Identifying Patients at Risk for Obstructive Sleep Apnea: Utilization of the STOP Bang Questionnaire in the Perioperative Assessment

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Abstract

Obstructive sleep apnea (OSA) is a serious condition affecting over 22 million Americans. It remains largely undiagnosed in an alarming number of people and carries with it many comorbid conditions that lead to an increase in morbidity and mortality. A review of current literature reveals that patients who present for surgery with undiagnosed OSA are at a significantly increased risk for airway emergencies, difficult intubations leading to unanticipated intensive care admissions, cardiac events, strokes, and even death. The following DNP project proposal aimed to educate anesthesia providers such as anesthesiologists, CRNAs, and SRNAs, in the use of the STOP BANG QUESTIONNAIRE, a validated screening tool, vs subjective assessment to help identify patients at high risk for OSA. Once these patients were identified, the Anesthesia provider would then inform the patient of their risk for OSA and need for polysomnography or sleep study. The patients were provided with a letter from the anesthesia group upon discharge from the Post Anesthesia Care Unit (PACU) informing the patient about their measured and observed risk for OSA and need for a formal sleep study. The goal was to improve identification of patients with obstructive sleep apnea in the perioperative setting and provide these high-risk patients with a letter communicating this risk and the necessary information to obtain a sleep study or polysomnography.

Keywords: Obstructive sleep apnea, OSA, Polysomnography, STOP BANG Questionnaire, Anesthesia provider

Chapter One: Introduction and Overview of the Problem of Interest

Obstructive Sleep Apnea (OSA) is a condition characterized by partial or complete closure of the oropharynx or upper airway during sleeping. This condition causes what we commonly refer to as snoring. In addition, periods of apnea are experienced, causing a drop in pulse oximetry levels. These periods of apnea and subsequent drop in oxygenation lead to hypoxia and hypercapnia (ELkouny et al., 2020). Patients with OSA suffer from fragmented sleep, daytime somnolence, and poor oxygenation (Elrashidy et al., 2018).

OSA has been shown to be associated with morbid obesity as well as higher morbidity and mortality rates. Patients with OSA are at risk for "cardiovascular disease including hypertension, stroke, congestive heart failure, atrial fibrillation, and coronary artery disease" (Hwang et al.,2021). According to Pivetta et al., (2021), OSA is a worldwide problem that effects over four hundred million people aged 30-69 years old. Furthermore, 80-90% of these individuals are undiagnosed and untreated (Pivetta et al., 2021).

In the United States, it is estimated that approximately 9%-24% of the male and 4-9% of the female population suffer from OSA. According to the American Sleep Apnea Association (2017), approximately 22 million Americans suffer from moderate to severe OSA, and up to 80% of those individuals are undiagnosed. Many patients who have been diagnosed with OSA are not compliant with the use of their continuous positive airway pressure (CPAP) device when sleeping. The diagnosis of OSA by polysomnography, and subsequent use of a CPAP device, which is used to maintain patency of airway while sleeping, can significantly improve sleep, reduce daytime somnolence, and improve overall health (Chang et al., 2019).

Background & Significance

Many patients that have OSA have not been formally diagnosed through polysomnography, otherwise known as a sleep study. OSA presents a public health concern that can result in negative patient outcomes and increased overall medical costs (Qassamali et al., 2019). This patient population is at a higher risk for complications from respiratory depression and airway obstruction when presenting for general anesthesia, intravenous sedation (IV sedation), or opioid therapy (Qassamali et al, 2019). Recognizing patients with OSA can help the anesthesia provider be well prepared to provide care for the patient.

Lack of consistent recognition and documentation of OSA risk factors is problematic, especially when these patients present for surgery requiring anesthesia. Anesthesia providers need to be able to recognize the risk for airway obstruction and respiratory complications that can occur with this patient population. Preoperative recognition of OSA is essential. When the risk for OSA is recognized preoperatively by anesthesia providers, there is a significant decrease in respiratory and cardiovascular complications, Intensive Care Unit (ICU) admissions postoperatively, and shorter recovery times in the Post Anesthesia Care Unit (PACU) (Tavallaei et al., 2020).

The American Society for Anesthesia and the Society for Anesthesia and Sleep Medicine advocate the use of an OSA screening tool for presurgical patients (Lakdawala et al., 2018). The Joint Commission for Accreditation of Health Care Organizations (JCAHO) recommends that each health care facility screen patients for OSA prior to surgery (Lakdawala et al., 2018). Furthermore, the American Society of Anesthesiologists (ASA) have updated their guidelines to include that routine screening for OSA is done preoperatively, unfortunately, many facilities in

the United States do not yet have policies in place to comply with this standard (Qassamali et al., 2022).

Risk associated with OSA present specific problems throughout the perioperative period. **Preoperative considerations** include patients with undiagnosed OSA have a greater risk of having cardiac complications, such as congestive heart failure, myocardial infarction, and atrial fibrillation within the thirty-day postoperative period. A study by Chung et al (2022), found that preoperative screening for OSA can reduce these risks. **Intraoperative considerations** include airway obstruction during induction of anesthesia requiring the use of oral or nasal airway, two hand mask ventilation, and difficulty intubation that may require advanced airway techniques such as video laryngoscopy or awake fiberoptic intubation. It is imperative that the anesthesia provider is prepared for these challenges and has necessary equipment at the ready. **Postoperative considerations** include that patients may present with complications in the PACU and become hypercapnic and somnolent due to the hypoventilatory effects of narcotics. These patients may require an oral or nasal airway in PACU as well as vigilant monitoring. It may benefit these patients to wear a CPAP or BIPAP in the PACU.

PICO Question Guiding Inquiry

Due to the high incidence of undiagnosed OSA in the U.S. population, it is imperative that perioperative and anesthesia departments in hospitals avail themselves of the tools available to assess a patient's risk for OSA. This not only provides an opportunity to improve patient safety, but also for patient and family education concerning OSA. Patients with undiagnosed OSA would benefit from education about OSA and information about how to obtain a formal sleep study. The use of an evidenced base screening tool screening in the preoperative period by

anesthesia providers will not only improve patient safety and education but will enhance compliance with the recommendations from the ASA, JCAHO, American Society for Anesthesia, and the Society for Anesthesia.

The **PICO** question is as follows: "In anesthesia providers caring for surgical patients 18 years of age and older in the perioperative setting, does the implementation of the STOP BANG QUESTIONAIRE stratify risk of OSA and lead to formal sleep study recommendation postoperatively?

The STOP-Bang questionnaire is a simple tool used to identify patients that are at high risk for obstructive sleep apnea (OSA). This tool is an acronym that stands for: **S- snoring, T- tiredness, O-observed apnea, P- high blood pressure**; and four demographic questions: **B- body mass index (BMI), A- age, N- neck circumference, G- gender.** STOP Bang is a validated tool that has been used in many countries around the world in preoperative setting to screen for OSA risk (Hwang et all., 2021).

System and Population Impact

Patients with undiagnosed OSA are vulnerable to a multitude of complications during the perioperative period ranging from difficult mask ventilation during induction of anesthesia, difficult intubation, delayed extubation resulting in unplanned ICU admission, hemodynamic instability, cardiac arrythmias and even death (Qassamali et al., 2019). When patients with OSA receive anesthesia medications such as narcotics, sedatives/hypnotics, inhalational anesthesia gas, and neuromuscular blocking agents, they can experience prolonged periods of apnea and

desaturation postoperatively. Studies show that many of these respiratory complications develop in PACU, prolonging the patient's stay in PACU (Elrashidy et al., 2018).

Patients with OSA have a higher morbidity and mortality rate than patients without OSA, and therefore would benefit from diagnosis and subsequent treatment for OSA to maximize their health (Hwang et al.,2021). When health care providers use screening tools such as the STOP Bang questionnaire, they can identify patients that are high risk for OSA while simultaneously excluding patients that do not need further testing, thereby preserving resources (Kee et la., 2018). This not only provides an opportunity to improve patient safety, but also for patient and family education concerning OSA. Current research demonstrates that identification of OSA prior to anesthesia and surgery is beneficial for patient safety and successful airway management (Mathangi et al., 2018).

Purpose and Objective

The purpose of this project was to implement the use of a validated, evidenced based screening tool for OSA into the preoperative anesthesia assessment. The project included the implementation of an educational program for anesthesia providers to introduce the use of the STOP BANG Questionnaire as a preoperative screening tool for surgical patients over ages 18. A STOP BANG score ≥ 3 alerted the anesthesia provider that the patient is at risk for having undiagnosed OSA and the screening tool followed the patient to the operating room on the paper chart. The anesthesia provider then documented (in a provided section below the screening tool) objective measurements observed (i.e., use of oral airway, observed airway obstruction, required two hand mask ventilation, etc).

The tool then followed the patient to the PACU where the anesthesia provider was able to discuss with the Post Anesthesia Care Unit (PACU) nurse the need to continue to be vigilant in monitoring airway patency and to closely observe patient's response to IV opioid therapy. The anesthesiologist discussed the patient's STOP Bang score and subsequent risk for OSA with the patient prior to discharge from PACU. The patients were given an educational pamphlet about OSA and polysomnography; lastly, the anesthesia provider provided the patient with a letter from the anesthesia group, making them aware of the patient's need for a sleep study based on the STOP Bang score ≥ 3 and observed identified risks.

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Organizational "Gap" Analysis of Project Site

There was no standardized screening tool being utilized at the clinical site where this DNP project was implemented. A needs assessment was conducted at this site, and it was determined that Anesthesiologists and Certified Registered Nurse Anesthetists (CRNAs) were only using a subjective assessment to determine the patient's risk for OSA. The assessment may not have been consistently documented in the electronic medical record, and the assessment was not consistently communicated with the PACU staff who cares for the patient in the high-risk

time immediately postop. According to Qassamali et al (2018), subjectively identifying patients with suspected OSA is highly ineffective and the use of a validated screening is encouraged. In addition, the anesthesia provider was not communicating with the patient their measured OSA risk and need for a sleep study.

