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Educating Anesthesia Personnel on STOP-BANG to Predict Difficult Airway

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Abstract

Impact Statement: The purpose of this study is to educate the anesthesia team on the incidence of a difficult airway in patients with obstructive sleep apnea (OSA) and the STOP-BANG Questionnaire to predict this complication.

Background: Characterized by cessation of breathing during sleep due to collapse of the upper airway, patients with OSA possess a high risk of a difficult airway during anesthesia induction. During periods of constriction, the pharynx becomes obstructed, leading to adverse reactions such as desaturation, blood gas instabilities, abrupt arousal from sleep, and daytime fatigue. A needs assessment revealed that the STOP-Bang Questionnaire, the most validated screening tool for OSA, is not incorporated by anesthesia providers in clinical practice.

Method: Anesthesia personnel within the Broward Health system were asked to anonymously participate in an educational module, sent via email provided by the institution. Over the course of one month, anesthesia personnel completed an informed consent and prompted to complete a pre-evaluation examination on pathophysiology and assessment of OSA. Participants were then forwarded to a 13-minute educational video surrounding OSA, the STOP-BANG Questionnaire, and its relevancy in detecting difficult airways. When complete, the participants were asked to answer the same questions on the post-evaluation examination in effort to determine any increase in knowledge and participants willingness to change practice. Information is collected through an anonymous website, Qualtrics.

Results: There was an average improvement score of 50%, demonstrating the receptiveness of the educational module. More importantly, the likeliness of utilizing the STOP-Bang Questionnaire tool during their preoperative assessment increased from 67% more likely during the pre-test, to 100% more likely in the post-test.

Discussion: In the concluding assessment for participating anesthesia providers, an overwhelming amount contributors demonstrated not only an increase in knowledge, but a greater willingness to incorporate the STOP-BANG Questionnaire into the daily anesthesia patient assessment. Limitations within this quality improvement study include a small sample size was very small, only reaching six anesthesia providers, as well as holding the same pre-and post-evaluation examination questions. The STOP-BANG questionnaire can aid in alerting anesthesia providers of a potential OSA diagnosis and assist the provider in preparing for possible interventions. Potential anesthetic considerations for diagnosed or suspected OSA include minimal sedation, preparation for difficult mask ventilation and airway with glidescope and fiberoptic tools, pre-oxygenation with the head of the bed elevated, use of continuous positive airway pressure (CPAP), and cautious use of opioids.

Keywords: obesity, obstructive sleep apnea, OSA, STOP-Bang Questionnaire, education model, anesthesia, difficult airway

Project title: Educating Anesthesia Personnel on STOP-BANG to Predict Difficult Airway

Purpose/PICO Clinical Question

PICO Question or Purpose

Population (P): Anesthesia providers

Intervention (I): STOP-BANG questionnaire education

Comparison (C): None

Outcomes (O): Improved provider utilization of STOP-BANG questionnaire to predict difficult airway

Problem Identification

As the occurrence of OSA increases worldwide, the need for education on the management of care has become imperative. However, as many symptoms can be mistaken for other comorbidities, OSA is frequently overlooked, underdiagnosed, and untreated, representing a health and safety concern.[1] Up to 80% of patients with moderate to severe OSA are undiagnosed.[2] This lack of a diagnosis may play a part in the lack of awareness of the disorder.

Characterized by periods of apnea and hypopnea due to partial or complete airway obstruction, a difficult airway is considered a critical complication in respiratory and anesthesia adverse events.[3] A difficult airway can be described as experiencing challenges in mask ventilation, endotracheal intubation, or both. Contributions that lead to a difficult airway stem from anatomic upper airway anomalies that may include a large neck circumference, a large tongue, congestion of oropharyngeal structures, and a decreased upper airway diameter.[3] During periods of obstruction and oxygen desaturation, the body responds by sympathetic activation and brain arousal.[4] Anesthesia providers must be alert to airway concerns due to the connection

between OSA and a difficult airway increase leading to the risks of intra- and post-operative complications, including an anoxic brain injury.[5]

The Society of Anesthesia and Sleep Medicine has made advances in detecting and treating patients with OSA, including the design and implementation of the screening instrument STOP-BANG. Being the most validated instrument in surgical patients, the STOP-BANG questionnaire acts as an acronym to aid providers in scoring the degree of OSA. This acronym stands for snoring (S), tiredness (T), observed apnea (O), blood pressure (P), body mass index (B), age over 50 years (A), neck circumference (N), and male gender (G).[2] The scores are based on yes or no answers, with the final score ranging from zero to eight.[6] Recent studies have explored the comparison between high-scoring STOP-BANG patients and the incidence of difficult airway and found that a score of three or more is associated with an increased need for vigilance. In contrast, a score of five or more identifies a need to adjust the intra-operative care plan.[2,5] Alternations may include having a difficult airway cart present as well as adjuncts to intubation, such as a glidescope.

While existing tools have helped minimize complications and optimize care intraoperatively for OSA patients, post-operative complications from difficult airways are still too familiar an occurrence. Therefore, the question prevails, are all providers taking their time to fill this out, or are they just doing it as a requirement and not acting on results? This project aims to improve anesthesia provider utilization of the STOP-BANG questionnaire to predict a difficult airway in patients with OSA.

Background

OSA is represented by the narrowing and constriction of the upper airway when the patient is asleep. During periods of constriction, the pharynx becomes obstructed, leading to

adverse reactions such as desaturation, blood gas instabilities, abrupt arousal from sleep, and daytime fatigue.[3] OSA is commonly overlooked and is linked to a multitude of comorbidities, including diabetes, cardiovascular disease, neurocognitive disorders, metabolic disorders, and cancer.[1,2]

Scope of the Problem

With estimations of diagnosis at almost 1 billion adults worldwide, OSA has quickly become one of the world's more common sleep-related breathing disorders.[7] The increasing prevalence of the disorder has been linked to the increasing rate of global obesity. In contrast, the frequency may also be attributed to the various tools being utilized and the varying definitions for respiratory events.[4] Incidence of OSA has been studied to be increased in the older population and male gender.[4]

In a 2018 systemic analysis by Nagappa et al.,[3] researchers examined a total of 16, both qualitative and quantitative, studies evaluating the occurrence of a difficult airway intraoperatively in patients with and without OSA. Within Nagappa et al.'s findings, patients with OSA diagnosis were found to have a 3.46-fold higher incidence of difficult intubation. Difficulty mask ventilating was 3.39-fold higher in patients with OSA compared to patients without OSA.[3] A combined difficulty mask ventilating and intubating was 4.12-fold higher in OSA patients.[3] On the contrary, there has been no reported difficulty in inserting a supraglottic airway in patients with OSA versus patients who do not have the disorder.[3,8] Overall, of the studies analyzed, OSA had a 4-fold higher risk of difficult airway than those without OSA.[3] A second 2018 review, conducted by Leong et al., concluded similar results, stating OSA to be a predominant risk factor in predicting difficult airway.[8]

Consequences of the Problem

Due to OSA's multifactorial and social consequences, the disorder has a high economic and public burden. A 2016 report estimated the cost of diagnosing and treating OSA in the United States alone to be $12.4 billion.[7] In one observational study, patients who had experienced a difficult airway and intubation intraoperatively had experienced various complications, including dental damage, oxygen desaturation, airway damage, intensive care unit admission, and difficult extubating. Overall, these impediments reportedly cost the hospital $14,468 more compared to patients who did not experience difficult intubations. In addition to monetary challenges, the average length of stay for this group of patients increases by approximately four days.[9]

Approximately 93% of difficult airways and intubations are unexpected.[9] Serious complications of experiencing a difficult airway include cardiopulmonary arrest, brain injury, airway trauma, and even death. In addition to the preceding, the anesthesia provider must monitor for potential complications such as aspiration, pneumothorax, edema, or bleeding post-operatively.[10]

