoon

    Sitting and talking to someone

    Sitting quietly after lunch (no alcohol)

    Stopped for a few minutes in traffic

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