

Increasing Recognition of Obstructive Sleep Apnea in Primary Care: Implementing the
STOP-Bang Questionnaire into Practice

By Brendan Glowacki, BS, RN

APPROVED BY:

Advisor/Chair - Lisa Seldomridge, PhD, RN, CNE

Date

Committee Member – Joshua Anderson, MS, PA-C

Date

Graduate Program Chair – Dorothea Winder, PhD, RN

Date

Running Head: OBSTRUCTIVE SLEEP APNEA SCREENING IN PRIMARY CARE

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Brendan Glowacki, BS, RN

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Brendan Glowacki

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Abstract

Problem Statement: Obstructive sleep apnea (OSA) is a prevalent disorder that is often undiagnosed due to a lack of screening within outpatient settings. A multitude of OSA screening tools are available for use, but are not regularly implemented. **Purpose:** This DNP project aimed to determine the feasibility and the impact of introducing a validated screening tool, the STOP-Bang Questionnaire (version 2014), in a primary care office with the intent of increasing recognition of OSA in adult patients. **Methods:** Project participants included three providers and 121 patients seen during the implementation period. Pre-intervention charts were chosen via random number generator until the desired number of patients had been reached (n=25). The charts of patients chosen were examined for age, race, gender and documentation of previous OSA screening. The survey revealed that none of the charts indicated documentation of sleep apnea screening or associated sleep specialist referrals. Data collection sheets were then given to patients 40 years of age or older with no previous history of OSA seen in the primary care office during the observational period. Data collection sheets included demographic data and a STOP-Bang Questionnaire assessment completed by the provider. **Results:** The project found that of 121 participants, 22 were at risk of moderate to severe OSA. Only 11 of the 22 patients were referred for further sleep testing. **Significance:** The STOP-Bang Questionnaire is an easy-to-use OSA screening tool that can be implemented in the primary care setting and enable providers to better direct preventative plans of care.

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Project Overview

Obstructive sleep apnea (OSA) is a prevalent disorder that interferes with the sleep quality of patients, affecting an estimated ten to seventeen percent of the American population (Qaseem et al., 2012). The side effects of OSA manifest in many forms, such as daytime sleepiness and fatigue, and increase the risk of developing diabetes, hypertension and stroke if left untreated (Institute of Medicine, 2006). An estimated 80% of patients do not report daytime sleepiness, a primary symptom of OSA, to their primary care provider, resulting in many cases remaining undiagnosed and untreated (Subramani, Wong, Nagappa, & Chung, 2017). Many screening tools have been created to assess for risk of sleep apnea, but the STOP-Bang Questionnaire (Chung et al., 2014) has stood out as a quick and efficient tool for use in the outpatient setting. Implementation of this tool in the primary care setting may aid in increasing provider OSA screening and referral rates to sleep specialists.

Problem Statement

Undiagnosed obstructive sleep apnea is a pervasive condition that impairs sleep quality and can manifest as various symptoms. Evidence suggested that OSA is highly underdiagnosed and increased the risk of developing comorbidities that have long-lasting effects, complicating the care of patients as they age. Use of the STOP-Bang Questionnaire to assess OSA risk in primary care settings can decrease the number of cases that go undetected via increased screening and referral rates to sleep specialists, resulting in earlier diagnosis and prevention of future disease processes.

Purpose of Project

The purpose of this project was to provide a tool to outpatient providers that would organize and streamline the process of assessing risk for obstructive sleep apnea. Evidence suggested that OSA is highly underdiagnosed and connected to several health outcomes that have long-lasting effects, complicating the care of that patient as they age. Implementation of the STOP-Bang Questionnaire could allow for earlier recognition and treatment, reducing the risk for development of several other comorbidities. Outcomes of the project included increasing the number of patients assessed with a moderate to severe risk of OSA while also increasing the number of patients referred to a sleep specialist who were determined to be at risk for OSA.

Clinical Question – PICOT

In adult patients seen in the primary care setting, did the use of the STOP-Bang Questionnaire, as compared to standard practice, increase the number of patients screened for a moderate to severe risk of sleep apnea and increase rate of referral to a sleep specialist?

Succinct Synthesis/Analysis of Supporting/Related Literature

Search Strategy

Utilizing several databases, via university and workplace access, including EBSCO HOST, MEDLINE, CINAL, the Cochrane Library, Health Source, OVID, and PubMed, a total of 137 articles were found. Search terms included “obstructive sleep apnea”, “OSA”, “primary care”, “outpatient”, “STOP-Bang”, “undiagnosed”, “preoperative”, “clearance”, “predicting”, and “screening”. Inclusion criteria were articles focusing on implementation of the STOP-Bang tool to identify OSA in previously undiagnosed patients when used in outpatient or preoperative settings. Exclusion criteria included articles that did not use the STOP-Bang Questionnaire to assess patients, used the STOP-Bang Questionnaire on patients previously diagnosed with OSA, focused on special populations or postoperative complications related to OSA, or articles that only utilized the STOP-Bang Questionnaire as a tool for identifying patients to undergo another intervention.

The search terms and inclusion criteria were chosen due to a lack of initial results when searching for “primary care” alone. After including “preoperative” in the search filter, more results were found with many focused on preoperative patients who had been assessed in a primary care setting or in a preoperative visit with the STOP-Bang Questionnaire. The remaining articles were narrowed down to 24 by applying the exclusion criteria and then to 13 after closer examination. Most of the excluded articles focused on postoperative complications in patients with previously diagnosed OSA or were designed only to validate the STOP-Bang Questionnaire. A few excluded articles used the STOP-Bang Questionnaire in a primary care setting, but focused on special

populations, such as those with epilepsy, mental conditions, or cognitive decline, and had outcome measures related to orientation, confusion and symptom relief. The last of the excluded articles mentioned the STOP-Bang tool as a means of identifying patients who would then be subjected to another intervention of the study, such as oximetry testing.

Analysis

The aim of the literature review was to obtain evidence related to implementation of the STOP-Bang Questionnaire as an effective screening tool for OSA in adult populations. The evidence was used to justify incorporation of the STOP-Bang Questionnaire into a primary care setting to increase provider tool usage and referral rates for further sleep specialist testing. The final articles included in the review articles consisted of eight nonexperimental studies and five systematic reviews. All 13 studies were at a Level III according to the Johns Hopkins Nursing Evidence-Based Practice Model (Crawford, 2009), consisting of nonexperimental studies or systematic reviews with quasi-experimental and non-experimental designs. All studies were also found to hold a “B” grade according to the U.S. Preventive Services Task Force scale of quality, which meant that the USPSTF would recommend this service for use by providers at large with moderate to high belief that the net benefit would be substantial to moderate for patients (USPSTF, 2017). Refer to Appendix A for the PRISMA diagram and to Appendix B for the Table of Evidence.

Nonexperimental Designs

Prospective observational studies. Six of the eight nonexperimental studies (Chung et al., 2012; Cowan et al., 2014; Evans, Yap & Turner, 2017; Kulkarni, Horst, Eberhardt, Kumar, & Sarker, 2014; Popević et al., 2017; Tan et al., 2016) used a

prospective observational design aimed at determining the predictive value of the STOP-Bang Questionnaire. Several studies collected STOP-Bang Questionnaire scores and compared them against polysomnography (PSG) data (Chung et al., 2012; Cowan et al., 2014; Kulkarni et al., 2014; Popević et al., 2017; Tan et al., 2016) while Evans, Yap & Turner (2017) opted to compare the scores against the standard practice of the Obstructive Sleep Apnea Evaluation Worksheet (OSAEW), and then contrast results based on the small number of drivers that completed PSG testing. All six of the studies had large sample sizes and found that a STOP-Bang score greater than or equal to five yielded a higher probability of severe OSA, while some noted that a score less than or equal to three were less specific, introducing a higher risk of false-positive results (Cowan et al., 2014; Popević et al., 2017). Recommendations from the six studies were similar, encouraging usage of the STOP-Bang Questionnaire as a predictive tool for moderate to severe OSA in outpatient populations. The recommendation to refer patients only for further testing at STOP-Bang Questionnaire scores of five and above were shared by Chung et al. (2012), Popević et al. (2017), Tan et al. (2016).

Retrospective studies. Two studies conducted by Doshi, Walia, Jones, Aston, & Awab (2015) and Singh et al. (2013) used retrospective methods to test the predictive value of the STOP-Bang Questionnaire. Doshi et al. (2015) used a retrospective chart review to compare portable sleep study results against gathered STOP-Bang Questionnaire data. Singh et al. (2013) used a retrospective cohort design, first gathering data via STOP-Bang Questionnaires and PSG testing and then comparing those results against chart data from the surgeons and anesthesiologists, focusing on prior, blinded diagnosis of OSA. Both studies made the same recommendation: that the STOP-Bang

Questionnaire be implemented as a screening tool for moderate to severe OSA patients, finding scores of 5, 6, 7 and 8 to be highly sensitive and specific for severe OSA diagnosis.

Systematic Reviews / Meta-Analyses

Five studies (Chiu et al., 2017; Chung, Abdullah, & Laio, 2016; Miller & Berger, 2016; Nagappa et al., 2015; Nations & Mayo, 2016) completed systematic reviews and meta-analysis with an aim to ascertain the predictive value of the STOP-Bang Questionnaire. The results of the reviews showed consistent recommendations to implement the tool as a screening method for outpatient clinics and pre-surgical patients. Scores of five and above on the STOP-Bang Questionnaire again yielded higher predictive values of moderate to severe OSA (Chiu et al., 2017; Chung, Abdullah, & Laio, 2016; Miller & Berger, 2016; Nagappa et al., 2015; Nations & Mayo, 2016).

Discussion

The literature review revealed several consistent findings, with all studies agreeing that the STOP-Bang Questionnaire was an effective tool to screen patients for moderate to severe OSA. All studies also concluded that STOP-Bang Questionnaire scores of three or below introduced a higher risk of a false-positive result, possibly creating the need for unnecessary follow up sleep specialist appointments to confirm or deny an OSA diagnosis.

