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Implementing STOP-BANG for Pre-operative Screening of Obstructive Sleep Apnea

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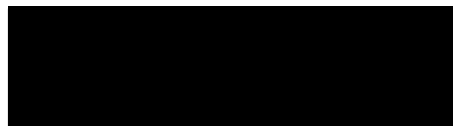
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Abstract

The perioperative staff at David Grant Medical Center (DGMC) sought a quick and reliable means for screening patients who may have undiagnosed obstructive sleep apnea (OSA). The aims of this evidence-based practice (EBP) project were to implement the STOP-BANG screening tool for risk stratification of OSA and compare our results with current literature and with military rates of OSA. The EBP project participants were pre-operative nurses and technicians, post-anesthesia care unit (PACU) nurses and technicians, and anesthesia providers at DGMC. Our method was a process improvement project that follows the revised Iowa Model for EBP implementation. Data analyses were reported as descriptive statistics for all subjects both with and without a preexisting diagnosis of OSA. The impact of our project at DGMC could help identify patients at risk for OSA so that anesthesia providers may adjust their plan according to the American Society of Anesthesiologist's (ASA) recommendations. Implementing STOP-BANG was a reliable and noninvasive solution for DGMC.

Keywords: Obstructive Sleep Apnea, OSA, STOP-BANG Questionnaire

Implementing STOP-BANG for Perioperative Screening of Obstructive Sleep Apnea

Obstructive Sleep Apnea (OSA) is prevalent in up to 25% of surgical patients (Vasu et al., 2012) and affects multiple body systems, with three levels of severity--mild, moderate, and severe. A mild case can become an acute, life-threatening problem for surgical patients due to pronounced apnea, hypoxemia, and exacerbation of existing comorbidities (Barash et al., 2017). Furthermore, OSA is economically burdensome when undiagnosed and increases perioperative morbidity with higher rates of ICU admissions. David Grant Medical Center (DGMCC) at Travis Air Force Base currently does not have a standardized method to screen patients for OSA before receiving anesthesia care. A potential solution for this problem was implementing the STOP-BANG questionnaire.

Problem Synthesis

OSA is defined as periodic obstruction of the upper airway during sleep, leading to episodic oxygen desaturation and hypercarbia (Barash et al., 2017). Cyclical cessation of breathing during sleep causes physiologic stress on several body systems. In the respiratory system, blood oxygen levels can suddenly drop because OSA causes upper airway obstruction, decreases functional residual capacity (FRC) and expiratory reserve volume (ERV), and increases total airway resistance (Abdeyrim et al., 2015). Further, hypoxemia causes oxidative stress leading to inflammation, endothelial dysfunction, and hypertension (Jelic & Le Jemtel, 2008). Hypertension results from increased sympathetic tone and negative intrathoracic pressure created by an obstructed airway, causing increased preload and afterload (Pierre & Phillippe, 2010). Additionally, OSA affects the endocrine system by disrupting glucose metabolism and is correlated with type 2 diabetes mellitus, independent of obesity (Punjabi et al., 2004). A common effect on the neurocognitive system is excessive hypersomnia, which cause inadequate focus, poor performance, irritability, morning headaches, forgetfulness, depression, and can cause motor vehicle and industrial accidents (Obstructive sleep apnea, 2020). It is, therefore, evident

OSA has significant effects on multiple body systems and disrupts normal physiology in various manners.

Patients with OSA are 20% more likely to have perioperative risks and complications such as apnea during recovery, hypoxia, hypercapnia, and difficult intubation compared to those who do not have OSA (Gupta et al., 2001), and 80% of patients undergoing surgery are unaware they have OSA (Finkel et al., 2009). Medications such as opioids, benzodiazepines, and sedative hypnotics can exacerbate these risks (Gupta et al., 2001). Consequently, patients with OSA have higher rates of transfers to ICU (24% vs 9% respectively), and increased hospital lengths of stay (Gupta et al., 2001). Moreover, patients who do not use continuous positive airway pressure (CPAP) therapy at home further increase their risks for adverse outcomes (Liao et al., 2009). These complications during and after surgery confirm that patients with OSA are at an increased risk for morbidity and mortality. At DGMC, a preoperative screening for OSA would give anesthesia providers the ability to appropriately treat OSA patients going to surgery, potentially saving money through decreased ICU admissions, decreased length of stays, reduced postoperative complications, and the ability to refer patients for definitive OSA diagnosis via polysomnography (PSG).

Relevance to Military Nursing

OSA is a problem in the military, and the screening and identification of patients at risk for OSA before surgery is essential in addressing patient safety. Mysliwiec et al. studied the prevalence of OSA among active-duty military members and found 62.7% of participants met

criteria for OSA. The study also stated: “Sleep disturbances are reported in almost one-third of military personnel who have deployed in support of Overseas Contingency Operations (OCO), resulting in approximately 600,000 military personnel and veterans with clinically relevant sleep conditions” (Mysliwiec et al., 2013). Additionally, according to the Medical Surveillance Monthly Report (MSMR), OSA remains undiagnosed for as many as 48% of active-duty personnel until their last year in service, which endangers them for complications in the operating room (OR) (Rogers et al., 2016). The finances and human resources required to address OR complications increase significantly when considering the number of unidentified OSA patients among military members, veterans, and dependents.

These are staggering statistics that need to be addressed to ensure compliance with the Quadruple Aim framework as defined by the Defense Health Agency (DHA) which are readiness, better care, better health and lower cost. Early screening and identification of OSA supports the readiness mission of the US military by providing members with treatment options before it becomes a severe problem which, in turn, ensures members can deploy. Also, OSA screenings improve the ability of military health providers to deliver better care by increasing perioperative preparedness while addressing complications as they arise, thus leading to better overall health. Screening for OSA can help lower costs by minimizing DHA resources on perioperative complications.

System or Clinical Question

Knowing the problems associated with OSA and a potential solution to detecting risks, we asked the clinical question, does staff education and the implementation of an OSA screening process improve the identification of OSA in adult surgical patients at DGMCC?

Search Strategy and Results

The PICOT question that guided our literature search was, “In adult surgical patients (P), does utilizing a STOP-BANG obstructive sleep apnea (OSA) risk screening tool with perioperative anesthesia recommendations (I), compared to current practice of no OSA risk screening (C), affect the rate of detecting patients at risk for OSA (O)?” The search strategy, further discussed below is illustrated in a PRISMA Diagram (Appendix A).

The databases utilized to collect the articles of current literature were Embase, CINAHL, and Pubmed. For Pubmed, search keywords were "Sleep Apnea, Obstructive"[mh] OR obstructive-sleep-apnea*[tw]) AND (stop-bang[tw] OR stop-questionnaire[tw]) AND english[lang] AND (2008:3000/12/12[pdat]; it yielded 392 results. For Embase, search keywords were “obstructive sleep apnea*”:ab,ti,kw AND ('stop bang':ab,ti,kw OR ‘stop questionnaire’:ab,ti,kw) AND ([article]/lim OR [article in press]/lim OR [review]/lim) AND [english]/lim AND [2008-2020]/py; it yielded 348 results. For CINAHL, search keywords were (MH "Sleep Apnea, Obstructive" OR obstructive-sleep-apnea*) AND (stop-bang OR stop-questionnaire); it yielded 189 results.

The results were limited to the last twelve years, English language, and peer reviewed articles. Inclusions were only full text-journal articles and full-text abstracts; all other sources were excluded. As of November 2020, total database searches yielded 929 articles.

To narrow the results, we focused on certain aspects of language, population, timeline, setting and use of STOP-BANG. We included articles focusing on adult populations, ambulatory or inpatient surgical settings, and comparative outcomes of other screening tools to

STOP-BANG. We excluded articles and journals focused on outpatient clinics, interventions to diagnose sleep apnea, surgeries not routinely performed at DGMCC, and pediatric populations. Eight articles met our stringent inclusion criteria for further review.

The Johns Hopkins Nursing Quality of Evidence-Based Practice tool was used to appraise the literature in our evidence table, and we assigned the level of evidence and quality rating (Appendix B). Two articles were level IIB, three were IIIA, two were IIIB, and one was IIIC. We included the IIIC article because it was a large sample size that assessed for general and disease-specific risk factors.

Solution Synthesis

The Berlin Questionnaire (BQ), Epworth Sleepiness Scale (ESS), STOP, and STOP-BANG are examples of common OSA screening tools that measure symptoms and predictors of OSA. While these tools do not diagnose OSA, they can mitigate perioperative problems by accurately identifying risks. Some screening tools are more reliable than others and the benefits and weaknesses of available options will be presented.

The Berlin Questionnaire (BQ)

The BQ was designed to identify patients at higher risk of having OSA in the primary care setting. The questionnaire asks ten questions comprising three categories: snoring severity, excessive daytime sleepiness, and history of hypertension or obesity. Patients can be classified into high risk or low risk of OSA based on the overall score. The BQ has high sensitivity and positive predictive value when compared to other screening tools; however, the BQ varies depending on the population in which it is used and has low specificity when compared to the other examined screening tools (Pataka et al., 2014). Consequently, DGMCC would benefit to

implement a more reliable screening tool encompassing the perioperative environment vs. primary care.

Epworth Sleepiness Scale (ESS)

The ESS is a self-administered survey with eight questions designed to determine the level of daytime sleepiness in individuals. The questions involve common activities and evaluate the propensity (on a scale of 0-3) that a person may fall asleep during the activity. The total range is 0-24. The higher the score, the higher the person's average sleep propensity (ASP). The mean ASP is approximately 4.5, and greater than 10 is considered mild excessive daytime sleepiness. The ESS questionnaire has high specificity and sensitivity to the likelihood of falling asleep--particularly for patients with narcolepsy (Johns, 2000) --but is limited for perioperative use because it does not assess other pertinent OSA characteristics such as snoring, age, gender, and neck circumference. Also, ESS has a relatively low sensitivity (66%) for screening OSA (Rosenthal & Dolan, 2008). Therefore, a screening instrument better suited for a perioperative environment should be used.

