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Screening for Sleep Apnea in Patients with Hypertension using the STOP-BANG Tool in a Primary Care Setting

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Final DNP Project Report

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Dedication

I dedicate my DNP project to my daughter Emily. I would not have started my DNP journey if it was not for her and after she passed away October 7, 2015, I knew that I was going to finish for her. She has been my motivation from the beginning and will always be my catalyst to continue on and provide healthcare to my patients in a way that they will never endure the hardships that we have. This is also for my daughter, Annabelle, to see that determination, perseverance and resiliency can help you overcome some of the hardest obstacles that we are faced with. We can get to where we want to go in life and no one can stop us. This is for my husband, Mike, who has been there pushing me when there was none left. You stayed by my side when all was taken from me. We have experienced some of the roughest waters that we could tread and hopefully, this is the start of what we deserve in life. This is for my mom, who has always encouraged me to further my education to the fullest extent and who always cheered me on along the way.

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Abstract

Obstructive sleep apnea (OSA) is a common cause of high blood pressure but often undetected in patients with hypertension. Screening tools for OSA exist but are underutilized. This project aimed to identify current practices and perceptions related to screening for OSA in patients with hypertension and improve primary care provider knowledge of OSA and screening rates using the STOP-BANG screening tool. The providers acknowledged the importance of screening patients with hypertension but there was no increase in screening after education was provided. Effective screening tools exist but effective strategies to bring this evidence to practice need to be explored further.

Keywords: Obstructive sleep apnea, STOP-BANG, hypertension, screening tools, primary care.

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Introduction

It is estimated that 22 million Americans suffer from sleep apnea, with as much as 80 percent of cases of moderate and severe obstructive sleep apnea being undiagnosed (American Sleep Apnea Association, 2015). One screening tool that should be considered in the primary care office is the STOP-BANG screening tool that would elicit potential patients who are suffering from sleep apnea. Sleep apnea can exacerbate many cardiovascular and cerebrovascular conditions and cause events such as myocardial infarction and stroke. Nurse practitioners should be aware of the potential consequences of undiagnosed sleep apnea and the ramifications that could occur. Sleep apnea is a secondary cause of hypertension and often goes undetected. STOP-BANG is an evidence-based screening tool that is brief and easy to use in a primary care setting.

Background

Sleep apnea is defined as a common sleep disorder characterized by repetitive episodes of apnea and hypopnea during sleep (Chung F., Yang, Y., & Liao, P., 2013). This condition is a common disorder that increases the risk for high blood pressure, heart attack, stroke, arrhythmias, heart failure, obesity, and diabetes (NIH, 2012). Obstructive sleep apnea is a secondary cause of hypertension, and is directly related to target-organ damage and increased markers of atherosclerosis (Drager, L., et al. 2016). According to the CDC, 1 in 3 Americans, or about 75 million individuals, suffer from hypertension. Kentucky has numbers consistent with the national average and hypertension rates have continued to rise since 1996 (CDC, 2013). This equates to a healthcare expenditure of $48.6 billion dollars annually (CDC, 2016). Additionally,

Kentucky alone reported in 2009 that 34.9% of adults report insufficient sleep fourteen out of thirty days per month (CDC, 2016).

An estimated 50% of patients with hypertension have concomitant OSA (Konecny, T., Kara, T., Somers, V.K. 2014). The mechanism of action that occurs is that an apneic episode produces surges in systolic and diastolic pressure that keep mean blood pressure levels elevated at night. These increases in pressure can also remain present during the daytime (Dopp, J.M., Reichmuth, K.J., Morgan, B.J., 2007). With 75 million Americans with hypertension and half of them having OSA, this means that there are about 37.5 million patients with sleep apnea. If 80% are undiagnosed then there are approximately 30 million patients that are not being treated for their sleep apnea.

Screening tools exist to help detect sleep apnea but are often not used. The STOP-BANG screening tool, originally developed for use in the surgical setting, is one example of an assessment tool that is useful for detection of sleep apnea problems (Chung F., Yang, Y., & Liao, P., 2013. Although developed for surgical patients, studies have demonstrated that this tool is effective in primary care as well (Keshava, K., et al. 2014).The STOP-BANG screening tool has a sensitivity of 87 percent. (Silva, G., et al., 2011). Studies have demonstrated that a STOP-BANG score of 7 or higher was indicative of sleep apnea 100% of the time (Keshava, K., et al., 2014). The eight-part questionnaire has a dichotomous answer of yes or no that allows for ease in scoring and determining the risk of each patient after administration. The questions are easily remembered with the mnemonic STOP-BANG which stands for snoring, tired, observed apnea, pressure or hypertension, BMI, age, neck circumference, and gender. In the primary care setting where time is limited, evidence supports the effectiveness and efficiency of this tool in driving the direction of care.

In spite of the evidence that exists, sleep apnea still remains an underdiagnosed and undertreated problem, leading to significant consequences. Due to the alarming statistics surrounding sleep apnea and its relation to hypertension, it is clear that an emphasis should be placed on screening patients so that the appropriate care can be administered. By implementation of the STOP-BANG screening tool for patients with hypertension, providers can improve health outcomes through the detection of an underlying disorder and may be able to reduce patient morbidity and mortality.