These results were applicable to the project, as they showed that the tool was simple, sensitive, and specific, given appropriate STOP-Bang Questionnaire cut off values (Chung et al., 2012; Cowan et al., 2014; Doshi et al., 2015; Singh et al., 2013). In order to draw a balance between remaining sensitive and specific for moderate to severe

OSA, without introducing false-positive results, a cutoff value was used. In a primary care setting, it was appropriate to use the cutoff value of greater than or equal to five on the STOP-Bang Questionnaire when considering a referral to a sleep specialist for further testing. The thinking was that if the providers felt there was a smaller chance of an unnecessary sleep specialist referral, they would be more apt to implement the STOP-Bang tool, increasing the identification of patients with sleep apnea and number of referrals to sleep specialists. As an estimated 80% of patients do not report daytime sleepiness to their primary care provider (Subramani, Wong, Nagappa, & Chung, 2017), use of the STOP-Bang Questionnaire in at-risk patient populations may have also prompted patients to expand on their symptoms, highlighting the importance of implementing simple, effective screening tools in the primary care setting.

Conceptual/Theoretical Framework & QI/EBP Model

To address the problem of undiagnosed OSA in the primary care setting, the Knowledge to Action (KTA) framework (Graham et al., 2006) was chosen to act as both a theoretical framework and as an evidence-based practice implementation model. The KTA was chosen as it focused on knowledge creation and subsequent application of that knowledge via a seven-phase action (implementation) cycle. The theoretical ideology of the KTA was that the answers to some problems may already exist within established literature, while some require the implementation of new studies to find a solution. If one were to perform a review of literature or conduct a new project, they would be building a higher level of baseline knowledge on a subject regardless. Equipped with a higher level of baseline knowledge, one would be able to not only identify solutions to current problems, but also be able to identify more complex and nuanced problems that required further investigation. The inherent feedback loop resulted in constant learning and utilization of said knowledge to further refine the steps of the of the action cycle, creating a more focused project.

The conceptual framework that guided the implementation portion of the DNP project focused on the action cycle of the KTA, which consisted of seven phases. Phase one focused on problem identification, either in the literature or in a specific clinical setting. In the context of the DNP project, it was identified that patients at the primary care office were not being screened thoroughly enough for OSA, as there was no systematic approach or tool being used. This disparity of under-diagnosis due to lack of screening was confirmed through the background literature review. Phase two was adaptation of the knowledge to the local context of the problem, represented by pre-

implementation data gathering in order to customize the intervention design to the office for a better chance of acceptance. Phase three was meant to assess for barriers to knowledge use, in this case establishing a baseline knowledge level of the providers in relation to OSA screening. Phase four incorporated all of the background information gathered in phase one through three to make an informed decision about an appropriate intervention to address the lack of screening. For the project, the STOP-Bang Questionnaire was chosen as an optimum OSA screening tool due its simplicity, efficiency and sensitivity. Phase five monitored knowledge use, or in this case, the utilization of the STOP-Bang Questionnaire to screen patients in the primary care office. Phase six, evaluation of outcomes related to knowledge use, began as the observational period ended. The collected data needed to be collated, analyzed, and synthesized into meaningful conclusions. This phase gave the student insight to the tool usage rates of the staff, the effectiveness of the screening method for identifying previously undiagnosed OSA patients, and the rate of referral to sleep specialists for further testing. Phase seven focused on sustaining continued knowledge use, representing integration of the tool into normal practice habits, making the intervention a permanent fixture within the clinical setting, extending the lifespan of the tool. This included edits to address gaps in provider education or baseline knowledge, tool utilization techniques and/or documentation methods.

Adhering to the KTA framework, tool implementation was both conceptually guided and realistically outlined, creating a streamlined process for the DNP student to follow. This approach matched the intent of the DNP project, further reinforcing the decision to utilize it as a guiding framework.

Project Design

Methodology

Setting and Sample

The Crossroads Medical Associates primary care office was based in Howard County, Maryland, home to an estimated population of 321,113 residents (United States Census Bureau, 2016). Ethnically, the county was approximately 58.4% non-Hispanic White, 19.1% Black or African American, 18.4% Asian or Pacific Islander and 6.6% Hispanic (United States Census Bureau, 2016). The gender differentiation of Howard County was near equal at 49% male and 51% female, with 24.6% under 18 years old and 13.1% over 65 years of age (United States Census Bureau, 2016). The primary care office employed 13 providers who saw about 260,000 total patients in 2017, ranging from young adult to geriatric. For the purpose of the project, patients included in the screening were required to be over the age of 40 years old, as this age group showed a marked increase in risk for undiagnosed OSA (American Sleep Apnea Association, 2013), and were excluded if they had previously been diagnosed with sleep apnea or another obstructive respiratory condition.

Tools

The STOP-Bang Questionnaire is a short, eight question survey that was developed by Chung et al. (2014) to assess patients for risk of OSA. The questions focus on the history of pertinent symptoms (snoring, tiredness, apnea, and hypertension) and comorbid factors (BMI, neck circumference, age, gender), with a combination of answers yielding a risk score. Each score is categorized into low, moderate or high risk of OSA, generally equating to scores of 0-2, 3-4, 5-8 respectively. Chung, Abdullah, & Liao

(2016) found that the sensitivity and specificity vary based on OSA severity using a cutoff score of ≥ 3 : any (84%, 56.4%), moderate to severe (93%, 43%), severe (100%, 37%). Due to the lower specificity, there was a risk for false-positives to occur.

Permission to use the tool was obtained (see Appendix C) and the false-positive risk was corrected by using a cutoff score of ≥ 5 to recommend a sleep specialist consultation, per the evidence found during the literature review.

Procedure

In order to establish a baseline regarding provider screening habits, a retrospective chart review was conducted using the previously stated methods until an $n=25$ had been reached. Inclusion in the project required that patients be 40 years of age or older, and seen in the office within the last year. Exclusion criteria included a documented history of diagnosed sleep apnea or chronic respiratory disease. Charts were examined for age, race, gender, and documentation indicating an attempt to screen the patient for OSA, or a referral to a sleep specialist. The information was then recorded in an Excel spreadsheet: age, race, gender, BMI, neck circumference > 40 cm, screened for OSA, and referral to a sleep specialist. In total, 39 charts were reviewed, with 14 being excluded due to having a neck circumference less than 40 cm ($n=7$), prior diagnosis of OSA or a chronic respiratory history ($n=5$), or being seen more than a year ago ($n=2$). Of the remaining 25 pre-intervention charts, none were found to have documentation showing screening for OSA in any form. All project data were kept on an encrypted flash drive, accessed on password protected devices disconnected from the internet and kept in a locked container when not in use.

To further assess baseline data, a brief knowledge assessment questionnaire was administered to the providers who chose to participate. This assessment gauged individual screening habits, knowledge of the STOP-Bang Questionnaire, assumptions related to the pervasiveness of OSA and their perceived barriers to OSA screening (see Appendix D). Gaps were noted and addressed as the student performed multiple, short, ten minute combined educational sessions for both providers and medical assistants about the screening tool and their responsibilities within the project. Educational sessions were delivered by DNP student during the period 9/1/18 through 9/15/18. Medical staff were given an educational handout related to the STOP-Bang Questionnaire (see Appendix E) and how to perform a neck circumference measurement (see Appendix F).

STOP-Bang Questionnaire implementation/BMI measurements began Sept 16, 2018 and were given to all patients of the participating providers who were 40 years old or greater with no documented history of sleep apnea or chronic respiratory disease. Implementation of the STOP-Bang Questionnaire (Chung et al., 2012) consisted of a paper form that included the a disclosure and consent form (see Appendix G), a screening tool with scoring instructions, documentation of the patient's risk level, recommendations based the resulting score, and questions regarding the patient's receptiveness to the sleep specialist referral if given (see Appendix H). To protect anonymity, no identifying patient data were collected on these forms. The medical assistants provided paper copies of the disclosure and consent form, completed neck circumference measurements and recorded the patients' BMI, gender, and age. These forms were then left in the exam room to serve as a reminder for the providers to screen at risk patients for OSA. Completed forms were left in a secure location, away from patient access, and then collected by the DNP student

for collation and entry into an Excel spreadsheet. Data collection occurred on a daily basis, and was reviewed weekly by the DNP student. Non-adherence or incorrect completion of the screening tool resulted in a follow up discussion between the student and the participating providers, stressing importance of the assessment and review of how to properly complete the tool.

At the conclusion of the observational period, November 15, 2018, all tabulated information was analyzed for significant trends. Due to the constraints of the university semesters, the post-intervention data comparisons were not conducted until February of 2019. The changes in provider screening habits and referral rates from pre-implementation to post-implementation, as well as trends related to interaction of age, gender or race on OSA screening, were recorded. Sustainability required that the providers of the primary care clinic understand the impact of the intervention on the care given. At the completion of the data analysis period, the results were compiled and presented to the clinical staff to illustrate how the intervention affected OSA screening and referral rates to sleep specialists. Following the purpose of the project, a positive measurable outcome included increased screening tool utilization in the primary care office, increasing the number of identified at-risk patients.

Organizational System Analysis (SWOT)

Assessment of the clinic using a SWOT analysis allowed for a better understanding of how to best adapt the implementation to the primary care office. Using the SWOT analysis (see Table 2), it was determined that as a primary care office, there were no specific patient populations that were seen that would be pre-disposed to sleep apnea, such as in a bariatric clinic, sleep specialist office or pulmonary office. The

clinical site employed a mix of providers from various backgrounds and used a thorough implementation of an electronic medical record (EMR), indicating that it would be easy to integrate a screening tool if it was acceptable to the clinic staff. Due to the number of providers, and the student's schedule, multiple educational sessions were delivered to the providers participating in the project. Other methods to encourage screening completion were implemented, such as having the medical assistants prompt the providers to complete the tool. Physical paper copies of the data collection sheets were a more accessible data collection method for tabulation and also acted as a reminder to do the assessment, rather than an EMR entry box that could easily be skipped over. Paper copies had an inherent risk that they would be lost. There was also the risk that the providers would find the screening unnecessary and fail to complete it, as they reportedly did some unofficial risk assessments.