STOP-BANG

STOP-BANG is an OSA screening tool adapted from the STOP questionnaire. The original STOP questionnaire is an acronym with four yes/no questions addressing **S**noring, **T**iredness, **O**bserved gasping or choking during sleep, and **h**ypertension. BANG, which was added to STOP to improve sensitivity, also asks four yes/no questions assessing **B**MI (>35kg/m²), **A**ge (>50 yrs), **N**eck circumference (>17" for males, >16" for females), and **G**ender. Patients are at risk for OSA if their STOP-BANG score is 3 or more and at low risk if their score is less than 3 (Vasu et al., 2012). Patients are at high risk for OSA if their STOP-BANG score is greater than 5 (Christennson et al., 2018). When compared to the BQ and ESS, STOP-BANG has

been shown to have similar sensitivity to BQ, while outperforming both BQ and ESS in specificity (Amra et al., 2018; Kee et al., 2018; Nagappa et al., 2017; Penafiel et al., 2018). Additionally, STOP-BANG has demonstrated a high level of sensitivity and specificity in surgical patients, the population of interest for DGMC. The limitation for STOP-BANG is that it has low sensitivity for identifying patients with mild and low-moderate OSA; however, all screening tools evaluated also have this limitation (Amra et al., 2018).

American Society of Anesthesiologist (ASA) OSA Guidelines

Created in 2006 and updated in 2014, the ASA developed practice guidelines for the perioperative management of patients with OSA. The purpose of the guideline is to improve perioperative care while reducing adverse outcomes for patients receiving anesthesia. Relevant recommendations are to consider local anesthetics and nerve blocks, to use CPAP or an oral appliance during sedation and postoperatively, to extubate while awake and, if possible, in the lateral, semi-upright, or other non-supine position, to fully reversal neuromuscular block before extubation, to reduce or omit dosages of benzodiazepines and opioids, and to consider nonsteroidal anti-inflammatory agents (Practice Guidelines, 2014). If a patient was deemed at risk for OSA, our recommendation was to have the guidelines available for DGMC providers to review prior to administering anesthesia to a patient.

Ultimately, OSA is relatively common for surgical patients, and an effective screening method may improve patient care at DGMC. STOP-BANG emerged as more accurate and efficient when comparing other screening tools analyzed in this paper. The BQ is not suitable for OSA screening in a pre-operative setting, and ESS has relatively low sensitivity for OSA (Rosenthal & Dolan, 2008). The STOP-BANG method demonstrated a high level of sensitivity and specificity in surgical patients, which was the population of interest for DGMC. Many

hospitals have implemented STOP-BANG in perioperative settings and current evidence supports utilizing this OSA screening tool.

Focus Areas

We determined four focus areas for our project. Our first focus area was to conduct a thorough review of the literature to determine the best method to screen preoperative patients for OSA. Our second focus area was to educate DGMC perioperative staff on STOP-BANG and clinical practice guidelines associated with OSA. The third focus was to implement the STOP-BANG questionnaire as part of pre-operative screening at DGMC. Our fourth focus area was to disseminate our results locally and nationally.

Business Case Analysis

We had an opportunity at DGMC to reduce costs associated with postoperative complications of OSA and increase the quality of care for the patient. OSA costs the economy an estimated \$150 billion dollars annually (Obstructive Sleep Apnea, 2020). The value of this project is an additive of quality and safety, while saving costs in minutes-of-care perioperatively. Quality is evident in patient safety, financial benefits, and operational readiness. Financial benefits are manifested as decreased OR time, decreased PACU time, and fewer ICU admissions which have a cost estimation of \$18-\$40/min, \$4-\$8/min, and \$2,464/day respectively (Anecare, n.d.). Identifying OSA risk increases operative preparation and allows providers to adjust their plan for OSA patients. A full description of the business case analysis can be reviewed in Appendix C.

Organizing Framework

The Iowa Model (Appendix D) is a comprehensive guide for all clinicians involved. It is a seven-step, trigger-initiated model that is easy to follow because of its algorithm. The seven steps are to identify the problem, state a problem, form a team, design, and pilot the practice change, integrate and sustain practice, and disseminate results. We chose The Iowa Model because it guides clinical decision-making and the EBP process from both the clinician and the

systems perspectives. It contains key decision-making points that align with our vision for STOPBANG. For example, the Iowa model allowed us to explore the clinical issue that no screening tool is used for OSA at DGMC. Furthermore, with an ample research base, we had the opportunity to adopt our findings into practice as outlined in the model. Lastly, the algorithm allowed re-evaluation, reassessment, and re-implementation for setbacks to the project.

Project Design

General Approach

This was a process improvement project to implement evidence-based practice. We educated DGMC perioperative staff prior to implementing STOP-BANG. Descriptive statistics were used to describe risk levels of all patients screened both with and without a pre-existing diagnosis of OSA.

Setting and Population

DGMC is the largest military treatment facility (MTF) within the Air Force, and serves 500,000 Department of Defense and Department of Veteran Affairs Northern California Health Care System eligible beneficiaries in the immediate San Francisco-Sacramento vicinity from 17 counties covering 40,000 square miles. The population treated are active duty, retirees, veterans, and dependents. DGMC performs between 3,000 and 4,000 surgeries annually and has 9 operating suites, 4 gastrointestinal suites, 2 cardiac intervention suites, and 1 cystoscopy suite. As of October 2020, they employed fifteen preoperative and post-anesthesia care unit (PACU) registered nurses and 28 anesthesia providers. Surgical capabilities include general surgery, obstetric & gynecological, orthopedic, vascular, cardiac, plastic reconstruction, ophthalmology, ear--nose--throat, dental, urology, pulmonology, interventional radiology, oral & maxillofacial, and neurologic procedures. We employed the project in the surgical settings of the pre-operative holding area, the operating room, and PACU. The population of interest were adult surgical patients. We educated the pre-procedure nurses and technicians, PACU nurses and technicians, and anesthesia providers.

Procedural Steps

The first step was to obtain written approval from the local flight commander, element leaders, and anesthesia medical director to assess feasibility and obtain “buy in” to support our project. Next, we educated preoperative staff, PACU staff, and anesthesia providers about OSA and the importance of screening for anesthesia and post-anesthesia care. We educated the same personnel about the STOP-BANG questionnaire (Appendix F), scoring, and subsequent anesthesia-care recommendations based upon STOP-BANG risk stratification.

We conducted the educational intervention via PowerPoint during an in-person monthly staff meeting. Furthermore, participation of questionnaires or education was voluntary. We documented attendance to ensure anyone not in attendance had the opportunity to receive a copy of the educational PowerPoint.

We deployed STOP-BANG the subsequent month of the in-service. A hard copy of the assessment was placed in each pre-op patient packet, and the pre-operative holding nurse asked patients the eight STOP-BANG questions and recorded the score on the screening tool. Results were included with the post-op paper chart. The anesthesia provider then had the opportunity to review the STOP-BANG score and attached recommendations as part of the pre-operative anesthesia interview. STOP-BANG included a legend for OSA risk stratification along with clinical recommendations from the ASA for providers to reference.

After the surgical procedure, the chart followed the patient to the PACU along with STOP-BANG to the RN. The PACU RN filed STOP-BANG in the patient chart which was separated by the administrative technician into a designated box solely for the STOP-BANG questionnaire. A member of the project team then collected STOP-BANG from the designated box at the end of each week. Next, STOP-BANG results were cataloged into an excel spreadsheet for data analysis. This process was implemented for two weeks; after which, participating anesthesia providers received a survey asking their perception of the use of STOP-BANG.

Data Analysis Plan

We gathered and analyzed data to describe the OSA risk in categories of low, moderate, or high and to see the relationship of risks to the current literature. The independent variable was STOP-BANG which results in an ordinal score of 0-8. Range categories are 0-2 (low risk), 3-4 (moderate risk), and 5-8 (high risk). Additionally, we described our outcome variables of overall mean, median, and standard deviation of STOP-BANG scores and percentages within each risk stratification (low, intermediate, and high risk for OSA) as well as for patients with and without a preexisting diagnosis of OSA. Lastly, we described the statistics of each individual question of STOP-BANG.

Potential Barriers

We identified several potential barriers that impacted our implementation. The primary barrier was staff compliance. The team members reengaged with pre-operative staff and reeducated the importance as well as answered questions from staff. We overcame further resistance with a simplified approach. The STOP-BANG screening was one page on brightly colored paper, short, and concise. We obtained STOP-BANG scores and gathered data with the fewest steps possible. Furthermore, providers had a simple, curtailed list of ASA recommendations for delivering anesthesia to patients suspected of having OSA.

Additionally, portions of the STOP-BANG were inadvertently missed (e.g., the neck circumference). Our prevention was an educational in-service prior to the project during which we communicated the importance of compliance for the two-week project period. However, some questions of STOP-BANG were still missed, and those forms were discarded from final data collection.

Another barrier of concern was lost paperwork. We used bright colored paper for better tracking, and this allowed participants to visually track the hard copy and use the bright color as a reminder to accomplish. Plus, we placed a designated STOP-BANG box by the administrative

technician to prevent mixing the questionnaire with patient charts.

Dissemination and Sustainability

Upon completion of our project, we disseminated our findings to Uniformed Services University (USU) faculty and DGMC stakeholders via in-person debrief. We followed up with a poster presentation for the OR and anesthesia department of DGMC, as well as present our poster during the 2022 USU research week.

Additionally, to disseminate our results nationally, we submitted a presentation to the annual TriService Nursing Research Program (TSNRP) EBP Research and Dissemination Course of 2022. This also included personnel from the Anesthesia Research Interest Group (ARIG). Lastly, we sought to activate the project into a permanent sustainable program by involving leadership stakeholders to implement policy in the form of a Standard Operating Procedure (SOP).

HIPAA Concerns

The institutional review board (IRB) underwent a full scrutiny of this project, and we proceeded after IRB approval (Appendix K). We did not collect sensitive and specific patient identification such as names, dates of birth, or social security numbers. General demographic information such as age, gender and STOP-BANG screening results was obtained via the questionnaire itself. We transcribed information to an electronic database to assist with statistical analysis. Furthermore, we safeguarded and stored de-identified paper copies of data in a locked drawer in a locked office at DGMC. The electronic database was stored on a CAC enabled computer maintained in a locked office.

Project Results

We implemented the project for two weeks and met our aims as described previously and are analyzed in the next section. We conducted a total of 67 STOP-BANG questionnaires to adult surgical patients and we compiled scores into categories of low-risk, intermediate-risk, and

high-risk for having OSA. Our results can be compared to the literature in order to exhibit the relationship of STOP-BANG to OSA discussed below. We further analyzed the data for those with and without a diagnosis of OSA. Our population of interests were active-duty military, veterans, or dependents of veterans.