The implementation of this educational, quality improvement project educated the anesthesia providers (Anesthesiologists and Certified Registered Nurse Anesthetists) on the use of the STOP Bang Questionnaire screening tool to identify patients at high risk for OSA. In addition, patients deemed at risk for OSA (a STOP BANG score of ≥3) were giving information about sleep apnea and how to get a sleep study. Finally, the patient was given a letter from the anesthesia group that stated the patient's measured risk for OSA and need for a formal sleep study. The patient can then share this letter with their primary care physician (PCP) at a follow up visit and the PCP can refer the patient to receive a formal sleep study evaluation.

The implementation of this quality improvement project improved patient care by educating the patients about their risk for OSA. Many patients have undiagnosed OSA, and this can lead to a myriad of comorbid conditions. By utilizing this opportunity to screen patients for OSA, the anesthesia providers had a positive influence on the health of this patient population. In addition, by identifying these patients in the preoperative area, patient safety was enhanced because anesthesia providers will anticipate complications that can occur with OSA patients and be proactive in avoiding the incidence of these complications during both the induction and emergence from anesthesia. The anesthesia provider educated patients on their risk for OSA and discuss the related health concerns and need for formal sleep study evaluation. When patients were discharged from the hospital after their surgery, they were equipped with information about OSA and polysomnography studies.

Chapter Two: Review of the Evidence/Literature

Search Methodology

The literature search was performed using the keywords *Obstructive sleep apnea, obstructive sleep apnea AND anesthesia, Obstructive sleep apnea AND STOP Bang Questionnaire, STOP Bang Questionnaire, STOP Bang Questionnaire preoperatively, STOP Bang Questionnaire preoperative assessment tool*. Multiple databases, including CINAHL, Google Scholar, Wiley online Library, PubMed, and Springer Link were used to gather information to support this project. A total of 463 results from Google Scholar and a total of 275 results from remaining search engines. A total of 39 abstracts were read from the articles retrieved from search. A total of 19 research articles met the inclusion criteria which included "STOP Bang Questionnaire", "Obstructive Sleep Apnea and preoperative assessment", "STOP Bang Questionnaire AND Anesthesia", and "STOP Bang questionnaire screening tool use perioperatively". The additional 20 articles were excluded because they did not specifically discuss the use of the STOP Bang Questionnaire in the perioperative setting, OSA and anesthesia, and OSA incidence.

Findings

The literature review revealed that an alarming 80% of patients with moderate to severe OSA are undiagnosed, leading to a poor quality of life, detrimental health comorbidities, and subsequent strain on the healthcare utilization and costs (Hwang et al.,2020). The gold standard for diagnoses is a sleep study or polysomnography. Polysomnography requires the patient to stay overnight at a sleep center and be monitored for periods of apnea and duration of obstructive episodes. This process can be costly, inconvenient, and require a referral from a health care provider (Hwang et al., 2020). Many patients may not regularly see their PCP or may not have an

established PCP, but present for surgery. This is an optimal time to utilize one of the available clinical screening tools to identify high risk patients (Hwang et al., 202). By identifying patients at risk for OSA and encouraging them to get a sleep study may markedly improve the patient's overall health.

Studies show that patients who are morbidly obese are not only more likely to suffer from OSA but carry a higher mortality rate as well. Patients with OSA are at a much higher risk of postoperative complications related to airway obstruction and other respiratory complications (Elrashidy et al., 2018). In this prospective double cohort study by Elrashidy et al (2018), obese patients undergoing bariatric surgery were screened using the STOP Bang questionnaire, and the incidence of "adverse respiratory events" were evaluated. This study revealed that patients with a STOP Bang score ≥3 (moderate risk for OSA), had a higher risk for adverse respiratory events in the perioperative period (Elrashidy et al., 2018). This project will identify patients with a STOP BANG score ≥3, recommend that they receive a formal sleep evaluation, and give them the tools to obtain a referral.

Evidenced based Practice

Kee et al (2018), compared the STOP Bang questionnaire to the OSA50 and the Berlin Questionnaires, and found that the STOP Bang questionnaire was superior in sensitivity and negative predictive values. This study reiterated the association between the incidence of OSA and multiple comorbid conditions such as hypertension, stroke, type 2 diabetes mellitus, atrial fibrillation, and coronary artery disease (Kee et al., 2018). Pivetta et al., (2021), looked at utilizing STOP Bang questionnaire as a tool to identify OSA in patients in many different geographical locations by reviewing forty- seven studies in a systematic review. Pivetta et al.,

(2021) confirmed that the STOP Bang screening tool was a useful tool even when used in multiple settings and in many different geographical locations.

A quality improvement project by Lakdawala et al., (2018), confirmed that patients with OSA are at risk for prolonged recovery postoperatively, unanticipated intensive care admissions postoperatively, related to respiratory adverse events, and an increased length of stay in the hospital postop. Mathangi et al., (2018) further confirms that the positive screening for OSA utilizing the STOP Bang questionnaire coincides with difficult airway management in the perioperative setting.

Limitations

Limitations exist for this literature search and research articles included. In Qassamali et al (2019), the sample size was small and included only 45 patients. A sample size this small may not yield sound results. In the systematic review and meta-analysis by Hwang et al (2020), a relatively small number (9) research articles were included. In this study, although the patients were not pre-screened prior to the study, the high prevalence of patients scoring >3 of high risk for OSA does suggest some type of bias. Patients within this study came from a high-risk cardiovascular group and notable many of these cardiac patients may have similar risk factors for OSA. Similarly, Elrashidy et al (2018) compared two groups of bariatric patients and screened both groups preoperatively using the STOP BANG Questionnaire. Group 1 had multiple comorbid conditions like hypertension, hyperlipemia, coronary artery disease and renal insufficiency. Group 2 did not have these same comorbidities. In the study by Frangopoulos et al (2019), the major limitation was that results were not verified by polysomnography and results were deduced from the STOP BANG screening tool alone. Another limitation is that the researchers modified the STOP BANG Questionnaire leaving out neck circumference due to its

lack of convenience while testing. In addition, this study was limited to Cyprus in southern Europe.

Chapter Three: Organizational Framework or Theory

Theoretical framework

The theoretical framework chosen for this quality improvement project is Lewin's Change Theory. This model requires three stages known as "unfreezing, change, and refreezing" (Nursing Theory, 2020). The premise behind this process is that before implementing a new change in practice, an old practice needs to be discarded. This process requires overcoming strong opinions and old habits formed within a group. This step can be challenging and resistance to change is often observed (Barto, 2019).

The first stage of Lewin's Change Theory is "unfreezing". Strategies to "unfreeze" current practice are to perform a gap analysis to show discrepancies between current practice and evidenced based practice recommendations (Barto, 2019). Sharing knowledge can be incorporated by posting evidenced based articles related to OSA in the department, providing the anesthesia providers with an educational power point presentation about the use of the STOP BANG questionnaire and sharing how this will improve patient care by providing them with valuable information about OSA and how to obtain a sleep study.

The "change" or "moving" stage involves further education of the stakeholders within the anesthesia department. Educating the anesthesia providers involves presenting the new information in a variety of ways (Barto, 2019). For this DNP project, the STOP Bang questionnaire and information about the incidence and complications related to OSA will be communicated to the anesthesia team via a presentation at the monthly anesthesia meeting and

the presentation will be distributed via email to any staff not present. The change phase is a “moving” phase. This process involves changing thoughts, feelings, and behaviors. The change phase is a productive phase and requires a detailed plan of action (Barto,2019).

The third and final stage of Lewin’s Change Theory is “re-freezing” or implementing and continuing the change implementation. Continued education, evaluation, communication, and monitoring are key concepts of the “re-freezing” stage of Lewin’s Change Theory (Wojciechowski et al., 2016). Reminders for the staff to perform the STOP BANG will be posted in the preoperative/holding area, anesthesia office, and PACU department. Education will be presented through departmental email as well. Through these measures, the process of re-freezing can solidify the new practice into the habit of screening for OSA using the STOP Bang questionnaire on all adult patients in the preoperative department.

The anesthesia providers at this chosen clinical site are accustomed to using their subjective assessment to identify patients at risk for OSA. Old habits like this can be difficult to change. To inspire staff to discard their old practice, an "unfreezing" stage needs to take place in which evidenced based practice recommendations are provided. The "moving" or "change" stage involves the education process previously discussed. This stage is followed by the "re-freezing" stage which involves the continued practice of implementing the STOP BANG Questionnaire on all adult surgical patients. Visual reminders were placed throughout the perioperative area to encourage compliance with the use of the STOP BANG Questionnaire. This repeated process will "re- freeze" or make the new process a habit and create a practice change that will benefit patients. The use of Lewin’s theoretical framework was instrumental in the implementation of this practice change project. A diagram of Lewin’s Change Theory can be found in Appendix F.

Chapter Four: Project Design

Institutional Review Board (IRB) Approval

Exemption status was received for this project from the IRB at St. Luke's Hospital Allentown on October 18th, 2022 (Appendix E). A written letter of support from the anesthesia department at St. Luke's Allentown was also received (Appendix C). Additionally, application for exemption from IRB approval is in process for Cedar Crest College. There are no risks that have been identified for the patient population. The benefits were increased recognition of patients who are at risk for obstructive sleep apnea (OSA) and subsequently provide the patient with an educational pamphlet about OSA and the benefits of having a sleep study. A formal letter of recommendation for a sleep study was given to the patient.