Implementation Timeline

Pre-intervention chart data were retrieved by the DNP student on patients 40 years old or greater with no documented history of sleep apnea or chronic respiratory disease that have been seen by the office in the last year until an n=25 was reached. The pre-intervention knowledge assessment was then conducted. Educational sessions lasting 5-10 minutes were delivered by DNP student during the period of 9/1/18 through 9/15/18 to all providers who agreed to participate and all medical assistants at the same time. Materials used in the educational sessions appear in Appendix E. STOP-Bang Questionnaire implementation/BMI measurements began Sept 16, 2018 and were given to all patients in the practice 40 years old or greater with no documented history of sleep apnea or chronic respiratory disease (see Appendix H). Completed forms were placed in a

secure location and collected by DNP student once per week. Data collection ended November 15, 2018. Data were analyzed by DNP student and post intervention data were compared against the pre-intervention chart reviews and analyzed for trends. All findings were presented to the practice providers in early March 2019, with recommendations for integration of the STOP-Bang Questionnaire as part of the normal practice.

IRB and Agency Approval

Approval was obtain from the Salisbury University Institutional Review Board before implementation of the project (see Appendix I) with the primary care office deferring to the University's process (see Appendix J).

Project Implementation

The project began the first week of September, as per the timeline. During the first week, the pre-intervention chart reviews were completed, reaching an n=25 after reading through a total of 39 charts. Fourteen charts were excluded on the basis of age (n=7), medical history of OSA/chronic respiratory disease (n=5), and date patient was last seen in the office >1 year (n=2). Of the 25 included charts, none had documentation highlighting OSA screening of any sort, and one patient received a referral to a sleep specialist only because they had requested one. Following the chart reviews, the pre-intervention provider surveys were administered and analyzed. Of the three participating providers, only one had heard of the STOP-Bang Questionnaire and none were able to accurately identify the percentage of Americans with undiagnosed OSA. When asked about barriers to screening and referral to sleep specialist appointments, the three providers were unable to think of specific barriers, but felt the time and scheduling requirement for a sleep study was too much for some patients.

Adhering to the timeline, the provider education was completed the same day as the pre-intervention surveys. During the administration of the educational sessions for the medical assistants the following day, the non-medical staff were included as well so they would be aware of the purpose for the project. This was done at the behest of the providers to include all possible staff that could be involved. After a brief introduction, the purpose, goal and process were explained. The non-medical staff were dismissed, and the medical assistants were given education about how to perform neck circumference measurements. The DNP student was advised that these measurements were already performed on specific patients, and, after reviewing the procedural steps, the medical assistants

demonstrated on each other in order to check their technique. All medical assistants were observed to perform the measurements without correction from the DNP student.

After completion of the staff education, the new process became that the front desk screened patients via the age cutoff (>40 y/o), and attached surveys to the billing form that followed patients throughout the visit. The medical assistants obtained consent, completed the first few parts of the survey (age, race, date, BMI, neck size), and left the paperwork for the providers to finish. After the patient had been seen for their appointment, they were sent to the front desk to complete their payment, taking both their billing sheet and the survey with them. The billing desk then collected the surveys as they processed the patient and set them aside for collection by the DNP student.

At the conclusion of the implementation timeframe, 194 total surveys were collected, but only 121 were applicable to the project. This was a result of several events, including a medical assistant who accidentally gave 12 surveys to patients under 40 years of age due to a misunderstanding in protocol, and the hiring of a new front desk staff member after the educational sessions had been conducted. This staff member gave 61 surveys out to patients who were under the age limit. In the first situation, the staff member was reeducated, while the second occurrence was discovered at the end of the collection period and did not require any specific intervention.

Patient and Staff Reception

During the implementation period, three patients declined to complete the survey due to concerns over mismanagement of their data and concerns about a possible increase in their insurance premiums. Otherwise, the DNP student, as well as the office staff, heard no objections from patients about the survey. The providers and office staff had no

overt concerns, but were observed to complete fewer and fewer of the questionnaire as time went on.

Barriers and Facilitators

The prime facilitators to the project were the medical assistants, as they acted as the main driving force during the project implementation when the DNP student was unable to be present. The process used during the implementation period relied on the front desk and the medical assistants heavily, but they were able to complete their duties without interruption in the standard flow of work. The largest barrier that was found during the implementation period was the inability of the DNP student to be present at the primary care office every day, to correct staff members who were implementing the process incorrectly, such as giving surveys to the wrong age groups. It was also noted following the implementation period that the providers felt digitization of the STOP-Bang Questionnaire into the EMR would have improved the number of completed surveys for long-term use.

Summative evaluation of implementation process

At the conclusion of the project implementation period the DNP student performed a cursory look at the data, and found it difficult to make a definitive inference about the risk of sleep apnea in the general population. Final analytics had not yet been performed, but there were not as many cases of obstructive sleep apnea as had been found during the review of literature. Final conclusions were not drawn until a full analysis was performed.

It was observed that after a few months of implementation, providers began to lose enthusiasm for the project and during the final portion of the implementation period,

some surveys were incomplete or blank. The patients associated with these providers were also observed to be generally younger and seeking medical care for more acute reasons, rather than for chronic conditions or an annual physical. A preliminary conclusion was that the STOP-Bang Questionnaire would be more applicable to specialized populations, or even limited to patients who present with certain characteristics, such as those with an overweight and above BMI, or a previous diagnosis of hypertension. This would ensure the patients captured from the screening effort are more likely to be at risk for OSA and reduce the need to perform the survey on every patient, but would be difficult to support as it could lead back to provider-based judgement, instead of a systematic use of the STOP-Bang Questionnaire.

Analysis and Discussion of Findings

At the conclusion of the implementation period, the data were entered into an Excel spreadsheet and analyzed. The participant demographics (Table 2) were 42.98% male (n=52) and 57.02% female (n=69), 83.47% Caucasian (n=101), 9.09% African American (n=11), 5.78% Asian (n=7) and 1.65% Latino (n=2). The mean age of the participants was 60.03 years old, with a mean BMI of 28.49 kg/m² and a mean STOP-Bang Risk Score of 2.69. Of the 121 surveys (Table 3), 18.18% (n=22) had STOP-Bang Risk Scores of 5-8, indicating a moderate to high risk of OSA. For those that showed an increased risk score, 50% (n=11) were referred for a further sleep study while 50% (n=11) were not. The participants who were not recommended for further OSA evaluation were 63.64% male (n=7) and 36.36% female (n=4), while those who were referred were 54.55% (n=6) male and 45.45% female (n=5). When comparing those with an increased risk of OSA to gender, it was found that 59.09% (n=13) were male, and 40.91% (n=9) were female, with a mean STOP-Bang Risk Score of 5.38.

As the pre-implementation patients were unable to be interviewed or assessed in order to complete STOP-Bang Questionnaires, the presence of obesity (BMI > 30), a cause of OSA per the National Heart, Lung, and Blood Institute (2019), was used as an indicator of increased sleep apnea risk. This result revealed that 16.0% (n=4) of the pre-intervention patients were potentially at risk for OSA.

Discussion

Literature shows that OSA is often underdiagnosed (Subramani, Wong, Nagappa, & Chung, 2017) and can increase the severity of other disease processes (Institute of Medicine, 2006), decreasing overall health for patients. Screening tools, such as the

STOP-Bang Questionnaire (Chung et al., 2012), were developed in order to quickly evaluate risk of OSA in surgical patient populations. Within this project, the STOP-Bang Questionnaire was adapted to the primary care population and used in an effort to increase screening rates and possible identification of patients at risk for OSA.

The results showed that 22 of the 121 patients surveyed were identified as “at risk” for moderate to severe OSA with the STOP-Bang Questionnaire, as compared to prior methods of provider-based clinical judgement, which had identified zero patients per the pre-implementation chart checks. To evaluate the potential effectiveness of the STOP-Bang Questionnaire, obesity was used as an indicator of increased OSA risk in the pre-implementation patient chart sample, and four patients were found to be at an increased risk. Comparing this to the 22 identified by the STOP-Bang Questionnaire, it is evident that the screening tool achieved the project’s goal of increasing screening tool utilization and increasing the number of patients identified as being at risk for OSA within the primary care population.

Given the results, the participating providers at the primary care office agreed that they wanted to implement the tool as standard practice, either informally or through the EMR.

Recommendations

Economic considerations

The implementation of the tool was a very convenient method of screening patients, with potential for even further cost reduction if it were integrated into the electronic medical record. While a follow up sleep study and a CPAP or BIPAP device, if recommended, patients may incur some cost but this is far outweighed by the potential cost savings related to medical treatment for comorbidities that otherwise may have been improved or prevented.

Implications for practice

The STOP-Bang Questionnaire is an inexpensive and effective tool for screening patients that may be at risk for OSA. The tool can be implemented while patients are in the waiting room or integrated into an EMR since it uses data that are already recorded in the chart and requires only a short interview by the provider to create a risk score. The resultant risk score can aid in supporting a recommendation for a sleep study, possibly preventing worsening comorbidities. The benefit of early identification of OSA and early intervention far outweighs the time spent screening.

Education about OSA and identifying signs within the general population may also provide benefit to providers, as the survey completed for pre-intervention knowledge assessment (Appendix D) revealed that the three providers underestimated the rate of OSA in the primary care population, and do not regularly screen patients over the age of 40. Encouraging providers to use a screening tool, or to at least prompt evaluation for OSA, would allow for increased assessment and identification of at risk patients.