Knowledge Gaps

While the STOP-BANG questionnaire was designed to identify high or low-risk OSA and aid anesthesia providers in formulating anesthetic plans for sedation and airway management, it was not developed as a diagnostic tool.[2] In this regard, patients may not be aware of an OSA diagnosis for providers to accurately test the reliability of this questionnaire and its relativity to predicting a difficult airway. If it is presumed the patient may have OSA, polysomnography should be performed prior to the day of surgery.[2] As it is difficult to lead

randomized control trials on the occurrence of a difficult airway, many current studies related to the subject are observational studies, potentially harming the level of evidence. In a 2018 systemic review and meta-analysis by Nagappa et al., researchers examined limitations to corresponding studies recognizing the lack of randomized control trials on the topic and studies using both diagnosed and suspected OSA patients, potentially incorporating false positives and false negatives.[3] Another systemic review, completed by Senaratna et al., acknowledged the prevalence of OSA within the population identified that research articles were obtained from the United States and Europe, demonstrating a new to determine global epidemiology.[4] Senaratna et al.'s review also criticizes the small sample sizes used in population prevalence studies.[4] Further research should focus on if higher STOP-BANG scores along with other predictors, such as Mallampati and thyromental distance, would influence the prediction of difficulty in airway management.[11]

Proposal Solution

The STOP-BANG questionnaire has been supported in predicting a difficult airway through previous studies and quality improvement research.[2,11] Depending on the score, the STOP-BANG questionnaire has aided anesthesia providers in making appropriate alterations in intraoperative care plans to avoid difficult airways and prolonged hospital stays. The questionnaire offers high sensitivity as a pre-operative clinical tool for OSA.[2] However, the STOP-BANG questionnaire is completed by the pre-operative nurse and rarely an anesthesia provider in many facilities. Thus, there becomes a challenge in ensuring whether the anesthesia team verified the questionnaire or if it had been overlooked. In returning to a state in which anesthesia providers contribute the questionnaire into their pre-operative assessment, there would be an increased awareness of the level of difficult airway management. Educating anesthesia

providers through an online educational module on the relevance and importance of this clinical tool may be beneficial in closing the safety gap of OSA diagnosis and difficult airways. Furthermore, translating this questionnaire into the pre-operative interview form would increase anesthesia awareness.

Patients living with OSA face numerous barriers, including a high risk for comorbidities, post-operative complications, and difficult airways.[3,4,5] Anesthesia providers have a responsibility to give safe, quality care and optimize patient outcomes. This high-quality care will start with the pre-operative interview. In addition, providing providers with the knowledge and emphasizing the importance of the STOP-BANG questionnaire as a clinical tool to predict a difficult airway will improve patient outcomes and satisfaction.

Summary of Literature

Eligibility Criteria

Studies assessed during this literature review were chosen based on the inclusion and exclusion criteria to define and set the previously stated objectives. Inclusion criteria included a publishing date within the previous five years, written in English, has full-text available online, and studies that spoke on behalf of adverse respiratory events. Exclusion criteria included patients without high-risk factors for OSA, pediatric population, adverse reactions beyond difficult airway or intubation, and patients with multiple comorbidities. Database sources used for this research were accessed through the Florida International University's (FIU) library services.

Information Sources

The databases utilized for the search included The Cumulative Index to Nursing and Allied Health Literature (CINAHL), MEDLINE, and PubMed. The literature review was

conducted by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). PRISMA is a set of items used in the reporting of systemic reviews and meta-analysis.

Search Strategy

Key search terms used to expand the research: (OSA* OR “Obstructive Sleep Apnea” OR “Sleep Apnea” OR apnoea* OR apnea*) AND (“STOP BANG questionnaire” OR SBQ*) AND (“Difficult Airway” OR “Difficult Intubation"). The initial search generated 51 articles. CINAHL reported six articles, MEDLINE reported 27 articles, and PubMED reported 18 articles. To ensure the most relevant articles to date were examined, only articles published within the past five years were included. This added criteria produced 16 articles for MEDLINE, 4 for CINAHL, and 9 for PubMED. The articles that remained were examined closely, subtracting duplicates. Through this process, 20 articles remained for further review.

The remaining article titles were assessed and approved for a full review of the abstract. Of these articles, ten articles met the criteria and were further analyzed by reading the full text. The removed articles included those that only focused on the patient’s adverse reactions of OSA and were not specific to difficult airways. In addition, systematic and meta-analysis reviews were included within the article search, leaving five studies to summarize. Diagram 1 describes the literature search process.

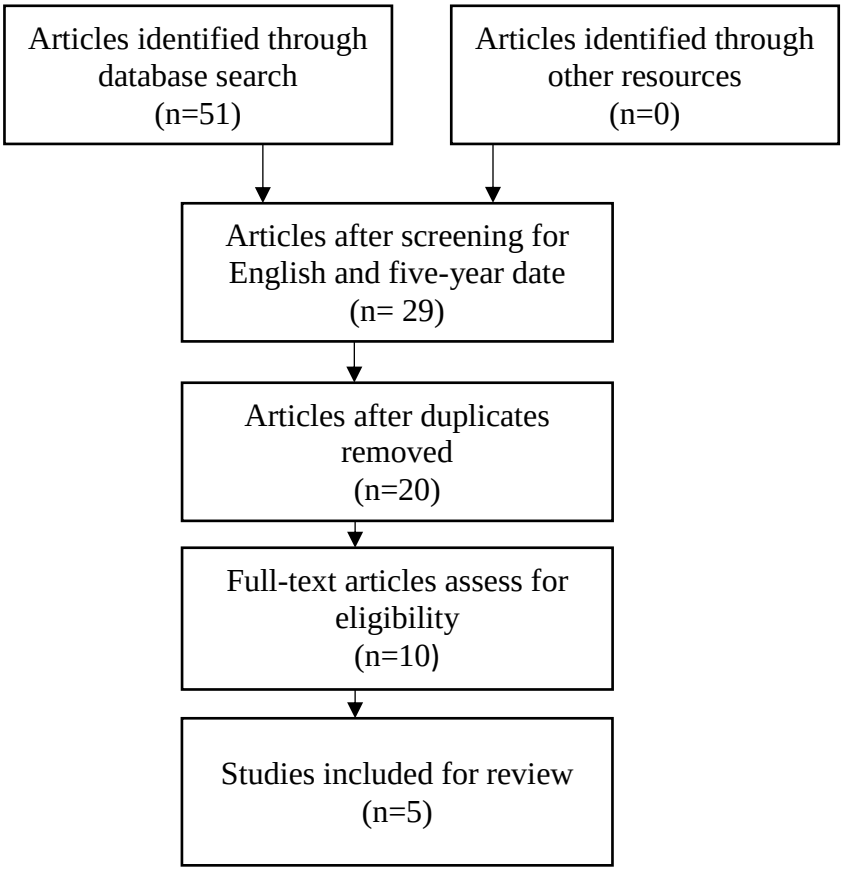

Diagram 1. Article Flow Diagram

Study Characteristics

Of the five chosen articles for the literature review, two objectives and ideas remained continuous. The first objective focused on estimating the occurrence of difficult airway and respiratory adverse effects in patients with OSA. This objective was investigated by Mathangi, Mathews, and Mathangi,[8] Chudeau et al.,[9] Sangkum et al.,[10] and Khan and Ahmed.[11] The remaining study by Gokay, Tastan, and Orhan[12] investigated the difference between OSA detection while using the STOP-BANG questionnaire in both the general population and commercial drivers.[11]

This literature review includes one cohort study,[8] one observational study,[9] two cross-sectional study,[10,11] and one systemic review.[12] All patients involved in these studies were able to consent and agreed to partake in the research. Participants within all five of these studies, Mathangi, Mathews, and Mathangi,[8] Chudeau et al.,[9] Sangkum et al.,[10] Khan and Ahmed,[11] and Chen et al.,[12] did not have a previous diagnosis of OSA but rather had significant risk factors.

Results of Studies

The literature illustrates a multitude of respiratory complications in the perioperative period for patients with OSA. Complications include the inability to secure an airway after induction, respiratory obstruction, and respiratory arrest due to administered medications.[8] Mathangi, Mathews, and Mathangi[8] conducted a study to examine the occurrence of OSA and compare the utilization of the STOP-BANG questionnaire versus other screening methods in predicting difficult mask ventilation and intubation. This prospective cohort study gathered 100 participants and asked the assembly involved to complete a STOP-BANG questionnaire form. Patients scoring above a three were considered to have a diagnosis of OSA, and researchers split the patients into two groups based on this result. The participating anesthesiologist was blind to which group was now diagnosed with OSA and which group was undiagnosed. All patients were sedated with the same medications after five minutes of preoxygenation and any use of additional ventilation and intubation maneuvers were recorded.

