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Implementation of the STOP BANG Screening Instrument for Obstructive Sleep Apnea within the Intensive Care Unit and 5 East Cardiac Unit

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Dedication

This work and my DNP project is dedicated to my wife Stephanie, who encouraged me to pursue this program. This is for the sacrifices we have made to create a better future for our five children. This is for my parents, David and Vicky Lush, who have given much of their time and support watching our children so I had much needed study time. This is for my in-laws, Mike and Debbie Smith, who have equally given their time in watching our Children so I could work on projects and papers. This is for our five children, Luke, Olivia, Drew, Riley and Reagan in hopes that I have been a good example to you all in pursuing your dreams.

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Abstract

BACKGROUND: Recent studies have found that OSA without the use of CPAP is an independent risk factor for cardiovascular disease and hypertension, which can lead to myocardial infarction (MI) and cerebral vascular accident (CVA) or stroke. This increases patient morbidity and mortality rates as well as medical costs. In those suffering from a myocardial infarction (MI) or cardiovascular accident (CVA), an important intervention is proper screening for the presence of OSA while in the acute care setting. The STOP BANG screening instrument is a simple yet effective tool in assessing for sleep apnea symptoms with a respective sensitivity of 93% for detecting moderate OSA and 100% in detecting severe OSA.

OBJECTIVE: To educate participating nursing staff on using the STOP BANG screening instrument, and implementing it within the MI and CVA populations. After completion of the implementation period, screening adherence was assessed as well as patient demographics.

METHODS: A literature review was conducted and the STOP BANG screening instrument was selected to assess for OSA. Participating nurses were educated on the use of the STOP BANG screening instrument who then implemented the tool on the MI and CVA populations. A pilot study was conducted that utilized a descriptive and qualitative study and involved a retrospective chart review that was one time only, and included a two-part study. The setting was within the ICU and 5 East Cardiac Units of Norton Brownsboro Hospital (NBH) from September 28, 2017 through December 17, 2017. RESULTS: The participation rate in the ICU was 78% and 100% in the 5 East Cardiac unit. Within the ICU a 60% screening adherence rate was achieved for CVA patients with a 40% non-adherence rate. For MI patients a 38% adherence rate was achieved for the ICU and 5 East units combined, and a 62% non-adherence rate. Among patient demographics, results were as follows: positive screens requiring supplemental oxygen was (P=.214), positive screens vs negative screens and the use of BiPAP were (P=.074) and

(P=1.000), notes made in records for positive screens were 9 out of 18 or 50% adherence.

CONCLUSIONS: Nurse provider participation was high within the ICU and 5 East Cardiac units. Screening adherence was higher among the CVA patient population compared to the MI population. There was no significance or correlations between the use of supplemental oxygen or the use of BiPAP, and positive STOP BANG screens. There was statistical significance between male patients with higher BMI's and positive STOP BANG screens. These results indicate that more research is required with larger sample sizes and multiple facilities to acquire more reliable results for generalizability.

Background

Cardiovascular disease and hypertension are two factors in the development of myocardial infarction (MI) and cerebral vascular accident (CVA) or stroke. Recent studies indicate that obstructive sleep apnea (OSA) without the use of continuous positive airway pressure (CPAP) is an independent risk factor for cardiovascular disease and hypertension (Martinez-Garcia et al. 2013; Barbe et al. 2012; Chen et al. 2015). Chen et al. (2015) concluded that in elderly patients, the risk of death in those without CPAP therapy was higher than those with it. Obstructive sleep apnea has been identified through large epidemiological studies to be an independent risk factor for stroke (Barone & Krieger, 2013). A study with more than 6000 patients demonstrated that those with OSA has a 3 and 4-fold increased odds ratio for ischemic heart disease and cerebrovascular disease compared to the control population (Barone & Krieger, 2013).

Cardiovascular disease and stroke are major causes of morbidity and mortality in the United States. Cardiovascular disease is the leading cause of death for both men and women. Around 610,000 or 1 in 4 people die from it each year (Centers for Disease Control and Prevention [CDC], 2015). The U.S. spends $108.9 billion dollars annually to cover lost production, medications and health care services from cardiovascular disease (CDC, 2015). Stroke is a major cause of disability in the U.S. and the fifth leading cause of death (CDC, 2016). Each year 1 person dies about every four minutes in the U.S. from a stroke which is about 130,000 people or 1 in 20 deaths (CDC, 2016). About 800,000 people suffer from a stroke each year and the U.S. spends $34 billion in health care costs including medications and missed days of work (CDC, 2016).