Process and outcome recommendations

If one were to replicate this project, follow-up teaching with staff who are performing initial assessments is recommended to reinforce the importance of accuracy in data collection. The three providers also agreed that weekly meetings to reinforce the purpose of the project and evaluation methods would be beneficial to maintaining a steady completion of surveys. The importance of having a collective effort supporting the project cannot be understated. While it would be possible for a single person to perform all the data collection, more time would be needed to obtain an appropriate number of questionnaires and a representative demographic sample. Performing a follow up educational survey would also be recommended, in order to assess for retention of knowledge related to OSA and the STOP-Bang Questionnaire. Integration into an existing EMR within the target office would be a beneficial step that, depending on the EMR used, can be completed at a low cost.

Dissemination Plan

The plan for communicating the findings included a formal luncheon at the primary care office where the project was implemented in order to update all medical personnel involved, as well as to gather any thoughts about incorporating the tool within the practice. Per the requirements for completion of the Doctor of Nursing Practice degree, the final DNP project paper was submitted to the University's e-repository, and a presentation of the project was given to the project committee members and Salisbury University School of Nursing staff. Additionally, a manuscript was submitted to the *Journal of Clinical Sleep Medicine* for possible publication.

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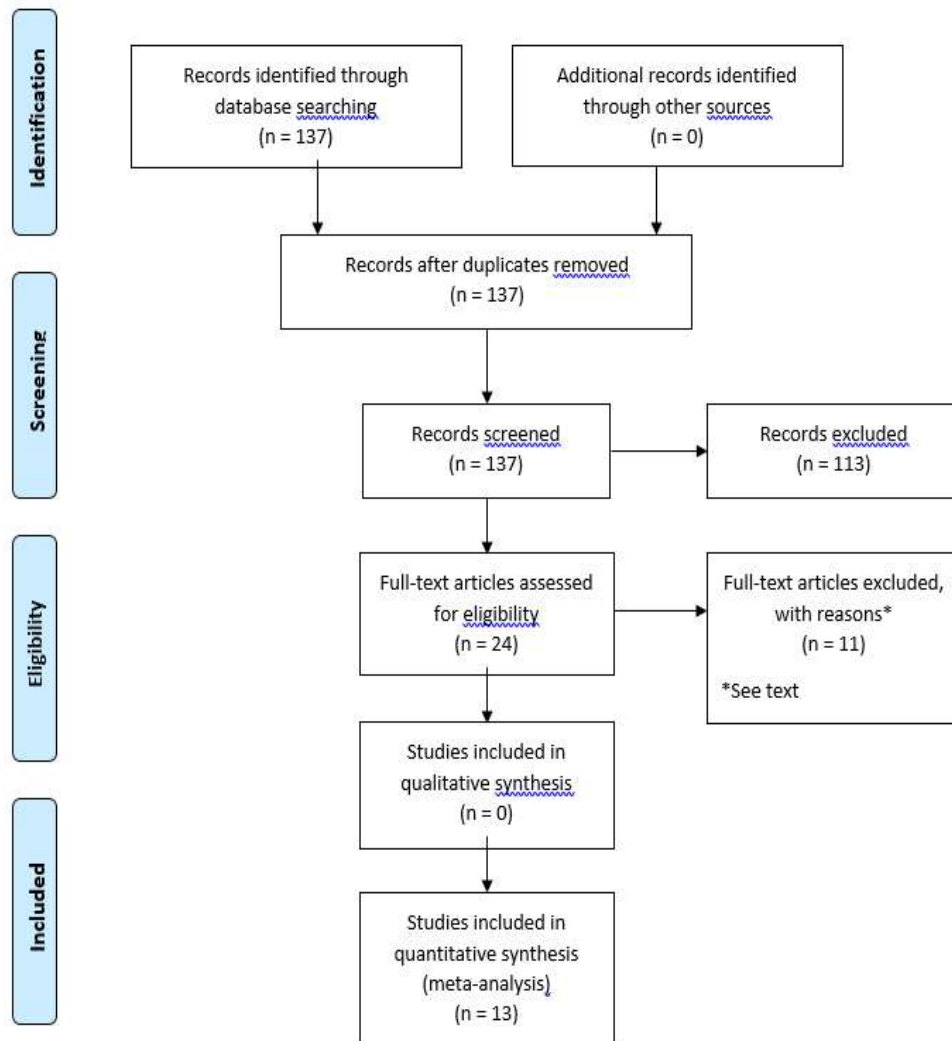
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Appendices

Appendix A: 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: Table of Evidence

Author, Title, Year	Objective	Design	Sample	Result / Conclusion	Strength and Quality of Evidence
Chung, Subramanyam, Liao, Sasaki, Shapiro, Sun: High STOP-Bang score indicates a high probability of obstructive sleep apnea; 2012	Evaluate the predictive probabilities for OSA at different scores on the STOP-Bang Questionnaire.	prospective observational study	746	<p>The probabilities of having OSA were greater as the STOP-Bang score increased. This trend was the same across the groups of all OSA, moderate/severe OSA, and severe OSA. As the STOP-Bang score increased from 0–2 to 7 and 8, the probability of having OSA, moderate/severe OSA, and severe OSA increased from 46% to 86%, 18% to 60%, and 4% to 38%, respectively.</p> <p>A STOP-Bang score of 5–8 identified patients with high probability of moderate/severe OSA. The STOP-Bang score can help the healthcare team to stratify patients for unrecognized OSA, practice perioperative precautions, or triage patients for diagnosis and treatment.</p>	Level III - B
Cowan, Allardice, Macfarlane, Ramsay, Ambler, Banham, Livingston, Carlin: Predicting sleep disordered breathing in outpatients with suspected OSA; 2014	Validate the utilities of Berlin, STOP and STOP-Bang Questionnaires, other patient characteristics, comorbidities, Epworth Sleepiness Scale (ESS), fractional exhaled nitric oxide (FENO) and blood markers for the prediction of sleep disordered breathing (SDB)	prospective observational study	129	<p>AHI was ≥ 5 in 97 patients and ≥ 15 in 56 patients. STOP and STOP-BANG scores were associated with both AHI cut-points but results with ESS and Berlin Questionnaire scores were negative. STOP-BANG had a negative predictive value 1.00 (0.77–1.00) for an AHI ≥ 15 with a score ≥ 3 predicting AHI ≥ 5 with sensitivity 0.93 (95% CI 0.84 to 0.98) and accuracy 79%, while a score ≥ 6 predicted AHI ≥ 15 with specificity 0.78 (0.65 to</p>	Level III - B

	on limited polygraphy.			0.88) and accuracy 72%. Neck circumference ≥ 17 inch and presence of witnessed apneas were independent predictors of SDB. STOP and STOP-Bang Questionnaires have utility for the prediction of SDB in the sleep clinic population. Modification of the STOP-Bang Questionnaire merits further study in this and other patient groups.	
Doshi, Walia, Jones, Aston, Awab: STOP-Bang Questionnaire as a screening tool for diagnosis of obstructive sleep apnea by unattended portable monitoring sleep study; 2015	Evaluate STOP-Bang Questionnaire as a screening tool for diagnosis of OSA by unattended portable monitoring sleep study by calculating sensitivity, specificity and positive predictive value for different STOP-BANG score thresholds.	retrospective chart review	502	Out of 502 unattended portable monitoring sleep studies, there were 465 males and 37 females. STOP-BANG thresholds of ≥ 2 and ≥ 3 have high sensitivity of 99.8 and 98.9 %, respectively, but very low specificity. Higher score thresholds of ≥ 7 and 8 have high specificity of 95 and 98.3 %, and PPV of 98.1 and 98.5 %, respectively, but very low sensitivity. A threshold of ≥ 7 in patients with BMI ≥ 30 was 100 % specific. High STOP-BANG thresholds of ≥ 7 or 8 can potentially alleviate need for few diagnostic studies. However, Lower STOP-BANG thresholds are not useful to rule out disease and formal in-lab sleep study should be done to rule out OSA due to high false negative rates of unattended portable monitoring studies at lower STOP-BANG thresholds.	Level III - B
Evans, Yap, Turner: Screening Commercial Vehicle Drivers for Obstructive Sleep	Implement the STOP-Bang Questionnaire to screen commercial	prospective observational study	382	All drivers were screened with the OSAEW and 369 were also screened with the STOP-Bang Questionnaire. One	Level III - B

Apnea: Tools, Barriers, and Recommendations; 2017	drivers for OSA			<p>hundred sixty-one (44%) drivers screened positive on the STOP-Bang, the OSAEW, or both. Of the 136 undiagnosed drivers with positive screens, only 50 commercial drivers were referred for sleep testing during project implementation. Nine of twelve drivers identified by the STOP-Bang Questionnaire tested positive for OSA after completing their sleep study.</p> <p>Both the STOP-Bang Questionnaire and the OSAEW were useful tools for OSA screening of commercial drivers.</p>	
Kulkarni, Horst, Eberhardt, Kumar, Sarker: Obstructive sleep apnea in general surgery patients: is it more common than we think?; 2014	Determine the risk of obstructive sleep apnea (OSA) in preoperative surgical patients.	prospective observational study	371	<p>Complete questionnaires were available on 367 (98.9%) patients. Two hundred thirty-seven patients (64.6%) were classified as high risk of OSA on the questionnaire. Polysomnography results available on 49 patients revealed severe OSA in 17 (34.5%), moderate in 8 (16.5%), mild in 14 (28.5%), and no OSA in 10 (20.5%) patients. The positive predictive value and sensitivity of the questionnaire were 76%, and 92% for the STOP-Bang Questionnaire, respectively. The sensitivity increased to 100% for severe OSA.</p> <p>Preoperative screening for OSA should be considered to diagnose patients at risk.</p>	Level III - B
Popević, Milovanović, Nagorni-Obradović,	Examine psychometric properties of STOP-Bang	prospective observational study	100	STOP-Bang classified 69% as potential OSA patients. Polysomnography identified OSA in 57% of	Level III - B

