Detecting Obstructive Sleep Apnea in Adult Primary Care Population

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Abstract

Obstructive sleep apnea (OSA) is a sleep-related disorder that affects the brain and heart. About 25 million people in the US are affected by OSA. The disorder is becoming highly prevalent, but 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 and tools ensure an effective detection of OSA. The purpose of the project was to improve the referral rates of high-risk patients for OSA evaluation through the use of Epworth OSA screening tool in a primary care clinic. The Plan-Do-Study-Act (PDSA) model was used to implement the intervention and evaluate the resulting outcomes to determine the success and failure rates of the intervention regarding the project goal. The data was collected from an outpatient primary care clinic. To obtain summaries of the obtained data, measures of central tendency were used and a two-proportion z-test was employed to analyze the efficiency of the education procedure. The findings revealed that the implementation of ESS tool increased the number of referrals of high-risk patients ($Z = 4.140$, $p = 0.000$). In conclusion, ESS tool is an effective tool in facilitating the management of sleep disorder. There should be widespread awareness of the positive benefits of ESS tool in order to increase the implementation of the tool in other clinical facilities. This project contribute to positive social change through nurses informing patients about the disadvantages of overworking and the importance of enough sleep in managing sleep disorder. Furthermore, primary care nurse practitioners should have professional development that is an integral part of quality improvement in healthcare institutions.

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Section 1: Nature of the Project

Introduction

Obstructive sleep apnea (OSA) is a chronic disorder that is a major contributing cause of cardiovascular-related morbidity and mortality. The disorder leads to perpetual episodes of temporary cessation of breathing named apnea or the reduction in airflow called hypopnea caused by the constant collapse of the upper airway (Spicuzza, Caruso, & Di Maria, 2015). OSA is indicated by various sleeping characteristics including extremely loud snoring, lowered oxygen levels, and perennial arousal from sleep that leads to daytime distraught concentration levels, a poor quality of life, and higher susceptibility to accidents (Dixit, Verma, & Pawar, 2018). Darien (2014) reported that OSA has negative impacts on the health of a person with the most affected organs being the brain and the heart. Approximately 25 million adults in the US are affected by OSA. The OSA prevalence estimates is 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 large number of patients who visit sleep specialist or are booked for polysomnography (Chai-Coetzer et al., 2013). In the adult primary care population, the high OSA reports have prompted the use of screening tools in an effort to detect the disorder early. The US Preventive Services Task Force (2017) reported that 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 the presence of sleepiness during the day hence generally improving the quality of life associated with sleep.

Dixit et al. (2018) identified OSA as a highly prevalent disorder that is not detected early hence the need for a screening tool. The tool identifies high-risk patients among an adult primary care population, hence 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 is time-consuming, labor-intensive, and is costly. Epworth Sleepiness Scale (ESS) is, therefore, a better alternative for screening for OSA as it counters the disadvantages of PSG (Zou et al., 2013). Zou et al. (2013) depicted ESS as a screening tool for OSA that produces results that determine whether a patient should undergo a PSG or go to a sleep laboratory (Zou et al., 2013). ESS is a tool that is used to measure the rate of sleepiness on the basis of eight conditions. The diagnosis of obstructive sleep apnea (OSA) can be achieved using the ESS that is followed up by complementary diagnosis done using a PSG (Downey, 2018). Primary care nurse practitioners are faced with the challenge of lacking adequate information with regard to efficiently screening and diagnosing OSA and the follow-up procedure on diagnosed patients; hence educating them is important (US Preventive Services Task Force, 2017). According to a study by Passamonte (2015), the referral of a patient to undergo a PSG rarely occurs because of the lack of adequate information on procedures to be followed to ensure a proper diagnosis and treatment of OSA. The lack of education on the side of the primary care nurse practitioners and physicians on the efficient way of screening or asking about a

patient's sleep patterns is a barrier to the diagnosis and treatment of OSA (Frost & Sullivan, 2016). The education curriculum of healthcare practitioners does not emphasize issues related to sleep hence OSA is not given the attention it requires.

Problem Statement

Research has shown that OSA is a major contributing factor of deaths that occur due to cardiovascular-related diseases (Spicuzza et al., 2015). Darien (2014) reported that in the US, the prevalence rates for OSA in adults is increasing and leads to various issues including poor quality of life due to the frequent episodes of apnea and hypopnea. Spicuzza et al. (2015) reported that OSA is highly prevalent in an adult primary care population because of the high-risk factors that are associated with the disorder. These high-risk factors include, but are not limited to obesity, menopause, the male gender, and oropharyngeal features as the contributing factors to the high rates of OSA. The problem that exists in the primary care facility is that there are minimal referrals of patients for OSA evaluation. This is because the primary care practitioners at the facility do not have adequate knowledge on the proper use of tools or procedures for ensuring that OSA screening is done earlier.

In the identified primary care facility, OSA is highly prevalent. Screening for OSA is necessary to avoid the costs associated with late detection of the disorder. Moreover, the number of patients at the clinic who have undiagnosed OSA contribute to the increased prevalence of the condition. Tantrakul et al. (2017) stated that OSA has a prevalence rate of 2% to 26% in the world and approximately 93% of women and 82% of men with OSA are not diagnosed. Dixit et al. (2018) concur with Tantrakul et al. (2017)

that OSA is becoming a highly prevalent disorder that often goes undiagnosed. Downey (2018) proposed screening strategies using ESS as an effective tool for identifying patients in need of a PSG. The US Preventive Services Task Force (2017) supported the sentiments by Downey (2018) that screening is the best way to identify high-risk patients with OSA that will guide in determining whether to refer a patient to a sleep expert or to schedule a PSG. Screening in an adult primary care population is an appropriate strategy to detect the presence of OSA as it is cheaper, faster, and less costly when compared to PSG (Dixit et al., 2018). Early detection is crucial as it ensures that the disorder is addressed earlier to improve the quality of life of the patient and lower mortality and morbidity rates.

The US Preventive Services Task Force (2017) also proposed that primary care practitioners need to be educated on the effective use of ESS screening tool to ensure proper diagnosis and follow-up procedures. Passamonte (2015) reported that the lack of adequate knowledge when it comes to the efficient identification and proper follow-up procedures of OSA patients is a significant hindrance to an appropriate diagnosis of OSA. This means that educating the nurse practitioners in the adult primary care makes a substantial contribution to ensuring 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 greatly contributes to a reduction in cardiovascular-related morbidities and mortalities (Spicuzza et al., 2015).

OSA also has an economical aspect or costs associated with the lack of treatment and late diagnosis of the disorder. The impact of OSA on the health sector and the

country can be direct costs of diagnosis or indirect costs of conditions that accompany OSA (Garvey, Pengo, Drakatos, & Kent, 2015). Moreover, motor vehicle accidents in the US are 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 millions in the US (The Institute for Clinical & Economic Review, 2013). According to Watson (2016), the cost of undiagnosed OSA 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 such as hypertension and diabetes. Achieving the project goals ensures that the costs associated with the lack of treatment or late diagnosis of OSA will decrease or be eliminated.