This background information reveals that OSA is a risk factor for cardiovascular disease that can impact healthcare and costs. There are no OSA screening tools within the Norton

Healthcare system other than the peri-operative area of Norton Brownsboro Hospital that only screens for OSA in surgical patients. To implement a protocol such as the STOP BANG screening instrument, evidence must support the education as a means for implementing evidence-based practice. The Iowa Evidence-based Practice Model is an example of how to bring evidence into practice and uses a 7-step process to introduce, develop and evaluate evidence-based practice (British Journal of Medicine, 2011). The model promotes the quality of patient care, helps control healthcare costs, and can be used to implement practice change at the unit or organization level (Brown, 2014). This model could be useful in implementing a practice change such as the STOP BANG screening instrument within the Norton Healthcare organization.

Screening Instruments

A literature review was completed to choose an appropriate OSA screening instrument for the MI and CVA populations. The databases Medline, PubMed, Ebscohost, and CINAHL were used to search for current evidence using the terms, obstructive sleep apnea screening, obstructive sleep apnea questionnaire, testing, MI, CVA, and cardiovascular health. The results were limited to English, age 18+, and published within the last 10 years.

A total of 6 studies were chosen that met the criteria. The literature review provided evidence that the most reliable and accurate OSA screening tools were the STOP BANG questionnaire, Berlin questionnaire, and Epworth Sleepiness Scale. A tool needed to be selected which was not only reliable and accurate but easy to use in a timely manner by nursing staff. The Amra et al., (2018), recommended a sleep study with Polysomnography (PSG) as the gold standard diagnostic but compared the 3 questionnaires. Their results indicated the sensitivities of the Berlin, STOP-BANG, and ESS were 86.42%, 81.46%, and 59%, respectively. Specificities

of Berlin, STOP-BANG, and ESS were 52.94%, 82.35%, and 76.47%, respectively. They concluded the Berlin and STOP-BANG were more sensitive and accurate than the Epworth Sleepiness Scale in screening for OSA. A systematic review and meta-analysis of 9,206 patients by (Nagappa et al., 2015), examined the validation of the STOP BANG questionnaire as a screening tool for OSA. The study revealed that the STOP-BANG questionnaire had a 94% and 96% sensitivity in detecting moderate to severe and severe sleep apnea. It was also stated the STOP-BANG is a practical, short, straight forward test that takes approximately 1-2 minutes, and has a 90-100% response rate. Their conclusion was that the STOP-BANG has a high performance and the higher the score, the higher the probability of moderate to severe sleep apnea. A study by Chung et al. (2016), associated with the American College of Chest Physicians, concluded that the STOP-BANG is a concise, effective, and reliable OSA screening tool with a sensitivity to detect moderate to severe OSA and severe OSA of 93% and 100%. In comparing the 3 questionnaires, it concluded that the STOP BANG was a more accurate tool for detecting mild, moderate and severe sleep apnea (Chung et al. 2016). For the Berlin, STOP-BANG and Epworth, the pooled sensitivity levels for moderate sleep apnea were 77%, 90%, 40%, and specificity levels were 44%, 36% and 62%. For severe sleep apnea the sensitivity levels were 84%, 93% and 58%, and specificity levels were 38%, 35% and 60%. No benchmark data from similar "best practice" institutions or programs could be found specifically for OSA screening pertaining to MI and CVA within the acute care setting. However, a QI project conducted by the American Society of Peri-Anesthesia Nurses in 2011, revealed a safer patient perioperative environment was created by incorporating the STOPBANG screening tool. The pilot project used the Iowa Model of evidence based practice and reviewed patient data pre- and post implementation of the OSA screening tool (Lakdawala, 2011). According to Chung et al.

(2012), the STOP-BANG is a simple yet effective tool in assessing for sleep apnea symptoms with a respective sensitivity of 93% for detecting moderate OSA and 100% in detecting severe OSA.

After reviewing the literature, the STOP-BANG tool is a valid and reliable instrument in screening for sleep apnea that is quick and simple to use. STOPBANG is an acronym that stands for Sleepiness, Tiredness, Observed apnea, high blood Pressure (STOP), BMI, Age, Neck circumference, Gender (BANG). Scores range from 0-8 where higher scores equal higher risks. Scores from 0-2 are classified as low risk for moderate to severe OSA, where scores of 5-8 are classified as high risk according to (Chung et al. 2013). Scores between 3-4 require further criteria for classification. An example would be a patient with a score ≥ 2 but has a BMI of 35, would be classified as high risk for having moderate to severe OSA (Chung et al. 2013). A study by Chung et al. (2012), evaluated the association between STOP BANG scores and the probability of OSA. The study concluded that a score of 5-8 identified patients as having a high probability of having moderate to severe OSA. It is important to note that the STOP BANG screening tool is only for assessing for symptoms of OSA and is not diagnostic indicator.