Mathangi, Mathews, and Mathangi[8] utilized either the Chi-square or the Fischer exact test to compare the minuscule data between the two groups. In contrast, the student *t*-test or Mann-Whitney U test was used to compare the continuous variables. The incidence of difficult mask ventilation was 51% of the total participating population, 77.8% were a part of the OSA group, while 15.2% of the events occurred within the undiagnosed group. The relative risk for difficult

mask ventilation was 5.11-fold higher for patients with OSA compared to undiagnosed patients. The presence of at least one comorbidity was significantly associated with an increased difficult mask ventilation but not with difficult laryngoscopy (p= 0.356) or difficult intubation (p= 0.148). When examining the definition of difficult mask ventilation within this study, two-handed mask ventilation and two-handed technique using an adjunct airway were commonly used. The incidence of difficult laryngoscopy was 18% in the OSA group and 7% in the undiagnosed OSA group. The incidence of difficult intubation was 22.2% in OSA compared to the 4.3% in undiagnosed OSA.[8]

Mathangi, Mathews, and Mathangi[8] concluded the STOP-BANG questionnaire to be a validated tool in surgical patients, with a high sensitivity and a negative predictive value in diagnosing OSA. A STOP-BANG score above three had a sensitivity of 82.2% at an apnea-hypopnea index (AHI) greater than 5 and a 100% sensitivity at AHI over 30. While the identification of difficult intubation was higher in the OSA group, researchers were unable to configure a direct correlation between the two. Overall, the occurrence of difficult airway was found to be significantly more in patients with a positive STOP-BANG score. However, study limitations included its cohort design and restricted sample size. The use of a theoretical framework was not made evident.

Similar to the previously mentioned study, Chudeau et al.[9] focused on the value of the STOP-BANG questionnaire on predicting respiratory complications prior to urgent surgery. This observational prospective study interviewed patients of consenting age undergoing emergency surgery at a level 1 trauma facility. Excluded from this study were patients under 18 years old, patients who were unable to answer questions, patients mechanically ventilated prior to surgery, patients with chronic respiratory failure, and patients with life-threatening emergencies. In total,

189 patients were included within the study. The STOP-BANG questionnaire score was obtained by one of the investigators while a different anesthesiologist managed anesthesia care. Perioperative respiratory complications were recorded, and included desaturation, difficult intubation, need for supplemental oxygen in a post-anesthesia care unit (PACU), unplanned delayed extubation, and a need for reintubation in PACU.[9]

Chudeau et al.[9] analyzed the participating patients by separating into a group for those who scored a STOP-BANG score above three and another group for those below three. Comparisons between the two groups were made with the Kruskal-Wallis test for continuous variables and the Fisher's exact test for the categorical ones. A receiver operative characteristic (ROC) curve was created to test the STOP-BANG score's ability to predict respiratory complications peri-operatively. In Chudeau et al.'s[9] findings, 55% of the 189 patients were at high risk of OSA with a score above three. Regarding respiratory complications, 14% had one or more respiratory complications intraoperatively and 47% in the PACU. There was no need for reintubation in any of the participants, while three patients with a positive STOP-BANG score and one patient with a negative STOP-BANG score needed to prolong mechanical ventilation within the PACU setting ($p= 0.63$).[9] According to the corresponding ROC curve, a threshold of three demonstrated a sensitivity of 67% and a specificity of 57% in respiratory complications while a score of five or higher possessed a greater specificity and positive likelihood ratio of 3.13.[9]

Researchers Chudeau et al.[9] found the STOP-BANG score associated with an increased risk of perioperative respiratory complications and an overall prolonged hospital stay. As polysomnography is not feasible prior to emergent surgery, the research team defined a STOP-BANG score of three to indicate an increased risk of OSA and a score of five to identify a high

risk of respiratory complications. This study's limitations included collecting complications ranging from mild to severe, most commonly reporting desaturations under 94% in the PACU setting, rather than focusing on the difficult airway management and intubation intraoperatively. While prospective observational studies are not considered level 1 evidence, they are of high quality and can be reported as reliable. The use of a theoretical framework was not made evident.

The STOP-BANG questionnaire has been a relied upon method in screening for OSA. However, its correctness may very among different populations. For example, Asian men typically possess a lower BMI (BMI 30 versus 35) but have a higher risk of having respiratory complications.[10] As a result, a modified STOP-BANG was created to bring awareness to this gap. The eight items included in this modified questionnaire are snoring, tiredness, apnea, hypertension, BMI greater than 30, greater than 50 years old, neck circumference greater than 40 cm, and male.[10] Sangkum et al.[10] therefore created a hypothesis that the modified version would have a larger involvement with adverse outcomes than would the original STOP-BANG questionnaire. In this 400-patient cross-sectional study, researchers followed patients who already had a high original STOP-BANG score. Based on patient characteristics, the patients were reevaluated on a modified scale, while the relationship was compared using the chi-square test. The ROC compared the capability of both the original and modified questionnaires to predict perioperative adverse events.[10]

Sangkum et al.[10] analyzed the 400 involved patients to find that only 73 had experienced perioperative adverse events. Based on the modified STOP-BANG score, the incidence of respiratory perioperative adverse events was 23.2% in patients with high risk for OSA and about 13.8% in patients with a low risk ($p= 0.016$). In comparison, based on the original STOP-BANG, if the patient was either high risk or low risk for OSA, patients had incidence of adverse events at

22.5 and 14.7% (p= 0.043). During the intraoperative period, both modified and original STOP-BANG were found to predict a greater occurrence of difficult ventilation and Cormack-Lehane classification of laryngoscope view greater or equal to three. Additionally, high-risk OSA patients also had a greater incidence for oxygen supplements during recovery period.[10]

To conclude research founded by Sangkum et al.,[10] the modified and original STOP-BANG score greater than or equal to three or five were not significantly different in predicting the incidence of perioperative adverse events. On the contrary, modified STOP-BANG was associated with intraoperative adverse events, including difficult intubation and the need for oxygen therapy in the PACU setting. The original STOP-BANG questionnaire displayed higher accuracy and was faster than any other OSA checklist or screening tool. A strength of this study was its prospective design. Limitations to this study was that the researchers were not blind to the participants, preventing the exclusion of bias.[10] The use of a theoretical framework was not made evident.

The fourth study that was reviewed was conducted by two researchers Khan and Ahmed.[11] Similar to the previous articles Khan and Ahmed aimed to measure the accuracy of the STOP-BANG questionnaire in predicting difficult mask ventilation in patients undergoing general anesthesia.[11] This prospective cross-sectional, observational study was conducted at a university teaching facility, in which 530 patients undergoing an elective procedure under general anesthesia were enrolled. Excluded from the study were patients with facial abnormalities, patients undergoing cardiothoracic surgery, patients with a previous diagnosis with OSA, and those with an airway-related anatomical deformity. STOP-BANG scores were recorded preoperatively, with greater than or equal to three being increased risk for OSA. All patients were connected to the same monitors and sedated with the same anesthetics. Mask

ventilation was performed for three minutes in a sniffing position and then intubated with a laryngoscope.

Khan and Ahmed[11] used the Chi-square test to observe the association between factors assessed and difficult mask ventilation. Multivariate logistic stepwise regression analysis was used to calculate the odds ratio and contribution of the predictors. Of the 530 patients recruited for the study, 139 had a STOP-BANG score over or equal to three, while the remaining had a score less than three. Among the 139 patients, 39.5% were found to have difficult mask ventilation, while 7.5% of the 391 remaining had difficulty mask ventilating. According to the results, the accuracy of STOP-BANG questionnaire in predicting difficult mask ventilation was 78.68%, with a negative predictive value of 92.58%.[11]

As concluded by Khan and Ahmed,[11] six out of the eight criteria of STOP-BANG can be independently associated with an increased risk of difficult mask ventilation. These factors include snoring, high blood pressure, BMI greater than 35, age greater than 50 years, neck circumference greater than 40 cm, and male.[11] The researchers determined that this questionnaire has a high negative predictive value for difficult mask ventilation and would be helpful in ruling out difficult mask ventilation and has been discovered to be 73% accurate in predicting difficult mask ventilation for a score greater than three. The limitation of this study is the level of evidence used to conclude results. However, there was an adequate sample size used to derive conclusions. Besides, this evidence has minimal bias after declaring no conflict of interest and controlling for confounding variables. The use of a theoretical framework was not made evident.