<div align="center">**Purpose Statement**</div>

OSA is a highly prevalent disorder in the world today that has not been efficiently detected thereby leading to the development of other diseases because of the late treatment (Spicuzza et al., 2015). The treatment of OSA when it is not detected in its early stages is also low. With regard to this, the project revolved around the practice-focused question: Will implementing the Epworth obstructive sleep apnea (OSA) screening tool in an out-patient primary care setting increase the number of referrals of high-risk patients? The strategy of educating primary care practitioners on how to effectively detect OSA, especially in an adult primary care population greatly contributed towards reducing the rates and costs associated with OSA not being treated earlier.

Nature of Doctoral Project

The project was conducted in an adult primary care facility and focuses 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. The project engaged 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, in turn, the improvement of the quality of life of patients.

The approach of the study included "Planning" which entails gathering data from the patients' chart by the quality improvement team to assess how many patients were screened for OSA before implementing the Epworth tool (AHRQ, 2015). The next step was to "Do" using the EPWORTH OSA screening tool to screen OSA in this setting and observed and "Studied" the results. The final step, "Act" involved concluding or evaluating the results to determine whether the project goals were achieved. In case the evaluation process indicated that the project goals were not achieved, the quality improvement team identified various improvement measures. When the evaluation process indicated an achievement of project goals, measures for applying the tool on a more significant scale were made.

Significance

The project involved the nurse practitioners and the patients that visit the primary care facility. The patients who visit the clinic also benefit from the early detections of OSA and the increase in the number of referrals for OSA evaluation. The costs that are associated with being re-admitted to the facility because of the effects associated with the lack of detection or late diagnosis of OSA are also avoided. Moreover, the primary care facility benefited from the project in that the quality of care provided to the patients is improved because of the early screening for OSA. The education of the nurses and caregivers on the use of ESS for screening for OSA led to improvements in their theoretical and expertise regarding the disorder.

One of the major objectives of the nursing practice is to provide quality care to patients. The detection of OSA has the benefit of increasing the referrals of patients for OSA evaluation by sleep specialist. This ensures that the aspect of screening for OSA is incorporated into the clinic's patient screening plan. The success of the project was a great indicator that transferring it to other areas is beneficial to major stakeholders. The project can be implemented on a wider scale, for instance, in other clinics. This ensures that OSA is also tested whenever a general test for illnesses and disorders is being done on high-risk patients. The US Preventive Services Task Force (2017) reported that the rising costs and effects of untreated OSA are attributed to the lack of proper diagnosis and education inadequacies on the part of the nurse practitioner on proper screening for OSA. An earlier detection of OSA eliminates the costs associated with untreated OSA. Moreover, it will help improve the quality of life of patients with OSA.

Summary

There has been a high prevalence of Obstructive Sleep Apnea. The effects of late detection of OSA have been the great contributor to cardiovascular-related morbidity and mortality. Also, the economic cost to the employers and the country also increases because of the late diagnosis or the lack of treatment of OSA. One way of countering the effects of OSA is early detection. The detection of OSA is done using the Epworth sleep apnea screening tool, for instance, in an adult primary care population. The education of the nurse practitioners and physicians on the use of ESS and an adequate follow-up procedure on diagnosed patients is also an effective measure to ensure early detection of OSA and increase OSA-related referrals. The first section highlighted the introduction to the problem, the nature of the project, and its purpose. The second section 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 disorder that is prevalent in the world today with many cases being

recorded in adult primary care facilities (US Preventive Task Force, 2017). The disorder

has low levels of detections and referrals hence increasing the cost of treating the diseases

that arise. The practice-focused question is: Will implementing the Epworth obstructive

sleep apnea (OSA) screening tool in an out-patient primary care setting increase the

number of referrals of high-risk patients? The purpose of the project was to increase of

referral rates of high-risk patients for OSA evaluation through the use of Epworth OSA

screening tool in a primary care clinic. The section contains the following subsections;

concepts, models and theories, relevance to nursing practice, local background and

context, role of the student, role of the project team and a concise summary of the

section.

Concepts, Models, and Theories

Improvements in the quality and safety of the healthcare system are challenging

task to achieve hence prompting for the adoption of QI methods like PDSA. A QI

approach that a firm seeks to apply should provide ways that test and evaluate any

interventions made in relation to healthcare with a general aim of providing high-quality

and efficient care with minimum costs involved (Taylor et al., 2013). The QI method that

serves the above purpose is the PDSA which can either be used independently or in

conjunction with other approaches, for instance, total quality management, Lean Six

Sigma or Continuous QI (Taylor et al., 2013). QI methods are being adopted into the

healthcare system because they create an overall advantage of ensuring that care is delivered safely, timely, effectively, efficiently, equitably, and cost-effectively (Reed & Card, 2015).

The PDSA model is a highly valuable QI strategy for the healthcare sector with various advantages and positive impacts associated with it. PDSA aims to critique as to whether an intervention's applicability in a given environment is successful or not. The whole PDSA process provides an output that enable users to achieve their goals in addition to learning and informed action (Reed & Card, 2015). Reed and Card (2015) further mention the advantages associated with PDSA as being easily applicable by anyone. However, using the model requires a vast amount of technique and knowledge to achieve the desired objectives.

Edward Deming came up with the PDSA cycle that has four key components, that is, Plan, Do, Study and Act as in Figure 1 below (Donnelly & Kirk, 2015). PDSA is defined as an interactive, four-stage problem-solving model used for improving a method or carrying out modification (Agency for Healthcare Research and Quality, AHRQ, 2015).

- **Plan** – Set your objectives based on service and patient needs

P

- **Do** – Implement the plan

D

- **Act** – To ensure the improvements are implemented

A

- **Study** – Analyse the results obtained

S
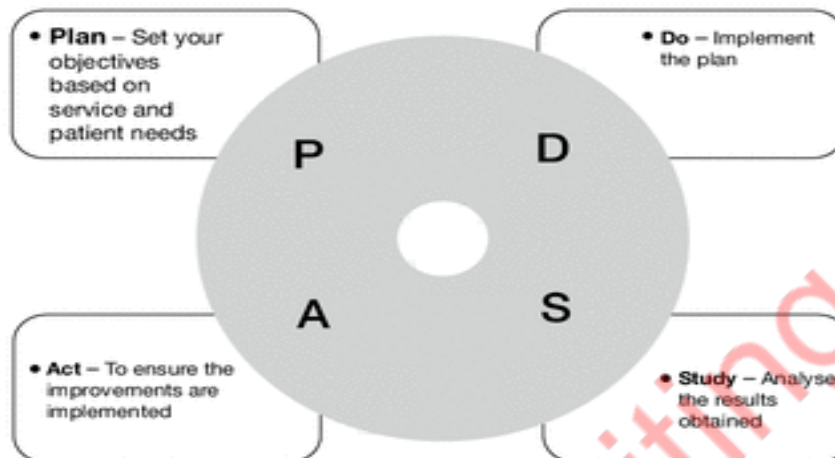
Figure 1. PDSA Model. Source: Donnelly, P., & Kirk, P. (2015). Use the PDSA model for effective change management. *Education for Primary Care, 26*(4), 279-281. doi:10.1080/14739879.2015.11494356

In the PDSA cycle, the 'plan' phase is where a change 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). This project incorporates a team that involves a nurse practitioner and supervisor in addition to the quality improvement team. This is efficient because the primary care facility workers helped in outlining the facility's quality requirements concerning the project hence making the acceptance of the result to have higher chances (Minnesota Department of Health, 2016).