Purpose

The specific aims of this study were to implement the STOP BANG protocol within the Norton Brownsboro ICU and 5 East Cardiac units, evaluate adherence to the protocol by the health care providers to the protocol, and determine if there is an association between positive STOP BANG screens and the use of supplemental oxygen or BiPAP. Implementation of the project involved education of at least 75% of the ICU and 5 East nurses on how to use the STOP BANG protocol, measurement of protocol adherence, and retrospective data collection from the electronic medical record from the MI (DRG 280-282) and CVA (061-068) patient population to

measure the association between positive STOP BANG screens and the use of supplemental oxygen or BiPAP. The six following research questions guided this study.

1. Was 75% of the nurses within the ICU and 5 East Cardiac units educated on how to use the STOP BANG screening instrument?

2. Was screening with the STOP BANG instrument adhered to within the units for the specified populations?

3. Why was there screening non-adherence during the implementation phase?

4: What proportion of patients who screened positive on the STOP BANG tool required oxygen supplementation or increased oxygen requirements at night?

5. Between those whose screened negative vs positive on the STOP BANG tool, who required use of BIPAP during nighttime hours during the implementation phase?

6. Was a note made in EPIC that the patient was given an education handout explaining a positive screen on the STOP BANG screening tool?

Methods

This evidence-based quality improvement project utilized a descriptive design to evaluate implementation and adherence to the STOP BANG screening protocol. Additionally, a retrospective chart review was done to determine adherence to the protocol and to collect data to identify association between STOP BANG screening assessments (positive or negative) and use of BiPAP and oxygen requirements. The target facility was the Norton Brownsboro ICU and 5 East cardiac unit. This study had two parts, part one of the study evaluated effectiveness of the implementation of the protocol by determining the percentage of the registered nurses who

received training on how to use the STOP BANG protocol. The primary investigator provided training on using the STOP BANG protocol during shift starts. The education was started on 9/28/2017 and lasted for one week to cover all shifts and consisted of how to implement the STOP BANG protocol (see Appendix A). The registered nurses were educated to screen any patient that was admitted with an MI or CVA with the STOP BANG protocol. This involved screening the patient with the 8 questions on the STOP BANG screening instrument (see Appendix A) and adding the "yes" column to obtain a score. A positive score was between 5-8 and indicated the patient was at higher risk for having moderate to severe OSA. In the event a patient screened positive, the registered nurse was to place a note in the patient's chart stating they received a positive screen and was given an education handout (see Appendix B) explaining what this score meant and they should follow up with their primary care provider post discharge. The education handout was not given to patients with negative screens, however, the RN was asked to explain to the patient the purpose of the screen. If a patient was not screened, the registered nurse was to make a note in the chart explaining why the screening was not completed. Once screening was completed, the registered nurse then scanned the hard copy of the STOP BANG screening instrument into the EMR. A roster of the ICU and 5 East nurses was given to the primary investigator from the unit managers. This was compared to those who attended the training sessions and checked for duplicates. There was a desired goal of at least 75% of the nurses to attend training. The second part of the study included a retrospective review of the EMR on all patients admitted to the ICU with an MI (DRG 280-282) or CVA (DRG 061-068), and 5 East with an MI (DRG 280-282) during the protocol implementation period. The purpose of the chart review is to have measurable data for the objectives and assess adherence to the STOP BANG protocol, the reason the protocol was not adhered to, what

proportion of those patients who screened positive required oxygen at night or higher oxygen requirements, and compare BiPAP requirements in patients who screened positive with those who screened negative on the STOP BANG protocol. The retrospective chart review also assessed if the patient who screened positive on the protocol received education via a handout on what a positive STOP BANG screen means. The demographic variables of age, race and gender were measured in all patients admitted to the ICU with an MI (DRG 280-282) or CVA (061-068) and 5 East with an MI (DRG 280-282): Other patient characteristics, that were not part of the study objectives, were evaluated to see if patients had incidents such as: BMI, pacemaker present, admission diagnosis of MI (DRG 280-282) or CVA (061-068), intubation, tachycardia, bradycardia, and the presence of Atrial fibrillation or Aflutter. These variables were recorded into a data collection tool on an Excel spreadsheet (see Appendix C).

Setting

The Norton Brownsboro Hospital ICU and 5 East Cardiac units located in Louisville, KY. is the setting of this study. The study focused on OSA, which is a risk factor for cardiovascular disease, and this setting was chosen due to Norton Brownsboro Hospital being a comprehensive stroke center that has achieved advanced certification from the Joint Commission and American Heart Association. There is a high rate of admittance of CVA patients to the ICU which focuses on neurosurgery but also admits STEMI patients. The ICU has a total of 36 beds with 16 beds located on the third floor and 20 beds located on the fifth floor. The 5 East Cardiac unit has 21 beds and admits NSTEMI patients. The study time frame was from September 28, 2017 thru December 17, 2017.