In an article guided by Chen et al.,[12] the validity of the STOP-BANG questionnaire to detect OSA in key populations was explored through an involved systemic review and meta-analysis. Following PRISMA, researchers utilized MEDLINE, Medline-in-process, Embase,

EmCare Nursing, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, PsycINFO, Scopus, and CINAHL.[12] Through a selective screening process, a total of seven studies were included, five studies evaluated the general population while the other two studies evaluated STOP-BANG in commercial drivers. In the general population, "prevalence of OSA (AHI greater than or equal to five), moderate-to-severe OSA (AHI greater than 15), and severe OSA (AHI greater than 30) was 57.6%, 21.3%, and 7.8%."[12] In comparison, in the studies involving commercial drivers, the prevalence of moderate to severe OSA was 37.3%. The trends of high sensitivity and negative predictive value of a STOP-BANG score greater than three.

Limitations included within the systemic review and meta-analysis small sample sizes, a higher risk of bias, as the selection bias may have compromised external validity of the meta-analysis. Another limitation includes an inconsistency of the predictive parameters is consistently high, presumably due to methodological heterogeneity. Wider use of the STOP-BANG questionnaire to screen for OSA helps improve public health and reduce safety risks caused by sleep apnea in the general population.[12]

Author(s)	Purpose	Methodology/ Research Design	Intervention/ Measures	Sampling	Primary Results	Conclusions
Mathangi, Mathews, and Mathangi[8]	To investigate the occurrence of OSA and compare screening measures to predict difficult airway in undiagnosed patients.	Prospective cohort study (Level II)	Questionnaire was completed on patients undergoing elective procedures and split into OSA and non-OSA groups. Occurrence of difficult airway were recorded and compared.	100 patients above the age of 18 going for an elective procedure.	A total of 45 cases of difficult mask ventilation, 14 cases of difficult intubation, and 25 cases of difficult laryngoscopy. Of the OSA group, 77.7% had difficulty with mask ventilation alone.	Multivariate logistic regression analysis demonstrated STOP-BANG as the single most important predictor of difficult mask ventilation. A positive screening test for OSA is associated with overall difficult airway management.
Chudeau et al.[9]	To investigate the ability of the STOP-BANG questionnaire to evaluate predictability of perioperative respiratory complications during emergent surgery.	Observational Prospective study (Level II)	STOP-BANG questionnaire was completed prior to emergency surgery, excluding surgery due to life-threatening injury. Perioperative complications were recorded	189 patients were included in this study at a Level 1 university hospital.	Of the patients monitored, 104 had a positive STOP-BANG screening. The incidence of respiratory adverse events was drastically higher in positive screening	In a multivariate analysis, the STOP-BANG score was independently associated with respiratory complications. A score greater than or equal to three is associated as a risk for complications and prolonged length of stay.

			during surgery and in the PACU setting.		patients intra and postoperatively.	
Sangkum et al.[10]	To investigate the association between high-risk OSA based on the modified STOP-BANG questionnaire and perioperative adverse respiratory events.	Cross-sectional study (Level IV)	Utilizing the modified STOP-BANG questionnaire, patients were observed perioperatively for adverse respiratory complications.	400 patients over the age of 18 years old were involved.	18.3% of the 400 patients experienced adverse effects. Incidence was 23.2 and 13.8% in patients with high risk and low risk (original STOP-BANG: 22.5 and 14.7%).	While the modified STOP-BANG was not associated with higher overall adverse events; a modified score greater than or equal to three was able to predict the incidence of difficult ventilation, laryngoscopic view three or greater, a need for oxygen therapy, and ICU admission.
Khan and Ahmed[11]	To investigate the accuracy of the STOP-BANG questionnaire in predicting difficult mask ventilation in patients receiving general anesthesia.	Prospective, cross-sectional, observational study (Level IV)	STOP-BANG was filled during the preoperative setting while the ease or difficulty was assessed and documented responsible for anesthetic management.	530 patients of consenting age were involved.	26.22% of patients had a STOP-BANG score of greater than or equal to three. 39.5% of this group was found to have difficulty mask ventilating. Of the patients who scored below three, 7.5% had difficult mask ventilating.	STOP-BANG score has a negative predictive value and can be useful in ruling out the possibility of difficult mask ventilation.

Chen et al.[12]	To investigate existing literature on the knowledge of the STOP-BANG questionnaire and the validity in the scores ability to detect OSA in both the general population and commercial drivers.	Systematic Literature Review (Level 1)	Literature review conducted using MEDLINE, Embase, Cochrane Central Register of Controlled Trials, Cochrane Database of Systemic Reviews, PsycINFO, Journals @ Ovid, Web of Science, Scopus, and CINAHL.	Only articles published in academic journals, full text, and in the English language were utilized. On the first search pediatric was defined as 18 years or less. A total of five studies were utilized.	In the general population, prevalence of all OSA, moderate-to severe OSA and severe OSA was 57.6%, 21.3%, and 7.8%. In commercial drivers, the prevalence of moderate-to-severe OSA was 37.3%	All systemic literature reviews conclude that there is a valid and effective screening tool for OSA in the general population and commercial drivers.

Conclusion

The STOP-BANG questionnaire has been supported in predicting a difficult airway through previous studies and quality improvement research.[2,11] Depending on the score, the STOP-BANG questionnaire has aided anesthesia providers in making appropriate alterations in intraoperative care plans to avoid difficult airways and prolonged hospital stays. The questionnaire offers high sensitivity as a pre-operative clinical tool for OSA.[2] However, the STOP-BANG questionnaire is completed by the pre-operative nurse and rarely an anesthesia provider in many facilities. Thus, there becomes a challenge in ensuring whether the anesthesia team verified the questionnaire or if it had been overlooked. In returning to a state in which anesthesia providers contribute the questionnaire into their pre-operative assessment, there would be an increased awareness of the level of difficult airway management. Educating anesthesia providers through online seminars or creating an in-service on the relevance and importance of this clinical tool. Furthermore, translating this questionnaire into the pre-operative interview form would increase anesthesia awareness.

Patients living with OSA face numerous barriers, including a high risk for comorbidities, post-operative complications, and difficult airways.[3,4,5] Anesthesia providers have a responsibility to give safe, quality care and optimize patient outcomes. This high-quality care will start with the pre-operative interview. In addition, providing providers with the knowledge and emphasizing the importance of the STOP-BANG questionnaire as a clinical tool to predict a difficult airway will improve patient outcomes and satisfaction.

Organizational assessment

The implementation of the STOP-BANG questionnaire's ability to predict a difficult airway will be conducted via the anesthesia team. We will first determine the steps needed to

develop an online educational module. The involved educational online module would include content on the background information on obesity, the pathophysiology behind OSA, complications of OSA, anesthesia considerations for patients with either diagnosed or suspected OSA, the STOP-BANG questionnaire, and recent literature supporting the findings. In addition to educational data, quizzes and simulation-based scenarios may be provided at the end of each section to summarize learned material. This educational module will be delivered to the anesthesia team using hospital-affiliated e-mail addresses. Data can be analyzed during the planning phase through pre-test questions on OSA, STOP-BANG questionnaire results, and the difficult airway algorithm. In the evaluation phase, the team will be given a post-test on the same subjects and simulation-based scenarios on scoring patients and maintaining difficult airways. Finally, the participating team will be asked to complete a survey to capture the providers' likelihood to integrate STOP-BANG questionnaires into the routine screening. The quality improvement project report must include the description of the OSA online educational program, the interventions employed to obtain the initial objectives, methods used for data collection, the background, history, and relevance of the clinical issue, significant findings and conclusions of the program, unexpected outcomes, limitations to design, and recommendations to improve the program.

Primary DNP Project Goal

The primary goal of this project is to eradicate the incidence of complications and adverse effects of difficult airways in patients with OSA by encouraging a change in practice among anesthesia providers and educating anesthesia providers on the significance of OSA assessment. The site being utilized for this intervention is a large public health medical center, offering a wide range of surgical services. This practice is located in Fort Lauderdale, Florida.

There are currently eleven anesthesiologists and twenty-four certified registered nurse anesthetists (CRNAs) within the main practice facility.

Goals and Outcomes

This project aims to determine whether a brief educational intervention affects the incidence of difficult airway complications in patients with OSA. The acronym SMART refers to a specific, measurable, achievable, realistic, and timely tool used to generate goals for a project. For this quality improvement plan, the specific goal is to improve the knowledge and understanding of the clinical importance and relevance of employing the STOP-BANG questionnaire to predict difficult airways in patients with OSA. This will be measured through the administration of the questionnaire before and after the educational intervention and the anesthesia provider's appropriateness in preceding interventions guided by the STOP-BANG score. This goal is achievable during the permitted six-month timeframe. This goal is realistic for the anesthesia team to be thoroughly educated on the reliability of the STOP-BANG questionnaire. Providers will have continual access to the educational module from any device with internet connection and will remain available after the project is complete for future reference. The objective will be achieved by the end of a six-month timeframe.