<p>Nešić, Milovanović, Milovanović: Screening commercial drivers for obstructive sleep apnea: Validation of STOP-Bang Questionnaire; 2017</p>	<p>(snoring, tiredness, observed apnea, high blood pressure, body mass index (BMI), age, neck circumference, male gender) scoring model (Serbian translation), an obstructive sleep apnea (OSA) screening tool, in a sample of commercial drivers</p>			<p>the sample. Test-retest reliability (Cohen's $\kappa = 0.89$) was adequate. STOP-Bang score was significantly correlated to apnea-hypopnea index (AHI) and OSA severity. Sensitivity was 100% for $AHI \geq 15$, highest specificity was 53.5% ($AHI \geq 5$)</p> <p>STOP-Bang showed good measurement properties, supporting its further use in OSA screening of commercial drivers</p>	
<p>Singh, Liao, Kobah, Wijesundera, Shaprio, Chung: Proportion of surgical patients with undiagnosed obstructive sleep apnea; 2013</p>	<p>Evaluate the proportion of surgical patients with undiagnosed moderate-to-severe OSA</p>	<p>retrospective cohort study</p>	<p>819</p>	<p>Over the study period, 5884 patients visiting the preoperative clinics were approached. A total of 1085 patients gave their consent. Two hundred and sixty-six patients withdrew from the study protocol, and 819 patients were able to complete a PSG study (Fig. 1). Of the 819 patients, 111 patients had pre-existing OSA diagnosis with 76 patients on home CPAP therapy. A significant proportion of the PSG study-identified OSA patients were not recognized by the physicians. As shown 76% of mild OSA, 65% of moderate, and 53% of severe OSA patients were not identified by the anaesthetists. The numbers of patients not identified by the surgeons were 97% of mild OSA, 93% moderate, and 90% severe OSA patients. In 267 (38%) patients diagnosed as moderate and severe OSA by the preoperative PSG ($AHI > 15$), 60% and 92% were missed by the anaesthetists and the</p>	<p>Level III - B</p>

				<p>surgeons, respectively.</p> <p>Anaesthetists and surgeons failed to identify a significant number of patients with pre-existing OSA and symptomatic undiagnosed OSA, before operation. This suggests that had our study patients been screened before operation with the STOP-Bang Questionnaire, the majority of undiagnosed moderate and severe OSA would have been identified. The sensitivity and the specificity of the STOP-Bang Questionnaire to identify patients with moderate-to-severe OSA is 93% and 43% and the positive predictive value and the negative predictive value is 52% and 90%, respectively.¹⁴ A higher STOP-BANG score has been shown to indicate a higher probability of moderate-to-severe OSA and may help identify these patients.¹⁶ The specificity for a STOP-BANG score of 5, 6, and 7 to predict severe OSA is 74%, 88%, and 96%, respectively.</p>	
<p>Tan, Yin, Tan, van Dam, Cheung, Lee: Predicting obstructive sleep apnea using the STOP-Bang Questionnaire in the general population; 2016</p>	<p>Evaluate the validity of the STOP-Bang Questionnaire to predict moderate-to-severe and severe OSA in the general population</p>	<p>prospective observational study</p>	<p>242</p>	<p>Total of 68 subjects (28.1%) and 26 subjects (10.7%) had an apnea-hypopnea index (AHI) of >15 and >30 events per hour, respectively. Of the subjects, 89 (36.8%) were classified as high risk based on the questionnaire. The sensitivity of a STOP-Bang score of >3 was 66.2% to detect AHI >15 and 69.2% to detect AHI >30. The specificities were 74.7% and 67.1%, respectively. The negative predictive values were</p>	<p>Level III – B</p>

				<p>85% for moderate-to-severe OSA and 94.8% for severe OSA. The corresponding positive predictive values were 50.6% and 20.2%, respectively. Using BMI cutoffs of 30 and 27.5 for Asians compared to the original cutoff of 35 did not improve the questionnaire performance significantly.</p> <p>The STOP-Bang Questionnaire can be used as a screening tool in the general population in view of its moderate sensitivity and high negative predictive value for subjects with moderate-to-severe and severe OSA.</p>	
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Author, Title, Year	Objective/Purpose	Search Results (studies)	Recommendations	Strength and Quality of Evidence
Chiu, Chen, Chuang, Chen, Tu, Hsieh, Wang, Guilleminaul: Diagnostic accuracy of the Berlin questionnaire, STOP-BANG, STOP, and Epworth sleepiness scale in detecting obstructive sleep apnea: A bivariate meta-analysis; 2017	Perform a meta-analysis investigating and comparing the summary sensitivity, specificity, and diagnostic odds ratio (DOR) among the Berlin Questionnaire (BQ), STOP-Bang Questionnaire (SBQ), STOP Questionnaire (STOP), and Epworth Sleepiness Scale (ESS) according to the severity of OSA	108 total: BQ – 42, SBQ – 30, STOP – 13, ESS - 15	Compared with the BQ, STOP, and ESS, the SBQ is a more accurate tool for detecting mild, moderate, and severe OSA. Sleep specialists should use the SBQ to conduct patient interviews for the early diagnosis of OSA in clinical settings, particularly in resource-poor countries and sleep clinics where overnight polysomnogram (PSG) is unavailable.	Level III - B
Chung, Abdullah, Hariril, Liao: STOP-Bang Questionnaire: A Practical Approach to Screen for	Use studies to disseminate effective usage strategies of the STOP-Bang Questionnaire	20	The STOP-Bang Questionnaire is a concise, effective, and reliable OSA screening tool. It can facilitate efficient allocation of resources in both diagnosing and treating	Level III - B

Obstructive Sleep Apnea; 2016			previously unrecognized OSA.	
Miller, Berger: Screening and assessment for obstructive sleep apnea in primary care; 2016	Evaluate the screening and assessment for OSA in primary care settings including the psychometric properties of OSA screening measures.	17	<p>The current practice model of screening and assessment for OSA in primary care is fragmented and ineffective. Primary care providers encounter patients with OSA symptoms but do not routinely screen, assess, or refer to a sleep specialist. More psychometric research is needed for the OSA screening measurements in primary care.</p> <p>The STOP Bang and Berlin questionnaires serve as the current best measures to predict the presence of moderate to severe OSA</p>	Level III - B
Nagappa, Liao, Wong, Auckley, Ramachandran, Memtsoudis, Mokhlesi, Chung: Validation of the STOP-Bang Questionnaire as a Screening Tool for Obstructive Sleep Apnea among Different Populations: A Systematic Review and Meta-Analysis; 2015	Determine the effectiveness of STOP-Bang for screening patients suspected of having OSA and to predict its accuracy in determining the severity of OSA in the different populations	17	In the sleep clinic population, the sensitivity was 90%, 94% and 96% to detect any OSA (AHI > 5), moderate-to-severe OSA (AHI >15), and severe OSA (AHI >30) respectively. The corresponding NPV was 46%, 75% and 90%. A similar trend was found in the surgical population. In the sleep clinic population, the probability of severe OSA with a STOP-Bang score of 3 was 25%. With a stepwise increase of the STOP-Bang score to 4, 5, 6 and 7/8, the probability rose proportionally to 35%, 45%, 55% and	Level III - B

			<p>75%, respectively. In the surgical population, the probability of severe OSA with a STOP-Bang score of 3 was 15%. With a stepwise increase of the STOP-Bang score to 4, 5, 6 and 7/8, the probability increased to 25%, 35%, 45% and 65%, respectively.</p> <p>Confirms the high performance of the STOP-Bang Questionnaire in the sleep clinic and surgical population for screening of OSA. The higher the STOP-Bang score, the greater is the probability of moderate-to-severe OSA.</p>	
<p>Nations, Mayo: Critique of the STOP-Bang sleep apnea questionnaire; 2016</p>	<p>Present the psychometric properties of the STOP-Bang sleep apnea questionnaire, an instrument designed to help identify OSA in adults prior to surgery</p>	<p>8</p>	<p>Reliability of the STOP questionnaire has been determined using test-retest agreement. In this case, the STOP questionnaire was administered twice to 55 patients, 1 to 27 days (median, 8 days) apart. The majority (96%) of those patients had the same score (K coefficient of 0.923; confidence interval, 0.82-100), indicating that the STOP questionnaire was stable over time. Predictive validity for the STOP questionnaire has been determined using a sample of patients (n = 211) who volunteered for a sleep study. Those determined to have OSA using the STOP questionnaire had apnea-hypopnea indices (AHIs) greater</p>	<p>Level III - B</p>

			<p>than 5 ($P < .05$).</p> <p>The STOP-Bang Questionnaire uses a simple mnemonic (STOP-Bang) to identify the instrument items, is simple to score, and has some demonstrated reliability.</p>	
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Appendix C: STOP-Bang Utilization Permission

UHN2018-2136


**Technology Development
& Commercialization**
NON-EXCLUSIVE ACADEMIC LICENSE
DEFINITIONS:

Organization name ("Licensee"): ___Salisbury University School of Nursing_____

Address: 1101 Camden Avenue Salisbury, MD 21801

("License Site") Crossroads Medical Associates

4801 Dorsey Hall Dr #201, Ellicott City, MD 21042

Contact person: Dr. Lisa Seldomridge Title: DNP Project chair, Director of Medical Sim Center

Mr. Brendan Glowacki, DNP student

Contact information: 410-543-6413 or laseldomridge@salisbury.edu

Proposed Use (check applicable):

Paper questionnaire

Please elaborate on Proposed Use: The STOP Bang questionnaire will be used in a Doctor of Nursing Practice (DNP) student project focusing on increasing OSA screening rates in a primary care office setting (Crossroads Medical Associates, Maryland) with adults over the age of 40.

Language(s): English

(collectively, the "Permitted Use" means Proposed Use and Language,)

"Effective Date": September 1, 2018

License "Term": One (1) year from the Effective Date.

Licensors: "UHN"

UNIVERSITY HEALTH NETWORK

having a business office at:

Technology Development & Commercialization

101 College Street, Suite 150,

Heritage Building, MaRS Centre,

Toronto, Ontario M5G 1L7

Canada

Notices. Notices must be sent to the attention of:

Director, Technology Development & Commercialization

UHN2018-2136

This license agreement ("Agreement"; and as further defined herein) is made effective as the Effective Date and is between UHN and Licensee with a business address at Licensee Site.