Implementation Plan

The literature review revealed that an alarming 80% of patients with moderate to severe OSA are undiagnosed and this leads to a poor quality of life, detrimental health comorbidities, and subsequent strain on the healthcare utilization and costs (Hwang et al.,2020). The gold standard for diagnoses is a sleep study or polysomnography. Polysomnography requires the patient to stay overnight at a sleep center and be monitored for periods of apnea and duration of obstructive episodes.

This process can be costly, inconvenient, and require a referral from a health care provider (Hwang et al., 2020). Many patients may not regularly see their PCP or may not have an established PCP, but present for surgery. This is an optimal time to utilize one of the available clinical screening tools to identify high risk patients (Hwang et al., 202). Identifying patients at risk for OSA and encouraging them to get a sleep study may markedly improve the patient's overall health.

A quality improvement project by Lakdawala et al., (2018), confirmed that patients with OSA are at risk for prolonged recovery postoperatively, unanticipated intensive care admissions postoperatively, related to respiratory adverse events, and an increased length of stay in the hospital postop. Mathangi et al., (2018) further confirms that the positive screening for OSA utilizing the STOP Bang questionnaire coincides with difficult airway management in the perioperative setting.

A needs assessment was performed at the clinical site, and it was determined that the current practice was limited to subjective assessment by the anesthesia provider. This can lead to inconsistent practice and identification of patients with OSA. A validated screening, tool like the STOP Bang questionnaire (Appendix B) has not been implemented at this hospital site. Full support for this project has been given by the anesthesia group at the clinical site.

This quality improvement project was first be initiated with an online power point voice over presentation that will educate the anesthesia staff about OSA and subsequent use of the validated screening tool-the STOP Bang questionnaire. This enhanced the anesthesia providers' knowledge and improved compliance with this quality improvement project. Cognitive aides were be posted in the perioperative areas as reminders to complete the STOP BANG Questionnaire.

A STOP BANG score of 3 or greater alerted the anesthesia provider that the patient was at risk for having undiagnosed OSA and the screening tool will follow the patient to the operating room on the paper chart. The anesthesia provider then documented (in a provided section below the screening tool) objective measurements observed such as airway obstruction, use of oral airway, witnessed apnea postoperatively, and snoring postoperatively or during

monitored anesthesia care anesthesia/sedation, or difficult intubation. The tool then followed the patient to the PACU where the anesthesia provider discussed with the Post Anesthesia Care Unit (PACU) nurse the need to continue to be vigilant in monitoring airway patency and to closely observe patient's response to IV opioid therapy due to the patient STOP BANG score. The anesthesiologist discussed the patient's STOP Bang score and subsequent risk for OSA with the patient prior to discharge from PACU. A brochure from the sleep study center will be given to the patient along with a discussion about why a sleep study is necessary and treatment can improve overall health. Lastly, the anesthesia provider gave the patient a letter from the anesthesia group informing the patient of the need for a sleep study based on the STOP Bang score of 3 or greater and observed identified risks (Appendix C).

Data Collection Tools

This project was implemented over a four-week period and the screening tools were kept in a folder and secured in a cupboard in PACU. No identifiable patient information was on the screening tools. A post implementation retrospective review of the completed paper screening tools was completed noting the number of surgical cases per week as compared to the number of screening tools utilized. The data was tracked weekly and recorded, noting how many patients were identified each week at risk for OSA. The forms were evaluated weekly for completion and compliance with documentation that an informative letter was given to patient before discharge. The anesthesia provider documented this on the final and third section of the screening tool.

The goal of this project is to have at least a 70% compliance in the use of the validated screening tool (STOP BANG) to identify patients at risk for OSA in the preoperative period. A goal will be set of at least 70% compliance in follow through with recommendation of a sleep

study evaluation for the patient scoring a 3 or greater on the STOP BANG score. Compliance was monitored and re-education through email or reminder posters was offered as needed.

Resources needed

The hospital and anesthesia department heads had given written and verbal support for this project. The anesthesia group recognized the need to implement a validated screening tool for OSA recognition. Resources needed involved printing costs, paper measuring tape, sleep study center brochures, and use of Microsoft office 365 power point for voice over power point presentation pre-implementation.

Budget Justification

There was limited cost involved with this quality improvement project. The paper and printing costs for the STOP Bang questionnaire on brightly colored orange paper, along with laminated cognitive aides, and paper measuring tapes were under two hundred dollars. The patient education brochures were supplied by the sleep center affiliated with the hospital as these referrals will patients for them.

The initial education was provided to the members of the anesthesia department via a power point presentation using a free version of Microsoft office 365 power point. A voice over power point presentation was distributed to the anesthesia group of Anesthesiologists and CRNAs by email prior to implementation. Permission to utilize the STOP BANG questionnaire has been granted from Universal Health Network (UHN), Ontario, Canada (Appendix A). There were no monetary incentives or benefits involved in the creation or implementation of this project. The benefits of this project are the successful implementation of a standardized validated

screening tool for OSA in the perioperative setting to increase identification of patients at high risk for OSA and formally recommend the patients follow up with a sleep study for diagnosis and treatment of OSA.

Chapter Five: Implementation Procedures and Processes

Implementation of this DNP project was accomplished by a Cedar Crest College doctoral student initially through an online educational presentation via a group email to the anesthesia department. The PowerPoint presentation with voice over narration was accomplished utilizing a laptop with internet access and Microsoft Office 365™. Topics covered in the PowerPoint included definition and incidence of Obstructive Sleep Apnea(OSA), use of the STOP BANG Question to identify individuals at risk for OSA, goals of identifying surgical patients at risk for OSA, system impact, the implementation plan, and sustainability for the future within the Anesthesia department at the clinical site. The implementation plan included initial screening of the preoperative surgical patient with the STOP BANG Questionnaire, if the patient's STOP BANG score is ≥ 3, then additional documentation was required on the bottom portion of the screening tool which included information about the perioperative airway assessment/risks noted by the anesthesia provider, and in the final section the anesthesia provider documented if patient education concerning OSA risk was given to the patient, as well as a letter from the anesthesia group stating the patient's measured and observed risk for OSA and recommending that they have a sleep study evaluation. An educational pamphlet was to be given to patient with their discharge instructions upon discharge from PACU or placed with the inpatient chart to be given to the patient upon discharge.

Additional cognitive aides aimed at providing visual cues for the anesthesia staff in order to enhance compliance with this project were placed in the preoperative/holding area, in the nine operating rooms (OR), and in the Post Anesthesia Care Unit (PACU). These laminated cognitive aides were placed near the computers in preoperative patient bays where preoperative charting takes place. These reminders contained the question " **Did you remember STOP BANG Questionnaire**?" Educating the anesthesia providers on the use of the STOP BANG screening tool not only improved patient safety but also enhanced compliance with the recommendations from the ASA, JCAHO, American Society for Anesthesia, and the Society for Anesthesia and Sleep Medicine.

The DNP student obtained data about weekly surgical cases and the number of screening tools used in order to measure compliance with the following: use of the STOP BANG Questionnaire, compliance in providing patient educational brochure(s) about OSA and what a sleep study involves, and an OSA letter from the anesthesia group for those patients identified as high risk for OSA due to STOP BANG score of 3 or greater. These numbers were stored on a spreadsheet to monitor compliance. No identifiable data was kept on the screening tools, however theses screening tools that are completed were kept in PACU in a locked cabinet to preserve data. The screening tools were collected over the course of four weeks for the purpose of this DNP project. Weekly evaluation of compliance was completed, and reminder emails were sent to encourage compliance if a lack of compliance was noted. The paper screening tools will be destroyed by shredding on or before May30th, 2023.

Inclusion criteria for this DNP project are all surgical patients eighteen years of age or older. The screening tools were to be completed on all surgical patients eighteen years of age and

older during a four-week period. If patients are already diagnosed with OSA and use a Continuous Positive Pressure Device (CPAP) or Bilevel Positive Airway Pressure (BIPAP) device this may be noted on the screening tool and compliance with the use of the device was discussed with the patient. It was requested that the tool still be completed by staff for the purpose of this DNP project.

Data collection ended after the four-week period. However, the anesthesia department heads expressed interest in continuing to screen patients for OSA and to eventually have the documentation transferred to the electronic medical record. Cognitive aides remained in place and necessary tools in order to continue the paper screening process were made available to the anesthesia department. A closing email was sent to the anesthesia department thanking them for their participation and notifying them of the project results.

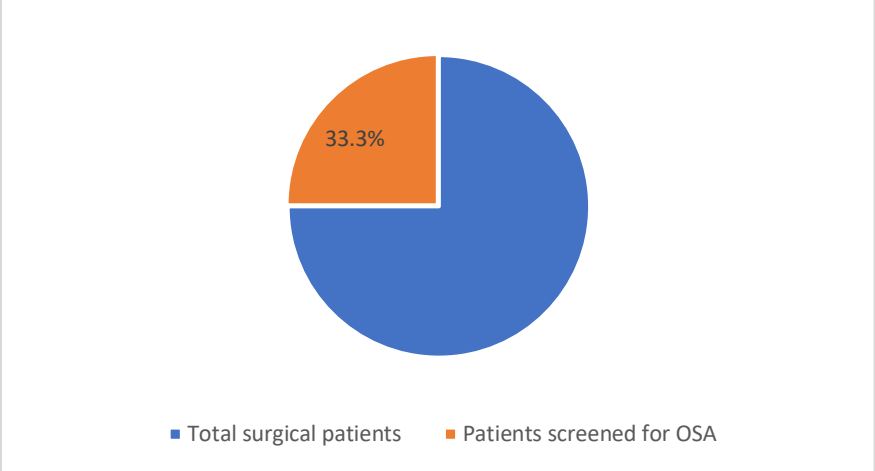
Chapter Six: Evaluation and Outcomes

This DNP project was implemented over a four-week period. The project's actual implementation was preceded one week prior with a voice over instructional power point presentation about OSA and how to implement the STOP BANG Questionnaire in the perioperative setting. This presentation was emailed to the anesthesia department and perioperative nursing department. The instructional presentation was available to be viewed multiple times by learners and the staff had access to the DNP student's contact information for any questions.