Analysis of the Results

We found overall that 32 patients (47.8%) were low risk, 25 patients (37.3%) were moderate risk, and 10 (14.9%) were high risk for OSA. The overall mean and median STOP-BANG scores were 2.76 and 3.00 respectively with a standard deviation of 1.76. A total of 6 patients had a diagnosis of OSA prior to our STOP-BANG screening. A total of 61 patients did not have a diagnosis at the time of our screening.

For the 6 patients *with* a diagnosis of OSA, we found 0 were at low risk, 1 was moderate risk (4% of total “moderate risk” category), and 5 were high risk (50% of total “high risk” category). The mean and median STOPBANG scores for these patients were 5.83 and 6.00 respectively with a standard deviation of 1.33.

For the 61 patients *without* a diagnosis of OSA, we found that 32 were low risk (100% of total “low risk” category), 24 were moderate risk (96% of total “moderate risk” category), and 5 were high risk (50% of total “high risk” category). The mean and median STOP-BANG scores for these patients were 2.46 and 2.00 respectively with a standard deviation of 1.49. As stated previously, Finkel et al. proposed that 80% of patients do not know they have OSA, while we found only 49% undiagnosed patients in moderate and high risks categories.

For the individual STOP-BANG questions, we found that the 67 participants answered **question 1** (snoring) 69% “no” and 31% “yes”; **question 2** (tiredness) 57% “no” and 43% “yes”; **question 3** (apnea) 84% “no” and 16% “yes”; **question 4** (hypertension) 67% “no” and 31% “yes”; **question 5** (BMI) 96% “no” and 4% “yes”; **question 6** (over 50) 48% “no” and 52%

“yes”; **question 7** (neck circumference) 66% “no” and 34% “yes”; **question 8** (male) 37% “no” and 63% “yes”.

We found 83% (5 out of 6) of patients who were diagnosed had a correlation to a high-risk STOP-BANG showing high sensitivity as compared to the literature (Amra et al., 2018; Kee et al., 2018; Nagappa et al., 2017; Penafiel et al., 2018). Also, 29 out of 35 (82%) patients who are at risk, do not have a diagnosis correlating with Finkel et al. who described that (81%) of the population do not know they are at risk. Interestingly, we also found that question 5, BMI, was only 4.5 percent “yes”. Since OSA strongly correlates with obesity, with up to 70% of OSA patients being obese (Wolk, 2003), it may be likely that this answer was incorrectly recorded or due to the military population which DGMC serves, which requires its service members to be physically active.

Mysliweic et al. studied the prevalence of OSA among military members and found 62% of participants met criteria for OSA. Our results showed 35 of 67 (52%) participants at DGMC had either moderate-risk or high-risk of having OSA, closely reflecting with Mysliweic et al.

Anesthesia providers at DGMC were surveyed after completion of the project via online survey. This portion gave insight on anesthesia providers’ involvement. This was a voluntary response for which no incentive was provided. Twenty-four anesthesia providers were asked 3 questions regarding the project and a total of 13 responses from anesthesia staff were collected. The results are as follows:

“Did you see a STOP-BANG questionnaire in a pre-op chart in September 2021?”

A total of 9 participants responded Yes, or 69%

A total of 4 participants responded No, or 31%

“Did you find the patient’s STOP-BANG results useful?”

A total of 9 participants responded Yes, or 69%

A total of 4 participants responded No, or 31%

“Should DGMC include STOP-BANG in the preoperative assessment?”

A total of 12 participants responded Yes, or 92%

A total of 1 participant responded No, or 8%

Organizational Impact

Our main impact was increased awareness for this evidence-based practice. With a 54.2% response rate from our survey of anesthesia staff, 92% of participants responded that DGMC should include STOP-BANG in the preoperative assessment, it is clear the organization is lacking and desiring an OSA screening tool. STOP-BANG is a sensitive and specific screening tool for OSA, and we believe that STOP-BANG is a practical solution that can meet the need for preoperative screening of OSA at DGMC.

Future Direction for Research and Practice

The direction of this project could expand to national and international military treatment facilities. A larger population and/or timeframe would be needed to collect more data to use STOP-BANG locally in DGMC. The data would need to be collected not only in our adult surgical population but also for the outpatient clinics at DGMC. Since business case analysis was performed previously, the commander of DGMC could use that--and the potential of more data collection--to permanently implement STOPBANG into different units at the hospital. This project was to compare the literature to DGMC and, therefore, potential impacts are data that follow the screening, such as decreased PACU length of stay, use of long-acting opioids or sedatives, oxygenation strategies, and many more.

The Defense Health Agency (DHA) could integrate STOP-BANG into their EMR system

to expand nationally and internationally. This would require implementation and data collection at multiple military treatment facilities. Also, the systems integration would have to involve a beta-testing phase. This could, however, require years of data collection and phasing integration.

Limitations

The size of our population was low, and it only reflects the data at DGMC for that time. A larger population over a longer period would be necessary to randomize the data and obtain more valid results. Furthermore, some STOP-BANG surveys were not fully completed and discarded from the data. This implies that staff were not fully compliant on completing the survey and steps were missed. Also, our survey was small with only 13 anesthesia providers and can only reflect those individuals' opinions at that time. Lastly, this project's intention was to validate STOP-BANG, as compared to the literature, for DGMC; therefore, we did not follow patients after screening to assess how care was managed differently for them or how it changed post-anesthesia recovery.

Conclusion

Our findings showed DGMC's population and rates of OSA are consistent with current literature: multiple studies stated that STOP-BANG has a high sensitivity for detection of OSA, Finkel et al. found that about 80% of patients are not aware they are at risk for OSA, and Mysliwiec et al. stated that around 60% of military members will have OSA. Our data reflected these findings: 83% of patients with OSA were screened as high-risk, 53% of patients were either moderate or high-risk, and 83% who are at risk do not have a diagnosis.

This project demonstrated that OSA is prevalent among DGMC's adult surgical population and the potential for future impact is substantial. OSA is a medical condition that warrants more attention because poor outcomes after surgery can be mitigated if detected early. Our project introduced the ability to detect OSA early and gave the data so that staff and hospital leadership could permanently use STOP-BANG in preoperative assessments. Furthermore, since

the DHA electronic health records do not have a standardize system for preoperative screening of OSA, this project provides data for potential future implementation into electronic health records.

References

- Abdeyrim A., Zhang Y., Li N., Zhao, M., Wang, Y., Yao, X., Keyoumu, Y., Yin, T. (2015). Impact of obstructive sleep apnea on lung volumes and mechanical properties of the respiratory system in overweight and obese individuals. *BMC Pulm Med.* 15(76). <https://doi.org/10.1186/s12890-015-0063-6>
- Amra, B., Javani, M., Soltaninejad, F., Penzel, T., Fietze, I., Schoebel, C., & Farajzadegan, Z. (2018). Comparison of berlin questionnaire, STOP-bang, and epworth sleepiness scale for diagnosing obstructive sleep apnea in persian patients. *International Journal of Preventive Medicine*, 9(1), 28-28. doi:10.4103/ijpvm.IJPVM_131_17
- Anecare. (n.d.). *The Anecare ANEclear Economic Benefits*. Retrieved September 18, 2020, from <http://www.anecare.com/Products/QED-100-Economic-Benefits.html>
- Barash, P. G., Cullen, B. F., Stoelting, R. K., Cahalan, M. K., Stock, C., Ortega, R., ... Holt, N. F. (2017). *Clinical anesthesia* (8th ed.). Wolters Kluwer.
- Christensson, E., Franklin, K. A., Sahlin, C., Palm, A., Ulfberg, J., Eriksson, L. I., Lindberg, E., Hagel, E., & Jonsson Fagerlund, M. (2018). Can STOP-Bang and Pulse Oximetry Detect and Exclude Obstructive Sleep Apnea?. *Anesthesia and analgesia*, 127(3), 736–743. <https://doi.org/10.1213/ANE.0000000000003607>
- Chung, F., Abdullah, H. R., & Liao, P. (2016). STOP-Bang Questionnaire. *Chest*, 149(3), 631–638. <https://doi.org/10.1378/chest.15-0903>
- Finkel, K.J., Searleman A.C., Tymkew, H., Tanaka, C.Y., Saager, L., Safer-Zadeh E., Bottros, M., Selvidge, J.A., Jacobsohn, E., Pully, D., Duntly, S., Becker, C., & Avidan, M.S. (2009).

Prevalence of undiagnosed obstructive sleep apnea among adult surgical patients in an academic medical center. *Sleep Med.* 10(7),753-8.

<https://doi.org/10.1016/j.sleep.2008.08.007>

Frost & Sullivan. (2016). Hidden health crisis costing America millions. AASM.

<https://j2vjt3dnbra3ps7ll1clb4q2-wpengine.netdna-ssl.com/wp-content/uploads/2017/10/sleep-apnea-economic-crisis.pdf>

Glenn, T. L., Mabry, J. E., Soccolich, S. A., & Hickman, J. S. (2020, April 6). Undiagnosed Obstructive Sleep Apnea in Commercial Motor Vehicle Drivers: Application of STOP-BANG. <https://vtechworks.lib.vt.edu/handle/10919/97533>.

