



Implementing protocol for obstructive sleep apnea screening in the primary care setting



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ABSTRACT

Aim: 1) To implement obstructive sleep apnea (OSA) screening of at-risk patients in a primary care setting; 2) to evaluate and refer screened participants to sleep studies since early identification of OSA symptoms is an important initial step in reducing the burden of undiagnosed OSA disease.

Method: Participants completed the STOP-Bang questionnaire and those considered to be at risk were referred for sleep studies for disease identification, categorization, and treatment.

Results: Prevalent OSA screening and referral rates at the clinic prior to project implementation was 3% and 0% respectively, compared to the corresponding rates of 43% and 39% post project implementation. Out of 187 participants screened between January and April 2018, 61% had scores of 3 and higher on the STOP-Bang questionnaire, however, only 39% of the at-risk participants agreed to undergo sleep studies. Those who declined sleep study referrals were mostly participants who were not experiencing higher burden of sleep deprivation. Out of 45 participants who underwent sleep studies, 67% were diagnosed with moderate to severe OSA with recommendations to initiate continuous positive airway pressure (CPAP) machine therapy.

Conclusion: Most primary care providers do not routinely screen at-risk patients for OSA despite existing clinical practice guideline recommending early and accurate diagnosis of OSA for this population. The Stop-Bang screening tool can reliably predict the presence of moderate to severe OSA. Early identification of OSA risks in the primary care setting through routing screening is very imperative in order to minimize its effects on cardiovascular morbidity and mortality. The obtained results highlight the potentially high unmet need for screening and treatment of OSA in the primary care setting.

1. Introduction

Obstructive sleep apnea (OSA) is one of the most common sleep-related respiratory disorders characterized by repeated episodes of upper airway obstruction during sleep.

Obstructive sleep apnea is associated with a myriad of adverse outcomes including hypertension, arrhythmias, cardiovascular disease, diabetes mellitus, stroke, motor vehicle accidents, and increased risk of death when left untreated (Aurora et al., 2015; Kendzerskaa et al., 2014; Miller & Berger, 2015; US Preventive Service Task Force [USPSTF], 2017). Approximately 7% to 14% of men and 2% to 5% of women in the general population are affected by OSA, with resultant myriad of adverse consequences according to the reviews by Aurora et al. (2015) and Kapur et al. (2017).

Healthcare providers rarely screen patients for OSA symptoms without prompting from the patients as noted on the recommendation

statement by the USPSTF (2017) and summarized in a review by Miller and Berger (2015). More so, very few screened patients are referred for sleep specialists for evaluation, diagnosis, and treatment (Kapur et al., 2017; USPSTF, 2017). Potential barriers to screening cited by providers include being unsure of how to identify and diagnose OSA, uncertainty regarding which type of sleep monitors are best for diagnosis, and how to effectively manage patients who have been diagnosed (USPSTF, 2017).

It is well-recognized that OSA is an underdiagnosed disorder and this lack of disease recognition poses significant economic and public health burdens. Early identification of OSA symptoms through screening is an important initial step in reducing the burden of undiagnosed disease by providing the opportunity to expedite appropriate treatment (Aurora et al., 2015; USPSTF, 2017).

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2. Background

Despite the fact that OSA is a common disease, it remains largely underdiagnosed, with 75% to 80% of cases remaining unidentified (Aurora et al., 2015; Kendzerskaa et al., 2014). Risk factors for OSA include being male and over 40 years of age, being overweight, history of hypertension, snoring, neck size > 18 inches, daytime sleepiness, gasping at night, witnessed apnea, and craniofacial and upper airway abnormalities (American Sleep Apnea Association, 2015; Surani, 2014; USPSTF, 2017). With the current surge of obesity in the United States, it is predicted that the prevalence of OSA and its associated complications are likely to increase, hence the need for early detection (Mayo Clinic, 2013; Surani, 2014; USPSTF, 2017).

The STOP-Bang (SB) questionnaire is a reliable and validated OSA screening tool (Chung, Yang, Brown, & Liao, 2014). The SB tool, when compared with similar screening tools, may identify more patients with OSA since it integrates known risk factors for OSA (obesity, hypertension, age over 50, and male gender) which are omitted by other tools (Chung et al., 2014; Vana, Silva, & Goldberg, 2013). A meta-analysis involving 17 studies by Nagappa et al. (2015) confirms the high performance of the STOP-Bang questionnaire in the sleep clinic, surgical, and general population for OSA screening. This finding agrees with the results from a prospective observational study conducted by Cowan et al. (2014) and the findings from a cross-sectional study to determine the predictive abilities of the SB questionnaire by Vana et al. (2013).