Sample

The STOP BANG protocol was implemented as a pilot study where the primary investigator educated on the need, protocol and instrument use as part of an OSA screening protocol in a population of patients. The study was to evaluate the implementation of the STOP BANG protocol and education was provided to a mass of nurses. The primary investigator then measured the effectiveness of the implementation process on adherence to the STOP BANG protocol. Data was also analyzed to determine associations/correlations between STOP BANG screening results and use of oxygen and BiPAP in patients who screened positive compared with those who screened negative to better understand effectiveness of implementing an OSA screening protocol in a high-risk population.

The sample for this study consisted of two populations. The primary population was the Norton Brownsboro ICU and 5 East staff nurses who participated in the education sessions during implementation of the STOP BANG screening instrument. Nurses were asked to participate in the study by the primary investigator. Participation was strictly voluntary and each nurse that participated signed consents explaining the study. Approximately 80 nurses from the ICU were invited to participate, and 5 nurses from the 5 East cardiac unit. All staff nurses who declined to participate were excluded from the study which resulted in a primary population of 63 nurses from the ICU and 5 nurses from 5 East with a total number of 68. Agency nurses were excluded from the study.

The secondary population of interest were those who suffered an MI or CVA during the period from Sept 28 through Dec 17, 2017, and met the inclusion criteria. The inclusion criteria included patients admitted to the ICU with a diagnosis of myocardial infarction including a STEMI or NSTEMI, or cerebral vascular accident including Ischemic or Hemorrhagic strokes.

On 5 East those admitted with a NSTEMI were included (please refer to table 1 for a comprehensive list of DRG diagnosis codes used for inclusion criteria during admission). Other inclusion criteria were those 18 years of age or older, and patients that were competent or able to answer the questions on the STOP BANG screening instrument. If the patient was intubated, awake and could follow commands, family or friends could answer the questions on the STOP BANG screening instrument for the patient. Non-English-speaking patients were included in the criteria as translator phones were available on the units. Exclusion criteria were those younger than 18 years of age, and non-verbal or non-mentation patients with a decreased Glasgow Coma Scale who was not able to follow commands or answer questions.

Data Collection

Approval from the Norton Healthcare Office of Research Administration (NHORA) and University of Kentucky Institutional Review Board (IRB) was obtained before any data was collected. The names of staff nurses who participated in the study, and signed consents given to them by the primary investigator, were obtained through rosters provided by the unit managers to obtain the percentage of nurses that participated in the study. The study only involves the implementation of the STOP BANG protocol in a population of practicing nurses using an education approach and evaluation of adherence.

To collect patient data, an official request for secured data was submitted to the Norton Healthcare Office of Research Administration to identify and obtain reviewable patient records using the DRG codes listed in Table 1. Data from the EPIC EMR was gathered at the Office of Nursing Research (room 5202) in a private room with a computer that was used to access patient charts**.** The medical record number (MRN) was used to access patient charts. A total of 52 records were returned that met the DRG criteria for MI's and 129 records that met the DRG

criteria for CVA's for a total of 181 records. The primary investigator (PI) entered the 181 records to assess if screening was implemented. Of the 52 records for MI's, 18 patients had screening adherence. From the 34 remaining records, 28 did not have screening adherence, and 6 records did not meet the inclusion criteria. Of the 129 records for CVA's, 44 patients had screening adherence. From the 85 remaining records, 29 did not have screening adherence and 56 records did not meet the criteria. Patient demographic variables were obtained and included age, race, and gender. Other patient characteristics, that were not part of the study objectives, were evaluated to see if patients had incidents such as: BMI, pacemaker present, admission diagnosis of MI (DRG 280-282) or CVA (061-068), intubation, tachycardia, bradycardia, and the presence of Atrial fibrillation or Aflutter. The primary investigator was evaluating any association between these incidents and OSA.

Data Analysis

Part one of the study evaluated effectiveness of the implementation of the protocol by determining the percentage of the registered nurses who received training on how to use the STOP BANG protocol. There was a desired goal of at least 75% of the nurses from the ICU and 5 East Cardiac unit to attend training. Descriptive statistics were utilized to measure the percentage of nurses that attended training and participated in the study. Part two used descriptive statistics for objective two, as a percentage to measure the protocol screening adherence, or the percentage of patient charts that were screened. No data analysis was used to for objective 3 to display why there was screening non-adherence, there were no notes made in the charts by the nurses on why there was non-adherence. For objectives 4 and 5 the Chi-Square test was used to examine any association/correlation between the use of supplemental oxygen and the use of BiPAP and positive STOP BANG screens. For objective 6, descriptive statistics

was used as a percentage of the number of charts that had notes placed in them stating an education handout was given to positive screened patients. Other confounding variables that were not part of the 6 objectives, such as patient demographics and patient characteristics, were examined and analyzed that could potentially affect the degree of association with positive STOP BANG screens. Patient demographics included age, race and gender. Patient characteristics included BMI, pacemaker present, admission diagnosis of MI (DRG 280-282) or CVA (061-068), intubation, tachycardia, bradycardia, and the presence of Atrial fibrillation or Aflutter. Within these demographics and characteristics, the Paired t-test was used to compare continuous variables, and the Chi-Square Test was used to analyze categorical variables. In cases were the Chi-Square or Paired t-test could not be used, the Fisher's Exact Test or Levene's Equality for Variances was used. For statistical analysis, the Statistical Package for the Social Sciences (SPSS) version 23; was utilized, and a level of $P<.05$ was used for statistical significance throughout.