Program Structure

In developing an educational module on OSA, a detailed assessment was implemented to identify the opportunities and strengths exist and the project’s value to stakeholders. The strength, weakness, opportunities, and threats (SWOT) analysis tool will be applied to assess both the internal and external characteristics and the threats of the quality improvement plan’s development.

The intention of the project is to evaluate the nurse anesthetist's knowledge of utilizing and interpreting the results of the STOP-BANG questionnaire. The first step within this process will be to identify expert stakeholders. The expert stakeholders will lead the development of a remote educational training system. The participants will initially be provided with a questionnaire to measure their knowledge of OSA, STOP-BANG, difficult airways, and peri-operative complications. Participants will then be provided with an online educational course addressing the current evidence supporting STOP-BANG use, care of the patient with OSA, and complications and interventions of a difficult airway. This course will be provided to the anesthesia team through an easily accessible online module. In doing so, anesthesia providers have the opportunity to access information in any system with internet access. After the intervention, participants will be asked to take a survey to analyze the variations in their knowledge before and after the educational course.

Strengths

Utilizing a tool, such as the STOP-BANG Questionnaire, to identify and predict difficult airways holds a purpose of achieving high quality patient care and supports the clinical site's mission to promote lifelong health to all patients. Therefore, the project's goal will be to provide the anesthesia team with the education necessary to identify airway difficulties before they occur, provide higher quality care, and improve patient outcomes. An online format will allow anesthesia providers to participate on any device with internet access, whether at home or in the clinical setting. The educational module will be available for providers even after the completion of the project.

Weakness

Moran et al. defines weakness as an internal issue that may be damaging to the program.[8] Weaknesses identified within this clinical site include an increased turnover and number of high acuity patients, lack of airway equipment, including fiberoptic and glidescope, available in the PACU, and the potential for pushback from the anesthesia team due to feelings of unnecessary repetition of knowledge. Due to the size of the clinical site and anesthesia team, the number of participants is restricted and represents a potential limitation to outcomes. Changes could be made to reach a wider audience, including neighboring facilities and incorporating Student Registered Nurse Anesthetists (SRNAs) into the improvement project. By failing to relay current literature, reviews, and guidelines for OSA care, a gap of knowledge becomes evident, and the patient has the potential to be affected negatively.

Opportunities

Educating anesthesia providers on the reliability, validity, and importance of employing the STOP-BANG questionnaire provides higher quality care for the patient. Anesthesia providers must have a fundamental understanding of the questionnaire, why identifying difficult airways pre-operatively is essential, and their expectations in executing these necessary interventions prior to induction. The anesthesia team is seen as the essential member of the quality improvement team by facilitating the patient's transition through all the peri-operative periods.

The directors of anesthesia will be responsible for the approval of the program and establish super users to lead the improvement plan. The super users will conduct follow-up education and ensure the anesthesia team completes the questionnaire through observation and documentation. With the participating clinical site running off paper documentation, a checklist for the preoperative questions and interventions necessary for a particular score will be

constructed and incorporated in the anesthesia packet. The operating room nurse will also be provided education tools to assist with intubation or ventilation of a difficult airway.

Threats

Elements that may potentially harm or interfere with the program's ability to achieve its objectives must be assessed. Risks to the program may include the anesthesia teams' negative feelings towards education due to feelings of repetition and redundancy. As the successful execution of this educational program is heavily dependent on compliance, the involved team must have an interest in the process and relay their agreement to engage. Patients may encounter negative outcomes if anesthesia providers are not adequately educated and counseled regarding OSA, consequences of difficult airways, and the difficult airway algorithm.

Conceptual Underpinning and Theoretical Framework of the Project

Theoretical frameworks have been used to assist in supporting a research study's structure.[14] The theoretical framework utilized throughout this project is Kurt Lewin's Theory of Change. Developed in the early 1950s, social scientist Kurt Lewin considered a resolution of conflict to be the factor that improves the human condition. In this revelation, Lewin stressed the idea of group behavior rather than individual behavior. Lewin established a 3-Step model to facilitate change at group, organization, and societal levels.[15] These three stages included unfreezing, moving, and refreezing.[14] The unfreezing stage involves the recognition of a problem and the need for change. Driving forces and restraining forces are identified and may include individual beliefs, group norms, and psychological safety.[14] The second stage, moving, involves the action of change. This stage inspires involved participants to perform the proposed change, with attitudes becoming more favorable towards the change while resistance decreases.[15] The final stage, refreezing, ensures that the change becomes the status quo.[14] If the

participants do not accept change or if it is not continually reinforced, the initiative will not sustain.

To represent the unfreezing stage, a needs assessment has been found that despite OSA diagnosis, patients are still enduring negative consequences of unidentified difficult airways intra-operatively and post-operatively. An online education module will be presented to anesthesia providers to highlight the pathophysiology of OSA and the significance of appropriate scoring of STOP-BANG and corresponding interventions. The negative effects of OSA peri-operatively would be discussed. The educational module will act as the change unit or moving stage. The final stage, refreezing, will be represented by reinforcement of super users to ensure questionnaires are completed on all patients and necessary equipment has been placed in the operating room. At the same time, the educational module remains available for reference to the anesthesia team.

Methodology

Setting and Participants

This quality improvement project will occur in a public-owned medical center, providing surgical interventions for a well-diverse population. There are eleven anesthesiologists and twenty-four CRNAs at this facility. Patients seen at this facility have an average ASA score of three, frequently requiring anesthesia and surgical staff intervention. This practice is located in Fort Lauderdale, FL.

Description of Approach and Project Procedures

The implementation of the STOP-BANG questionnaire's ability to predict a difficult airway will be conducted via the anesthesia team. We will first determine the steps needed to develop an online educational module. The involved educational online module would include

content on the background information on obesity, the pathophysiology behind OSA, complications of OSA, anesthesia considerations for patients with either diagnosed or suspected OSA, the STOP-BANG questionnaire, and recent literature supporting the findings. In addition to educational data, quizzes and simulation-based scenarios may be provided at the end of each section to summarize learned material. This educational module will be delivered to the anesthesia team using hospital-affiliated e-mail addresses. Data can be analyzed during the planning phase through pre-test questions on OSA, STOP-BANG questionnaire results, and the difficult airway algorithm. In the evaluation phase, the team will be given a post-test on the same subjects and simulation-based scenarios on scoring patients and maintaining difficult airways. The participating team will be asked to complete a survey to capture the providers' likelihood to integrate STOP-BANG questionnaires into the routine screening. The quality improvement project report must include the description of the OSA online educational program, the interventions employed to obtain the initial objectives, methods used for data collection, the background, history, and relevance of the clinical issue, significant findings and conclusions of the program, unexpected outcomes, limitations to design, and recommendations to improve the program.

Protection of Human Subjects

Anesthesia providers at the previously mentioned medical center will be invited to participate in this quality improvement project via email. Pending approval for the Institutional Review Board (IRB), invited participants will be sent an informed consent on a HIPPA-compliant online platform. These platforms include Survey Monkey, Google Forms, Jotform, Survey Sparrow, or REDCap. Participants may decide to withdraw from the project at any time. Participants will have individualized logins for the educational module in order to save progress

and keep results hidden from other members involved. Data will be stored in a protective database open to the primary investigator. Benefits of participation include provider improvement of OSA knowledge, the STOP-BANG questionnaire, and consequences of difficult airways. Participation has the potential to lead to increased patient satisfaction and quality care and a decrease in airway complications.

Data Collection

Prior to being provided access to the online educational module, participants will be asked to complete a pre-test of questions based on their current knowledge of OSA, demographic questions ascertaining the type of anesthesia provider and years of experience, and their current apprehension of the STOP-BANG questionnaire and current practice. After completing the educational module, participants will be asked to complete a post-test of the same questions and multiple Likert questions evaluating the likelihood of incorporating the STOP-Bang questionnaire into clinical practice and the perceived increase of knowledge following completion of the module. A HIPPA-compliant online database will allow for the storage of the questions and gathering of statistical information related to each question.

Data Management and Analysis Plan

Data will be stored in a protective database open to the primary investigator. No direct identifiers will be collected in this investigation, and all results will be reported collectively. Answers to the pre-and post-test questions and the module and simulation questions within the training program will be compared both before and after the intervention is complete.