A successful PDSA ensures that project goals are achieved in addition to saving on costs involved in implementing unrealistic interventions in a given setting (Reed & Card, 2015). Moreover, the model is useful for use in the healthcare sector because of its

easy application and adaptability since it is flexible enough to suit the various functions and processes in a healthcare facility (Reed & Card, 2015). PDSA model is proven to be an effective QI strategy for the evaluation of healthcare inventions. For instance, the model is used in pragmatic research to extrapolate on the implementation procedures of an invention in the healthcare sector. This helped in discovering any difficulties in the implementation process and act as a guide for the healthcare facilities to integrate a successful intervention in their processes (Coury et al., 2017). The use of PDSA model in the healthcare sector ensures interventions are effective (Taylor et al., 2013). This is clear evidence that the PDSA model is suitable for the study.

The PDSA cycle as a quality improvement is proven to be effective through a pragmatic study called 'strategic opportunities to stop colon cancer in priority populations (Coury et al, 2017).' PDSA is used to test the trialability of interventions because health-related interventions need adequate and efficient knowledge of the healthcare facility's processes and procedures to avoid any fatalities (Coury et al., 2017). The authors are in support of PDSA cycles as it ensures that an intervention is adequate and facilitate its adoption in the healthcare facility where the intervention is being experimented on (Coury et al., 2017). The training done when using the PDSA model may imply that it is a simple tool hence the person using it may not place great considerations on acquiring the adequate knowledge necessary for the proper implementation of the tool. This may have adverse effects both on the learning efforts and the implementation process of the intervention in the intended setting (Reed & Card, 2015).

Aurora and Quan (2016) reported that in an adult primary care center, the primary care nurse practitioner or physician is the best-placed person that can efficiently identify the symptoms of OSA among high-risk patients and hence, make referrals for evaluation. In adults, especially those in a primary care setting, OSA is rarely reported, and there are low referrals for OSA evaluation done by the primary healthcare providers (Williams et al., 2015). The project improved the referrals for OSA evaluation that lead to an improvement in the quality of care provided to the patients.

Chai-Coetzer et al. (2013) and Williams et al. (2015) argued that the physicians and nurse practitioners working in primary care settings are the reason for the lack of data relating to sleep history and the low number of referrals for OSA evaluation. Chai-Coetzer et al. (2013) further indicated that for efficient assessment and detection of OSA, the healthcare practitioners need to be educated on the proper use of screening tools. The impact of educating primary care practitioners on efficient detection using screening tools and adequate follow-up mechanisms lower the effect of late detection of OSA (Chai-Coetzer et al., 2013).

Williams et al. (2015) attributed the knowledge deficit of primary care nurses and physicians to be the main cause of the lack of diagnosis of OSA with 82% men and 93% women remaining undiagnosed. 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). In his study on development and outcomes of a primary care-based sleep assessment service in Canterbury, New Zealand, Epton et al. (2017) explained the procedures of training the nurse practitioners to involve a general

overview of sleep disorders, pulse oximetry, and training on the screening tools for OSA. The results of the study by Epton et al. (2017) indicated that the training of healthcare practitioners on OSA and its detection has a great impact on the number of referrals 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 having OSA during the acute post-stroke period more likely to pass on unlike patients without OSA (Ifergane et al., 2016). There is adequate evidence accruing to the fact that OSA is a growing risk factor that is related to hypertension, COPD, asthma, obesity, and diabetes thus raising morbidity and mortality rates (US Preventive Services Task Force, 2017).

The economic aspect or costs associated with the lack of treatment and early diagnosis of OSA affect the health sector, country, and the individual. For instance, moving vehicle accidents in the US are caused by 800,000 drivers with OSA (Garvey et al., 2015). The cost of undiagnosed OSA 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 will significantly contribute to the minimization of costs, that is, both the direct and indirect costs. This is because detecting the disease early ensures that treatment is done in due time hence the risk factors of OSA are not worsened

leading to morbidity and mortality (Faust, Acharya, Ng, & Fujita, 2016). The detection of OSA at an earlier stage gives room for early treatment hence lower the number of cardiovascular-related mortalities and morbidities and make the quality of life of the patient to improve (Ifergane et al., 2016). Early detection can be achieved through the use of PSG. Uddin, Chow, and Su (2018) noted that.

Due to the processes involved in performing a PSG, the process requires a lot of time, approximately, the whole night. Also, the process requires constant supervision and is labor intensive. These factors contribute to the overall costs associated with detecting and diagnosing OSA (Faust et al., 2016). 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, and Montserrat, 2016).
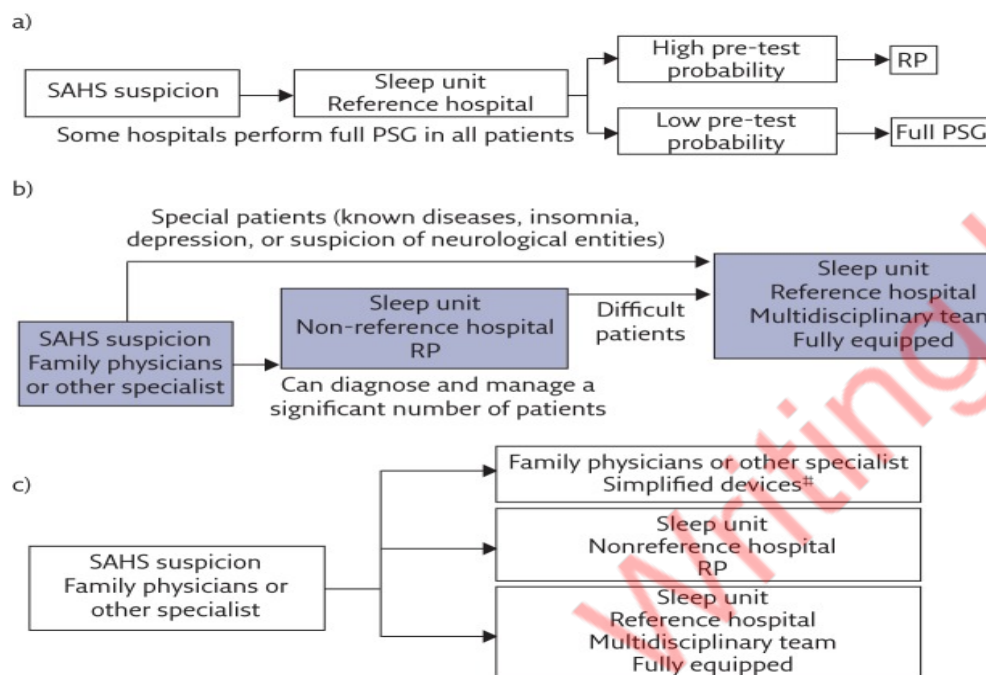
Figure 2. Management of OSA: Source: Suárez et al. (2016).