Results

For objective 1, among the ICU nurses, after being approached by the primary investigator, 63 out of 80 nurses or 78% participated voluntarily in the study. These participating nurses signed an informed consent provided by the primary investigator explaining the study. The participating nurses were then educated on how to use and implement the STOP BANG protocol. Among the 5 East Cardiac unit nurses, all 5 nurses or 100% participated voluntarily, signed inform consent and were educated on how to use and implement the STOP BANG protocol. Nurses that decided not participate in the study simply stated they did not feel comfortable participating or they did not want to add voluntary work to their required duties. For objective 2, a total of 119 combined CVA and MI records met the inclusion criteria for

screening. From the 119 records 73 of these were CVA's and 46 were MI's. A total of 62 records had screening adherence. Among the 73 stroke patient records that met the inclusion criteria, 44 had screening adherence, and 29 had non-adherence, which yielded a 60% adherence rate for the ICU. From the ICU 3E unit, screening was non-adherent on 14 of the CVA records, and on 5W screening was non-adherent on 15 of the CVA records. The 5 East Cardiac unit does not admit CVA patients. Among the 46 MI patient records that met the inclusion criteria, 18 had screening adherence which yielded a 39% adherence rate for the ICU and 5 East Cardiac units combined. From the 5 East unit, screening was non-adherent on 20 MI records, ICU 5W was non-adherent on 4 MI records and 3E was non-adherent on 4 MI records. For the 29 CVA records and 28 MI records that were non-adherent in screening, no note was made in the patient's chart as to why the screening was not completed. Among the 62 screened patients, for all units the number of days to be screened revealed an average of 1.93 days (SD=1.367, range= 0-6).

Among the 62 records with screening adherence, 18 records or 29% screened positive with a STOP BANG score between 5-8, which consisted of 11 CVA's or 18%, 6 NSTEMI's or 9% and 1 STEMI or 2%. For objective 4, analysis of chart data revealed that the proportion among the 18 patients who screened positive, 8 or 44% required supplemental oxygen. Using the Chi-Square/Fisher's Exact Test, the result revealed a P value of .214, which showed no association or correlation between the use of supplemental oxygen and a positive STOP BANG screen. For objective 5, in examining those who screened negative vs positive and required the use of BiPAP during nighttime hours the following results were revealed: For positive screens, 2 patients or 11 % required the use of BiPAP during nighttime hours, using the Fisher's Exact Test, this revealed a P value of .074, which showed no association or correlation statistically between positive screens with the use of BiPAP and positive STOP BANG screens, but did show

clinical significance. For negative screens, 16 patients or 89% did not required BiPAP use during nighttime hours. Using the Fisher's Exact Test, this revealed a P value of 1.000, which showed no association or correlation statistically between negative screens with the use of BiPAP. These results revealed no association or correlation between positive vs negative screens and the use of BiPAP during nighttime hours. For objective 6, in examining the frequency of notes made in the charts for positive screens, out of 18 positive screens, 9 notes or 50% were placed in the charts. Out of those 9 notes, 6 notes were placed in the records of patients with CVA's, and 3 for MI's. These results pertained to the 6 objectives research questions.

The confounding variables that were not implicitly in the objectives, such as patient demographics and patient characteristics were of interest and used to describe the secondary-population within the ICU and 5 East Cardiac units. These variables could have a potential effect on the degree of association between positive screened patients and objectives 4 and 5. The results for the patient demographics were as follows: For positive screens the mean age of all patients was 63.22 years (SD=9.662). Using the Levene's Test of Equality for Variances this resulted in a P value of .928, which showed no association or correlation between age and a positive STOP BANG screen. For positive screens and race, using the Fisher's Exact Test this resulted in a P value of .550, which showed no association or correlation between race and positive STOP BANG screens. For positive screens among gender, there were 13 males and 5 females, using the Chi-Square Test for comparison, the P value result was .025, which showed a higher association or correlation between a positive STOP BANG screen among male vs female. Among the confounding patient characteristic variables, the results were as follows: The BMI of positive screened patients demonstrated a mean value of 32.06 (SD = 6.812), using the Levene's

Test for Equality of Variances, a P value result of .005 was revealed. This demonstrated an association or correlation between a higher BMI and a positive STOP BANG screen. Among arrhythmias, no association or correlations were found between arrhythmias or the presence of OSA. Using the Chi-Square Test, the results were as follows: Tachycardia revealed a P value of .538, Bradycardia revealed a P value of .444, A-Fib revealed a P value of 1.000, and no A-Flutter was present among positive screens. Among those patients with positive screens who had pacemakers the results revealed a P value of 1.000, which showed no association or correlation between pacemakers and the presence a positive STOP BANG screen. Finally, for positive screens that were intubated, the result revealed a P value of 1.000, which showed no association or correlation between intubation and a positive STOP BANG screen. It is important to note that no proportion of the sample reported a pre-existing diagnosis of OSA, including the 18 positive screens.