Results

Implementation of the DNP project was accomplished through an online educational module in effort educate the anesthesia team on the incidence of a difficult airway in patients with OSA, and the STOP-BANG Questionnaire as a tool to predict this complication. Topics integrated within the module include the pathophysiology of OSA, the STOP-Bang Questionnaire, complications of OSA, the incidence of difficult airways within the population, and interventions to prevent injury. Education was provided via voiceover PowerPoint video.

Participants consisted of CRNAs and anesthesia providers from Broward Health Medical Center in Fort Lauderdale, Florida. Participants were recruited via personal email addresses provided by Florida International University and were invited to complete the quality improvement project voluntarily and anonymously. The recruitment email contained a description of the research. and contact information of the principal investigator. Participants had the right to withdraw from participation at any time. An educational module was created through PowerPoint, YouTube, and Qualtrics XM. Participants were directed to the website and educational module via the recruitment email. Completion of the module was self-paced according to the individual participant. The pre- and post-tests could only be completed once throughout the implementation period from May 1, 2022, to June 1, 2022.

Participants were instructed to complete a pre-test of twelve knowledge-based questions regarding OSA prior to viewing the educational video to gauge baseline knowledge. Participants then viewed the 13-minute educational module. Following the video, participants were instructed to complete the post-test, which consisted of the same twelve knowledge-based questions from the pre-test to demonstrate increased knowledge of the topics. Data was collected and analyzed using Qualtrics XM.

Summary

Demographics

A convenience sample 44 anesthesia professionals were recruited to participate, with a response rate of 13.36% (n = 6). The sample included 5 CRNAs and 1 anesthesia attending with various years of clinical experience.

Gender	50% Female 50% Male
Age	Median 56 years
Ethnicity	
Hispanic	33%
Caucasian	17%
Black or African American	17%
Asian	17%
Other	17%
Years of Experience	
Over 10 years	50%
6-10 years	0%
3-5 years	33%
0-2 years	17%

Evaluation

The pre-test consisted of nine knowledge-based questions on OSA plus three survey questions pertaining to participants' current practice of OSA screening and use of the STOP-

BANG Questionnaire. The pre- and post-test knowledge questions were identical. The following table examines participants answers for the twelve pre-test questions.

Question	Answered Correctly	Answered Incorrectly	Other Comments
What percentage of OSA patients remain undiagnosed?	33%	67%	
Indications for airway adjuncts is indicated by a STOP-BANG score greater than or equal to which number?	17%	83%	
I frequently use an OSA screening tool during my preoperative assessment.			100% True
How often do you utilize multimodal agents for perioperative pain control and opioid reduction?			66% Always 17 % Usually 17% Sometimes
Regarding Obstructive Sleep Apnea (OSA):	50%	50%	
Which of the following is NOT INCLUDED in the STOP-BANG Questionnaire?	33%	67%	
All patients with OSA have a difficult airway, therefore, a glidescope or other endoscopic techniques must be used.			100% False
Which apnea hypopnea index (AHI) number expresses moderate OSA?	50%	50%	
Which of the following is the more commonly used screening tool used for OSA.	100%	0%	
Which disorder is defined by the cessation of breathing during sleep as the result of transient abolition of drive to the respiratory muscles?	50%	50%	
How likely are you to use the STOP-BANG Questionnaire in your daily assessment to predict difficult airways?			67% More Likely 33% Somewhat
How likely are you to adjust the anesthesia care plan according to your OSA screening tool scores?			83% More Likely 17% Somewhat

Following the thirteen-minute educational video, the participating providers were asked to repeat the pre-test questions to determine the receptiveness of the information.

Question	Answered Correctly	Answered Incorrectly	Other Comments
What percentage of OSA patients remain undiagnosed?	100%	0%	
Indications for airway adjuncts is indicated by a STOP-BANG score greater than or equal to which number?	60%	30%	
I frequently use an OSA screening tool during my preoperative assessment.			100% True
How often do you utilize multimodal agents for perioperative pain control and opioid reduction?			80% Always 20% Sometimes
Regarding Obstructive Sleep Apnea (OSA):	50%	50%	
Which of the following is NOT INCLUDED in the STOP-BANG Questionnaire?	50%	50%	
All patients with OSA have a difficult airway, therefore, a glidescope or other endoscopic techniques must be used.			100% False
Which apnea hypopnea index (AHI) number expresses moderate OSA?	80%	20%	
Which of the following is the more commonly used screening tool used for OSA.	100%	0%	
Which disorder is defined by the cessation of breathing during sleep as the result of transient abolition of drive to the respiratory muscles?	80%	20%	
How likely are you to use the STOP-BANG Questionnaire in your daily assessment to predict difficult airways?			100% More Likely
How likely are you to adjust the anesthesia care plan according to your OSA screening tool scores?			100% More Likely

Interpretation

When interpreting results, each presented knowledge-based question had an increased score, demonstrated by an average improvement score of 50% after viewing the educational module. More importantly, the likeliness of adjusting their anesthesia care plan according to results of the STOP-Bang Questionnaire tool increased from 67%, to 100% more likely in the post-test. While it may be unrealistic to expect most providers to change their practice, a step of awareness for the disease and the need to change emphasize the responsiveness of the providers.

While diagnosing OSA may not be possible for every patient, screening tools, such as the STOP- Bang Questionnaire, can be used to identify at risk patients the day of surgery. Through communication with anesthesia providers and observation, over 30% of participants do not use a preoperative OSA screening tool in their initial assessment of patients. The intent of this project was to educate anesthesia providers on the importance of screening surgical patients to identify patients at risk for difficult airway. The education focused on the pathophysiology of OSA, associated intraoperative and postoperative complications, risk factors, the STOP-Bang Questionnaire, and anesthetic considerations and interventions for difficult airways. The increased knowledge and awareness this quality improvement project delivered will have a positive impact on patient care throughout the perioperative period. This education module will allow anesthesia providers to identify at risk patients based on the STOP-Bang score, and if deemed high risk, providers can take appropriate measures to ensure patient safety during the induction period.

Limitations

While there was observed receptiveness within the quality improvement project, limitations exist. The sample size was very small, only reaching six anesthesia providers, while

this topic affects broader population. Participants for the quality improvement project were recruited via email from a particular hospital in South Florida. Another limitation observed within this project, was having the same pre- and post-test questions, making it easy for participants to sought answers out within the educational video in effort to raise their post-test score.

Discussion

Obstructive sleep apnea (OSA) poses an increased risk for perioperative complications in surgical patients. The prevalence of OSA will continue to rise as the population ages and rates of obesity increase. Roughly 80% of the population remain undiagnosed and untreated. Through pre-and post-assessment quizzes, it becomes evident that there remains a lack of knowledge for this disorder. In the concluding assessment for participating anesthesia providers, an overwhelming amount contributors demonstrated not only an increase in knowledge, but a greater willingness to incorporate the STOP-BANG Questionnaire into the daily anesthesia patient assessment. Utilizing this data, the team should rearrange the individual patient assessment sheet to incorporate the STOP-BANG Questionnaire. Depending on the STOP-BANG score of the patient, a cheat sheet that incorporates the appropriate corresponding interventions for preventing or aiding in difficult airways, will be made available. These cheat sheets should be posted in high traffic areas, including the anesthesia workroom and pre-operative area.

Plan for Sustaining the Practice Change

Reinforcement to facilitate sustainability is the main goal of the project's theoretical framework, Kurt Lewin's Theory of Change. To aid with this objective, the educational PowerPoint and video will remain accessible to all anesthesia providers. The project has been

presented to providers at multiple Broward Health sites, with goals to educate, increase awareness, and facilitate a practice change. This change in practice would not require any financial impact or dependency. To encourage organizational change, meetings should be held to gain feedback on the interventions cheat sheet. While it may be unrealistic to expect the entire anesthesia team to change their daily practice, it represents a positive step in promoting awareness of OSA.