A systemic review conducted by Senaratna et al. (2017) concluded that the prevalence of OSA increased correspondingly with increasing age and was also greater in obese men and women compared with overweight men and women. It is well-recognized that OSA is an underdiagnosed disorder and this lack of disease recognition poses significant economic and public health burdens. Health conditions that could affect sleep studies include dementia or daily forgetfulness, severe brain injuries, developmental delays, or stimulant use (Vana et al., 2013).

The USPSTF (2017) reviewed evidence from 76 good –to-fair quality treatment trials and concluded that the use of continuous positive airway pressure (CPAP) machine on patients diagnosed with OSA resulted in decrease in blood pressure and apnea-hypopnea index (AHI).

3. Methods

The methodology utilized in this quality improvement initiative was a self-report STOP-Bang questionnaire administered by four healthcare providers which included Nurse Practitioners (N = 3) and a Medical doctor (N = 1). Approval was given for the project implementation by the Medical director of the project facility. Ethical approval for this project was granted by the Institutional Review Board of the University of South Alabama.

3.1. Patients and setting

The participants for the project were adult patients, 40 years and older. The setting is a privately - owned urban primary care clinic with three locations in Houston, Texas area. This quality improvement project was limited to only the facility in the East side of Houston. The facility is staffed by two medical doctors (MDs), one cardiologist, three nurse practitioners (NPs), one office manager, two licensed vocational nurses (LVN), three medical assistants, two physical therapists, one radiology technician, and one phlebotomist. Approximately 850 mostly adult to geriatric patients comprising insured and uninsured low and middle income patients of all races visit the clinic annually. Fifty-five percent of the patient population is female, and over 70% of all the patients have diagnosis of hypertension, type 2 diabetes mellitus, or both. All participants were invited by trained clinic staff (two nurses and three medical assistants) during patient triage stage, and were capable of speaking either English or Spanish language. The exclusion

criteria included existing diagnosis of OSA; and health conditions that could affect sleep studies, such as dementia or daily forgetfulness, severe brain injuries, developmental delays, or stimulant use (Vana et al., 2013). A total of 187 patients agreed to participate in the project. Five patients declined to participate.

3.2. Measurement instruments

The physiological measurements obtained from participants included blood pressure and heart rate at the time of visit. Other data obtained included participant's body mass index (BMI), gender, neck size, and co-morbidities such as diabetes mellitus (DM), hypertension (HTN), and stroke, if present. The STOP-Bang questionnaire is a reliable and validated OSA screening tool which incorporates eight risk factors. These factors include snoring, tiredness, observed apneas, blood pressure, BMI > 35, age > 50, neck circumference > 40 cm, and male gender (Cowan et al., 2014; Qaseem et al., 2013; Vana et al., 2013).

The presence of 3 or more of these factors indicates risk for OSA. In the sleep clinic population, the STOP-Bang questionnaire has a sensitivity of 90%, 94%, and 96% to detect any OSA (AHI \geq 5), moderate-to-severe OSA (AHI \geq 15, and severe OSA (AHI \geq 30) respectively, with corresponding negative predictive value (NPV) of 46%, 75%, and 90%.

The probability of severe OSA with a STOP-Bang score of 3 is 25% in the sleep clinic population. 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 75%, respectively (Chung et al., 2014; Nagappa et al., 2015).

3.3. Procedure

A random patient chart audit conducted by the investigators in October 2017, showed that only 3% of patients were routinely screened for OSA during routine office visit. Random selection of the first 10 patients who visited the clinic over the course of six days in October 2017, resulted in 60-patient charts that were audited. None of the audited patients was referred for sleep studies. An informational in-service was provided by the principal investigator to all providers (three Nurse Practitioners and one Medical Doctor) and participating staff on the intended quality improvement project.

Subjects covered during the education sessions included screening protocols, inclusion and exclusion criteria, project implementation periods, and criteria for patient referral. This was followed by the implementation of the STOP-Bang questionnaire on consenting adult patients by the providers during patient assessment and review of systems between January and April 2018. Participants who have scores of 3 or more with or without OSA symptoms were referred for sleep studies.

Four weeks after a 14-week implementation period, a second 60-patient chart audit was conducted by the principal investigator in June 2018, using the same randomization technique that was utilized in the initial 60-patient audit. The purpose of this was to determine how many patients within that sample had been screened for OSA utilizing the STOP-Bang tool. The percentage of patients screened post-implementation was compared to the percentage screened pre-implementation.

Also, the percentage of screened patients who were referred for sleep studies pre- and post-intervention implementation was analyzed by the principal investigator. These findings which included screening rates and referral rates differences were presented to the clinical group by the principal investigator. The entire project implementation lasted 14 weeks from January to April 2018.