The Centers for Disease Controls and Prevention came into partnership with the American Academy of Sleep Medicine and the Sleep Research Society to develop and implement the Health Sleep Awareness Project that was aimed at assessing whether OSA risk assessment and quality improvement in healthcare were being performed (Aurora & Quan, 2016). The early detection of OSA in a primary care facility and appropriate referrals and follow-up procedures done on the high-risk patients has various advantages. It reduces the number of case of undiagnosed OSA, improves a patient's quality of life and health, and reduces the overall costs associated with undiagnosed and untreated OSA (Aurora & Quan, 2016). Early detection of OSA is necessary, especially in adults. This is because sleep-related disorders increase with the increase in age of a person (Faust et al., 2016). Similarly, cardio-vascular related morbidities and mortalities, hypertension, and diabetes associated with OSA are reduced (Faust et al., 2016).

Jin (2017) demonstrated that the screening of OSA is done using questionnaires and is recommended for adults, especially those in a primary care population. The main benefit of screening for OSA is that it enables an early treatment of the disorder hence curtailing the associated consequences that come with the late diagnosis or treatment of OSA. The primary care facility is the best place to screen for OSA because for most patients; it is the first place that they seek medication or mention any sleep-related complications that they have, especially during medical checkups by high-risk patients (Aurora & Quan, 2016). Sharma et al. (2015) mentioned that screening for OSA ensures the efficient detection and early treatment of the disorder.

Screening tools are developed as a measure of ensuring that OSA-related morbidity and mortality rates are curtailed. The US Preventive Services Task Force (2017) depicted that there is a clear relation between OSA and mortality hence screening for OSA early provides adequate room for the early treatment to reduce mortality-related impacts. The US Preventive Services Task Force further stated that the various challenges of screening for patients in a primary care facility are the 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 (US Preventive Task Force, 2017).

The tools that are used for screening for OSA include Epworth Sleepiness Scale, Stop, STOP-BANG, and 4-Variable screening tool (4-V) 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-V 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 (BQ) is another screening tool for OSA. BQ 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).

Aurora and Quan (2016) argued that among high-risk patients, the best way to lower the effects of undiagnosed OSA is by screening the patients. For the screening procedures for OSA to be effective and efficient, 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 healthcare practitioners with knowledge on the importance of screening for OSA and on the use of screening tools (Aurora & Quan, 2016). The questionnaire used for screening for OSA in a primary care setting is proven a useful tool to increase the referral rates for OSA evaluation (Suárez et al., 2016). The questionnaires is used on high-risk patients in a primary care facility. High-risk patients for OSA have the following symptoms; snoring, sleeping during daytime, obesity, short necks, and are probably of the male gender (Suárez et al., 2016).

Epworth Sleepiness Scale 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 in an effort 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 PSG; however, it is costly, labor-intensive, and time-consuming. Therefore, ESS is a better option when compared to PSG 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 highly prevalent in the world today 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 PSG 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.

<h3 style="text-align:center">Local Background and Context</h3>

Obstructive sleep apnea 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 5600 to 7000. 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 obstructive sleep apnea at the clinic. Undertaking the project on this site benefited the high-risk patients who were screened for OSA using the Epworth OSA screening tool 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 healthcare 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. 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

Obstructive sleep apnea is a sleep-related disorder that is becoming highly prevalent in today's society. Despite the high prevalence of the disorder, especially in primary care settings, the report and referral rates for OSA are relatively low in number (Williams et al., 2015). In this section of the proposal, the procedures that were followed to address the local problem presented. The practice-focused question that guided the project is discussed in this section. Similarly, this section outlines the sources of evidence that depict where data relevant to the project is obtained from. Moreover, the data analysis techniques and procedures are presented in the analysis and synthesis section. A succinct summary of the section is then provided.

Practice-Focused Question

In the primary care facility in Maryland, there is no tool for screening for OSA. The patients who visit the clinic have no indications of sleep information on their medical records. Also, the nurse practitioners who work at the primary care facility lack proper education on OSA screening tools and, therefore, the referrals for OSA evaluation are relatively low. With regard to this, the following practice-focused question was used in the project; In an outpatient, primary care setting, will implementing the Epworth obstructive sleep apnea (OSA) screening tool increase the number of referrals of high-risk patients over a period of one month? Despite the high prevalence rates of OSA, the early detection of the disorder was not being done, the sleep history of patients lacked,

and referral rates of high-risk patients for OSA evaluation were low (Chai-Coetzer et al.,

2013).

Sources of Evidence

Data for the project was collected from an outpatient clinic. The average number

of patients who visit the clinic per year is 5600 to 7000. 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 which

makes the patients at the clinic to be at high-risk of having OSA (Faust et al., 2016).

However, the clinic did not have guidelines for screening the high-risk patients for OSA.

The clinic had a reporting structure that allowed the facility to track one month referrals

of high-risk patients for OSA evaluation (Personal Communication with clinic staff,

2018).

The OSA-related referrals done by primary care practitioners were low at the

clinic. This was related to the lack of the use of OSA screening tool and the lack of

adequate knowledge on the use of OSA screening tool amongst the nurse practitioners.

Educating the nurse practitioners on how to use screening tools and questionnaires to

detect OSA and on proper follow-up mechanisms for OSA diagnosed patients increased

the OSA referrals (Chai-Coetzer et al., 2013). Education of nurse practitioners in the

primary care setting on the use of OSA screening tools ensured an efficient and effective

detection of OSA and hence increased the referrals for sleep study (Chai-Coetzer, 2013;

Elton et al., 2017; Williams et al., 2013). Completing this project in this clinic benefited

those high-risk patients who are screened for OSA using the Epworth OSA screening tool and received referrals for a sleep study as appropriate (Aurora & Quan, 2016).

In the healthcare sector, there is a rising need for Quality improvement (Knudsen et al., 2017). QI methods are being adopted to improve the quality and safety of the healthcare industry. An adequate QI strategy provides efficient measures for testing and evaluating an intervention in the healthcare sector with low costs involved (Taylor et al., 2013). PDSA model is a QI strategy that can be applied in the healthcare sector to analyze and critique an intervention in relation to the project goals. The output obtained from using the PDSA model enables learners to achieve their goals, explain their results and, learn from the results and efficiently generates informed action (Reed & Card, 2015). The PDSA cycle involves the primary care facility workers whom the project helps to ensure that the project is of high quality and produces the desired results (Minnesota Department of Health, 2016).