(In this Agreement, UHN and Licensee may be referred to individually as a "Party", or collectively as the "Parties".)

Whereas, UHN owns and controls certain rights, title and interest in the STOP-Bang tool (version 2014) (the "Technology", as further defined herein) developed by UHN Principal Investigator, Dr. Frances Chung, and

Whereas, Licensee wishes to utilize the Technology for specific purposes (the "Permitted Use", as further defined herein), and as such, wishes to license the Technology from UHN for such purposes.

NOW THEREFORE in consideration of the mutual promises, representations, covenants and agreements of the Parties contained herein, the Parties agree as follows:

ARTICLE 1 – INTERPRETATION

1.1 **Further Defined Terms.** For the purposes of this Agreement, unless the context otherwise requires, the following terms shall have the respective meanings set out below and grammatical variations of such terms shall have corresponding meanings:

- (a) **"Agreement"** means this license agreement, and all of its Schedules, and the terms "herein", "hereunder", "hereto" and such similar expressions shall refer to this Agreement;
- (b) **"Confidential Information"** of a Party means any and all information of and disclosed by, a Party (a "Disclosing Party") which has or will come into the possession or knowledge of the other Party (a "Receiving Party") in connection with or as a result of entering into this Agreement and which is marked as confidential or is identified as confidential at the time of disclosure, including information concerning the Disclosing Party's past, present and future business, research and development, technology, customers and suppliers. Information shall not be considered "Confidential Information" to the extent that the information:
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 - (ii) subsequently becomes part of the public domain through no act or fault of the Receiving Party or its agents or employees,
 - (iii) can be demonstrated by the Receiving Party's written records to have been known or otherwise available to the receiving party prior to the disclosure by the Disclosing Party,
 - (iv) can be demonstrated by the Receiving Party's written records to have been provided to the Receiving Party, without restriction, by a third party who is not under a duty of confidentiality respecting the information disclosed and who has a legal right to disclose it,
 - (v) can be demonstrated by the Receiving Party's written records was independently developed by or on behalf of the Receiving Party by persons who had no knowledge of or access to the information disclosed,
 - (vi) is required to be disclosed by law or an order of a court, tribunal, or government agency, provided that the Receiving Party gives to the Disclosing Party prompt notice of the required disclosure in order to allow the Disclosing Party reasonable opportunity to seek a confidentiality order or the like, or
 - (vii) is identified in writing by the Disclosing Party as no longer constituting Confidential Information;
- (c) **"Generated Data"** means all data, information and any other matter or deliverable arising from the performance of the Permitted Use by the Licensee;
- (d) **"Intellectual Property"** or **"IP"** mean inventions (whether patentable or unpatentable), discoveries, written material, information, know-how, trade secrets, designs, formulae, algorithms, concepts, proprietary data, techniques, instructions, processes, procedures, flow charts, logic diagrams, manuals, specifications, instructions, or any copies of the foregoing in any medium, or the expression thereof;
- (e) **"License"** shall have the meaning provided in Section 2.1;
- (f) **"Licensed Technology"** means the Technology and the UHN Intellectual Property Rights;
- (g) **"Technology"** means the processes, procedures and other relevant technical information pertaining to the STOP-Bang Tool (version 2014), including without limitation, the software, data, know-how, drawings, product specifications and other specifications, all as further described in Section II of Schedule "A";

UHN2018-2136

- (h) **“UHN Intellectual Property Rights” or “UHN IP Rights”** means any rights in which UHN owns, seeks to own and/or seeks to enforce in Technology, including without limitation those rights described in Subsections I(A), (B) and (C) of Schedule “A”

ARTICLE 2 - GRANT OF RIGHTS

2.1 **License Grant.** Subject to the terms and conditions of this Agreement, UHN grants to Licensee a non-exclusive license to use the Licensed Technology solely for the Permitted Use at Licensee Site(s) for the Term (the “License”).

2.2 **Prohibited Uses.** Unless otherwise explicitly stated in this Agreement, the Licensed Technology may only be used for information purposes. Licensee shall not have any rights to grant sublicenses to any third party. Licensee shall not use the Licensed Technology in any product or service made available to a third party for purposes of consulting, sale, lease, license or transfer, other than as expressly allowed per the Permitted Use. THE LICENSED TECHNOLOGY MAY NOT BE USED FOR PURPOSES OF THERAPEUTIC OR DIAGNOSTIC USE.

ARTICLE 3 – REPRESENTATIONS, WARRANTIES, LIABILITY AND INDEMNIFICATION

3.1 **REPRESENTATIONS, WARRANTIES AND LIABILITY.** EXCEPT AS OTHERWISE EXPRESSLY SET OUT IN THIS AGREEMENT:

- (A) UHN EXPRESSLY DISCLAIMS ANY AND ALL IMPLIED OR EXPRESS WARRANTIES AND MAKE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY, SAFETY OR FITNESS FOR ANY PARTICULAR PURPOSE OF THE LICENSED TECHNOLOGY AND IN RESPECT OF ANY GENERATED DATA;
- (B) UHN SHALL PROVIDE LICENSED TECHNOLOGY “AS IS”. UHN DOES NOT WARRANT OR REPRESENT THAT ISSUED PATENTS ARE VALID, OR PENDING PATENT APPLICATIONS WILL ISSUE, OR WHEN ISSUED WILL BE VALID, OR THAT THE PRACTICE OR EXPLOITATION OF ANY LICENSED TECHNOLOGY, TECHNICAL INFORMATION OR KNOW-HOW DISCLOSED TO LICENSEE PURSUANT TO THIS AGREEMENT DOES NOT, OR WILL NOT, CONSTITUTE INFRINGEMENT OF RIGHTS OF PERSONS NOT PARTIES HERETO;
- (C) UHN SHALL NOT BE LIABLE TO LICENSEE FOR ANY DAMAGE, INCLUDING (WITHOUT LIMITATION) ANY DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGE SUFFERED BY LICENSEE RESULTING FROM THE USE OF THE LICENSED TECHNOLOGY, TECHNICAL INFORMATION OR KNOW-HOW DISCLOSED TO LICENSEE PURSUANT TO THIS AGREEMENT. FURTHERMORE, UHN MAKES NO REPRESENTATION THAT THE LICENSED TECHNOLOGY, TECHNICAL INFORMATION OR KNOW-HOW DISCLOSED TO LICENSEE PURSUANT TO THIS AGREEMENT, ARE FREE FROM DEFECT OR LIABILITY OF INTELLECTUAL PROPERTY INFRINGEMENT;
- (D) **LIMITED LIABILITY.** UHN’S ENTIRE LIABILITY TO LICENSEE FOR DAMAGES OR ALLEGED DAMAGES HEREUNDER, WHETHER IN CONTRACT, TORT OR ANY OTHER LEGAL THEORY, IS LIMITED TO, AND WILL NOT EXCEED AN AMOUNT EQUAL TO THE SUM OF TOTAL AMOUNTS PAID TO UHN UNDER THIS AGREEMENT. LICENSEE ACKNOWLEDGES THAT UHN LICENSE FEE (IF ANY) REFLECTS THE ALLOCATION OF RISK UNDER THIS AGREEMENT AND THE LIMITATION OF LIABILITY SPECIFIED HEREIN.

3.2 **Indemnification.** Licensee assumes all risks associated with Licensee’s use of, or inability to use, the Licensed Technology and in all respects associated with Generated Data. Licensee, for and in consideration of and as a condition to the granting of the License, agrees to indemnify, save harmless, and defend UHN and its directors, officers, research/clinical staff, employees, research trainees, students, and agents (collectively the “UHN Indemnitees”), against any and all claims, suits, losses, damages, costs, fees, liabilities and expenses (including reasonable legal expenses; collectively the “Indemnified Damages”) arising from Licensee’s use of the Licensed Technology and in respect of all matters associated with the Generated Data, and otherwise any material breach of this Agreement by Licensee, except and to the extent that such Indemnified Damages arise from the negligence or willful misconduct of the UHN Indemnitee(s). In no event shall UHN (and its directors, officers, research/clinical staff, employees, research trainees, students, and agents) be liable to Licensee for special, indirect or consequential damages, even if UHN has been advised of the possibility thereof, including but not limited to lost profits, lost revenues, failure to realize expected savings or any other commercial or economic loss of any kind.

ARTICLE 4 – FURTHER COVENANTS

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4.1 **Licensee.** Licensee covenants and agrees for the benefit of UHN that it shall:

- (a) exercise the License granted herein or otherwise use the Licensed Technology and the Generated Data in accordance with all applicable laws, statutes, ordinances, regulations, guidelines and rules, including, all applicable statutes and regulations and applicable guidelines set forth by the Canadian Institutes of Health Research (CIHR), National Institutes of Health (NIH) or other governmental agencies where applicable; and
- (b) cause to be applied to, where appropriate, any markings required by applicable government statutes and laws to maintain continued validity and enforcement of UHN Intellectual Property Rights in the Technology; and
- (c) ensure that any of its research/clinical staff, employees, research trainees, students, and agents involved with the performance of this Agreement on its (ie. Licensee's) behalf are aware of any and all obligations under this Agreement, including any and all confidentiality obligations and Permitted Use obligations and restrictions, and have agreed to be legally bound by them.

4.2 **UHN.** UHN covenants and agrees for the benefit of Licensee that it shall ensure that any of its research/clinical staff, employees, research trainees, students, and agents involved with the performance of this Agreement on its (ie. UHN's) behalf are aware of any and all obligations under this Agreement, including any and all confidentiality obligations, and have agreed to be legally bound by them.

ARTICLE 5 - INTELLECTUAL PROPERTY

5.1 **UHN Ownership and Patent Prosecution.** Nothing contained in this Agreement shall be construed to convey any right, title or interest of UHN in the Licensed Technology to Licensee other than as specifically stated in this Agreement. Any registration, associated prosecution and maintenance of UHN IP Rights and all other legal rights in the Licensed Technology shall be managed solely by UHN in its discretion.