Gupta, R.M., Parvizi, J., Hanssen, A.D., & Gay, P.C. (2001). Postoperative complications in patients with obstructive sleep apnea syndrome undergoing hip or knee replacement: A case-control study. *Mayo Clin Proc*, 76,897–905. <https://doi.org/10.4065/76.9.897>

Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing*, 14(3), 175-182.
[doi:10.1111/wvn.12223](https://doi.org/10.1111/wvn.12223)

Jelic, S., & Le Jemtel, T.H. (2008). Inflammation, oxidative stress, and the vascular endothelium <https://doi.org/10.1016/j.tcm.2008.11.008>

Johns, M.W. (2000). Sensitivity and specificity of the multiple sleep latency test (MSLT), the maintenance of wakefulness test and the Epworth sleepiness scale: Failure of the MSLT as a gold standard. *Journal of Sleep Research*, 9(1), 5-11.
<https://doi.org/10.1046/j.1365-2869.2000.00177.x>

- Kee, K., Dixon, J., Shaw, J., Vulikh, E., Schlaich, M., Kaye, D. M., Zimmet, P., & Naughton, M.T. (2018). Comparison of commonly used questionnaires to identify obstructive sleep apnea in a high-risk population. *Journal of Clinical Sleep Medicine*, 14(12), 2057-2064. <https://doi.org/10.5664/jcsm.7536>
- Kim, R. D., Kapur, V. K., Redline-Bruch, J., Rueschman, M., Auckley, D. H., Benca, R. M., Foldvary-Schafer, N. R., Iber, C., Zee, P. C., Rosen, C. L., Redline, S., & Ramsey, S. D. (2015). An Economic Evaluation of Home Versus Laboratory-Based Diagnosis of Obstructive Sleep Apnea. *Sleep*, 38(7), 1027–1037. <https://doi.org/10.5665/sleep.4804>
- Liao, P., Yegneswaran, B., Vairavanathan, S., Zilberman, P., & Chung, F. (2009). Postoperative complications in patients with obstructive sleep apnea: A retrospective matched cohort study. *Canadian Journal of Anesthesia/Journal Canadien Danesthésie*. 56(11), 819–828. <https://www.ncbi.nlm.nih.gov/pubmed/19774431>
- Moher D., Liberati A., Tetzlaff J., Altman DG., (2009). The PRISMA Group (2009) Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- Mysliwiec, V., Gill, J., Lee, H., Baxter, T., Pierce, R., Barr, T. L., ... Roth, B. J. (2013). Sleep Disorders in US Military Personnel. *Chest*, 144(2), 549–557. <https://doi.org/10.1378/chest.13-0088>
- Nagappa, M., Wong, J., Singh, M., Wong, D. T., & Chung, F. (2017). An update on the various practical applications of the STOP-bang questionnaire in anesthesia, surgery, and perioperative medicine. *Current Opinion in Anesthesiology*, 30(1), 118-125. [doi:10.1097/ACO.0000000000000426](https://doi.org/10.1097/ACO.0000000000000426)

Obstructive Sleep Apnea - Adults (2020, April 9th). Medline Plus.

<https://medlineplus.gov/ency/article/000811.htm>

Pataka, A., Daskalopoulou, E., Kalamaras, G., Fekete Passa, K., & Argyropoulou, P. (2014).

Evaluation of five different questionnaires for assessing sleep apnea syndrome in a sleep clinic. *Sleep Medicine*, 15(7), 776-781. doi:10.1016/j.sleep.2014.03.012

Penafiel, F.S., Poniachik, J.G., Lopez, A.C., Monasterio, J.U., & Patino, O.D. (2018). Evaluation

of sleep questionnaires of patients with obstructive sleep apnea syndrome. *Chilean Medical Journal*, 146(10). <http://dx.doi.org/10.4067/S0034-98872018001001123>

Pierre A., & Philippe C. (2010). Endocrine aspects of obstructive sleep apnea, *The Journal of*

Clinical Endocrinology & Metabolism. 95(2), 483–495.

<https://doi-org.usu01.idm.oclc.org/10.1210/jc.2009-1912>

Practice Guidelines for the Perioperative Management of Patients with Obstructive Sleep Apnea:

An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Obstructive Sleep Apnea. *Anesthesiology* 2014; 120:268–286 doi: <https://doi.org/10.1097/ALN.0000000000000053>

Punjabi, N.M., Shahar, E., Redline, S., Gottlieb, D.J., Givelber, R., & Resnick, H.E. (2004).

Sleep-disordered breathing, glucose intolerance, and insulin resistance: The sleep heart health study. *Am J Epidemiol*. 160, 521–530. <https://doi.org/10.1093/aje/kwh261>

Rogers, A. E., Stahlman, S., Hunt, D. J., Oh, G. T., & Clark, L. L. (2016). Obstructive sleep

apnea and associated attrition, active component, U.S. Armed Forces, January 2004-May 2016. *MMSR*, 23(10), 2–11.

<https://health.mil/Reference-Center/Reports/2016/01/01/Medical-Surveillance-Monthly-Report-Volume-23-Number-10>

Rosenthal, L.D. & Dolan, D.C. (2008). The epworth sleepiness scale in identifying obstructive sleep apnea. *The Journal of Nervous and Mental Disease*, 196(5), 429-431.
doi:10.1097/NMD.0b013e31816ff3bf

Vasu, T.S., Grewal, R., & Doghramji, K. (2012). Obstructive sleep apnea syndrome and perioperative complications: a systematic review of the literature. *Journal of Clinical Sleep Medicine*, 8(2), 199–207. <https://doi.org/10.5664/jcsm.1784>

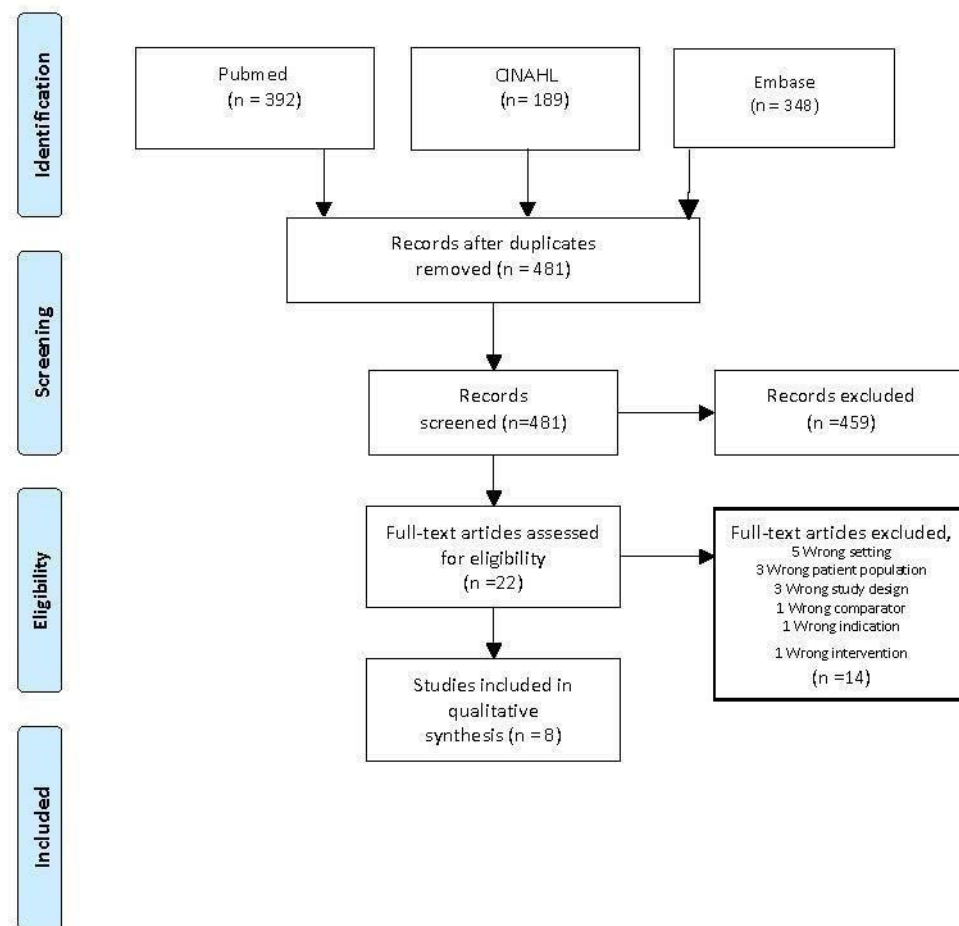
Wolk, R., Shamsuzzaman, A. S., & Somers, V. K. (2003). Obesity, sleep apnea, and hypertension. *Hypertension* (Dallas, Tex.: 1979), 42(6), 1067–1074.
<https://doi.org/10.1161/01.HYP.0000101686.98973.A3>

Appendix A

PRISMA



PRISMA 2009 Flow Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix B

Evidence Table

1st Author Name (Publication Yr)	Study Purpose/Aims	Research Questions/Hypotheses (IF different from/specifically described separately from study purpose & aims)	Study Design	Total Sample Size (How many initially, how many at final analysis?)	Sampling Plan	Independent Variables AND LEVEL OF MEASUREMENT	Dependent Variables AND LEVEL OF MEASUREMENT	Statistical Analyses - what tests were used for which research questions?	Results	Strengths (how promoted internal/external validity)	Weaknesses (biases; poorly controlled threats to internal/external validity)	LEVEL OF EVIDENCE - using JHNEBP tool (Strength and Quality)
Amra et al., 2018	Identify the best OSA screening questionnaire, and compare Berlin, STOP-BANG, and Epworth Sleepiness Scale.	None specified	Cross-sectional	400 adult patients suspected of OSA in Bamdad Respiratory Research Center	Patients were divided into high risk and low risk, then PSG was performed for all patients.	OSA questionnaires (Berlin, STOP-BANG, ESS): Ordinal and Nominal	The frequency of patients with OSA using PSG, No OSA, mild OSA, moderate OSA, and severe OSA: ORDINAL	SPSS version 17.0 for sensitivity, specificity, positive predictive values, negative predictive values, and likelihood ratios. The Spearman's correlation coefficient was used for the questionnaires.	Berlin had the highest sensitivity, but STOP-BANG had the highest specificity, area under the curve (AUC), and PPV for predicting OSA. The sensitivity of ESS was especially low.	1. Sample size. 2. Tests were two-tailed and statistically significant <i>P</i> value	1. Limited to Persian population. 2. Berlin and ESS questionnaires were administered last and accuracy of answers could be affected. 3. Comorbidities did not simulate a general population, few patients without OSA.	IIB
Bazemore et al., 2019	Implement STOP-BANG among Veteran patients	Will implementing a standardized screening tool among Veteran patients increase detection of patients at risk for OSA?	pre and post implementation	A chart review of 200 randomly selected patients pre and post implementation who met inclusion criteria	Patients scheduled for elective surgery with the exception of cataract surgery or currently hospitalized patients	STOP-BANG: ordinal and nominal	% of patients identified as having OSA: NOMINAL	Descriptive statistics	Thirty-one percent of patients had an established diagnosis of OSA. Compliance rates with preoperative STOP-Bang screening were 91.3%. Of patients screened preoperatively, 44% were at risk for OSA with a STOP-Bang score of 4 or greater.	High compliance rate (91.3%), buy-in from screening staff (NPs)	Manual chart review limited the number of patients that could be included in the sample. Another limitation was this was done at a single institution vs multiple VA sites	IIIA
Christensson, et al., 2018	Evaluate if STOP-Bang and Pulse oximetry can detect and exclude obstructive sleep apnea	Can STOP-BANG and oxygen desaturation index identify subjects with OSA?	Prospective, observational multicenter trial	460 beginning. 11 had missing STOP-BANG or AHI data; 449 final patients (n=449).	Adult patients (≥18 years of age) referred to a sleep clinic for evaluation of sleep apnea	STOP-BANG scores and comorbidities: ORDINAL	Patients identified as having OSA via home sleep study test: NOMINAL	Spearman correlation coefficient. Regression models to assess each variable of STOP-Bang. The Mantel-Haenszel test assessed trends in STOP-Bang and comorbid diseases related to AHI categories. The Spearman rank order correlation assessed for STOP-Bang score, AHI, and ODI.	STOP-Bang correlates well to OSA. A score of <6 has low specificity. STOP-BANG should be used first-line to exclude patients with low risk of sleep apnea, and to identify patients with high risk of moderate and severe sleep apnea (STOP-Bang score >5).	1. Large sample size. 2. Low attrition (2%) with a high compliance rate. 3. Conducted in 4 different sleep clinics	1. OSA prevalence is different in sleep clinics compared to the general population. 2. Because multiple sleep clinics were used, different portable diagnostic devices were used.	IIB