The learner and the project team 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 or not the goal of increasing referrals for OSA evaluations will increase. Moreover, the model helped the team to identify areas of improvement in the scenario where the purpose of the project is not attained. With the quality of the project in mind, the project team consisted of a nurse practitioner and supervisor from the adult primary care facility. In addition to the PDSA model, the study involved the education of primary care practitioners on how to use the Epworth Sleepiness Scale to screen for OSA. The evidence from the clinic's system and the

information written by seminal scholars ensured that the purpose of the project of determining whether the education of primary care healthcare practitioners on the use of Epworth OSA screening tool can be used to increase the referral rates of high-risk patients for OSA evaluation was efficient.

The DNP student 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 five 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 selected to contribute to the project were used as reference by the DNP student and the project team while implementing the project at the outpatient clinic at Maryland.

The nurse practitioners that were educated on the use of ESS for screening for OSA included those from the outpatient clinic in Maryland. Moreover, the management and other nurse practitioners were involved while making the proposition to include OSA screening as part of the standard tests that all patients who visit the clinic must go through. Data was collected from the clinic after Walden University's IRB approval.

Analysis and Synthesis

The project team collected data on the number of referrals of high-risk patients for OSA evaluation before the implementation of the use of the ESS screening tool and education on the use of the Epworth OSA screening tool is done. Similarly, referral rates

for OSA evaluation or study was retrieved after a two-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 healthcare system before and after the project's intervention, hence the need for use of descriptive and inferential statistics. The number of patients sent to see sleep specialists was an indication that the education procedure is 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 pre-implementation of the ESS tool and education and post-implementation of the ESS tool and education was used to assess the quality improvement measures and goals attained. To compare how effective the implementation of the ESS tool and education of primary care nurse practitioners is 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 5600-7000 (Afthanorhan, Nazim, & Ahmad, 2015).

Summary

The section highlighted practice-focused questions that guide the project together with the sources of evidence. The project focused on educating the primary care healthcare practitioners on how to use the Epworth OSA screening tool to increase the number of referrals of high-risk patients for OSA evaluation. The data was collected from the clinic. Referral rates before and after the education process were extracted from the

records of the patients. Analysis and synthesis was done using descriptive and inferential

statistics. Means and frequencies were used to summarize the data obtained whereas the

two-proportion z-test was used to explore the intervention's efficiency.

Section 4: Findings and Recommendations

Introduction

The section aims to answer the project question and present the results and data analysis findings. The section provides a recap of the problem statement and the project question. The data analysis results include both descriptive and inferential statistics. Descriptive statistics include frequency tables, mean, and standard deviation.

The practice question was: In an outpatient primary care setting, will implementing the Epworth obstructive sleep apnea (OSA) screening tool increases the number of referrals of high-risk patients over a period of one month? The project proposed to examine the effect of implementing the Epworth obstructive sleep apnea (OSA) screening tool in an outpatient primary care setting on the number of referrals of high-risk patients.

Data was collected from an outpatient clinic of patients with acute and chronic illnesses and those needing health promotion and disease prevention. The Maryland Clinic observes low referrals that are related to the lack of the use of OSA screening tool and the lack of adequate knowledge on the use of OSA screening tool amongst 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 two months from the time the ESS tool had been implemented at the clinic and education had been given to the nurse practitioners. Two-proportional Z-test was used to compare the number of referrals for the male and female high-risk patients in the

clinic following the implementation of the ESS tool and the education of primary care nurse practitioners.

Findings and Implications

This section presents the descriptive statistics and inferential statistics based on the clinical question. Descriptive statistics described demographic characteristics of the patients. Inferential statistics involved the use of proportion Z-test. 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 Epworth obstructive sleep apnea (OSA) screening tool. The results in Table 1 depict demographic information at pre-intervention and post-intervention according to gender. The results revealed that there were more males (58.4%) than females (41.6%) at pre-intervention of the OSA tool. However, at post-intervention of the OSA tool, more than half of the respondents (55%) were males compared to females (45%).

Table 1

Gender of respondents at pre- and post-intervention of OSA tool

Intervention	Gender	N	%
Pre-Intervention	Male	35	58.4
	Female	25	41.6
Post-Intervention	Male	33	55
	Female	27	45

The project examined the respondents with BMI > 30 as depicted in Table 2 for respondents in both at pre-intervention and post-intervention of OSA tool. The results showed that there were more males (63.2%) than females (36.8%) with BMI > 30 at pre-intervention of OSA tool. Also, more than two-thirds (71.4%) with BMI > 30 at post-intervention of OSA tool were males compared to less than a third (28.6%) females. The results also revealed that in overall, a majority of respondents (52.5%) with BMI > 30 were in post-intervention compared to respondents (47.5%) at pre-intervention.

Table 2

BMI of respondents at pre- and post-intervention of OSA tool

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

The project also examined the patient's comorbidity at pre-intervention and post-intervention. The results as depicted in Table 3 revealed that a majority of the respondents with comorbidity > 1 at pre-intervention were males (64.7%) compared to females (35.3%). Besides, a majority of respondents at post-intervention were males

(60%) compared to females (40%). In overall, there were more patients with comorbidity

> 1 at pre-intervention (53.1%) compared to post-intervention (46.9%).

Table 3

BMI of respondents at pre- and post-intervention of OSA tool

Intervention	Comorbidity > 1	N	%
Pre-Intervention	Male	11	64.7
	Female	6	35.3
	Total	17	53.1
Post-Intervention	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 1. The figure shows

that there were no referrals at pre-intervention while there were 15 referrals for both male

and females at post-intervention.
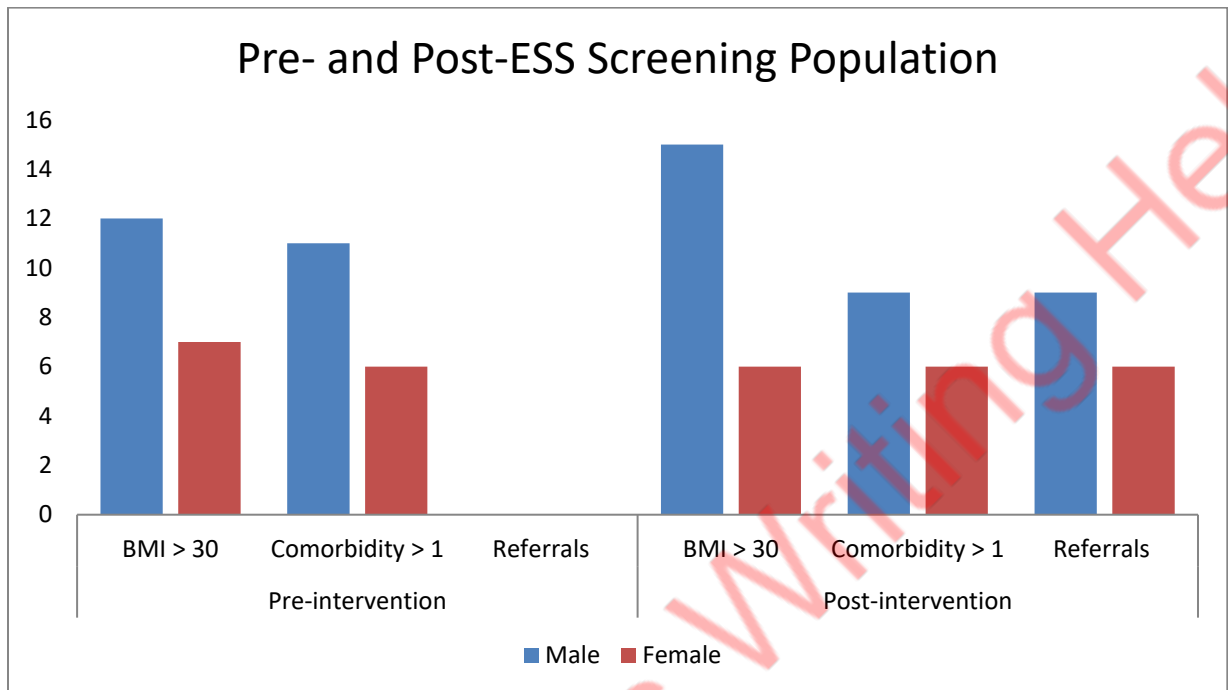
Figure 3. Pre- and Post-ESS Screening Population