Discussion of Results with Implications to Advanced Nursing Practice

OSA is a relevant topic within anesthesia, and an initial needs assessment demonstrated that intervention is necessary. The prevalence of OSA will continue to rise as lifespan and obesity rates increase.[16] While 80% of the United States population continues to go undiagnosed, the STOP-BANG questionnaire provides opportunity to ensure patient safety for high-risk patients.[2] Due to the questionnaire's high sensitivity and predictability ability, the STOP-BANG score has become the superior tool utilized to detect OSA.[3] With the initial goal to increase knowledge of OSA and STOP-BANG score interpretations, an increased use and understanding of the screening tool is a potential outcome. The STOP-BANG questionnaire can aid in alerting anesthesia providers of a potential OSA diagnosis and assist the provider in preparing for possible interventions. Potential anesthetic considerations for diagnosed or suspected OSA include minimal sedation, preparation for difficult mask ventilation and airway with glidescope and fiberoptic tools, pre-oxygenation with the head of the bed elevated, use of continuous positive airway pressure (CPAP), and cautious use of opioids.[17]

Future Ideas

While OSA has been linked to numerous life-sustaining complications, not all patients fit criteria for diagnosis. Future ideas in research include developing a cost analysis in management

of OSA perioperatively as well as the cost effectiveness of use of diagnostic algorithms and portable monitors.

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IRB Approval

FIU | FLORIDA INTERNATIONAL UNIVERSITY

Office of Research Integrity
Research Compliance, MARC 414

MEMORANDUM

To:	Dr. Fernando Alfonso
CC:	Blake Giroux
From:	Elizabeth Juhasz, Ph.D., IRB Coordinator EJ
Date:	March 23, 2022
Protocol Title:	**"Educating Anesthesia Personnel on STOP-BANG to Predict Difficult Airway: A Quality Improvement Project"**

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #:	IRB-22-0095	**IRB Exemption Date:**	03/23/22
TOPAZ Reference #:	111532		

As a requirement of IRB Exemption you are required to:

1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
3) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

EJ

Broward Health IRB Exemption

---------- Forwarded message ---------
From: **Dietz, Noella A** <Ndietz@browardhealth.org>
Date: Tue, Mar 22, 2022 at 8:50 AM
Subject: FW: IRB Approval
To: [redacted]

[redacted]

Please let your school know that the IRB does not consider educational projects nor quality improvement research. This request was sent to me from the IRB.
Thanks, ND

Noella A. Dietz, PhD

Corporate Director of Research, Research Institute

1600 S. Andrews Avenue, Fort Lauderdale, FL 33316

t- 954.712.2983 | f- 954.355.4775 |

Ndietz@browardhealth.org

The mission of Broward Health is to provide quality healthcare to the people we serve and support the needs of all physicians and employees.

BrowardHealth.org

Pretest and Posttest Questionnaire:

Understanding and Interpreting STOP-BANG

INTRODUCTION

The primary aim of this QI project is to improve the knowledge of CRNAs pertaining to the complications and relevance of Obstructive Sleep Apnea (OSA) and utilizing the STOP-BANG Questionnaire to predict difficult airways in this population.

Please answer the question below to the best of your ability. The questions are either in multiple choice or true/false format and are meant to measure knowledge of OSA and its screening tool.

PERSONAL INFORMATION

1. **Gender:** Male Female Other_____
2. **Age:** _____
3. **Ethnicity:**

   Hispanic Caucasian African American Asian Other_____

4. How many years of experience do you have as an anesthesia provider?

   Over 10 6-10 years 3-5 years 0-2 years SRNA

QUESTIONNAIRE

1. **What percentage of OSA patients remain undiagnosed?**
    a. Up to 50%
    b. Up to 60%
    c. Up to 70%
    d. Up to 80%
2. **Indications for airway adjuncts and increased precaution is indicated by a STOP-BANG score greater than or equal to which number?**
    a. 3
    b. 4
    c. 5
    d. 6
3. **I frequently use an OSA screening tool during my preoperative assessment.**
    True or False
4. **How often do you utilize multimodal agents for perioperative pain control and opioid reduction?**
    a. Always
    b. Usually
    c. Sometimes
    d. Rarely
    e. Never
5. **Regarding obstructive sleep apnea (OSA):**
    a. Up to 25% of cases with moderate to severe cases of OSA may remain undiagnosed.

b. It is mainly a neurological disorder associated with poor quality of sleep.

c. Obesity is associated with a 2- to 3-fold increased risk of OSA relative to normal weight individuals.

d. It is linked to cardiovascular disease, psychiatric disorders and gastro-esophageal reflux.

e. It is aggravated by smoking and alcohol intake.

6. Which of the following is NOT INCLUDED in the STOP-BANG Questionnaire?

a. Neck circumference greater than 40 cm

b. Male gender

c. BMI of 30

d. Daytime tiredness

7. All patients with OSA have a difficult airway, therefore, a glidescope or other endoscopic techniques must be used.

True or False

8. Which apnea hypopnea index (AHI) number expresses moderate OSA?

a. Less than 5 per hour

b. More than 5 but less than 15 per hour

c. More than 15 but less than 30 per hour

d. More than 30 per hour

9. Which of the following is NOT a screening tool used for OSA.

a. Epworth Sleepiness Scale

b. PHQ-2

c. STOP-BANG Questionnaire

d. Berlin Questionnaire

10. Which disorder is defined by the cessation of breathing during sleep as the result of transient abolition of drive to the respiratory muscles?

a. Central Sleep Apnea

b. Obesity- Hypoventilation Syndrome

c. Obstructive Sleep Apnea

d. Complex Sleep Apnea Syndrome

11. How likely are you to use the STOP-BANG Questionnaire in your daily assessment to predict difficult airways?

a. Most likely

b. Somewhat likely

c. Somewhat unlikely

d. Most unlikely

12. How likely are you to adjust the anesthesia care plan according to your OSA screening tool scores?

a. Most likely

b. Somewhat likely

c. Somewhat unlikely

d. Most unlikely

ANESCO™
Driving Results in Anesthesia

February 1, 2022

Fernando Alfonso, DNP, CRNA, APRN
Clinical Assistant Professor,
Department of Nurse Anesthesiology
Florida International University

Dr. Alfonso,

Thank you for inviting Broward Health to participate in Doctor of Nursing Practice (DNP) project conducted by Blake Giroux entitled "An Educational Module on Anesthesia's Use of STOP-BANG to Predict Difficult Airways." in the Nicole Wertheim College of Nursing and Health Sciences, Department of Nurse Anesthetist Practice at Florida International University. I have warranted her permission to conduct the project using our providers.

Evidence-based practice's primary aim is to yield the best outcomes for patients by selecting interventions supported by the evidence. This project intends to evaluate if a structured education targeting providers will increase knowledge on Anesthesia's Use of STOP-BANG to Predict Difficult Airways.

We understand that participation in the study is voluntary and carries no overt risk. All Anesthesiology providers are free to participate or withdraw from the study at any time. The educational intervention will be conveyed by a 15-minute virtual PowerPoint presentation, with a pretest and posttest questionnaire delivered by a URL link electronically via Qualtrics, an online survey product. Responses to pretest and posttest surveys are not linked to any participant. The collected information is reported as an aggregate, and there is no monetary compensation for participation. All collected material will be kept confidential, stored in a password encrypted digital cloud, and only be accessible to the investigators of this study: Blake Giroux and Dr. Alfonso. We expect that Blake Giroux will not interfere with normal hospital performance, behaving in a professional manner and following standards of care.

Prior to the implementation of this Educational project the Florida International University Institutional Review Board will evaluate and approve the procedures to conduct this project. Once the Institutional Review Board's approval is achieved, this scholarly project's execution will occur over two weeks. We support the participation of our Anesthesiology providers in this project and look forward to working with you.

February 1, 2022

Edward Punzalan, DNP, CRNA, APRN — Date
Administrative Director of Nurse Anesthesia
Healthcare Performance Anesco

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CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT
"Educating Anesthesia Personnel on STOP-BANG to Predict Difficult Airway"

SUMMARY INFORMATION
Things you should know about this study:

- **Purpose:** Educational module to improve knowledge in understanding the pathophysiology of Obstructive Sleep Apnea (OSA) and the utilization of the STOP-BANG Questionnaire to predict difficult airways within this population.
- **Procedures**: If you choose to participate, you will be asked to complete a pretest, complete a educational module, and then a post test.
- **Duration:** This will take about a total of 1 hour total.
- **Risks**: The main risk or discomfort from this research is minimal. There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may have included mild emotional stress or mild physical discomfort from sitting on a chair for an extended period of time, for instance.
- **Benefits:** The main benefit to you from this research is increase the participants knowledge in interpreting the results of the STOP-BANG questionnaire to increase the quality of care for patients with OSA.
- **Alternatives:** There are no known alternatives available to you other than not taking part in this study.
- **Participation:** Taking part in this research project is voluntary.