Discussion

Within the 6 objectives, the major findings of this study showed that the primary population of nurse providers had a 78% participation rate from the ICU and 100% participation rate from the 5 East Cardiac unit. This finding is important because without participation there is no study. No similar studies could be found specifically to OSA screening within the acute care setting, however a 2012 psychology research paper found that drops in participation caused drops in the confidence of research findings. A 100% participation rate is perfect but not always possible. The paper mentioned that in reviewing standard research texts, a number was not identified for a participation rate to exceed to be scientifically acceptable, although some researchers mentioned 60%, 80% or 90% as the target participation rate (Journal of

Psychotherapy and Psychosomatics, 2012). The clinical relevance of this is important because a drop in the confidence of research could potentially effect evidence based practice within the clinical setting. The findings for the STOP BANG screening adherence rate was 60% for the CVA population and 39% for the MI population. It is difficult to determine the reasons for 62% low adherence rates for MI's due to notes not being placed within charts that were not screened. Another factor that may have affected screening from the 5 East unit was work burden. The participating nurses from this unit were also assistant nurse managers that not only had patient teams, but were also required to fulfill administrative duties. Findings from this study suggest that there are no associations or correlations between positive screens and the use of supplemental oxygen or BiPAP use. Although, clinical significance was found between positive screens and the use of BiPAP which simply means there is practical importance, and is a subjective interpretation of the result by a provider.

The major findings of the confounding demographic variables not implicitly stated in the objectives showed there is no association or correlation between positive screens and age or race. However, there was an association or correlation between positive screens with males and positive screens. Among the confounding patient characteristic variables, there was an association or correlation between positive screens and BMI and positive screens. This finding was important since these are known characteristics of patients already diagnosed with OSA (Chui et al. 2017). No associations or correlations were found between the remaining confounding patient characteristic variables such as tachycardia, bradycardia, A-Fib, A-Flutter, the presence of a pacemaker, and intubated patients with a positive STOP BANG screen.

There is currently no required screening protocol at NBH with the STOP-BANG or any other tool for OSA. Education and "buy-in" of nurses on evidence-based OSA screening process

are important factors in helping to identify OSA in patients with MI or CVA. The medical consequences of not identifying undiagnosed OSA in these populations would not allow to the providers or patients options for treatment to potentially improve outcomes.

Limitations

This study had limitations with small sample sizes, as well as only being implemented on 2 units within 1 facility. Poor adherence to the STOP BANG screening protocol and a short implementation period were other study limitations. Poor adherence rates limits data collection and the validity of the study. A longer duration period may have allowed larger sample sizes which could have yielded different results. The convenience sample of the patient population was mostly white in those who were screened and there were no minorities in the positive screens. Another limitation was self-reporting as this is not completely reliable, patients may sometimes not be aware that they snore or have other symptoms. There were however times when family would report for a patient.

Recommendations for Future Study

Steps must be taken to further asses the burden of OSA on the MI and CVA populations as well as increase provider awareness and screening. Within this study, there was limited evidence to reveal the burden of OSA on these populations. It is important to study the burden on these populations as literature has shown OSA is an independent risk factor for cardiovascular disease. A large scale multi-unit, multi-level, multi-facility comparison with a longer duration period must be conducted to gain larger sample sizes to better understand the burden on these populations for more reliable and generalizable results. This could be accomplished by getting buy-in from stakeholders throughout the Norton system on the need for OSA screening by presenting evidence-based research showing the implications and costs of untreated OSA, and

how it could impact readmission rates. This would improve provider awareness and aide in the implementation process of OSA screening through better stakeholder support. In addition to expanding studies to other facilities, increasing the evaluation period would also be beneficial in identifying trends over time. A long evaluation period would give the results stronger reliability and validity. To improve non-adherence rates, post implementation surveys to the providers should be conducted to evaluate reasons for non-adherence. Future research questions may ask why non-adherence is prevalent within the OSA screening process. Other research questions may ask, what providers should conduct OSA screening within the acute care setting, how prevalent is OSA among races other than whites, and what is the burden of OSA on the heart failure population. Other patient characteristics should be tracked such admission diagnosis, the use of oxygen or CPAP, and desaturation events during the night and socio-economic status. It would also be important to measure the co-morbid burden in the sample between positive and negative screens for OSA risk and mortality. Further development of a treatment protocol for those who screened positive for being at increased risk for OSA is needed to ensure follow up.