Figure 4 reveals the sleepiness scores from the Epworth tool. The results showed that a majority of the patients (44%) reported 1-6 normal sleepiness while a significant number of patients (33%) reported 9-24 abnormal sleepiness. Few patients (23%) indicated that they experience 7-8 average sleepiness.
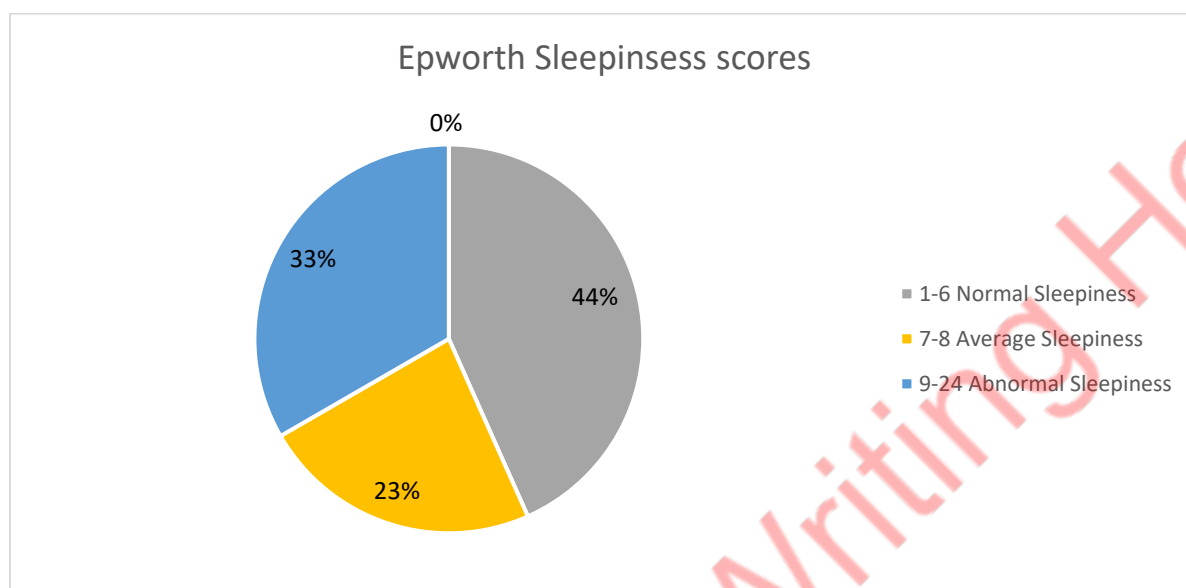
Figure 4. Epworth sleepiness scores

Data Analysis Findings

The essential goal of the project was to examine the effect of implementing the Epworth obstructive sleep apnea (OSA) screening tool in an outpatient primary care setting on the number of referrals of high-risk patients. In addition, the project examined the importance of educating primary care nurse practitioners on quality improvement measures. To answer the project question, two-proportion Z- test was conducted to examine the difference between pre-intervention and post-intervention of the Epworth obstructive sleep apnea (OSA) screening tool on referrals of high-risk patients.

Table 4

Proportion Z-test for pre-intervention and post-Epworth OSA intervention

Intervention	Proportion Z-test	Significance
Pre-Post Intervention	4.140	0.000

The results as depicted in Table 4 revealed that the findings were significant (Z = 4.140, p = 0.000) at 0.05 level of significance. This revealed that implementing the Epworth obstructive sleep apnea (OSA) screening tool 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 pre-intervention to 15 referrals at post-intervention. 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 obstructive sleep apnea (OSA) screening tool in an outpatient primary care setting on the number of referrals of high-risk patients. The findings revealed that implementing the Epworth obstructive sleep apnea (OSA) screening tool 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 sleep disorder 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 sleep disorder 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 the sleep disorder. 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 sleep disorder. Through the implementation of the ESS tool, nurse practitioners are able to direct patients to seek further medical treatment for sleep disorder.

Further, the findings revealed the effectiveness of educational intervention on sleep disorder 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 sleep disorder. 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 sleep disorder is managed by promoting early diagnosis as well as medication.

Contribution of the Doctoral Project Team

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 sleep disorder through the implementation of ESS tool. The use of evidence-based practice enabled the DNP student to facilitate quality care improvement among patients with sleep disorder. The DNP student implemented the ESS tool that led to referrals of patients with sleep disorders. 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 sleep disorder.

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 sleep disorder 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 sleep disorder.

Section 5: Dissemination Plan

This 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 provision through sharing and disseminating their research findings and actively reporting the results of their clinical innovation at their best practice. Disseminating findings requires putting into consideration key aspects such as target audience and venue or organization. The student also 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. The student may also focus on seeking further opportunities to disseminate project findings and outcomes in appropriate conferences and summary that can be published in recognized journals.

The target audience for disseminating this project is the scholarly community, nurse practitioner and physician stakeholders, and patients with chronic health disorders such as sleep apnea disorder and cardiovascular diseases. The scholarly community will benefit as the student will use numerous channels to disseminate the outcomes. The appropriate venue for disseminating the outcomes to the scholarly community is the university and publishing journal centers. Also, the patients will benefit from this project following the evidence-based outcome and quality improvement outcome. 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 DNP project as it helps the project stakeholder/manager to build relationships with the target audience due to increased interactions. Self-analysis helped the student to be informed how to efficiently transfer written evidence from the DNP program to the audience to help in the practical utilization of findings implications. My role as a project manager was to ensure the completion of this project in utmost honesty and unbiasness so that other stakeholders benefit from the outcomes. My personality of the ability to encourage collaboration and interaction facilitated the completion of the project. In addition, I minimally portrayed my weaknesses to ensure the smooth implementation of the project. As a nurse practitioner, I ensured adherence to nurse practitioner ethics by maintaining the anonymity of the respondents and treating them with utmost respect. The completion of this project was a bit complicated due to the lack of cooperation from some respondents. However, I was able to complete the project due to my personality of patience. As a fast learner, I was able to grasp the importance of training and education of nurse practitioners which aligns with my long-term goals of becoming a health educator/ nursing educator.