Evaluation

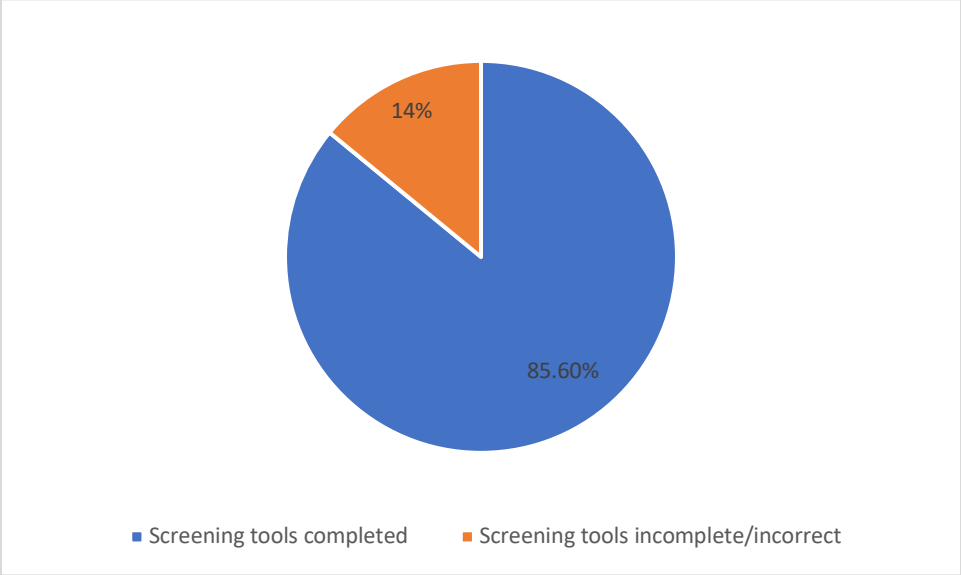
The purpose of data evaluation was to determine the anesthesia provider's compliance with the use of a STOP BANG Questionnaire in the preoperative setting, to determine how many undiagnosed preoperative patients were identified as at risk for OSA, and how many identified patients received follow up educational material and recommendations postoperatively from the anesthesia department. The screening tools were collected weekly and data compilated.

During the four-week implementation period, 606 adult surgical patients were cared for in the perioperative department, of which, 202 preoperative patients were screened for OSA. This reflected an overall compliance rate of 33% although the original compliance goal was 70%.

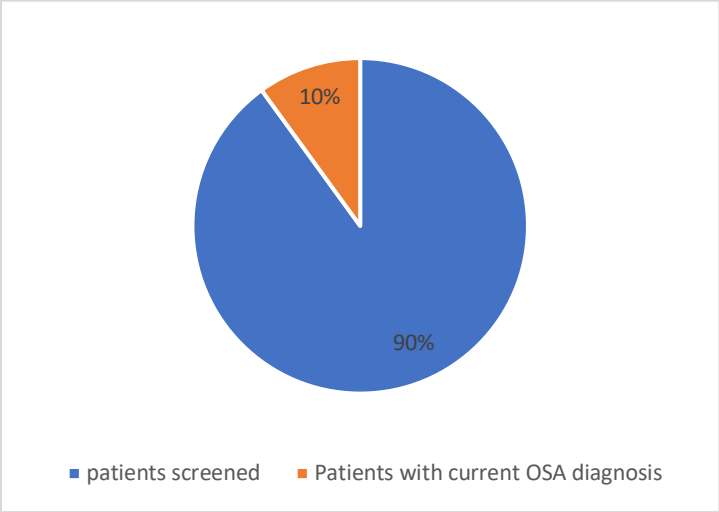


Of the completed screening tools, 14% were incomplete in the intraoperative and postoperative sections and 85.6% of the completed screening tools were correctly completed. The 14% that were incomplete were the forms where the STOP BANG screening was performed and the patient received a 3 or greater, but the intraoperative portion and/or the postoperative portion was not filled out by provider. Therefore, it was not documented whether or not the OSA

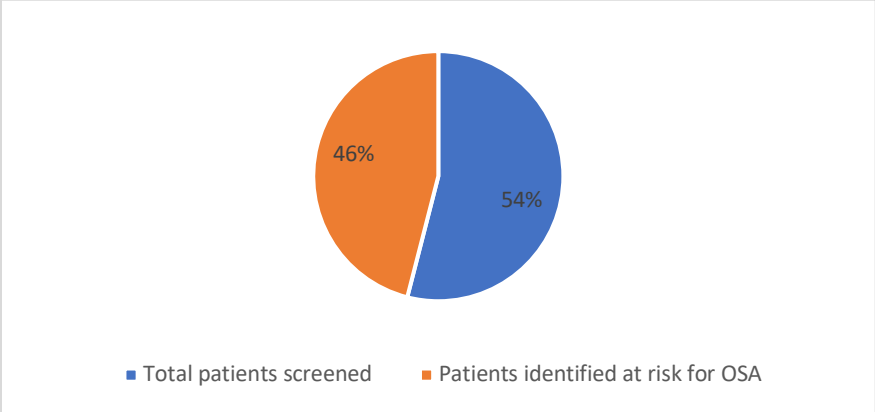
pamphlet and letter were given to the patient. This is an important step of the project because this is when the OSA educational pamphlet and recommendation letter for sleep study referral is given to the patient, and the anesthesia provider has the opportunity to communicate the measured OSA to the patient.



Of the patients screened, 10% had a current diagnosis of OSA and already had a CPAP/BIPAP machine at home. The anesthesia providers were encouraged to discuss the patient's compliance with the use of their CPAP/BIPAP at home and document this on the form.



A total of 93 patients that were screened were identified as at risk for OSA. This translates into 46% of the patients screened identified as at risk for OSA, meaning that nearly half of the patients who were screened were identified as at risk for OSA. These patients can now benefit from this gained knowledge and be provided with the tools needed to improve their health. These identified patients were notified about their measured risk, provided with an educational pamphlet about OSA as well as a letter recommending a formal sleep study. The screening tools were collected weekly and data compilated.



Discussion

Current research demonstrates that identification of OSA prior to surgery/anesthesia is beneficial for patient safety and successful airway management (Mathangi et al., 2018). The use of a standardized screening tool has been documented as effective in determining a patient's risk for OSA. Patients with OSA have a higher morbidity and mortality rate than patients without OSA, and therefore would benefit from diagnosis and subsequent treatment for OSA to maximize their health (Hwang et al.,2021). When health care providers use screening tools such as the STOP Bang questionnaire, they can identify patients that are risk for OSA while

simultaneously excluding patients that do not need further testing, thereby preserving resources (Kee et la., 2018).

The STOP Bang questionnaire is easy to use in the perioperative setting and highly sensitive, making it a suitable choice for this quality improvement project. The American Society of Anesthesiologists (ASA) recommends the use of a screening tool in the preoperative/preanesthetic setting as part of best practice for preoperative patients (Lakdawala et al., 2018). Anesthesia providers have a unique opportunity to screen patients for obstructive sleep apnea when they present for surgery.

The PICO question for this DNP project was, “In anesthesia providers caring for surgical patients 18 years of age and older in the perioperative setting, does the implementation of the STOP BANG QUESTIONAIRE stratify risk of OSA and lead to formal sleep study recommendation postop?” Of the patients screened for OSA, 85.6% of screening tools were completely correctly and resulted in patients being given an educational pamphlet about OSA and a letter from the anesthesia group recommending that the patient speak to their primary care physician about a formal sleep study evaluation.

The implementation proved to be successful in identifying patients who were at risk for OSA. Compliance with use of the screening tool was lower than anticipated (33.3%). However, of patients screened with the STOP BANG Questionnaire, 46% of those patients were identified as at risk for OSA. Of the patients identified as high risk for OSA, 85.6% of those patients were given an educational pamphlet about OSA as well as a sleep study recommendation letter from the anesthesia group.

It should be noted that the sample of patients screened was relatively small in relation to the total number of surgical patients that could have been screened. Future projects would benefit

from a larger screening sample of patients and would result from a higher level of compliance from anesthesia providers. A future project could include implementation of the STOP BANG Questionnaire into the electronic medical record (EMAR) which may improve provider compliance. The stakeholders at the clinical site are open to developing this into the EMAR in the future.

Chapter Seven: Implications for Nursing Practice

Obstructive sleep apnea (OSA) presents a public health concern that can result in negative patient outcomes and increased overall medical costs (Qassamali et al., 2019). This patient population is at a higher risk for complications from respiratory depression and airway obstruction when presenting for general anesthesia, intravenous sedation, or opioid therapy (Qassamali et al, 2019). Recognizing patients with OSA can better prepare the anesthesia provider to provide safe, quality care to these patients.

Lack of consistent recognition and documentation of OSA risk factors is problematic, especially when these patients present for surgery requiring anesthesia. Anesthesia providers need to be able to recognize the risk for airway obstruction, respiratory complications, and multiple comorbidities that can occur with this patient population. This knowledge gives the anesthesia provider an opportunity to tailor their anesthetic plan for the patient with OSA. When the risk for OSA is recognized preoperatively by anesthesia providers there is a significant decrease in respiratory and cardiovascular complications, Intensive Care Unit (ICU) admissions postoperatively, and shorter recovery times in the Post Anesthesia Care Unit (PACU) (Tavallaei et al., 2020).