5.2 **Infringement.** The Licensee shall promptly notify UHN if it has knowledge of any third-party use and/or infringement of Licensed Technology. In the event that a third party brings or asserts a claim against Licensee or UHN that the use of the Licensed Technology infringes rights in Intellectual Property owned or otherwise controlled by such third party, the Parties shall mutually cooperate and/or otherwise provide reasonable assistance in connection to any defence against such claim.

5.3 **No Actions and Challenges.** Licensee agrees to not knowingly take any action which would jeopardize the obtaining or maintaining of UHN Intellectual Property Rights in the Technology. Licensee shall not challenge the validity of any UHN Intellectual Property Rights in the Technology or otherwise any right of UHN to the Licensed Technology.

5.4 **Generated Data.** Licensee shall own all Generated Data. Licensee agrees to furnish UHN with a written report encompassing the Generated Data arising from the Permitted Use on expiration or earlier termination of this Agreement.

5.5 **Translations.** Licensee agrees to provide UHN Principal Investigator and UHN with copies of any language translations of the Licensed Technology along with any relevant validation certificates. Licensee shall grant Dr. Chung and UHN a non-exclusive, perpetual, royalty-free license to use any such language translations for teaching and/or academic research purposes, with a further right to grant sublicenses to third parties for similar such purposes.

ARTICLE 6 – PUBLICATIONS

6.1 **Publications.** Licensee agrees to furnish UHN with a preprint of any publication, or an advance copy of any other disclosure encompassing the Generated Data or other research findings arising from the use of the Licensed Technology. Licensee shall acknowledge Dr. Frances Chung and UHN as the owner of the Licensed Technology in any publication or disclosure, and shall cite the following website www.stopbang.ca.

ARTICLE 7 - CONFIDENTIAL INFORMATION

7.1 **Use of Confidential Information.** The Parties agree that they will only use the Confidential Information of the other solely for the purposes contemplated and in accordance with this Agreement and for no other purpose. The Parties will ensure that their research/clinical staff, employees, research trainees, students, and agents to whom the Confidential Information is disclosed further to performance under this Agreement are informed of the

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confidential nature of the information and are legally bound to retain such information in confidence. The Parties further agree that, except as required to do so by applicable law or court order, they will not disclose the Confidential Information (or any part thereof) of the other Party, and will promptly provide to said other Party written notice if said first Party is legally compelled or otherwise required by law or court order to disclose any part of the Confidential Information, so that said other Party may seek a protective order or take other appropriate action. A Party in receipt of Confidential Information from the other shall maintain any such received Confidential Information in confidence for a period of **three (3) years** from the date of receipt of such Confidential Information.

ARTICLE 8 - TERM & TERMINATION

8.1 Termination for Breach. UHN may earlier terminate this Agreement in its sole discretion if the Licensee materially breaches any of its obligations under this Agreement, and upon written notification of such breach fails to, refuses, or cannot remedy the breach to the satisfaction of UHN within thirty (30) days of receipt of such written notice from UHN.

8.3 Termination by Mutual Consent. The Parties may earlier terminate this Agreement at any time by mutual consent, which consent shall be evidenced by a written agreement duly executed by the Parties.

8.4 Post-Termination. On the expiration or earlier termination of this Agreement:

- (a) Licensee shall immediately stop any further use of, and otherwise cease to derive any benefit from, the Licensed Technology; and
- (c) if and/or as required, the Parties shall take all necessary steps in a prudent business manner to effect the orderly earlier termination of this Agreement.

ARTICLE 9 – GENERAL

9.1 Entire Agreement. The Parties acknowledge that the Agreement and its Schedule is the entire agreement and understanding of the Parties as to the use of the Licensed Technology, and supersedes all prior discussions, agreements and writings in respect hereto.

9.2 General Assurances. The Parties agree to do all such things and to execute such instruments and documents as may be necessary or desirable in order to carry out the provisions and intent of this Agreement.

9.3 Enure to Benefit. This Agreement shall enure to the benefit of and be binding upon the respective Parties and, where the context admits or requires, their respective permitted successors or assigns.

9.4 Assignment. This Agreement cannot be assigned, sold, transferred or encumbered in any manner by Licensee without the expressed written consent of UHN, which consent will not be unreasonably withheld, but any such consent shall be subject to and conditional on the receipt by UHN of any payment owed to UHN.

9.5 No Use of Names. Except as required for the purposes of complying with the provisions of this Agreement, Licensee shall not use the name, logo, trade-mark or trade-name of UHN in connection with any publication, publicity, promotion news release, advertising or similar public statements or otherwise without the prior written consent of UHN.

9.6 Waiver. No amendment, supplement or waiver of any provision of this Agreement shall be binding on any Party unless consented to in writing by such Party. No waiver of any provision of this Agreement shall constitute a waiver of any other provision, nor shall any waiver constitute a continuing waiver unless otherwise expressly provided. Further, no failure or delay by any Party in exercising any right or remedy shall operate as a waiver thereof, nor shall any single or partial exercise or waiver of any right or remedy preclude its further exercise or the exercise of any other right or remedy.

9.7 Severability of Provisions. In the event that any provision of this Agreement is determined to be invalid or unenforceable by a court of competent jurisdiction in any jurisdiction, the remainder of the Agreement shall remain in full force and effect without said provision in said jurisdiction and such determination shall not affect the validity or enforceability of such provision or the Agreement in any other jurisdiction. The Parties shall in good faith negotiate a substitute clause for any provision declared invalid or unenforceable, which shall most nearly approximate the intent of the Parties in entering this Agreement.

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9.8 **Survival.** Articles 1, 3, 6, 7 and 9 in their entirety, and Sections 2.2, 5.1, 5.4, 5.5, 8.4, 9.1, 9.3 through 9.6 and 9.8 shall survive expiration or earlier termination of this Agreement until such time as specifically stated in a particular Article/Section or until the Parties agree to the release of the obligations (in whole or in part) contained therein.

9.9 **Counterparts.** This Agreement may be executed in counterparts each of which shall be deemed an original but all of which together shall constitute one and the same instrument. The Parties further agree to the exchange of execution of the Agreement in electronic format (e.g. as a "pdf" document).

The Parties are executing this Agreement so as to be effective on the Effective Date.

UNIVERSITY HEALTH NETWORK

LICENSEE

Per:

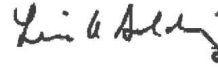


Name: Dr. Bradley Wouters

Title: EVP, Science and Research

Date: Nov 7, 2018

Per:



Name: Dr. Lisa Seldomridge

Title: DNP Project Chair, Director of Medical Sim Center

Date: 11/5/2018

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SCHEDULE A**Licensed Technology****I. UHN Intellectual Property Rights****A. Patent Applications/Issued Patents:**

United States Provisional Patent Application No. 61/974,319

Title: SYSTEM AND METHOD FOR SLEEP APNEA ASSESSMENT

Priority date: April 2, 2014.

B. Foreign & Domestic Dependent Applications:

All patent application(s) or issued patents claiming priority to the applications listed in Subsection I(A) of this Schedule A.

C. Continuations, Continuations-in-Part, Divisionals, Renewals, Extensions:

For greater certainty, the UHN Intellectual Property Rights of this Section I shall include:

- (i) all continuations and continuations-in-part applications to the patent applications in Subsections I(A) and (B), and all patents issuing therefrom, with the proviso that ownership rights in any continuation-in-part applications and or patents shall only apply to issued claims containing subject matter which can claim the benefit of a priority date of any patent or patent application described in Subsections I(A) or (B);
- (ii) all foreign counterparts of any of the foregoing (including without limitation, any European Supplementary Protection Certifications or equivalents);
- (iii) all divisionals, patents of addition, reissues, renewals, and/or extensions of any of the patents, patent applications, continuation and continuation-in-part applications set out in any of the foregoing Subsections I(A), (B), (C)(i) and (ii).

II. Other Intellectual Property

Processes, procedures and other relevant technical information pertaining to STOP-Bang Tool (version 2014) including without limitation, the software, data, know-how, drawings, product and other specifications, and the like, regardless of format or media or mode or representation.

Appendix D: Provider Pre-Intervention Screening Survey

1.) Do you regularly assess all patients over the age of 40 for obstructive sleep apnea?	YES	NO
2.) Do you prompt questions about obstructive sleep apnea?	YES	NO
3.) Do you refer possible OSA sufferers to sleep specialists for further testing?	YES	NO
4.) Have you heard of the STOP-Bang Questionnaire?	YES	NO

- 5.) What percentage of primary care patients do you think suffer from undiagnosed sleep apnea?
- 20%
 - 40%
 - 60%
 - 80%

Please write in for the following questions:

What barriers do you feel there are to screening patients for obstructive sleep apnea?

What barriers do you feel patients have to pursuing sleep specialist consultations?

Appendix E: Educational Handout

This handout is to provide information on the STOP-Bang Questionnaire in relation to the project being conducted within the office. Please contact Salisbury University DNP student, Brendan Glowacki, at (410-995-8155) if you have any questions or concerns related to the project or screening tool. The STOP-Bang Questionnaire was established by Chung et al. (2012) in association with their anesthesiology clinic. It is used to screen patients for low, moderate and high risk for obstructive sleep apnea. Patients that score a moderate to high result are recommended to be referred to a sleep specialist for further testing to confirm the diagnosis. The STOP-Bang Questionnaire consists of eight total assessment points gathered through routine body measurements and additional history questions asked by the provider:

- 1.) Do you **SNORE** loudly? (Heard in other rooms or bothering partners)
- 2.) Do you feel overly **TIRED** during the day? (Falling asleep while driving or at work)
- 3.) Has anyone **OBSERVED** you stop breathing or gasping for air during sleep?
- 4.) Have/are you being treated for high blood **PRESSURE**?
- 5.) Is your **BMI** greater than 35 kg/m²?
- 6.) Are you over the **AGE** of 50?
- 7.) Is your **NECK** size large? (Males = collar size equal to or larger than 17 in or 43 cm, Female = collar size equal to or larger than 16 in or 41 cm)
- 8.) **GENDER** = Male?