I was able to complete the background section, sources of evidence section, the collection, and synthesis of evidence, and the findings section. I completed these sections through following the project guideline and rubric as well as incorporating the remarks of the instructor. The challenge encountered was formatting the project which I improved due to the guidance provided by my instructor. Also, as a project leader, I encountered a lack of cooperation from some of the workers at the clinic. A lot of time was wasted

while implementing the education intervention and retrieving data from the care facility. Continuous interaction with the team members and patients ensured cooperation was restored. The insights gained through the scholarly journal are that knowledge and skills are crucial for the completion of the project. In addition, interaction with various stakeholders increased the knowledge regarding the steps required in completing the project.

Summary

The project evaluated the efficacy of the educational intervention and Epworth OSA tool in increasing the number of referrals. The outcomes revealed that of educational intervention and Epworth OSA tool increases the number of referrals for high-risk patients with chronic disorders. The outcomes revealed 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 staffs 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.

References

Afthanorhan, A., Nazim, A., & Ahmad, S. (2015). A parametric approach using Z-test for
comparing two means to multi-group analysis in partial least square structural
equation modeling (PLS-SEM). *British Journal of Applied Science & Technology,*
6(2), 194-201. Retrieved from
www.journalrepository.org/media/journals/.../Afthanorhan622014BJAST14380_1
.pdf

Agency for Healthcare Research and Quality (AHRQ) (2015). Health literacy universal
precautions toolkit (2nd Edition). *Plan-Do-Study-Act (PDSA) Directions and*
Examples. Retrieved from https://www.ahrq.gov/professionals/quality-patient-
safety/quality-resources/tools/literacy-toolkit/healthlittoolkit2-tool2b.html

Aurora, R. N., & Quan, S. F. (2016). Quality measure for screening for adult obstructive
sleep apnea by primary care physicians. *Journal of Clinical Sleep Medicine,*
12(8), 1185-1187. doi:10.5664/jcsm.6064

Chai-Coetzer, C. L., Antic, N. A., Sharn, L. R., Reed, R. L., Esterman, A., Catcheside,…
McEvoy, R. D. (2013). Primary care vs specialist slep center management of
obstrusive sleep apnea and daytime sleepness and quality of life: A randomized
trial. *Journal of American Medical Association, 309*(10), 997-1004.
doi:10.1001/jama.2013.1823

Coury, J., Schneider, J. L., Rivelli, J. S., Petrik, A. F., Seibel, E., Brieshon D'Agostini,
B.,…Coronado . D. (2017). Applying the plan-to-do-act (PDSA) approach to a

large pragmatic study involving safety net clinics. *BMC Health Services Research, 17*, 411-423. doi:10.1186/s12913-017-2364-3

Darien. I. L. (2014). Rising prevelance of sleep apnea in U. S. threatens public health. *American Academy of Sleep Medicine.* Retrieved from https://aasm.org/rising-prevalence-of-sleep-apnea-in-u-s-threatens-public-health/

Dixit, R., Verma, S., & Pawar, K. S. (2018). Screening for obstructive sleep apnea using epworth sleepiness score and berlin questionnaire: Which is better? *Indian Journal of Respiratory Care, 7*(1), 33-36. doi:10.4103/ijrc.ijrc_20_17

Donnelly, P., & Kirk, P. (2015). Use the PDSA model for effective change management. *Education for Primary Care, 26*(4), 279-281. doi:10.1080/14739879.2015.11494356

Downey, R. (2018). Obstructive sleep apnea clinical presentation. *Pulmonology*. Retrieved from https://emedicine.medscape.com/article/295807-clinical

Drakatos, P., Ghiassi, R., Jarrold, I., Harris, J., Abidi, A., Douiri, A.,...., Joerg S. (2015). The use of an online pictorial Epworth Sleepiness Scale in the assessment of age and gender specific differences in excessive daytime sleepiness. *Journal of Thoracic Disease, 7*(5), 897-902. doi:10.3978/j.issn.2072-1439.2014.06.11

Epton, M. J., Kelly, P. T., Shand, B. I., Powell, S. V., Jones. J. N., G. R. B., & Hlavac, M. C. (2017). Development and outcomes of a primary care-based sleep assessment service in Canterbury, New Zealand. *NPJ Primary Care Respiratory Medicine, 27*(26), 1-14. doi:10.1038/s41533-017-0030-1

Faust, O., Acharya, U. R., Ng, E. Y. K., & Fujita, H. (2016). A review of ECG-based diagnosis support systems for obstructive systems for obstructive sleep apnea. *Journal of Mechanics in Medicine and Biology, 16*(1), 1-9, 1640004. Retrieved from http://orcid.org/0000-0002-0352-6716

Foroughi, M., Razavi, H., Malekmohammad, M., Naghan, P. A., & Jamaati, H. (2016). Diagnosis of obstructive sleep apnea syndrome in adults: A brief review of existing data for practice in Iran. *Tanaffos, 15*(2), 70-74. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5127617/

Frost & Sullivan (2016). Hidden health crisis costing America millions: Underdiagnosing and ndertreating obstructive sleep apnea. *American Academy of Sleep Medicine*, 3-22. Retrieved from https://aasm.org/resources/pdf/sleep-apnea-economic-crisis.pdf

Garvey, J. F., Pengo, M. F., Drakatos, P., & Kent, B. D. (2015). Epidemiological aspects of sleep apnea. *Journal of Thoracic Disease, 7*(5), 20-929. doi:10.3978/j.issn.2072-1439.2015.04.52

Ifergane, G., Ovanyan, A., Toledano, R., Goldbart, A., Abu-Salame, I., Tal, A., Stavsky, M., & Novack, V. (2016). Obstructive sleep apnea in acute stroke: A role for systematic inflamation. *Stroke*. Retrieved from http://stroke.ahajournals.org/content/early/2016/04/12/STROKEAHA.115.011749

Jin, J. (2017). Screening for obstructive sleep apnea. *JAMA: The Journal of the American Medical Association, 317*(4), 450-458. doi:10.1001/jama.2016.20362

Knudsen, S. V., Laursen, H. V. B., Elhers, L. H., & Mainz, J. (2017). There is need for mprovement of quality improvement- a systematic review of the pdsa method in QI studies. *International Journal for Quality in Healthcare, 29*(1), 1-45. doi:10.1093/intqhc/mzx125.72

Laratta, C. R., Najib, T. A., Marcus, P. & Sachin, R. P. (2017). Diagnosis and treatment of obstructive sleep apnea in adults. *Canadian Medical Association Journal, 189*(48), 1481-1488. Retrieved from http://go.galegroup.com.ezp.waldenulibrary.org/ps/i.do?p=EAIM&u=minn4020&id=GALE|A517261925&v=2.1&it=r&sid=ebsco&authCount=1#

Levy, Y., & Ellis, T. J. (2011). A guide for novice researchers on experimental and quasi-experimental studies in information systems research. *Interdisciplinary Journal of Information, Knowledge, and Management, 6*, 151-161.