The American Society for Anesthesia and the Society for Anesthesia and Sleep Medicine advocate the use of an OSA screening tool for presurgical patients (Lakdawala et al., 2018). The

Joint Commission for Accreditation of Health Care Organizations (JCAHO) recommends that each health care facility screen patients for OSA prior to surgery (Lakdawala et al., 2018). Furthermore, the American Society of Anesthesiologists (ASA) have updated their guidelines to include that routine screening for OSA is done preoperatively, however, many facilities in the United States do not yet have policies in place to comply with this standard (Qassamali et al., 2022).

Implications for Practice

Current research demonstrates that identification of OSA prior to surgery/anesthesia is beneficial for patient safety and successful airway management (Mathangi et al., 2018). The use of a standardized screening tool has been documented as effective in determining a patient's risk for OSA. Patients with OSA have a higher morbidity and mortality rate than patients without OSA, and therefore would benefit from diagnosis and subsequent treatment for OSA to maximize their health (Hwang et al.,2021).

The STOP Bang questionnaire is easy to use in the preoperative setting and highly sensitive, making it a suitable choice for this quality improvement project. When health care providers use screening tools such as the STOP Bang questionnaire, they can identify patients that are high risk for OSA while simultaneously excluding patients that do not need further testing, thereby preserving resources (Kee et la., 2018). Furthermore, the American Society of Anesthesiologists (ASA) recommends the use of a screening tool in the preoperative/preanesthetic setting as part of best practice for preoperative patients (Lakdawala et al., 2018).

Due to the high incidence of undiagnosed OSA in the U.S. population, it is imperative that perioperative and anesthesia departments in hospitals use the evidenced based tools available to assess a patient's risk for OSA. This not only provides an opportunity to improve patient safety in the perioperative period, but also provides the patient with information about their risk for OSA as well providing testing and treatment options available for them.

The DNP project approach that was utilized involved a voiceover power point educational presentation that was emailed to the entire anesthesia department and perioperative nursing staff. Visual cognitive aides were posted in the preoperative area and PACU. The STOP BANG questionnaire was printed on bright orange paper and was made available in the preoperative area and anesthesia office. The anesthesia providers were instructed to perform screening on all adult surgical patients 18 years of age or older over the 4-week implementation period. Patients who received a STOP BANG score of ≥ 3 were identified as at risk for OSA. These patients were given an educational pamphlet and a letter from the anesthesia department informing them about their measured and observed OSA risk. The letter encouraged the patient to talk to their primary care physician about their need for a formal sleep study.

Strengths

This DNP project had several important strengths. The voice over power point presentation was clear and easy to follow, the screening tool was simple and easy to use, requiring the user to check a simple "yes" or "no" box. Once patients were identified as at risk for OSA, the provider would only have to notify the patient about their risk, provide an educational pamphlet and a letter, and check the corresponding boxes on the screening tool noting that information was given to the patient.

The overall cost of the project was limited to printing costs, pamphlet costs, and neck circumference measuring tapes. The assumed benefits are improved patient health, by identifying patients who should receive a formal sleep study and providing these patients with necessary treatments(i.e., Continuous Positive Airway Pressure-CPAP, etc). This project had an overall positive impact on nurse anesthesia practice. Utilizing an evidenced based screening tool to improve practice provided quality care for patients. The implementation of the use of this validated screening tool allowed for the translation of evidence into everyday practice. Patient care was impacted positively by identifying patients at risk for OSA, and provide them with information about diagnostic services, such as polysomnography, that can help improve their health.

Limitations

This project's limitations include a limited time frame (4 weeks). It is possible that an extended amount of time would be needed to make this practice a habit and improve compliance. Another limitation is that the screening tool was a paper tool and not a permanent part of the patient record. This may have limited participation if providers did not consider it a necessary part of the medical record.

This clinical site utilizes the EPIC electronic medical record system for charting. The ideal process would have been to have the STOP BANG screening tool incorporated into EPIC with automatic prompts to remind the user to complete the tool. The system could then be set to automatically generate a patient referral for a sleep study. A telephone call to the patient could be scheduled a few days or a week after surgery to set up an appointment at the sleep center, making patient compliance with a follow up sleep study more probable.

Linkage to DNP Essentials

All DNP projects must incorporate each of the eight DNP essentials, which are outcome competencies that were created by the American Association of Colleges of Nursing (AACN, 2006). DNP essential I is the use of scientific underpinnings for practice(2006). This project used current evidenced-based practice regarding the use of the STOP BANG questionnaire to screen for OSA. STOP Bang is a validated tool that has been used in many countries around the world in preoperative setting to screen for OSA risk (Hwang et all., 2021). Kee et al (2018), compared the STOP Bang questionnaire to the OSA50 and the Berlin Questionnaires, and found that the STOP Bang questionnaire was superior in sensitivity and negative predictive values. Multiple high-quality studies were utilized in the research for this DNP project.

DNP essential II is the use of organizational and system leadership for quality improvement(AACN,2006). The stakeholders for this project were identified as the Anesthesiologists, Certified Registered Nurse Anesthetists(CRNAs), and nursing staff. A needs assessment was done at the clinical site, and it was found that no formal screening for OSA was being done in the perioperative setting. Practice change requires education and special training as part of this quality improvement project the anesthesia providers were educated about the use of the STOP Bang questionnaire. There was improvement noted in the identification of patients at risk for OSA, the documentation of OSA risk, and postoperative patient education, as well as subsequent patient notification through a formal letter from the anesthesia group upon discharge.

DNP essential III is the use of clinical scholarship and analytical methods for evidence-based practice (AACN,2006). A thorough review of the literature was completed and an educational power point with voice over was completed in order to educate the anesthesia providers about the risks associated with OSA and the need to screen for OSA in the

perioperative setting. This knowledge was integrated into the project planning and application of this knowledge was utilized throughout the project in order to influence change within nurse anesthesia practice.

DNP essential IV is the use of information systems technology and patient care technology for the improvement and transformation of healthcare (AACN,2006). Technology in the form of search engines were utilized to research the evidenced based literature. The internet was utilized to send the voice over instructional power point via email to the anesthesia and perioperative nursing departments. Data was collected and data collection tools were used to stratify results of the project outcomes. Microsoft Excel™ was used to create visual aids to show project results.

DNP essential V is the use of health care policy for advocacy in health care (AACN, 2006). This DNP project advocated for the use of a validated screening tool for OSA rooted in evidenced based care, in order to provide superior care to patients. The use of a validated OSA screening tool such as the STOP BANG Questionnaire is well documented in the literature. As the anesthesia team provides this important information to patients, they are providing an important service and being health care advocates.

DNP essential VI is the use of interprofessional collaboration for improving patient and population health outcomes (AACN,2006). This essential was met through the presentation of the evidenced based literature to the stakeholders (anesthesia providers) and through collaboration with the chief anesthesiologist, the anesthesiologist charged with supervising all projects in the department, and the CRNA clinical coordinator of student nurse anesthetists. Additionally, approval from both the hospital internal review board (IRB) and the Cedar Crest

College IRB also meets this essential. Interprofessional collaboration also took place between the nursing and anesthesia staff as they worked as a team during the implementation of this project.

DNP essential VII is the use of clinical prevention and population health for improving the nation's health (AACN,2006). This essential was met by identifying patients who may have OSA and helping them to get access to a sleep study for formal diagnosis and treatment. Shedding light on the subject of OSA, and educating people about their personal risk, progress is being made toward disease prevention and treatment. This clinical site and healthcare system can become advocates within the community for OSA screenings in neighboring hospital systems. This can then in turn spread throughout other hospitals in the nation at large and contribute to the health of the nation.

DNP essential VIII is advanced nursing practice (AACN,2006). The DNP nurse is an advanced practice nurse who holds a specialized skill set and expertise in one area of advanced nursing. The DNP nurse can provide advanced care within this specialty (AANA, 2006). This essential was met by the anesthesia providers utilizing the STOP BANG screening tool to screen for OSA in the preoperative patients. The advanced practice role of the CRNA dictates that special attention is paid to high-risk airway assessments and understanding disease processes and how they relate to overall health. By the addition of this added assessment tool and providing patients with education needed to improve health and wellness, the anesthesia providers are fulfilling this DNP essential.

Chapter Eight: Summary of Project

Summary and Conclusions

Obstructive sleep apnea (OSA) is a serious condition that remains largely undiagnosed in a staggering number of people. OSA carries with it many comorbid conditions that lead to an

increase in mortality rates (Qassamali et al, 2019). A review of current literature reveals that patients, who present for surgery with undiagnosed OSA, are at a significantly higher risk for airway emergencies, difficult intubations leading to unanticipated intensive care admissions, cardiac events, strokes, and even death. The STOP BANG Questionnaire is a validated, easy to use tool that screens for OSA risk.

This DNP project's goal was to educate anesthesia providers such as anesthesiologists, CRNAs, and SRNAs, in the use of the STOP BANG screening tool in order to help identify patients at risk for OSA and make recommendations for a formal sleep study. Recognizing patients that may have OSA can help the anesthesia provider better plan the anesthetic care for these patients. Additionally, the anesthesia provider was then able to inform the patient of their risk for OSA and need for a formal sleep study. The patients who scored ≥ 3 were notified about their measured OSA risk, given an educational pamphlet about OSA, and a letter from the anesthesia group suggesting the patient get a formal sleep study to share with their primary care physician. The ultimate goal was to educate the patient about their risk for OSA and give them the tools and information needed to obtain a referral for a formal sleep study and subsequent treatment.

Lack of consistent recognition and documentation of OSA risk factors is problematic. It is imperative that the anesthesia provider recognizes the risk for airway obstruction and respiratory complications that can occur within this patient population. In addition, health care providers need to take advantage of every opportunity to provide this important screening and subsequent treatment for patients. When a patient presents for surgery it's an optimal time to utilize a clinical screening tool to identify patients at risk for OSA (Hwang et al., 202).