For the purposes of this project, **a score of 5 to 8 counts as a positive result, requiring a recommendation to a sleep specialist.**

Providers: If you perform a screening on a patient and /or refer them to a sleep specialist, please include it in your documentation, as I will be conducting a retrospective chart review at the conclusion of the observational period.

Medical Assistants: I will be educating the staff on taking neck measurements and ask that you please include this step into your patient intake for the duration of the project, as well as recording patient BMI, race and gender from the chart. When completed, please leave the paper copies of the questions in the rooms to be completed by the provider.

Appendix F: Obtaining a Neck Circumference Measurement/Calculating BMI

Neck circumference is measured by beginning on the lateral (outside) aspect of the neck and measuring around until the tape reaches to the origin point (Aswathappa, Garg, Kutty, & Shankar, 2013). The tape should be below the level of the laryngeal prominence (known as the Adam's apple). For the purpose of the study, we are only concerned if a patient's neck circumference is greater than 43 cm in size for men and 41 cm for women. The office will be provided with disposable paper measuring tapes. If a patient's neck is larger than 43 cm (Males) or 41 cm (Females), the measurement should be recorded on the survey sheet.

Procedure

- 1.) Ask the patient if they consent to having their neck circumference measured, with to speak to the provider, or decline the screening
 - a. If they decline, then skip the screening and remove the STOP-Bang Questionnaire from the room
 - b. If YES, proceed with the neck circumference measurement
- 2.) Record if the measurement is greater than or less than 40 cm on the STOP-Bang Questionnaire data collection sheet. **If the patient experiences distress, anxiety or concern during the measurement, stop immediately and notify the provider.**
- 3.) After the neck circumference measurement has been completed, please obtain a current height and weight, enter these into the chart, and record the chart-calculated BMI on the STOP-Bang Questionnaire data collection sheet. Leave the STOP-Bang Questionnaire data collection sheet in the room for all participating patients.

Appendix G: Disclosure/Consent Statement for Participation

I am looking for the help of patients in answering a survey focused on OSA screening and having their height, weight, and neck size measured. If you agree to participate, a

medical assistant will measure your height, weight and determine your neck size using a paper measuring tape. The survey will be completed by your provider, is brief and should take about 1-2 minutes of your time. All information will be kept safe and secure. No personal data, including your name, birth date, or social security number will appear on the survey or in association with your measurements.

Your help and participation are strictly voluntary and your choice to take part or not to take part will in no way affect your care. You may choose not to finish the survey or to stop the measurements at any point during your visit today. Your help is very important and will help me create OSA screening methods, as well as help me complete my final Doctor of Nursing Practice (DNP) project. If you do not consent or have questions about this project, please tell your provider.

If you feel anxious during the measurements, while answering the survey, or upon hearing the results of the survey, please tell your provider so that he/she can address your concerns and answer any questions. If you have any questions about this study or would be interested in the results, please contact the Salisbury University DNP student, Brendan Glowacki at (410) 995-8155. Thank you for your help

If you have any ill effects or questions about the research, please contact the Office of Graduate Studies and Research at Salisbury University at 410-548-3549 or toll free 1-888-543-0148

Appendix H: Obstructive Sleep Apnea Project Data Collection Form

Age: _____ Race: _____ Today's Date: ____ / ____ / ____

1.) Do you SNORE loudly? (Heard in other rooms or bothering partners)	YES	NO
2.) Do you feel overly TIRED during the day? (Falling asleep while driving or at work)	YES	NO
3.) Has anyone OBSERVED you stop breathing or gasping for air during sleep?	YES	NO
4.) Have/are you being treated for high blood PRESSURE ?	YES	NO
5.) Is your BMI greater than 35 kg/m ² ? BMI = _____ (From chart or calculation) Reminder: BMI = [weight in pounds / (height in inches x height in inches)] x 703 OR [weight in kilograms / (height in centimeters x height in centimeters)] x 10,000	YES	NO
6.) Are you over the AGE of 50?	YES	NO
7.) Is your NECK size large? Neck size _____ (Males = collar size equal to or larger than 17 in or 43 cm Female = collar size equal to or larger than 16 in or 41 cm)	YES	NO
8.) GENDER = Male?	YES	NO
<i>Total # of YES answers</i>		

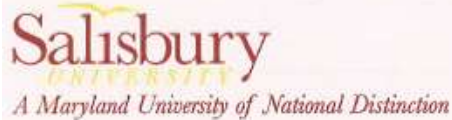
Reference: STOP-Bang Questionnaire (Chung et al., 2012)

Moderate to High Risk for OSA = Yes to 5 - 8 questions total

PROVIDERS:

1. Have you issued a referral to a sleep specialist during this visit today? YES NO
2. Was the patient receptive to information about OSA today? YES NO

Appendix I: IRB Approval



Salisbury University
Institutional Review Board
Committee on Human Research
Phone: (410) 548-3549
Fax: (410) 677-0052
Email: humanresearch@salisbury.edu

IRB Research Protocol Approval Notification

Date: 6/19/18

To: L. Seldomridge
RE: Protocol #59
Type of Submission: Exempt
Type of IRB Review: Exempt
Protocol is scheduled to begin 9/18 end 4/19

Approval for this project is valid from 6/19/18 to 4/30/19.

CONGRATULATIONS.

This letter serves to notify Dr. Lisa Seldomridge that the Salisbury University (SU) Institutional Review Board (IRB) approved the above referenced protocol entitled, Increasing Recognition of Obstructive Sleep Apnea in Primary Care: Implementing the STOP-Bang Questionnaire into Practice

Pursuant to Federal regulations 21 CFR 56.109, the IRB has determined that this protocol qualifies for Exempt review.

Federal regulation 45 CFR 46.103 (b)(4)(iii) requires Primary Investigators (PI), except when a subject is in immediate danger, to assure any change to an approved protocol is not initiated prior to IRB review and approval. Additionally, the PI must also inform the IRB of unanticipated problems involving risks to participants.

These same federal regulations require **continuing review** of research be conducted by the IRB at intervals appropriate to the degree of risk. Your research is scheduled to begin 9/18 and end 4/19. When necessary, the PI will receive a continuing review reminder notice prior to the date protocol approval ends; however, it is the PI's responsibility to submit continuing review reports in a timely manner (at least 3 weeks prior to scheduled end date on the protocol approval).

The SU IRB is organized and operated according to guidelines of the United States Office for Human Research Protections and the United States Code of Federal Regulations and under Federal Wide Assurance No. FWA00020237.

If you have any questions about this review or questions, concerns, and/or suggestions regarding this process, please do not hesitate to contact the Office of Graduate Studies and Research at 410-548-3549 or humanresearch@salisbury.edu.


Chair, IRB Committee on Human Research

Appendix J: Agency IRB Agreement and Deferment

Warren M. Ross, M.D. & Associates - Joshua Anderson, P.A.
CROSSROADS MEDICAL ASSOCIATES
4801 DORSEY HALL DRIVE #201
ELLICOTT CITY, MD 21042
(410)997-5191 phone
(410)997-7957 fax

Committee on Human Subjects
Salisbury University
1101 Camden Avenue
Salisbury, MD 21801

To whom it may concern,

As the Lead Physicians Assistant of Crossroads Medical Associates, I grant permission for Brendan Glowacki to conduct his DNP Project, Screening Primary Care Patients for Obstructive Sleep Apnea Using the STOP-Bang Questionnaire at Crossroads Medical Associates in Ellicott City from August 2018 through May 2019. This project will evaluate the effectiveness of the implementation of the STOP-Bang Questionnaire to increase recognition of Obstructive Sleep Apnea in adults in Primary Care.

We understand that the project will examine the assessment/screening, diagnosing, and treatment practices of health care providers in our Group before and after participating in a targeted educational session on use of the STOP-Bang Questionnaire. The project will include an educational session and data extraction from a retrospective chart review by Mr. Glowacki, and data collection of demographics, BMI measurements, neck circumference and additional focused history questions by participating providers. We understand that all patient data will be de-identified and reported in aggregate.

We agree to participate in the educational session on use of the STOP-Bang Questionnaire and correct measurement of neck circumference. We look forward to hearing about the outcomes of this quality improvement project.

We are deferring to Salisbury University's Institutional Review Board.

Sincerely,

Joshua Anderson



Table 1

SWOT Analysis

<p><u>Strengths</u></p> <ul style="list-style-type: none"> • General population outpatient clinic • Electronic medical record based • Mix of MD's and PA's – wellness-based model 	<p><u>Weaknesses</u></p> <ul style="list-style-type: none"> • Does not currently use an official OSA screening tool • Rotation schedule of providers
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Medical assistants can be utilized for the project implementation • EMR - retrospective chart reviews and data reporting 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Informal approximation of OSA risk– STOP-Bang Questionnaire may seem redundant • Paper data collection methods may be thrown away

Table 2

Demographics of Participants

	Caucasian	African American	Asian	Latino
N =121	101	11	7	2
Gender				
Male	47 (46.53%)	4 (36.36%)	3 (42.86%)	0
Female	54 (53.47%)	7 (63.64%)	4 (57.14%)	2 (100%)
BMI - Mean				
Male	30.26	23.73	23.97	N/A
Female	27.59	29.89	26	27.25
Age - Mean				
Male	62.70	63.25	58.00	N/A
Female	59.02	53.00	50.25	65.5

Table 3

STOP-Bang Questionnaire Results

	Caucasian	African American	Asian	Latino
N =121	101	11	7	2
STOP-Bang Score Mean				
Male	3.02	2.00	2.67	N/A
Female	2.59	2.26	1.25	2.00
Moderate to High Risk				
Male	13 (59.10%)	0	0	0
Female	8 (36.36%)	1 (4.55%)	0	0
Referral Accepted				
Male	6 (54.45%)	0	0	0
Female	4 (36.36%)	1 (9.10%)	0	0
Referral Declined				
Male	7 (63.64%)	0	0	0
Female	4 (36.36%)	0	0	0