Liu, Y. F., Hu, J., Streelman, M., & Guthrie, O. W. (2015). The epworth sleepiness scale in the assessment of slep istrurbance in veterans with tinnitus. *International Journal of Otolaryngology, 9*, 1-14. doi:10.1155/2015/429469

Li, Y., Zhang, J., Lei, F., Liu, H., Li, Z., & Tang, X. (2015). Self-evaluated and close relative-evaluated epworth sleepiness scale vs. multiple sleep latency test in patients with obstructive sleep apnea. *Journal of Clinical Sleep Medicine, 10*(2), 171-176. doi:10.5664/jcsm.3446

Marsden, E., & Torgerson, C. J. (2012). Single group, pre-and post-test research designs: Some methodological concerns. *Oxford Review of Education*, *38*(5), 583-616.

Miller, J. N., & Berger, A. M. (2015). Screening and assessment for obstructive sleep

    apnea in primary care. *Sleep Medicine Reviews, 29*, 41-51.

    doi:10.1016/j.smrv.2015.09.005

Minnesota Department of Health. (2016). PDSA: plan-do-study-act. *Public Health and*

    QI Toolbox. Retrieved from

    http://www.health.state.mn.us/divs/opi/qi/toolbox/pdsa.html

Passamonte, R. L. (2015). Identifying OSA risk in the general adult primary care

    population. Doctor of Nursing Practice (DNP) Projects, University of

    Massachusetts. Retrieved from

    https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1047&context=nursin

    g_dnp_capstone

Peppard, P. E., Young, T., Barnet, J. H., Palta, M., Hagen, E. W., & Hla, K. M. (2013).

    Increased prevalence of sleep-disordered breathing in adults. *American Journal of*

    Epidemiology, 177(9), 1006-1014. doi:10.1093/aje/kws342

Peltzer K. & Pengpid S. (2018). The prevalence and social determinants of hypertension

    among adults in Indonesia: A cross-sectional population-based national survey.

    International Journal of Hypertension, 1-9. doi:10.1155/2018/5610725.

Reed, J. E., & Card, A. J. (2015). The problem with plan-do-study-act cycles. *BMJ*

    Quality and Safety, 25(3), 147-52. doi:10.1136/bmjqs-2015-005076

Sia, C-H., Hong, Y., Tan, L. W. L., van Dam, R. M., Lee, C-H., & Tan, A. (2017).

    Awareness and knowledge of obstructive sleep apnea among the general

    population. *Sleep Medicine, 36*, 10-17. doi:10.1016/j.sleep.2017.03.030

Singh, S., Shankar, R., & Singh, G. P. (2017). Prevalence and associated risk factors of hypertension: A cross-sectional study in urban Varanasi. *International Journal of Hypertension*, 1-10. doi: 10.1155/2017/5491838

Sharma, S. K., Katoch, V. M., Mohan, A., Kadhiravan, T., Elavarasi, A., Ragesh, R,… Gupta, R. (2015). Consensus and evidence-based Indian initiative on obstructive sleep apnea guidelines 2014 (first edition). *Lung India, 32*(4), 422-434. Retrieved from http://www.lungindia.com/article.asp?issn=0970-2113;year=2015;volume=32;issue=4;spage=422;epage=434;aulast=Sharma;aid=LungIndia_2015_32_4_422_159677

Singh, J., & Mims, N. (2015). Screening tools for the obstructive sleep apnea for the cardiovascular clinician. *American College of Cardiology*. Retrieved from http://www.acc.org/latest-in-cardiology/articles/2015/07/14/11/04/screeing-tools-for-the-obstructive-sleep-apnea-for-the-cardiovascular-clinician

Spicuzza, L.,Caruso, D., & Di Maria, G. (2015). Obstructive sleep apnoea syndrome and its management. *Therapeutic Advances in Chronic Disease, 6*(5), 273-285. doi:10.1177/2040622315590318

Suárez, M., Osorio, J., Torres, M., & Montserrat, J. M., (2016). Should the diagnosis and management of OSA move into general practice. *Breathe (Sheffield, England), 12*(3), 243-247. doi:10.1183/20734735.011216

Tantrakul, V., Numthavaj, P., Guilleminault, C., McEvoy, M., Panburana, P., Khaing, W., Attia, J., & Thakkinstian, A. (2017). Performance of screening questionnaires

for obstructive sleep apnea during preganancy: A systematic review and meta-analysis. *Sleep Medicine Reviews, 36*, 96-106. doi:10.1016/j.smrv.2016.11.003

Taylor, M. J., McNicholas, C., Nicholay, C., Darzi, A., Bell, D., & Reed, J. E. (2013). Systematic review of the application of the plan-to-study-act method to improve quality in healthcare. *BMJ Quality and Safety, 23*(4), 1-12. doi:10.1136/bmjqs-2013-001862

The Institute for Clinical & Economic Review. (2013). Diagnosis and treatment of obstructive sleep apnea: supplementary data and analyses to the comparative effectiveness review of the agency for healthcare research and quality. *The New England Comparative Effectiveness Public Advisory Council Public Meetng*, (pp. 3-85). Retrieved from https://icer-review.org/wp-content/uploads/2016/01/Final-Report_January20132.pdf

Uddin, M. B., Chow, C. M., & Su, S. W. (2018). Classification methods to detect sleep apnea in adults based on respiratory and oximetry signals: A systematic review. *Physiological Measurement, 39*(3), 1-14. doi:10.1088/1361-6579/aaafb8

US Preventive Services Task Force (2017). Screening for obstructive sleep apnea in adults: US preventive services task force recommendation statement. *Journal of American Medical Association, 317*(4), 407-414. doi:10.1001/jama.2016.20325

Watson, N. F. (2016). Health care savings: the economic value of diagnostic and therapeutic care for obstructive sleep apnea. *Journal of Clinical Sleep Medicine, 12*(8), 1075-1077. doi:10.5664/jcsm.6034

Williams, N. J., Joao, V. N., Zizi, F., OKuyemi, K., Airhihenbuwa, C., Ogedegbe, G. & Jean-Louis, G. (2015). Factors associated with referrals for obstructive sleep apnea evaluation among community physicians. *Journal of Clinical Sleep Medicine, 11*(1), 23-66. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4265654/

Wiskar, K. (2012). Physician health: A review of lifestyle behaviors and preventive health care among physicians. *British Columbia Medical Journal, 54*(8), 419-23.

Zou, J., Guan, J., Yi, H., Meng, L., Xiong, Y., Tang, X.,…Yin, S.(2013). An Effective Model for Screening Obstructive Sleep Apnea. *Public Library of Science, 8*(12), 1-14. doi:10.1371/journal.pone.0080704

Appendix A: 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

Figure 5. ESS Questionnaire sample. Source: Foroughi, M., Razavi, H.,

Malekmohammad, M., Naghan, P. A., & Jamaati, H. (2016). Diagnosis of obstructive

sleep apnea syndrome in adults: A brief review of existing data for practice in Iran.

Tanaffos, 15(2), 70-74. Retrieved from

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5127617/