Dissemination Plan

This DNP project will be disseminated to the graduate students and faculty at Cedar Crest College on April 20th, 2023. This will be a live presentation utilizing Microsoft PowerPoint. Additionally, a digital poster demonstrating the major concepts and outcomes of this project will be on display on the day of the presentation. Finally, this DNP project background and outcomes will be housed in a National DNP repository for public viewing.

Future Ideas

In reviewing the results of this DNP project, it is evident that although the project had the support of the anesthesia department stakeholders, compliance with completing the screening tools was less than the original goal. Visual reminders were posted around the perioperative department and a voice over power point was distributed via email to the anesthesia providers a week prior to implementation.

There are several ways that this project could be expanded upon by a future graduate student. Namely, a validated screening tool such as STOP BANG could be implemented into the electronic medical record (EMR), weekly email reminders could be sent to the anesthesia providers, as well as email updates about the anesthesia team's compliance completing the screening tool may all improve provider participation. Additionally, an interdisciplinary team involving both anesthesia providers and sleep study professionals could prove beneficial in enhancing communication and follow up care. The referrals for a sleep study could be made directly through the EMR and a follow up phone call could be made by the sleep study team to the patient in order to schedule a sleep study for the patient. The sleep study professional team could then communicate the results of the follow up.

Conclusion

OSA presents a public health concern that can result in negative patient outcomes and increased overall medical costs (Qassamali et al., 2019). According to the American Sleep Apnea Association (2017), approximately 22 million Americans suffer from moderate to severe OSA, and up to 80% of those individuals remain undiagnosed. Many of these patients pass through hospitals and receive surgical services without ever being formally identified as high risk for OSA. These are missed opportunities to educate patients about OSA and to provide them with information about diagnostic services and treatments, that can help improve their health and quality of life. There remains a need to educate anesthesia providers about the use of validated STOP BANG Questionnaire that can stratify a patient's risk for OSA. With the implementation of this DNP project, anesthesia providers gained knowledge about the use of the STOP BANG Questionnaire as a tool to recognize patients that are at risk for OSA. The anesthesia providers can then take this information into consideration when anticipating the needs of the patient that they are caring for in the perioperative period. The patient at risk for OSA can be provided with educational pamphlets about OSA and polysomnography (sleep study) along with a letter from the anesthesia group that communicates the patient's measured and observed risk for OSA. By making the patient aware of their risk for OSA and recommending a formal sleep study the anesthesia provider is providing quality care that will benefit the patient long beyond the day of surgery.

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Appendix A

UHN Toronto General Toronto Western Princess Margaret Toronto Rehab

Technology Development & Commercialization

NON-EXCLUSIVE ACADEMIC LICENSE

DEFINITIONS:

Organization name (“**Licensee**”): Cedar Crest College & St. Luke’s University Health Network Anesthesia department

Address: Cedar Crest College 100 College Dr, Allentown, PA 18103

(“**Licensee Site**”) **St Luke’s University Health Network 1736 Hamilton St, Allentown, PA 18104**

Contact person: Liane M. Bacon Job Title: BSN, RN, SRNA

Contact information: 5488 Main Rd, Sweet Valley, PA 18656

Proposed Use (check applicable):

1 Paper questionnaire ☐ Website ☐ Downloadable app

Please elaborate on Proposed Use: To be used as a preoperative screening tool to identify patients and recommend sleep study testing- The number of patients identified as high risk for OSA will be tracked for purposes of a DNP degree project for Liane M. Bacon, BSN,RN,SRNA

Language(s): English

(collectively, the “**Permitted Use**” means Proposed Use and Language,)

“Effective Date”:

License “**Term**”: One (1) year from the Effective Date.

May 2022

Licensor: “UHN”
UNIVERSITY HEALTH NETWORK
having a business office at:
Technology Development & Commercialization
101 College Street, Suite 150,
Heritage Building, MaRS Centre,
Toronto, Ontario M5G 1L7
Canada

Notices. Notices must be sent to the attention of:
Director, Technology Development & Commercialization

Appendix B

STOP-Bang Questionnaire

Preoperative Nursing/Anesthesia Assessment for Obstructive Sleep Apnea

Snoring?
Do you **Snore Loudly** (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?
Yes
No

Tired?
Do you often feel **Tired, Fatigued, or Sleepy** during the daytime (such as falling asleep during driving or talking to someone
Yes
No

Observed?
Has anyone **Observed** you **Stop Breathing** or **Choking/Gasping** during your sleep?
Yes
No

Pressure?
Do you have or are being treated for **High Blood Pressure**?
Yes
No

Body Mass Index more than 35 kg/m²?
Yes
No

Age older than 50?
Yes
No

Neck size large? (Measured around Adams apple)
Is your shirt collar 16 inches / 40cm or larger?
Yes
No

Gender = Male?
Yes
No

For general population
OSA - Low Risk: Yes to 0 - 2 questions
OSA - Intermediate Risk: Yes to 3 - 4 questions
OSA - High Risk: Yes to 5 - 8 questions
or Yes to 2 or more of 4 STOP questions + male gender
or Yes to 2 or more of 4 STOP questions + BMI > 35kg/m²
or Yes to 2 or more of 4 STOP questions + neck circumference 16 inches / 40cm

Property of University Health Network.

Anesthesia Provider- Intraoperatively

Two Hand Mask Ventilation required?	**Yes**	**No**
Use of oral airway necessary?	**Yes**	**No**
Use of nasal airway necessary?	**Yes**	**No**
Witnessed airway obstruction?	**Yes**	**No**

Anesthesia Provider Postoperatively

Discussed risk for OSA with patient?	**Yes**	**No**
If patient previously diagnosed with OSA – discuss compliance with CPAP/BIPAP?	**Yes**	**No**
Provided patient with OSA/sleep study educational pamphlet?	**Yes**	**No**
Provided patient with sleep study recommendation letter?	**Yes**	**No**

Appendix C

Northeastern Anesthesia Physicians ~ NAP
24 South 18th Street
Allentown, PA 18104
Phone 610-628-8372
Email: napadmin@comcast.net

Dear Patient,

Today your anesthesia provider screened you for **Obstructive Sleep Apnea (OSA)** risk using a tool called the "STOP BANG Questionnaire". In addition to the score, you received from the screening, you also exhibited some signs and symptoms during your procedure today which indicate that you are at high risk for having OSA. This information, coupled with your medical history leads us to believe that you may be at risk for **OSA.**

OSA is caused by a blockage of the airway, this usually happens when the soft tissue in the back of the throat and/or the tongue collapses occluding the airway during sleep. This causes periods of apnea (when breathing stops for a short time) and oxygen levels can drop significantly. Although OSA can occur in anyone and at any age, it typically affects men who are over age 40, and those who are overweight.

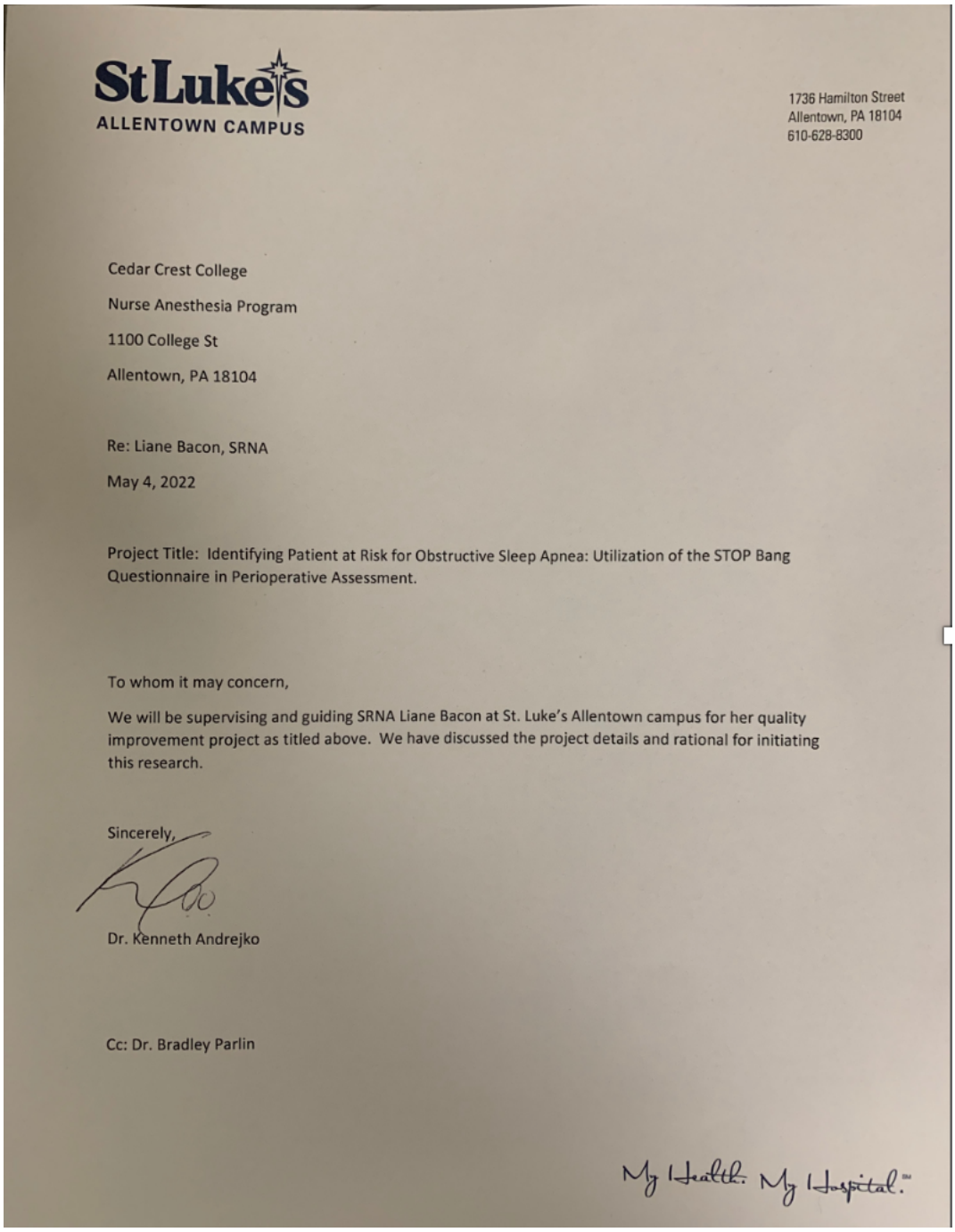
Symptoms of sleep apnea include: snoring, witnessed pause or gasping for air, daytime sleepiness, inability to concentrate, falling asleep while driving or at work, headaches, and depression. Early recognition and treatment of sleep apnea is very important because sleep apnea is associated with irregular heartbeats, high blood pressure, heart attacks, and strokes.