Conclusion

There are currently no recommendations on screening for OSA in the acute care setting. According to an article by the U.S. Preventive Task Force (2017), screening is not recommend for OSA in asymptomatic adults. Within the same article, the American College of Physicians does recommend a sleep study for those with daytime sleepiness, and The American Academy of Sleep Medicine recommends that routine health maintenance evaluations include questions about OSA and evaluation for risk factors (U.S. Preventive Task Force, 2017). In an article by Kapur et al. (2017), The American Academy of Sleep Medicine (AASM) reports that an estimated 30 million people in the U.S. suffer from sleep apnea. The AASM does not mention screening

questionnaires for sleep apnea but does recommend an attended polysomnography in an accredited sleep center or home sleep apnea testing should be performed for suspected obstructive sleep apnea, (Kapur et al., 2017).

One of the aims of this study was to show the burden of OSA on the MI and CVA populations in the acute care settings, and evaluate the use of supplemental oxygen or the use of BiPAP and associations with positive STOP BANG screens, these were objectives 4 and 5. No significance correlation was found between the use of supplemental oxygen or the use of BiPAP and positive screens. Within the special interest variables, a significant correlation was found between males and positive screens vs females. A significant correlation was also found between a higher BMI and positive screens. Although no significant correlations were found within objectives 4 and 5, this does not mean that screening should not be performed on these populations as results could be more reliable and generalizable with larger sample sizes.

One problem is the lack of knowledge from providers on the negative health effects of OSA due to a lack of standardized screening guidelines. It is unknown within this study how well the STOP BANG screening instrument identified OSA symptoms in patients with a known diagnosis of OSA. From the positive screened patients, none were known to have a prior diagnosis of OSA. Screening is important as studies have shown that proper treatment of OSA can have positive health effects. In this study, no correlation was found between Atrial Fibrillation and the presence of OSA, but a recent article concluded that studies of patients with Atrial Fibrillation suggest that there is a significant correlation between treatment of OSA by continuous positive airway pressure and maintaining sinus rhythm after electrical cardioversion, and improve catheter ablation success rates (Lintz et al., 2018). A study by Olga et al. (2014),

found results which found a significant correlation between CPAP therapy and a positive effect on the long-term survival in patients with ischemic stroke.

Without standardized guidelines for the screening of OSA within the acute care setting, a lack of awareness will continue to exist. More research must be conduct and steps must be taken to bring knowledge and awareness of OSA and its burden on cardiovascular disease populations so that screening processes may be implemented. In the next steps, it would be reasonable to educate all major stakeholders within the Norton Brownsboro Hospital on the impact of untreated OSA on cardiovascular health and associated costs. By utilizing this information and using a framework model such as the Iowa Evidence-based Practice Model, it would be feasible to continue an evidence-based practice such as the STOP BANG screening instrument and continue risk screening for OSA at Norton Brownsboro and eventually throughout the Norton system. This pilot study was successful with high nurse participation and adherence rates and could be improved by including future treatment plans developed for positive screened patients requiring supplemental oxygen to CPAP while hospitalized, and follow up appointments post discharge. There are major opportunities for prevention focus with a treatment plan for those who screen positive. The next steps for future screening would include follow-ups on those patients who scored between 5-8. On patients who screen positive, information such as time intervals, when was oxygen added, did they require CPAP or go home with a CPAP, and did they have a follow up sleep study, would allow a fuller understanding of the patient's clinical course. This must be accomplished before we can understand and look for linkages between screening positive on the STOP BANG OSA risk assessment and readmission rates. This work/study could potentially have influence on reducing readmission rates and costs.

Table 1. Inclusion List of Myocardial Infarction DRG codes n=52

Inclusion Criteria List of Myocardial DRG codes	
DRG Codes	**Diagnosis Definition**
280	ACUTE MYOCARDIAL INFARCTION, DISCHARGED ALIVE W MCC
281	ACUTE MYOCARDIAL INFARCTION, DISCHARGED ALIVE W CC
282	ACUTE MYOCARDIAL INFARCTION, DISCHARGED ALIVE W/O CC/MCC

Table 2. Inclusion List of Stroke DRG codes n=129

DRG Codes	**Diagnosis Definition**
061	Ischemic stroke, precerebral occlusion or transient ischemia with thrombolytic agent with mcc
062	Ischemic stroke, precerebral occlusion or transient ischemia with thrombolytic agent with cc
063	Ischemic stroke, precerebral occlusion or transient ischemia with thrombolytic agent without cc/mcc
064	Intracranial hemorrhage or cerebral infarction with mcc
065	Intracranial hemorrhage or cerebral infarction with cc or tpa in 24 hours
066	Intracranial hemorrhage or cerebral infarction without cc/mcc
067	Nonspecific cva and precerebral occlusion without infarction with mcc
068	Nonspecific cva and precerebral occlusion without infarction without mcc