Please carefully read the entire document before agreeing to participate.

PURPOSE OF THE PROJECT
You are being asked to be in a quality improvement project. The goal of this project is to improve health care provider knowledge in understanding the pathophysiology of Obstructive Sleep Apnea (OSA) and the utilization of the STOP-BANG Questionnaire to predict difficult airways within this population.

DURATION OF THE PROJECT
Your participation will require about 1 hour of your time.

PROCEDURES

If you agree to be in the project, we will ask you to do the following things:
If you agree to be in the study, we will ask you to do the following things:
1. Complete an online 10 question pre-test survey via Qualtrics, an Online survey product for which the URL link is provided
2. Review a PowerPoint constructed educational module lasting 1 hour on Qualtrics, an Online survey product for which the URL link is provided.
3. Complete the online 10 question post-test survey via Qualtrics, an Online survey product for which the URL link is provided.

RISKS AND/OR DISCOMFORTS
The main risk or discomfort from this research is minimal. There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may have included mild emotional stress or mild physical discomfort from sitting on a chair for an extended period of time, for instance.

BENEFITS
The main benefit to you from this research is increase the participants knowledge in interpreting the results of the STOP-BANG questionnaire to increase the quality of care for patients with OSA.
The overall objective of the program is to increase the quality of healthcare delivery and improve healthcare outcomes for our patients.

ALTERNATIVES
There are no known alternatives available to you other than not taking part in this project. However, if you would like to receive the educational material given to the participants in this project, it will be provided to you at no cost.

CONFIDENTIALITY
The records of this project will be kept private and will be protected to the fullest extent provided by law. If, in any sort of report, we might publish, we will not include any information that will make it possible to identify you as a participant. Records will be stored securely, and only the project team will have access to the records.

PARTICIPATION
Taking part in this research project is voluntary.

COMPENSATION & COSTS
There is no cost or payment to you for receiving the health education and/or for participating in this project.

RIGHT TO DECLINE OR WITHDRAW
Your participation in this project is voluntary. You are free to participate in the project or withdraw your consent at any time during the project. Your withdrawal or lack of participation will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove you without your consent at such time that they feel it is in the best interest.

RESEARCHER CONTACT INFORMATION

If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Blake Giroux at 904-599-5166 at bgiro002@fiu.edu and Fernando Alfonso at 305-348-3510/ falfonso@fiu.edu.

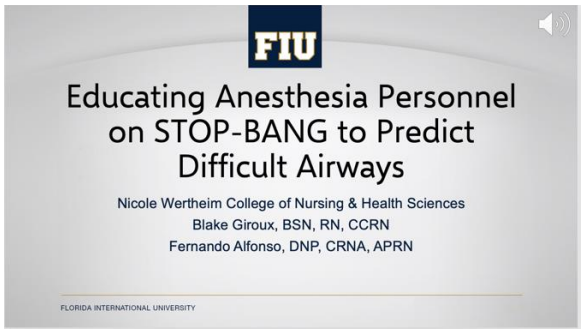
IRB CONTACT INFORMATION

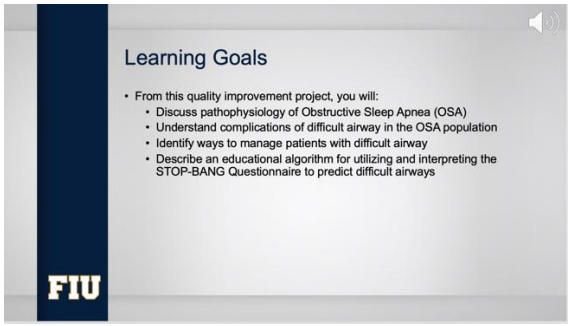
If you would like to talk with someone about your rights pertaining to being a subject in this project or about ethical issues with this project, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

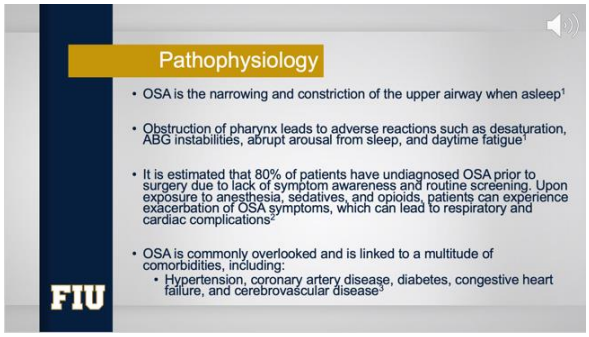
PARTICIPANT AGREEMENT

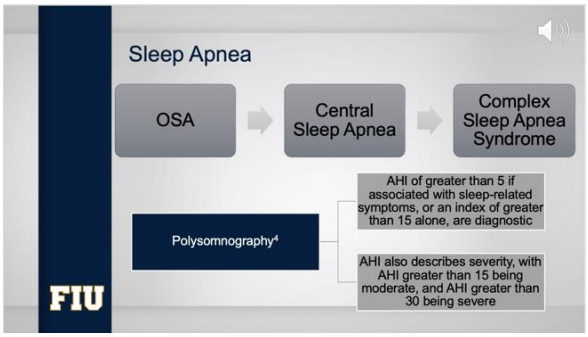
I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. By clicking on the "consent to participate" button below I am providing my informed consent.

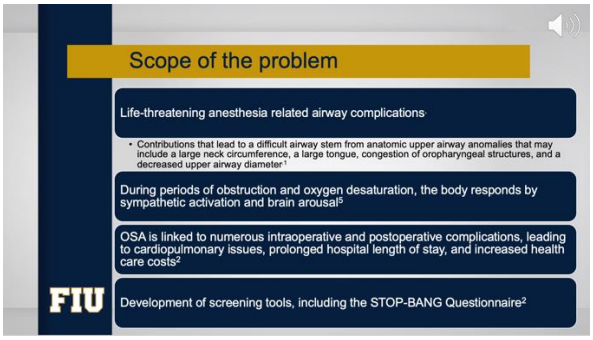
Educational Module

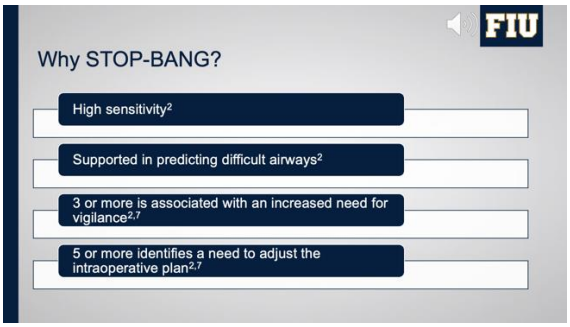


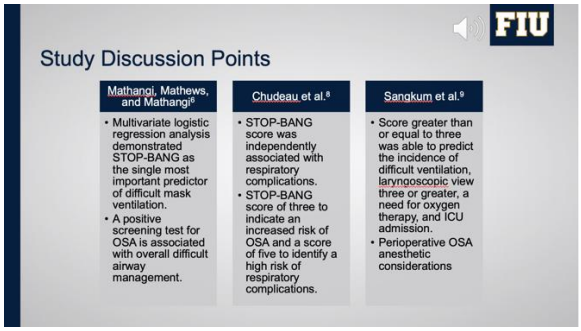












Study Discussion Points

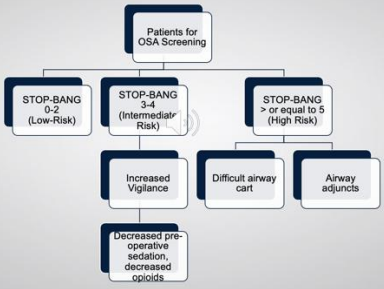
Khan and Ahmed[10]

- High negative predictive value for difficult mask ventilation and would be helpful in ruling out difficult mask ventilation
- Six out of the eight criteria of STOP-BANG can be independently associated with an increased risk of difficult mask ventilation

Chen et al.[11]

- Systematic literature review
- Valid and effective screening tool for OSA

Algorithm in Interpreting STOP-BANG



Take Home Points

- Obstruction of pharynx leads to adverse reactions such as desaturation, ABG instabilities, abrupt arousal from sleep, and daytime fatigue[1]
- 80% of undiagnosed patients[2]
- STOP-BANG Questionnaire provides opportunity to ensure patient safety
- OSA had a 4-fold higher risk of difficult airway than those without OSA[1]
- Possible interventions corresponding to STOP-BANG score[8,12]

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