3.4. Statistical analysis

Data analysis comprised a 60-patient chart audit 4 weeks following the 14 weeks implementation period, comparison of the percentage of patients screened pre- and post-intervention implementation and

Table 1
Participant descriptive analyses.

| Characteristic | Frequency | Percent |
|--------------------------------|-----------|---------|
| Gender | | |
| Female | 99 | 53.0% |
| Male | 88 | 47.0% |
| Total | 187 | 100.0% |
| Diagnosis and Co-morbidity | | |
| HTN only | 126 | 67.0% |
| HTN and diabetes | 25 | 13.0% |
| None | 60 | 32.0% |
| BMI greater or equal to 35 | | |
| Yes | 29 | 16.0% |
| No | 159 | 84.0% |
| Total at-risk participants | 115 | 61% |
| Total non-at-risk participants | 72 | 39% |

comparing the rate of sleep study referral pre- and post-intervention implementation. Descriptive analyses of all variables were generated using IBM SPSS Statistics 20.0. Participants' characteristics are presented as numbers and percentages (Table 1).

4. Results

A total of 187 patients consented to participate in this quality improvement project with 99 (53.0%) identified as female while 88 (47.0%) identified as male (Table 1). The screening rate of the 60 audited patients pre-implementation was 3.0% (n = 2) and this increased to 43.0% (n = 26) post-implementation (Fig. 1). The referral rate of the 60 audited patients pre-implementation was 0.0% (n = 0), and this increased to 39.0% (n = 24) referral rate post implementation (Fig. 2). On the descriptive variables related to the outcomes, participants with SB scores of 3 or more (at risk participants based on the utilized screening tool) were 115 (61.0%), while participants with low risk of having OSA (SB scores < 3) were 72 (39.0%). Screened and referred participants who did sleep studies out of the total at-risk participants (n = 115) was 45 (39.0%) participants, out of which 30 participants (67%) were diagnosed and categorized with moderate to severe OSA. Participants with diagnosis of HTN only was 55.0% (n = 102), participants with diagnosis of both HTN and diabetes was 13.0% (n = 25). Participants with neither HTN nor DM diagnosis was 32.0% (n = 60). Participants with BMI greater or equal to 35 was 16.0% (n = 29).

5. Discussions

Obstructive sleep apnea is frequently underdiagnosed in the primary care setting. Primary care providers rarely screen patients for OSA symptoms without prompting from the patients or patients' family member with complaints of sleep disturbances. Participants' population was mostly female rather than male as observed in other sleep clinic studies (Seng et al., 2016; Vana et al., 2013). However, this observation is consistent with the fact that OSA can occur in any age group, but is most prevalent in older men and post –menopausal women (Miller & Berger, 2015).

The sample had a high OSA prevalence rate similar to the prevalence rate of 42.1% noted by Seng et al. (2016); 68.1% noted by Vana et al. (2013); and 82% noted by Ganesh, Kulkarni, and Noronha (2014). The proportion of persons with OSA in the general population who are asymptomatic is unknown, and may be on the rise due to increasing prevalence of obesity (USPSTF, 2017).

The most common cardiovascular condition found within the sample population was hypertension. This finding is similar to the 42.6% prevalence reported by Vana et al. (2013), and between 30% and 80% reported by Floras (2015). Obstructive sleep apnea is associated with a myriad of adverse outcomes including hypertension, arrhythmias, cardiovascular disease, diabetes mellitus, stroke, motor vehicle accidents, and increased risk of death when left untreated (Aurora et al., 2015; Kendzerskaa et al., 2014; Miller & Berger, 2015; USPSTF, 2017).

A study by Donovan et al. (2017) with 818 patients with type 2 DM reported that 90.1% of the participants were at high risk for OSA. This is consistent with the study results as 13% of the population has diagnosis of both HTN and DM, while 16% of the participants have BMI of 35 and above.

The overarching aim of this project was to increase the percentage rate of obstructive sleep apnea screening of at-risk adult patients by 40% in an adult primary care clinic within 14 weeks. The results showed that routine OSA screening can result in significant increase in the percentage OSA screening rate in the primary care setting, thus enabling healthcare providers to refer at –risk patients for further studies. This is consistent with the findings of a similar study by Williams, Williams, Stanton, and Spence (2017) on the implementation of an OSA program over one month period which resulted in increased prevalence of a STOP-Bang score of 3 or more from 5% to 21% after intervention.