Table 3. Demographic Characteristics

Characteristic	Mean (SD) or n (%)
Age	63.44 (14.400)
BMI	28.87 (6.244)
Gender	
Male	31 (50%)
Female	31 (50%)
Race	
Blk	3 (4.8%)
Cauc	59 (95.2)
Admitting Dx	
CVA	44 (71%)
NSTEMI	13 (21%)
STEMI	5 (8.1%)
Screening Outcomes	Mean (SD or n (%)
Pacemaker	
Positive screens	4 (6.5%)
Negative screens	57 (91.9%)
Tachycardia	
Positive screens	18 (29%)
Negative screens	43 (69.4%)
Bradycardia	
Positive screens	23 (37.1%)
Negative screens	39 (62.9%)
A fib	
Positive screens	2 (3.2%)
Negative screens	59 (95.2%)
Vent	
Positive screens	6 (9.7%)
Negative screens	55 (88.7%
Aflutter	
Negative screens	62 (100%)
Desaturation during stay	
Positive screens	8 (12.9%)
Negative screens	54 (87.1%)
Negative screen with BiPAP	
Positive	2 (3.2%)
Negative	60 (96.8%)
Positive screen with BiPAP	
Positive	2 (3.2%)
Negative	60 (96.8%)

Table 4. Comparison of characteristics

	Screened positive (n=) Mean (SD) or n (%)	Screened negative (n=) Mean (SD)	P
Age	63.22 (9.62)	63.52 (16.038)	.93
BMI	32.06 (6.812)	27.28 (5.473)	.005
Gender Male Female	 13 (72.2%) 5 (27.8%	 18 (40.9%) 26 (59.1%)	.025
Race Caucasian Black	 18 (100%) 0	 41 (93.2%) 3 (6.8%)	.550
Admitting Dx CVA NSTEMI STEMI	 11 (61.1%) 6 (33.3%) 1 (5.6%)	 33 (75%) 7 (15.9%) 4 (9.1%)	.302
Pacemaker	1 (5.9%) OSA 17 (94.1%)	CVA 41 (93.2%) MI 3 (6.8%)	1.000
Tachycardia	6 (35.3%) OSA 11 ((%64.7)	12 (27.3%) 32 (72.7%)	.538
Bradycardia	8 (44.4%) OSA 10 (55.6)	15 (34.1%) 29 (5.9%)	.444
Intubated	2 (11.8%) OSA 16 (88.2%)	4 (9.1%) 40 (90.9%)	1.000
Aflutter	0%	0%	
Desaturation during stay	4 (22.2%) OSA 14 (77.8%)	4 (9.1%) 40 (90.9%)	.214
Negative BiPAP screen	0 OSA 18 (100%)	2 (4.5%) 42 (95.5%)	1.000
Positive BiPAP screen	3 (11.8%) OSA 15 (88.2%)	0 (0%) 44 (100%)	.074

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Appendix A

STOP		
Do you **S**NORE loudly (louder than talking or loud enough to be heard through closed doors)?	Yes	No
Do you often feel **T**IRED, fatigued, or sleepy during daytime?	Yes	No
Has anyone **O**BSERVED you stop breathing during your sleep?	Yes	No
Do you have or are you being treated for high blood **P**RESSURE?	Yes	No

BANG		
BMI more than 35kg/m2?	Yes	No
AGE over 50 years old?	Yes	No
NECK circumference > 16 inches (40cm)?	Yes	No
GENDER: Male?	Yes	No

TOTAL SCORE		

High risk of OSA: Yes 5 - 8

Intermediate risk of OSA: Yes 3 - 4

Low risk of OSA: Yes 0 - 2

(Appendix B) Patient Education Handout

STOP BANG Patient Education Handout

Because of being in the ICU, a special test was done on you called the STOP BANG test to check for obstructive sleep apnea. Your result indicates that you may be at risk for sleep apnea. This tool is only used to assess your risk of having obstructive sleep apnea and not a diagnosis. Having obstructive sleep apnea puts a person at higher risk for heart attack and stroke. You are encouraged to follow up with your primary care physician after discharge and potentially setting up a sleep study workup.

(Appendix C) Audit Tool for patient data Post-Implementation

Unique ID	Age	Race	BMI	Admit dx	Pacer Y/N	On vent	Tachy-cardia	Brady cardia	AFIB Aflutter	Screen completed
1A										
1B										
1C										

Unique ID	Reason not Adhered to	Positive screen O2 Range	Desaturation During ICU stay	Negative screen With BiPAP	Positive screen With BiPAP	Education Handout Given	Note Made in Chart
1A							
1B							