Chung et al., 2012	To evaluate the association between STOP-Bang scores and the probability of OSA.	Hypothesis: A high STOP-Bang score indicates a high probability of moderate/severe OSA.	Non-experimental; Descriptive; Correlational	Initially 6,369 screened for OSA using the STOP-Bang Questionnaire & invited for PSG; 746 patients were used for the final analysis	Adult patients, ASA I-IV, undergoing elective procedures, over a period of 4 yr; EXCLUSION: Patients unwilling/unable to give informed consent or expected to have abnormal EEG findings	Patients who scored 0, 1, or 2 were grouped as the reference: ORDINAL	An AHI ≤ 5 was classified as non-OSA and was used as the reference: NOMINAL	Descriptive statistics; median and interquartile range; logistic regression, and plotted. To assess the performance of the STOP-Bang questionnaire, multiple 2x2 contingency tables were used to calculate sensitivity, specificity, positive predictive values (PPVs), and negative predictive values (NPVs) for each score.	The predicted probabilities for moderate/severe OSA increased from 0.36 to 0.60 as the STOP-Bang score increased from 3 to 7 and 8. The probabilities of having OSA were greater as the STOP-Bang score increased.	1) Sample size 746 2) Similar patient characteristics 3) Tests are repeatable and are relevant as true screenings and diagnostics.	1) False-positive rates were implied from the sensitivity (37%) 2) The sample was gathered by "approach" and did not mention randomization suggesting bias. 3) The only blinded participants mentioned to the study were sleep study technicians. 4) Some attrition.	IIIB
Kee, et al., 2018	Compare three commonly used screening tools for OSA	Determine the screening characteristics of the Berlin, STOP-BANG, and OSA50 questionnaires.	Prospective, cross-sectional, descriptive study	812 participants were enrolled. 758 recorded a valid sleep study. 54 patients were excluded. n=704	Assessed for specific risk factors for OSA. This included demographics; smoking and alcohol consumption; medical history; anthropometric assessment including height, weight, waist, hip, and neck circumferences; and blood pressure.	OSA screening tools (Berlin Questionnaire, OSA50, STOP-BANG, Study questionnaire) in comparison to the home sleep study: NOMINAL and ORDINAL	The frequency of patients in a cardiovascular clinic with OSA as evidenced by home sleep study via Apnea-Link Plus: NOMINAL	Differences between those with and without REI >15 events/h were examined using the chi-square test or independent sample t test. Cox and Snell R2 was calculated as a measure of overall efficacy for each screening test. Variables associated with an REI ≥ 15 events/h with a value of $P > .1$ were entered into a binary logistic regression analysis to identify variables independently contributing to variance of REI ≥ 15 events/h.	A total of 38% of patients had a positive test. The respective sensitivities and specificities of the screening questionnaires STOP-BANG ≥ 3 (95% and 19%), STOP-BANG ≥ 5 (60% and 69%), Berlin (75% and 38%), and OSA50 (88% and 21%). All patients with a STOP-BANG < 3 had an REI < 30 events/h.	1. Large sample size. 2. Participants were assessed for general and disease-specific risk factors 3. All home sleep study has sensitivity and specificity comparable to polysomnography. 4. Odds ratios were used	1. Not representative of general population. 2. The questionnaires do not cover all symptoms of OSA. 3. AnpealLink Plus device was used as opposed to the standard in laboratory PSG.	IIIC
Nagappa et al., 2017	Determine the association of postoperative complications in patients screened as HR-OSA versus low-risk OSA (LR-OSA)	N/A	meta analysis and systematic review	10 cohort studies: 23,609 patients (HR-OSA, 7877; LR-OSA, 15,732)	EMBASE, Medline (via PubMed), Cochrane Central Register of Controlled Trials, Medline In-process, Cochrane Database of Systematic Reviews, and CINAHL. MESH key words: "obstructive sleep apnea," "STOP-Bang questionnaire," "perioperative complications."	Patients screened as HR-OSA and LR-OSA: nominal	postoperative complications and hospital length of stay: interval	Bayesian random-effects models via Monte Carlo Markov Chain simulations with noninformative prior distributions and Gibbs sampling for the mean and variance parameters with 95% credible intervals (CrI) on all outcomes. Heterogeneity was tested and quantified with the τ^2 and I2 statistics, respectively. A random-effects analysis was used to estimate the OR	postoperative complications were 3.9-fold higher in the HR-OSA vs LR-OSA. Hospital LOS was 2.1 days longer in HR-OSA vs LR-OSA.	1) large sample of accumulated patients with various surgical procedures 2) Detail data collection and methods	1) various surgical risk factors were not considered 2) Included clinically and methodologically diverse studies 3) some of the important comorbidities like CAD, IHD, and CCF were not reported by many of the studies	IIIA

Sankar et al., 2018	Evaluate the validity of STOP-BANG scores assigned before operation	Is STOP-BANG associated with an increased risk of 30-day mortality, cardiac complications, or length-of-stay?	retrospective cohort study	The cohort comprised 26,068 patients	(STROBE) recommendations for the design and reporting of observational studies	STOP-BANG risk stratum: ORDINAL	30-day mortality, cardiac complications, and length-of-stay. ORDINAL and NOMINAL	two-tailed P-value <0.05 was used to define statistical significance; descriptive statistics; histogram plots and the Kolmogorov-Smirnov test of normality; Wilcoxon Rank-Sum test; χ^2 test; univariate statistics	The correlations of STOP-BANG with ASA-PS (Spearman $\rho=0.28$), Revised Cardiac Risk Index ($\rho=0.24$), and Charlson Comorbidity Index ($\rho=0.10$) were weak, albeit statistically significant ($P<0.001$). After risk-adjustment, STOP-BANG risk strata were not associated with 30-day mortality, cardiac complications, or length-of-stay.	Large population sample; multiple statistical tests	Comparisons were mostly to cardiac comorbidities and not others (i.e. pulmonary)	IIIA
Vasu, et al., 2012	Determine whether preoperative HR-STOP-BANG scores correlated with a higher rate of complications of OSA	None specified	Historical cohort study	135	questionnaire for all elective surgical patients	STOP-BANG questionnaire: nominal	Risk level of OSA: ordinal	multivariate analysis. P-value was used to show risk of OSA and postoperative complications	56 patients (41.5%) had high risk scores for OSA. Patients at high risk had a higher rate of postoperative complications compared with patients at low risk (19.6% vs 1.3%; $P<.001$).	1) Adequate sample size of 135. 2) STOP-BANG questionnaire easy to reproduce.	1) Sampling data was not explained (i.e. were patients approached randomly) 2) Exclusion criteria not included 3) "post operative" complications were not explained so it's difficult to reproduce this study 4) limitations were not discussed 5) sample size was not identified as "initial" and "final"; so, there could have been attrition.	IIIB

Appendix C

*Business Case Analysis***BUSINESS CASE with VALUE BASED CARE ASSESSMENT****Proposed Title for Project/Initiative/Opportunity to Improve**

Implement STOP-BANG questionnaire in the preoperative environment and provide useful preoperative information related to patients' risk for OSA to anesthesia providers.

Opportunity Statement *(Description of proposed project/initiative/opportunity to improve)*

There's an opportunity to increase patient safety and reduce PACU length of stay by implementing a validated STOP-BANG screening tool.

Business Opportunity/Objectives *(Prioritize listing – macro and micro objectives)***Macro objectives**

1. Identify undiagnosed obstructive sleep apnea (OSA).
2. Cost savings for DHA

Micro objectives

1. STOP-BANG questionnaire education to preop nurses, techs and anesthesia providers to identify OSA patients
2. Questionnaire for staff members in order to track providers perceptions and usage
3. Metrics tracking Cost savings associated with decreased OR time, time to emergence from anesthesia, and PACU length of stay.

Potential Impact of the Initiative/Project *(Identify outcome metrics & benchmarks/and how objectives align with Quadruple Aim, Value Based Care, and HRO goals)*

The impact of using the STOP-BANG questionnaire would promote patient safety by decreasing the amount of respiratory depressant medications received in the perioperative environment, result in better provider awareness by identifying OSA risk, and decrease costs through decreased length of stay in PACU. The metrics would be the number of patients identified to be at high risk for OSA after using STOP-BANG, the providers' perceptions of using the screening tool and what changes—if any—were made to their anesthetic plan. These metrics align with the quadruple aim of improving pt experiences, improving the health of the population, lowering cost and having better outcomes.