The post-screening referral rate did not meet the goal of 50% increase in the rate of screened patients referred for polysomnography within two weeks post screening for diagnosis, categorization, and treatment as indicated (Fig. 2). Out of the 115 at-risk participants, only

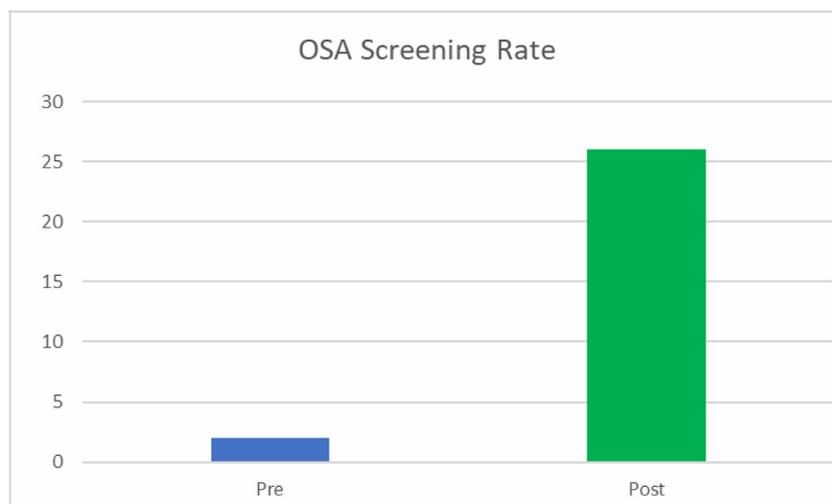


Fig. 1. OSA screening rates at pre and post implementation presented as numbers.

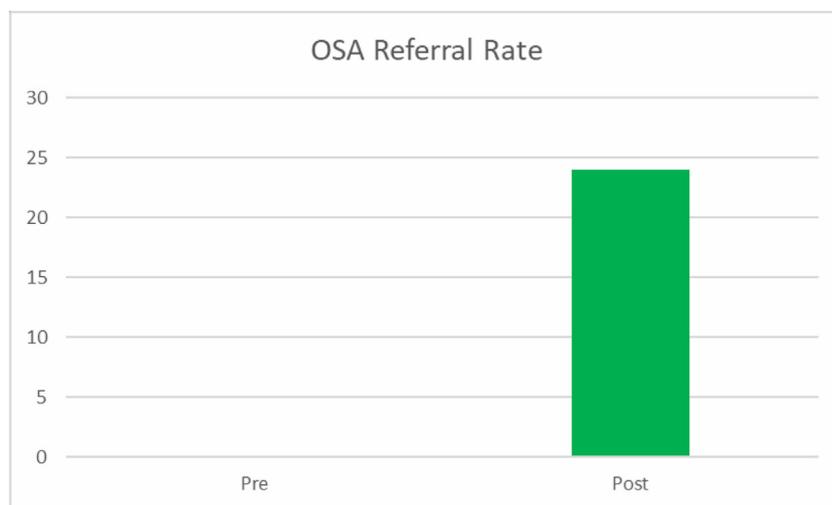


Fig. 2. OSA referral rate at pre and post implementation presented as numbers.

45 (39%) agreed to undergo sleep studies. Donovan et al. (2017) reported a similar finding whereby only 213 out of 738 at-risk participants (28.9%) agreed to undergo sleep studies. The high decline rate occurred despite multiple reminder phone calls to the participants by the sleep clinic staff. Those who declined sleep study referrals are mostly participants who are not experiencing higher burden of sleep deprivation. The lack of willingness to pursue diagnostic testing may also arise from other barriers such as out-of-pocket payments, transportation, and overnight child care as reported by Donovan et al. (2017). These findings tend to underscore the USPSTF recommendation that asymptomatic adults or adults with unrecognized symptoms do not require OSA screening (USPSTF, 2017). Further studies may benefit from focusing OSA screening on patients with complaints of sleep deprivation and other symptoms of OSA.

6. Limitations

This quality improvement project has some limitations. The utilization of self-report of pre-existing patient conditions such as snoring and tiredness; and the use of convenience sampling to select participants may affect the generalizability of the results.

Another factor that may affect the generalizability of the results was the fact that 61% of screened at-risk participants declined to undergo sleep studies for various reasons, and there was no estimation on the number of screened patients with complaints of perceived daytime interference. More so, participants with symptoms of OSA such as snoring and daytime sleepiness may have been more likely to agree to participate in this study compared to those without any sleep-related symptoms.

7. Conclusions

Most primary care clinicians do not routinely screen at-risk patients for OSA despite existing clinical practice guideline recommending early and accurate diagnosis of OSA for this population. More so, very few screened patients are referred to sleep specialists for evaluation, diagnosis, and treatment. Some potential barriers to screening cited by clinicians include being unsure of how to identify and diagnose OSA, uncertainty regarding which type of sleep monitors are best for diagnosis, and how to effectively manage patients who have been diagnosed. The SB questionnaire can reliably predict the presence of moderate to severe OSA. The obtained results highlight the potentially high unfulfilled need for screening and treatment of OSA in the primary care setting. Early identification of OSA risks in the primary care setting through screening is very imperative in order to minimize its effects on

cardiovascular morbidity and mortality.

Conflict of interest

The authors report no conflicts of interest, no financial support, or investigational use of product in the planning and implementation of this project.

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