We **highly recommend** that you be evaluated at a sleep study center for **OSA.** Enclosed are some reading materials about obstructive sleep apnea, as well as testing and treatment available. Feel free to share this and discuss with your primary health care provider.

Sincerely,

Your anesthesia team providers
Northeastern Anesthesia Physicians

Appendix D



St Luke's
ALLENTOWN CAMPUS

1736 Hamilton Street
Allentown, PA 18104
610-628-8300

Cedar Crest College

Nurse Anesthesia Program

1100 College St

Allentown, PA 18104

Re: Liane Bacon, SRNA

May 4, 2022

Project Title: Identifying Patient at Risk for Obstructive Sleep Apnea: Utilization of the STOP Bang Questionnaire in Perioperative Assessment.

To whom it may concern,

We will be supervising and guiding SRNA Liane Bacon at St. Luke's Allentown campus for her quality improvement project as titled above. We have discussed the project details and rational for initiating this research.

Sincerely,

Dr. Kenneth Andrejko

Cc: Dr. Bradley Parlin

My Health. My Hospital.℠

Appendix E

An event for Protocol SLQI 2022-139 **has been marked as having completed review**
Local ID: SLQI 2022-139 Protocol: SLQI 2022-139
Title: Identifying Patients at Risk for Obstructive Sleep Apnea: Utilization of the STOP Bang Questionnaire in the Perioperative Assessment.
Principal Investigator: Bacon SRNA, Liane
Type of Submission: New Studies
IRB Meeting Date: 11/01/2022
Action: Approved
Reviewed By: Exempt
Action Date: 10/28/2022
Agenda: Please see the attached exemption request;
SLQI 2022-139 St Luke's Anesthesia letter of support.pdf
SLQI 2022-139 Request for IRB Exemption.pdf
SLQI 2022-139 DNP Synopsis.pdf
SLQI 2022-139 HIPAA De-Identification Certifcation.pdf
SLQI 2022-139 Request for Waiver of Subject Authorization.pdf
SLQI 2022-139 Permission to use STOP BANG.pdf
SLQI 2022-139 STOP Bang Questionnaire .docx
SLQI 2022-139 Sleep Apnea Brochure.pdf
SLQI 2022-139 SLUHN Advertisements.pdf.
This approval is based on the understanding that you will:
- Immediately inform the IRB of all patients serious adverse events and any changes in procedures and project status changes that may occur after this review.
- Use only reproductions of the enclosed informed consent form displaying the IRB approval stamp.
- Agree to comply with FDA, OPRR, and St Luke's Hospital IRB regulations.
- Allow the review of research project records by the IRB as requested.

St. Luke's University Health Network has a Federal Wide Assurance [FWA 00003557] from OHRP. The Institutional Review Board is registered with OHRP [IRB 00002757] and is in compliance with 45 CFR 46, 21 CFR 50 and 21 CFR 56. To the extent these Federal regulations are in agreement with the ICH Guidelines, we are also in GCP compliance.

Review Completed By: Parampreet Kaur, MD
Completed Date: 10/28/2022

Appendix F

Cedar Crest College IRB approval

Your IRB Request has been Approved by the Project Advisor/Supervisor and the Committee Chair. This is the final Approval.

Attached you'll find the IRB Request Form for this request, including any notes added by the reviewer.

If additional files were submitted the request form and additional files will be delivered together in a zipped file.

Notes:

IRB Request Number: 455

Title of Research: Identifying patients at risk for Obstructive Sleep Apnea: Utilization of the STOP BANG Questionnaire in the Perioperative Assessment

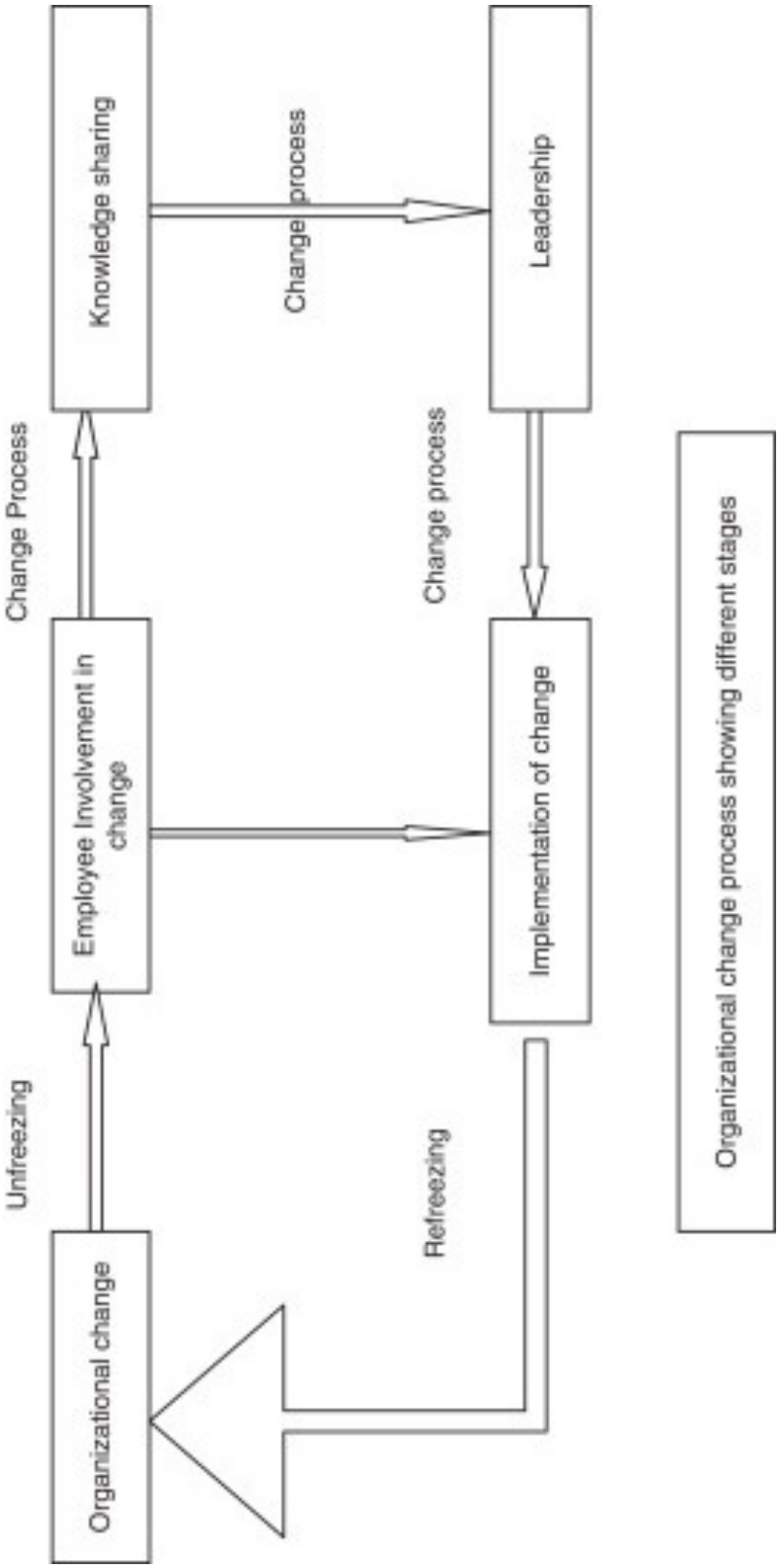
Review Type: EXEMPT REVIEW

Lead Researcher: Liane M. Bacon

Project Advisor/Supervisor: Dr. Karen Bensinger

Date Submitted: 11/20/2022

Appendix G


Knowledge sharing
Change process
Leadership
Change Process
Change process
Employee Involvement in change
Implementation of change
Unfreezing
Refreezing
Organizational change
Organizational change process showing different stages

Appendix H

AASM American Academy of SLEEP MEDICINE

A patient's guide to understanding

Diagnostic Testing for Obstructive Sleep Apnea in Adults

This patient guide outlines the AASM's recommendations for testing for obstructive sleep apnea (OSA). This guide will help you know what to expect when talking with your medical provider. If you want more information you can read the full clinical practice guideline.

HOW DO YOU FIND OUT IF YOU HAVE OSA?

A diagnosis must include an in-center sleep apnea test or a home sleep apnea test. Your medical provider should not diagnose OSA based only on a survey.

Testing for OSA should be done as part of a complete sleep assessment and follow-up visits with your medical provider. The chances of having OSA can sometimes be determined using surveys, but some symptoms of OSA can be caused by other sleep disorders.

WHEN CAN TESTING FOR OSA BE DONE AT HOME?

Your medical provider can use a home sleep apnea test if:

- Your symptoms suggest you are at a higher risk for moderate-to-severe OSA,

  You are at a higher risk for moderate-to-severe OSA if you feel very sleepy or tired during the day and have at least two of these symptoms: routine loud snoring, witnessed gasping while asleep, choking or holding your breath while asleep, or high blood pressure.