Alternatives (courses of action) chosen for Analysis

1. Implement different OSA screening tools (Epworth Sleepiness Scale, Berlin Questionnaire).
2. Perform diagnostic sleep study on patients prior to surgery.
3. “*Status Quo*”: Continue to not perform any preoperative OSA screening.
4. Implement STOP-BANG for the identification of OSA positive patients

Analysis of Alternatives	
Alternative 1:	Implement different OSA screening tools (Epworth Sleepiness Scale, Berlin Questionnaire)
Pros	Cons
- Evidence shows multiple screening tools can predict a patient's risk of having undiagnosed OSA - Providing variable screenings allows for more levels of diversity to our patients	While researchers have validated several screening tools, the STOP-BANG questionnaire often appears as a superior screening tool for OSA (Amra et al., 2018; Kee et al., 2018; Nagappa et al., 2017; Penafiel et al., 2018).
Alternative 2:	Perform diagnostic sleep study of patients prior to surgery
Pros	Cons
Definitive diagnosis for OSA	- More costs: Per subject, you could expect a laboratory cost of \$1,840 (Kim et. al, 2015) - Longer time to complete than screening - Sleep studies would not be given to every patient preoperatively
Alternative 3:	"Status Quo": Continue to not perform any preoperative OSA screening.
Pros	Cons
- No costs would be incurred - Easy to implement - No need for provider buy-in	- Harmful anesthetics given to likely OSA patients - Longer stay in post anesthesia recovery (PACU) - More money spent on PACU time
Assumptions	
- MHS Genesis will add STOP-BANG to the electronic preoperative assessment. - Staff nurses and anesthesia providers will implement the screening. - Anesthesia providers will participate in a post-implementation survey. - Participating patients and staff will be easy to track. - An adequate number of patients will be screened. - Further data collection needed to see if PACU stays and costs were changed. - STOP-BANG is the current best practice.	
Recommendation and Rationale	
Recommendation	
Our recommendation is to use the STOP-BANG questionnaire vs. an alternative screening tool, as STOP-BANG is superior in predicting OSA.	
Rationale	

As noted in the above pros and cons section, when compared to other alternatives, this questionnaire is inexpensive and easy to implement with high rates of success noninvasively predicting patients with OSA, and doing so without harm to the patient.

Value Based Care - Investment Required by the Organization and the Associated "VALUE" or \$ GAINED. *Below represents two ways to present this information. Depending on the initiative, you may need to alter this outline. Please adjust as appropriate and if need be ... do not hesitate to create this portion on a separate document and then attach to this assignment.*

Value = Quality + Service

Cost

I. Quality projected based on:

<i>afety</i>	OSA increases the risk for perioperative complications by 20% (Gupta et al., 2001) and approximately 80% of patients undergoing surgery are unaware they have OSA (Finkel et al., 2009). Anesthesia providers who suspect a patient has OSA can then take necessary precautions to decrease perioperative risks.
<i>Financial Benefit</i>	Avoid additional PACU costs: The American Society of Anesthesiologists (ASA) suggest patients should stay in recovery for an extended period after the last episode (de-saturation, re-intubation, hypoxia, etc.). Eliminating these complications reduces PACU time at a cost of \$4 - \$8 per minute. Avoid costly ICU admissions: Residual anesthetics in OSA patients may contribute to the inability to extubate these patients following surgery. This results in an ICU stay averaging \$2,464 per day. Reducing complications: OSA patients are 2 - 3 times more likely to require re-intubation due to airway obstruction, which frequently results in an ICU stay or unplanned hospital admission. Avoid additional OR costs: OSA patients with residual anesthetic are slow to arouse and have

		extended emergence times. The cost for extra time in the OR per patient ranges from \$18 - \$40 per minute. Reducing emergence time also leads to more predictable scheduling and more productive use of the OR and anesthesia personnel (Anecare, n.d.).
	<i>Operational Readiness Benefit</i>	Sedation Readiness: Nagappa found that “using the STOP-BANG questionnaire may lead to improved perioperative management of patients who may have unrecognized OSA during [...] sedation related procedures” (Nagappa et al., 2017). Intubation Readiness: Recognizing OSA patients can prepare anesthesia providers to address intubation complications resulting from high-risk OSA (Nagappa et al., 2017). Providers can prepare ahead of time with the appropriate strategies and tools.
	<i>Total</i>	<i>Time dependent: \$4 - \$40/min or \$2,464/day</i>

II. Service projected based on:

<i>Environmental and Social Impact/Benefit</i>	OSA identification for high-risk jobs: Pre-operative STOP-BANG questionnaires can identify OSA patients that could have otherwise been unaware of their condition. This is especially of social and environmental benefit for patients that work in high-risk jobs that require them to stay alert (Glenn et al., 2020).
<i>Economic Impact/Benefit</i>	Impact on Productivity: Untreated OSA led to a loss of productivity in the US of approx \$86.9 billion in 2015 (Frost & Sullivan, 2016). Frost & Sullivan found that work absences declined by 1.8 days per year and productivity on the job increased by about 17% for people who treated their OSA (Frost & Sullivan, 2016).

<i>Patient Satisfaction/Benefit</i>	Minimum ICU and Hospital stays for the Patient: Patients can benefit greatly from the STOP-BANG questionnaire. Being identified as an OSA risk patient early in their perioperative care can minimize potential serious and permanent complications, as well as lengthier ICU and recovery unit stays. Reduced Hospital and Insurance Bills: Being identified with OSA early in their perioperative care can benefit the patient by minimizing hospital costs from lengthier stays in the ICU and recovery units. Early Detection and Treatment of OSA: “Effective OSA screening in a preoperative clinic, followed by the initiation of CPAP treatment, may yield long-term health benefits” (Chung et al., 2016).
<i>Provider Satisfaction/Benefit</i>	Simplicity of use: When compared with other tools, the STOP-BANG questionnaire is faster (1-2 mins) and easier to use, and has high sensitivity in identifying high-risk OSA patients, making it very likely to be adopted and used by the provider (Chung et al., 2016). Preventing Unexpected Perioperative Complications: Studies confirm that “untreated OSA was independently associated with more cardiopulmonary complications, particularly unplanned re-intubations” (Chung et al., 2016). Anesthesia providers who are prepared have less surprises intraoperatively, which means there is less stress, which allows the management of the patient to go smoother. Less stress leads to decreased risk in making medical errors. Postoperatively, the provider is comfortable with the outcome. PACU visits are

	significantly decreased when OSA is identified and properly managed preoperatively.
Total	No monetary value

III. Cost projected based on:

<i>Staff Salary</i>	STOP-BANG Cost - According to Salary.com, an anesthesiologist in the local zip code makes an average \$220/hr. The STOP-BANG questionnaire consists of eight yes/no questions, and takes 1-2 minutes to administer. DGMC is currently averaging 8 OR cases per day. This results in 8-16 minutes of time spent by the anesthesia providers for the entire OR. 16 minutes x \$224/hr = \$58. The STOP-BANG questionnaire would cost \$29 - \$58/day in salary to administer if done by an anesthesiologist..
Total	\$29 - \$58 per day utilizing anesthesiologist *This calculation is based on maximum costs utilizing anesthesiologist. If CRNAs are incorporated, the cost would be lower.

IV. PROJECTED VALUE :

Recaptured Time	By appropriately treating OSA in the anesthesia arena, we can recapture minutes in the OR, ICU, and PACU. Research is limited on specific times that can be recaptured, but our resources find the following savings: PACU - \$4 - \$8/min OR - \$18-\$40/min ICU - \$2,464/day (Anecare, n.d.)
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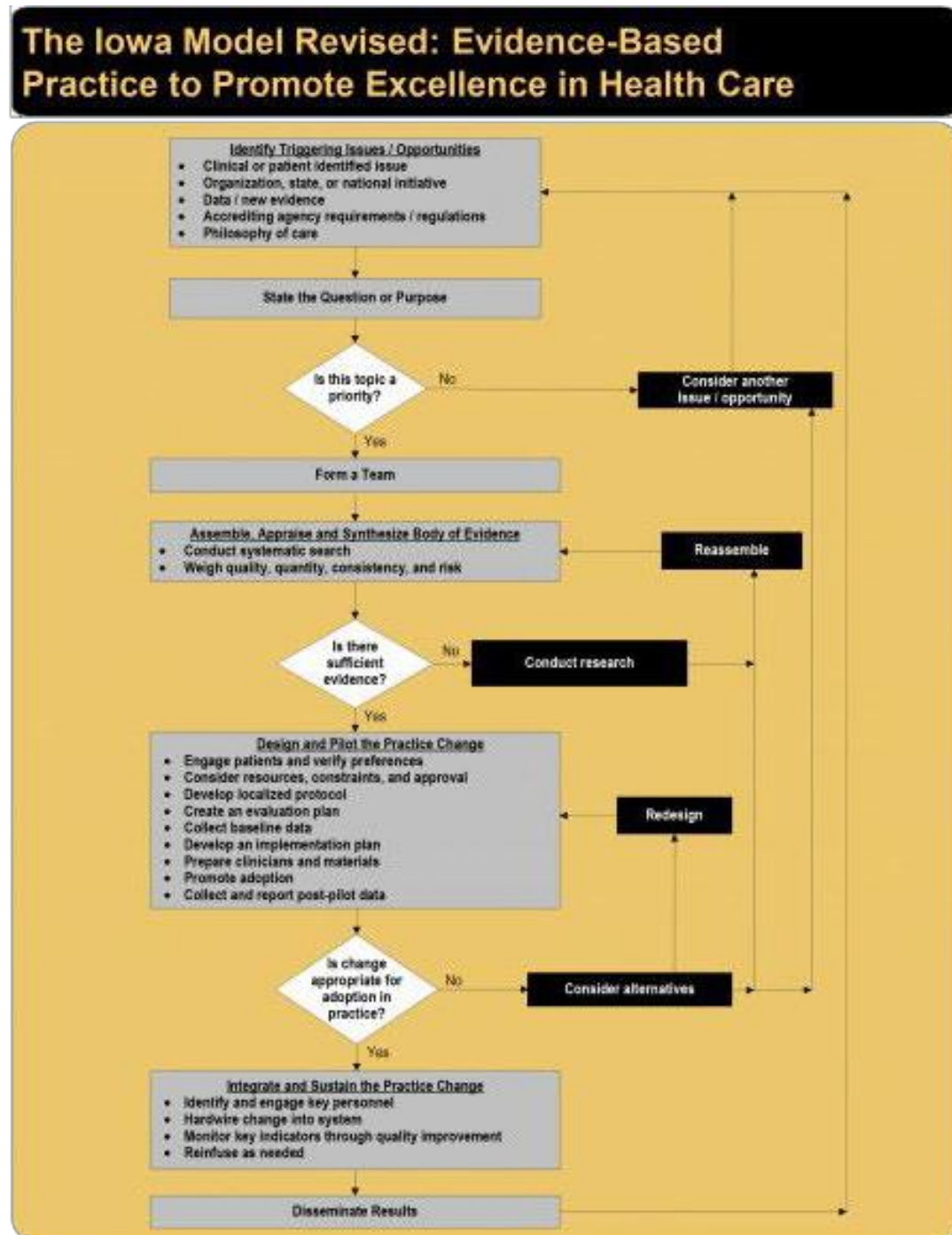
Risks and Mitigation Plan			
Risks		Plan	
1. Non-compliance		1. Additional paperwork given to staff may not be completed. DGMC is transitioning to a new electronic record (MHSGenesis). We will approach facilities systems to see if adding STOP-BANG to the pre-operative assessment is possible. Pt refusal to participate is also possible. However, considering the brevity of the STOP-BANG questionnaire and it being noninvasive questions, participation is expected to be high.	
2. Incompetence		2. Staff performing the pre-operative evaluation may not be familiar with the STOP-BANG. Easy to follow and specific instructions will accompany the screening tool to ensure competent compliance.	
3. Bias		3. Anesthesia Provider bias may skew their response to the post-operative survey questionnaire.	
Implementation Plan			
Phase 1:	Gather data through research journals		
Milestone Description:		We must determine what screening tool is most specific and sensitive to predicting OSA. Also, the tool must already be validated in clinical settings. We searched through PubMed, Cinhal, Ovid provides peer-reviewed research to gather the data. Additionally, we determined the current pre-surgical clinical site (DGMC) does not use an OSA screener.	
Deliverables		Due Date	Accountable Person
A synthesis of the problem (OSA) and the solution based on literature review.		This was completed April 2020	Maj Anderson Maj Swanson Capt Shawver
Resources Needed			
Access to journal articles, computers, librarians, educators. Information needed from the pre-operative setting to gather baseline data.			
Expected Level of Benefit			
This is imperative to find, analyze, and use a validated screening tool such as STOP-BANG. Without this literature review phase, the project would not be evidence-based.			
Phase 2:	Disseminate		

Milestone Description:	We will need to add STOP-BANG questionnaire to the pre-operative assessment. We will need to create a questionnaire polling the perceptions and utilization from anesthesia providers.		
Deliverables		Due Dates	Accountable Person
- STOP-BANG added to MHSGenesis or paper copy of STOP-BANG implemented during pre-op assessment		1 April 2021	Maj Anderson Maj Swanson Capt Shawver MHS Genesis SME
Resources Needed			
Ability to alter MHSGenesis. If unable to add STOP-BANG questionnaire to MHSGenesis, our backup plan is to provide a paper questionnaire to be added to the chart.			
Expected Level of Benefit			
Rolling out the STOP-BANG questionnaire will give anesthesia providers added information about their patient prior to procedures.			
Phase 3:	Implementation and Education		
Milestone Description:	STOP-BANG to be accomplished during pre-operative assessment in MHSGenesis, and post-implementation survey to be given to an anesthesia provider.		
Deliverables		Due Dates	Accountable Person
- Initial training and education session - Post-implementation survey		March staff meeting 15 Nov 2020	Maj Anderson Maj Swanson Capt Shawber
Resources Needed			
Buy-in from DGMC staff to administer STOP-BANG questionnaire and complete the end of study survey			
Expected Level of Benefit			
Educating the providers and OR/pre-OP nursing staff during the planned monthly staff meeting will assure that everyone involved is on the same page with the STOP-BANG implementation. It will be highlighted what the STOP-BANG is, what questions to ask and the recommendations on how to proceed based on the findings. Following the education and training session, the full Implementation of STOP-BANG questionnaire and surveying anesthesia providers post-operatively will provide pertinent data and statistics that can be further analyzed to fit the program.			
Phase 4:	Track		
Milestone Description:	Compile data and statistics acquired from STOP-BANG questionnaire and post-op survey.		
Deliverables		Due Dates	Accountable Person

A condensed, compiled catalog of information obtained from STOP-BANG questionnaire and post-implementation survey.		30April2021	Maj Anderson Maj Swanson Capt Shawver
Resources Needed			
Excel			
Expected Level of Benefit			
Gathered data will give us information to evaluate			
Phase 5:	Evaluation		
Milestone Description:		Collected data will be evaluated for patterns and results	
Deliverables		Due Dates	Accountable Person
Status report to leadership		31May2021	Maj Anderson
Completed EBP project			Maj Swanson Capt Shawver
Resources Needed			
MTF support staff			
Statistician			
Expected Level of Benefit			
We expect to show that implementation of STOP-BANG will identify more patients with suspected OSA, and positive pre-op STOP-BANG will either alter an anesthesia provider’s anesthetic plan, or it will have no effect on the anesthesia provider’s anesthetic plan. If the post-implementation survey completed by anesthesia providers indicates they did refer to ASA clinical recommendations, or data shows positive reception to the STOP-BANG screening, we would advocate for STOP-BANG to be implemented into MHSGenesis across the Air Force enterprise. Further research recommendations would be to study the length of stay in the PACU and time to emergence for patients with positive STOP-BANG questionnaire.			

NOTE: Modified from Harvard Business Review Press. (2011). *Pocket mentor: Developing a business case*. Boston: Author (pp 82-85).

Appendix D

Iowa Model of Evidence-Based Practice

(Iowa Model Collaborative, 2017)

Appendix E

Timeline

Project Year 2 (2020)												
Activity/Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
USUHS VPR Submission and Approval												X
Site IRB Submission and Approval												X
Project Planning												
Project Implementation/Data Collection												
Data Analysis												
Dissemination												

Project Year 1 (2021)												
Activity/Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
USUHS VPR Submission and Approval	X											
Site IRB Submission and Approval	X											
Project Planning		X	X									
-Task 1: Identification of Barriers												
-Task 2: Stakeholder engagement meetings												
-Task 3: Educate staff on tool/recommendations												
Project Implementation/Data Collection				X								
-Task 1: Implement STOP-BANG questionnaire												
Data Analysis					X	X						
-Task 1: Post-procedure Likert scale survey												
-Task 2: Statistical analysis												
Dissemination							X	X	X	X	X	X
-Task 1: HIPAA compliance												
-Task 2: Write-up of findings												

Project Year 2 (2022)												
Activity/Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Project Implementation/Data Collection												
Data Analysis												
Dissemination	X	X	X	X	X							

Appendix F

STOP-BANG Screening Tool

STOP	Each 'yes' = 1	
Do you SNORE loudly (louder than talking or loud enough to be heard through closed doors)?	Yes	No
Do you often feel TIRED , fatigued, or sleepy during daytime?	Yes	No
Has anyone OBSERVED you stop breathing during your sleep?	Yes	No
Do you have or are you being treated for high blood PRESSURE ?	Yes	No

BANG		
BMI more than 35kg/m ² ?	Yes	No
Age over 50 years old?	Yes	No
Neck circumference >16in (40cm)?	Yes	No
Gender : Are you male?	Yes	No

TOTAL SCORE	____/8	
-------------	--------	--

Low risk of OSA: 0-2

Intermediate risk of OSA: 3-4

High risk of OSA: 5-8

Does this patient have OSA on their H&P? Y/N

ASA Practice Guidelines for the Perioperative Management of Patients with Obstructive Sleep Apnea

Recommendations to be considered for STOP-BANG score 3-8.>3 (Intermediate), suggested for STOP-BANG score >5 (High Risk)

- For superficial procedures, consider **local anesthetic and nerve blocks** with or without moderate sedation
- For patients previously treated w/ **CPAP** or an **oral appliance**, consider using these modalities during sedation and postoperatively
- Unless there is a medical or surgical contraindication, patient at increased perioperative risk from OSA should be **extubated while awake**
- **Full reversal of neuromuscular block** should be verified before extubation
- When possible, extubation and recovery should be carried out in the **lateral, semi-upright, or other non-supine position**
- **Regional analgesic techniques** should be considered to reduce or eliminate the requirement for systemic opioids
- If possible, **reduce or omit** dosages of **benzodiazepines and opioids**
- To reduce opioid requirements, **nonsteroidal anti-inflammatory agents** should be considered if appropriate

(Practice Guidelines, 2014)

Appendix G

Data Analysis Table

		Variable Name	Variable Description and type of measure	Data Source	Possible Range of Values	Level of Measurement	Time Frame for Collection	Statistical Test	Decision Rule
Population	IV (descriptive variable)	STOP-BANG Screening Tool	<u>Type:</u> Process measure <u>Description:</u> A mixed ordinal and nominal data collection tool consisting of 8 questions which produce ordinal scale	Questionnaire	0-2: Low Risk (1) 3-5: Moderate Risk (2) 6-8: High Risk (3)	Ordinal	15 days	None	N/A
	DV (outcome variable)	OSA risk categorized	pts screened to be at low, intermediate, and high risk for OSA;	Questionnaire	0-100%	Interval	15 days	Descriptive Statistics	Based on literature, up to 80% of patients may be unaware they have OSA
		OSA risk categorized: MIL	military pts screened	Questionnaire	0-100%	Interval	15 Days	Descriptive Statistics	Based on literature, appr. 60% of military have OSA
		Mean, median	Mean, median scores of pts with OSA and without OSA diagnosis	Questionnaire	0-8	Ordinal	15 Days	Descriptive Statistics	N/A
		% of risk in categories	% of patients with low, moderate, high risk	Questionnaire	0-100%	Interval	15 Days	Descriptive Statistics	N/A

Appendix H



Appendix C: Daniel K. Inouye Graduate School of Nursing
DNP Project Team Mentor (Committee Membership) Agreement Form

DOCTOR OF NURSING PRACTICE PROJECT
DNP Project Clinical Question and Team Mentor (Committee Membership) Agreement Form

Graduation Year: 2022 Phase 2 Site(s) Name: DGMCI

Name(s) of DNP Project Student Team:

1. Jeremy Swanson	AGCNS ☐	FNP ☐	PMHNP ☐	RNA ☒	WHNP ☐
2. Mark Anderson	AGCNS ☐	FNP ☐	PMHNP ☐	RNA ☒	WHNP ☐
3. Christopher Shawver	AGCNS ☐	FNP ☐	PMHNP ☐	RNA ☒	WHNP ☐
4. _____	AGCNS ☐	FNP ☐	PMHNP ☐	RNA ☐	WHNP ☐
5. _____	AGCNS ☐	FNP ☐	PMHNP ☐	RNA ☐	WHNP ☐
6. _____	AGCNS ☐	FNP ☐	PMHNP ☐	RNA ☐	WHNP ☐

The tentative title of the DNP Project Proposal for this student group is:

Implementing STOP-BANG for Peri-operative Management of Obstructive Sleep Apnea

Committee Approved DNP Project Clinical Question:

In adult surgical patients, does utilizing the STOP-BANG screening tool for the detection of OSA, impact providers' beliefs, knowledge, and practice of OSA peri-operative management?