AND

- You do *not* have certain health conditions and are *not* at risk for other sleep-related breathing disorders.

  These health conditions include: significant heart and lung disease, neuromuscular conditions, history of stroke and chronic opioid use, or significant sleep disorders. Talk with your medical provider for more information.

WHEN IS IT IMPORTANT TO GET TESTED FOR OSA IN A CENTER?

Your medical provider should use an in-center sleep apnea test, instead of a home sleep apnea test, if:

- You have certain health conditions or are at risk for other sleep-related breathing disorders,

OR

- Your medical provider thinks you are more likely to have mild OSA based on your symptoms.

  Mild OSA is diagnosed most accurately using an in-center sleep apnea test.

For more information on how these recommendations were developed, visit:
aasm.org/clinical-resources/practice-standards/practice-guidelines/

A patient's guide to: Testing for OSA

WHEN SHOULD DIAGNOSTIC TESTING BE REPEATED?

If diagnostic testing needs to be repeated, your medical provider should use an in-center sleep apnea test. Some reasons your medical provider may repeat an in-center sleep apnea test:

- When the results of a home sleep apnea test are negative or unclear

OR

- When the results of the first in-center sleep apnea test are negative and your medical provider still thinks that you have OSA.

COMPARING AN IN-CENTER SLEEP APNEA TEST WITH A HOME SLEEP APNEA TEST

	IN-CENTER SLEEP APNEA TEST	HOME SLEEP APNEA TEST
ADVANTAGES ⊕	»» More accurate diagnosis »» Can detect other sleep disorders »» Patient is observed by medical staff during the test	»» Less expensive »» More convenient; is performed at home »» Less intrusive and more comfortable
DISADVANTAGES ⊖	»» More expensive »» Limited access in some areas »» May disrupt your normal sleep schedule	»» Does not measure everything that an in-center sleep apnea test can. »» More likely to give inaccurate results because of incorrect setup of equipment

NEXT STEPS

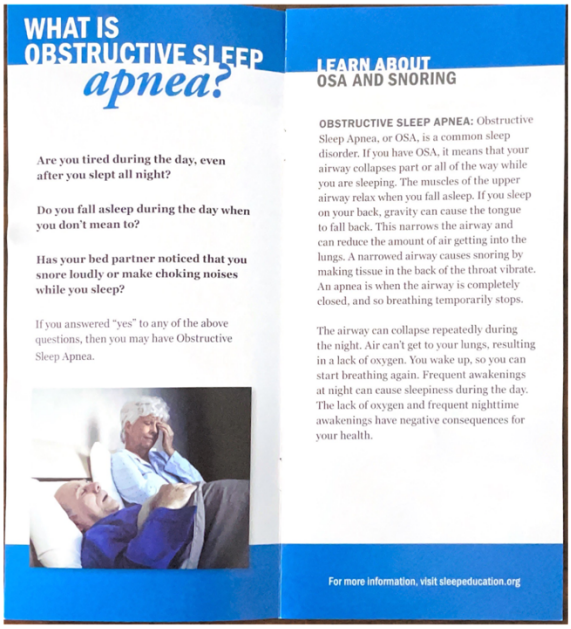
You should always talk with your medical provider if you think you have OSA. For more information about sleep apnea or to find an accredited sleep center near you, please visit **sleepeducation.com.**

For more information on how these recommendations were developed, visit:
aasm.org/clinical-resources/practice-standards/practice-guidelines/

AASM

Appendix I


SNORING AND
sleep apnea
AASM American Academy of SLEEP MEDICINE
sleepeducation.org


WHAT IS OBSTRUCTIVE SLEEP apnea?
Are you tired during the day, even after you slept all night?
Do you fall asleep during the day when you don't mean to?
Has your bed partner noticed that you snore loudly or make choking noises while you sleep?
If you answered "yes" to any of the above questions, then you may have Obstructive Sleep Apnea.
LEARN ABOUT OSA AND SNORING
OBSTRUCTIVE SLEEP APNEA: Obstructive Sleep Apnea, or OSA, is a common sleep disorder. If you have OSA, it means that your airway collapses part or all of the way while you are sleeping. The muscles of the upper airway relax when you fall asleep. If you sleep on your back, gravity can cause the tongue to fall back. This narrows the airway and can reduce the amount of air getting into the lungs. A narrowed airway causes snoring by making tissue in the back of the throat vibrate. An apnea is when the airway is completely closed, and so breathing temporarily stops.
The airway can collapse repeatedly during the night. Air can't get to your lungs, resulting in a lack of oxygen. You wake up, so you can start breathing again. Frequent awakenings at night can cause sleepiness during the day. The lack of oxygen and frequent nighttime awakenings have negative consequences for your health.
For more information, visit sleepeducation.org

Signs of OSA include:

- Loud or frequent snoring
- Choking or gasping while you sleep
- Morning headaches
- Daytime sleepiness or tiredness
- Trouble concentrating

If you have any of the symptoms above, you may have OSA.

WHO IS AT RISK FOR OSA?

You are at an increased risk if you are:

- Overweight
- Hypertensive
- Male with a neck size of 17 inches or more
- Female with a neck size of 16 inches or more
- Male over the age of 40
- Female over the age of 50

Not all people with OSA have these risk factors. Children can have OSA as a result of large tonsils or narrow airways. Young adults, even those who are physically fit, may also have OSA. It is impossible to diagnose OSA just by looking at someone.

HOW IS OSA DIAGNOSED?

Your health care provider can refer you for a sleep evaluation. Breathing and the amount of oxygen in your blood are measured during the study. The sleep evaluation may occur in a sleep center or at your home. Your results will help your health care provider make a diagnosis.

OSA is treatable. It is important to get tested and treated.

Risks of OSA include:

- High blood pressure
- Heart attack
- Stroke
- Pre-diabetes and diabetes
- Depression

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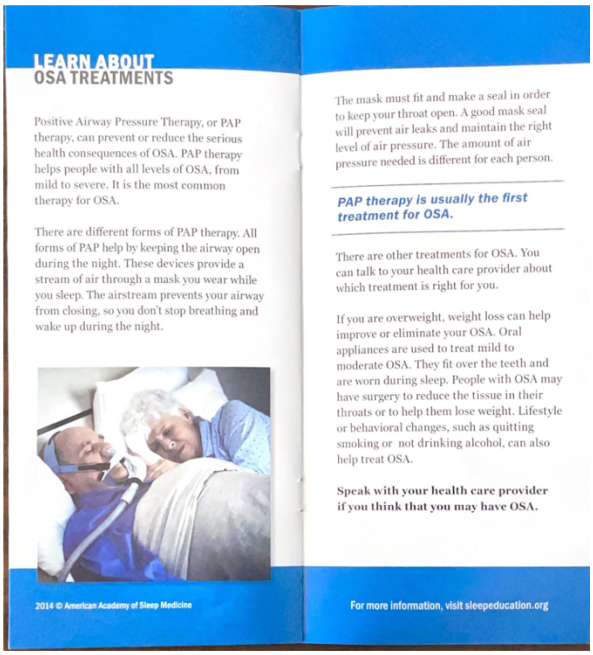

LEARN ABOUT OSA TREATMENTS

Positive Airway Pressure Therapy, or PAP therapy, can prevent or reduce the serious health consequences of OSA. PAP therapy helps people with all levels of OSA, from mild to severe. It is the most common therapy for OSA.

There are different forms of PAP therapy. All forms of PAP help by keeping the airway open during the night. These devices provide a stream of air through a mask you wear while you sleep. The airstream prevents your airway from closing, so you don't stop breathing and wake up during the night.

The mask must fit and make a seal in order to keep your throat open. A good mask seal will prevent air leaks and maintain the right level of air pressure. The amount of air pressure needed is different for each person.

PAP therapy is usually the first treatment for OSA.

There are other treatments for OSA. You can talk to your health care provider about which treatment is right for you.

If you are overweight, weight loss can help improve or eliminate your OSA. Oral appliances are used to treat mild to moderate OSA. They fit over the teeth and are worn during sleep. People with OSA may have surgery to reduce the tissue in their throats or to help them lose weight. Lifestyle or behavioral changes, such as quitting smoking or not drinking alcohol, can also help treat OSA.

Speak with your health care provider if you think that you may have OSA.

For more information, visit sleepeducation.org

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For more information, visit sleepeducation.org

Appendix J

Northeastern Anesthesia Physicians ~ NAP
24 South 18th Street
Allentown, PA 18104
Phone 610-628-8372
Email: napadmin@comcast.net

Dear Patient,

Today your anesthesia provider screened you for **Obstructive Sleep Apnea (OSA)** risk using a tool called the "STOP BANG Questionnaire". In addition to the score, you received from the screening, you also exhibited some signs and symptoms during your procedure today which indicate that you are at high risk for having OSA. This information, coupled with your medical history leads us to believe that you may be at risk for **OSA.**

OSA is caused by a blockage of the airway, this usually happens when the soft tissue in the back of the throat and/or the tongue collapses occluding the airway during sleep. This causes periods of apnea (when breathing stops for a short time) and oxygen levels can drop significantly. Although OSA can occur in anyone and at any age, it typically affects men who are over age 40, and those who are overweight.

Symptoms of sleep apnea include: snoring, witnessed pause or gasping for air, daytime sleepiness, inability to concentrate, falling asleep while driving or at work, headaches, and depression. Early recognition and treatment of sleep apnea is very important because sleep apnea is associated with irregular heartbeats, high blood pressure, heart attacks, and strokes.

We **highly recommend** that you be evaluated at a sleep study center for **OSA.** Enclosed are some reading materials about obstructive sleep apnea, as well as testing and treatment available. Feel free to share this and discuss with your primary health care provider.

Sincerely,

Your anesthesia team providers
Northeastern Anesthesia Physicians