Names of DNP Project Team Mentors (type the name and obtain digital signatures):

I agree to serve as a member of the DNP Project Team (Team Mentors) for the above DNP Student Project Team. As a Project Team Mentor, I agree to the duties and responsibilities outlined within the DNP Project Manual which include but are not limited to the provision of consultation and guidance supporting the entire DNP project journey and to ensure the DNP project is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation.

NOTE: You may have 3-4 DNP Team Mentors [committee members including your DNP Senior Mentor (Chair)]. The Phase II Site Director may also be a member of the group, as well as other USUHS faculty or others who may serve as content experts. All non-USUHS faculty selected as a Team Mentor must be approved by the DNP Project Director.

Senior Mentor (Chair):	Maj Julie Petsche	Signature:	PETSCHJULIE LENORE.114749 9333	Digitally signed by PETSCHJULIELENORE.11 47499333 Date: 2020.12.11 08:41:53 +0800	Date:	
Team Mentor (Member):	Maj Jeremy Swanson	Signature:	SWANSONJEREM Y.S.1387020760	Digitally signed by SWANSONJEREM.Y.S.1387020 760 Date: 2020.12.10 13:42:15 +0800	Date:	
Team Mentor (Member):	Maj Mark Anderson	Signature:	ANDERSON.MA RK.O.14069031	Digitally signed by ANDERSON.MARK.O.140 6903164 Date: 2020.12.10 13:29:26 +0800	Date:	12/10/20
Team Mentor (Member):	Capt Chris Shawver	Signature:	64 SHAWVER.CHRISTO PHER.D.1052222709	Digitally signed by SHAWVER.CHRISTOPHER.D.1052 222709 Date: 2020.12.10 14:17:33 +0800	Date:	

Appendix I




Completion Date 30-Mar-2020
 Expiration Date 30-Mar-2023
 Record ID 36058214

This is to certify that:

Christopher Shawver

Has completed the following CITI Program course:

OUSD P&R Human Research
 Biomedical Investigators and Research Study Team
 1 - Basic Course

(Curriculum Group)
 (Course Learner Group)
 (Stage)

Not valid for renewal of certification through CME. Do not use for TransCelerate mutual recognition (see Completion Report).

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)



Verify at www.citiprogram.org/verify/?wef4d1ad4-73d7-4844-8b97-3ead54ba06c4-36058214




Completion Date 23-Mar-2020
 Expiration Date 23-Mar-2023
 Record ID 36037485

 OUSD P&R Human Research
 Biomed Research Coordinators, Clinical Coordinators, Study Coordinators & Research Administrators
 1 - Basic Course

 (Curriculum Group)
 (Course Learner Group)
 (Stage)

Not valid for renewal of certification through CME.




Completion Date 17-Mar-2020
 Expiration Date 17-Mar-2023
 Record ID 35971875

 OUSD P&R Human Research
 Biomedical Investigators and Research Study Team
 1 - Basic Course

 (Curriculum Group)
 (Course Learner Group)
 (Stage)

Not valid for renewal of certification through CME.

Appendix J



Office of Research
4301 Jones Bridge Road
Bethesda, Maryland 20814
Phone: (301) 295-3303; Fax: (301) 295-6771

NOTICE OF PROJECT APPROVAL

Change Number: Original

VPR Site Number: GSN-61-11757
Principal Investigator: Shawver, Christopher
Department: Graduate School of Nursing
Project Type: Student
Project Title: Implementing STOP-BANG for Perioperative Management of Obstructive Sleep Apnea
Project Period: 2/16/2021 to 2/16/2022

Assurance and Progress Report Information:

<u>Name</u>	<u>Sup</u>	<u>Approval Type</u>	<u>Status</u>	<u>Approved On</u>	<u>Forms Received</u>
Progress Report	0			To be Submitted	N/A

Remarks:

This Notice Of Project Approval has been reviewed and approved. Please remember that you must submit a final Progress Report (Form 3210) upon completion of this project.

Questions regarding this approval should be directed to the following person in the Office of Research:
Sharon McIver, (301) 295-9814.

RANDOLPH.TOY Digitally signed by
A.V.1242107698 RANDOLPH.TOYA.V.1242107698
 Date: 2021.02.22 13:33:41 -05'00'

Mark G. Kortepeter, MD, MPH
 FACP, FIDSA, FASTMH
 COL (R) MC US Army
 Vice President for Research
 Uniformed Services University of the Health Sciences

cc: File
 Dr. Kennett Radford
 Larura Taylor

Appendix K

DEPARTMENT OF THE AIR FORCE
60TH MEDICAL GROUP (AMC)

27 May 2021

FINAL IRB DETERMINATION – NON-HUMAN RESEARCH**Determination Date: 27 May 2021****PROJECT LEAD:** Capt Chris Shawver, USAF, NC
Maj Mark Anderson, USAF, NC
Maj Jeremy Swanson, USAF, NC**IRB Reference Number:** FDG20210017P**PROJECT TITLE:** "Phased implementation of STOP-BANG for perioperative management of obstructive sleep apnea."**1. You may begin your project, as you would any other clinical or operational activity, with the approval and sponsorship of your leadership.**

Your project was determined on 1 March 2021 to be considered **not human research** as defined by DoD regulation 32 CFR 219 and FDA regulation 21 CFR 56. Continued IRB oversight for this activity is not required. The proposed project does not include non-routine intervention or interaction with a living individual for the primary purpose of obtaining data regarding the effect of the intervention or interaction, nor do the researchers obtain private, identifiable information about living individuals.

Since the IRB does not have regulatory oversight for your study, it is the investigator's responsibility to validate the study's scientific merit and research design and to ensure the conduct of the study is upheld by the highest ethical standards, as required by the Wing. Should you require assistance in reviewing the scientific merit and research design of your study, please contact the Protocol Office. Protection of subjects' rights safety and welfare and responsibility for protecting PHI/PII and research data now fall on the investigator and their commander.

In accord with DoDI 6000.08 any intramural funding of this study as research or as a clinical investigation may continue to be received or sought regardless of this IRB determination.

2. Your project has received a one-time research determination. If the goals and/or activities of the project change during the course of the project, or if new activities are proposed that would constitute human subjects research, re-contact the Protocol Office, so that a regulatory expert may determine whether or not the revised plan involves human subject research activities.**3. This project does not require an institutional update submission to the 60 MDGEDO. Your project will be administratively removed after 3 years from the original**

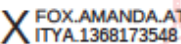
Appendix K (cont)

determination date, without any further action. Contact the 60 MDG Protocol Office if you wish to extend this determination following the 3 years.

4. Contact the 60 MDG Protocol Office regarding any publications/ presentations resulting from your study.

5. IAW DASD (HRPO) Operating Instructions 2019.10.03 this research will be documented and made available to the Defense Health Agency Office of Research Protections (DHA ORP) upon request. If DHA ORP disagrees with the Designated Reviewer's determination, the research study may be temporarily suspended until resolution.

6. If you have any questions, please contact the 60 MDG Protocol Office at (707) 423-7268 or by email at jeffrey.d.copple.civ@mail.mil. Please include your project title and reference number in all correspondence or inquiries.

 FOX.AMANDA.A
ITYA.1368173548
Digitally signed by
FOX.AMANDA.A
ITYA.1368173548
Date: 2021.06.01 12:00:02 -07'00'

AMANDA A. FOX, Capt, USAF, NP-C
60 MDG Exemption Determination Official

Appendix L



Appendix G: Daniel K. Inouye Graduate School of Nursing
DNP Project Completion Verification Form

DOCTOR OF NURSING PRACTICE PROJECT
Completion Verification Form

The DNP Project titled: Implementing STOP-BANG for Perioperative Screening of Obstructive Sleep Apnea

was completed at David Grant Medical Center by the following student(s):

(Student Name)

(Digital Signature)

Mark Anderson

ANDERSON.MAR
K.O.1406803164
Digitally signed by
ANDERSON.MARK.O.1406803164
Date: 2022.04.04 20:20:04 -0700

Jeremy Swanson

SWANSON.JEREM
Y.S.1387020760
Digitally signed by
SWANSON.JEREMY.S.1387020760
Date: 2022.04.05 15:22:26 -0700

Chris Shawver

SHAWVER.CHRISTO
PHER.D.1052222709
Digitally signed by
SHAWVER.CHRISTOPHER.D.10
52222709
Date: 2022.04.04 17:02:37 -0700

The DNP Practice Project Team verifies that the following components of the DNP project, accomplished by the above students, is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation:

- Presentation of DNP project to the leadership/stakeholders at the Phase II Site,
- Abstract/Impact Statement (*Appendix F*), and
- DNP Project written report (*Appendix E*).

Verified by:

(type name)

(Digital Signature)

Senior Mentor

Team Mentor

Team Mentor

Team Mentor
& Phase II Site Director

PETSCH.JULIE.LENORE.1147
499333
Digitally signed by
PETSCH.JULIE.LENORE.1147499333
Date: 2022.04.06 12:32:42 -07'00'

For RNA Students only - add the following additional signature for final verification of project completion:

LCDR Kenneth Barber

RNA Project Director *(type name)*

BARBER.KENNETH.D
OUGLAS.1177263644
Digitally signed by
BARBER.KENNETH.D.OUGLAS.11772636
44
Date: 2022.04.18 09:58:57 -04'00'

(Digital Signature)

Appendix M

Approvals

STOP-BANG FOR PERIOPERATIVE RISK ASSESSMENT OF OSA merged.pdf

1

IMPLEMENTING STOP-BANG FOR OSA

Implementing STOP-BANG for Pre-operative Screening of Obstructive Sleep Apnea

Mark O. Anderson, Jeremy S. Swanson, Christopher D. Shawver
Daniel K. Inouye Graduate School of Nursing
Uniformed Services University of the Health Sciences Travis Air Force Base

Page 1 / 84

Approvals

Approval complete
on Apr 12, 2022

Start a new approval

3 APPROVERS

Barber, Kenneth
Approved

Diane Seibert
Approved

USU Pub Clearance
Approved

APPROVAL ACTIVITY

Leave a comment...

USU Pub Clearance approv