Purpose

The purpose of this study was to assess baseline practices related to screening for obstructive sleep apnea (OSA) among adult patients with hypertension in a primary care setting. Furthermore, the purpose was to educate providers about sleep apnea and the STOP-BANG screening tool and to evaluate subsequent changes in knowledge and screening rates.

Methods

This pilot study was a quasi-experimental study to assess the feasibility of methods and initial effects of the intervention to improve screening for OSA among patients diagnosed with hypertension. Institutional review board approval was obtained.

Setting and Sample: This study took place in a Norton Healthcare primary care setting in Louisville, Kentucky. There were three sample groups. First, there was the pre-implementation patient chart group. A power analysis concluded that the point of reaching saturation would be 100 charts. Inclusion criteria for the pre-implementation charts were that the patient was between the ages of 18 and 70 years old and had been treated for hypertension or an ICD 10 code I10 by any of the providers in the specific office chosen. Next, 100 charts were randomly selected using

a random number generator in Excel. These charts were dated between January 1, 2016, and December 31, 2016. Secondly, there was a group of providers that voluntarily participated and were consented to be a part of the study. Providers were eligible based on being physicians, nurse practitioners or physician assistants employed in the chosen setting. These providers delivered care to patients with hypertension and were willing to receive education on the STOP-BANG screening tool and utilize the tool in their practice. This educational intervention occurred on May 31, 2017. Lastly, for the post-implementation phase, patients charts for review were chosen based on being a patient of one of the consented providers and had an office visit for hypertension or an ICD 10 code I10 and were between the ages 18 to 70. The random number generator in Excel randomly selected 100 patients' charts to be reviewed. The charts were reviewed after the conclusion of the 3 month period between June 1, 2017, and August 30, 2017.

Procedures: To conduct a needs assessment, a retrospective chart review was completed to assess the selected office providers' current practices in regards to a screening of patients with hypertension for OSA. Providers were given a questionnaire to complete that elicited their current knowledge and perceptions regarding sleep apnea and the use of sleep apnea screening tools. This survey included 4 multiple choice questions to test their knowledge and 13 Likert-style questions to assess their perceptions, current practices, and barriers revolving around sleep apnea. Next, the study was explained and education was given to the participating providers in a face to face manner. This education included information on how to administer and score the STOP-BANG tool and what criteria warranted a referral for polysomnography. Participants were encouraged to use the tool and were informed that a retrospective chart review would be conducted at the conclusion of the three-month implementation phase. During implementation, consented providers conducted visits with their normal patient population and when a patient met

the inclusion criteria they were to use the STOP-BANG screening tool to assess for sleep apnea. The STOP-BANG tool was printed on paper and supplied for providers to score their patients and the medical assistant scanned the form into the EMR. After the three-month timeframe was complete, a retrospective chart review was completed on the three consenting providers and their patients that were seen for hypertension. Audit tools were used in both chart reviews to ensure consistency. At the conclusion of the study, the providers were provided with a post-survey that was replicated from the pre-implementation survey to assess their knowledge and perceptions after the implementation concluded.

Data Analysis

A descriptive statistical analysis was performed. For the demographic information, the means and standard deviations were reported for the age and BMI, while frequency distribution was reported for the gender of the patients included in the charts reviewed. Pearson's chi-squared test and the Fisher's exact test were used to test for associations among categorical variables. The Mann-Whitney U test was performed to test for differences in the potential STOP-BANG scores between the pre and post cohorts because they were skewed. Statistical analyses were done using the SPSS program with an alpha level of 0.05 throughout.

Results

There were eight possible provider candidates and all were approached. Seven providers were physicians and one was a physician assistant. There were six providers that were female and two male providers. Three providers consented to take part in the study, two male providers, and one female provider, while five female providers declined. The three providers were all physicians with experience ranging from 6-26 years. The pre and post provider questionnaires

were given to the three participating providers. The first four questions assessed the knowledge of the providers and information about sleep apnea as well as the STOP-BANG tool (see Table 1). For the first question, there was a deficit of knowledge about the undiagnosed patients as none of the providers answered correctly. In the post phase, only one provider was able to retain information that was taught in the educational intervention. The physiology behind how sleep apnea and hypertension were related elicited a correct response from all providers in the pre-intervention phase but was changed in the post phase as one respondent answered incorrectly. There was an increase of knowledge observed in question three. All providers were able to correctly answer the question about scoring the STOP-BANG tool in the pre and post implementation phases. Overall, the average score for all of the providers increased by 8.34%. Two of the providers increased their knowledge while one provider's knowledge decreased and potentially was not able to retain information from the educational intervention (see Table 2).

Table 1. Provider Knowledge Responses

Questions	Pre Response	Post Response
1. About what percentage of patients with OSA remain undiagnosed?		
a. 20%		1/3
b. 40%		1/3
c. 60%	3/3	
d. 80%		1/3
2. When patients have apneic episodes this causes		
a. Blood pressures to surge only at night time.		1/3
b. Blood pressures to surge which	3/3	2/3

continues to be apparent during the daytime.		
c. Blood pressures to surge only during the daytime.		
d. Nothing happens to blood pressure.		
3. The letter "O" in STOP-BANG stands for?		
a. Overweight		1/3
b. Obese	2/3	
c. Over the age of 50		
d. Observed apnea	1/3	2/3
4. A score of 4 on the STOP-BANG screening tool suggests?		
a. No Risk of OSA		
b. Mild Risk of OSA		
c. Moderate Risk of OSA	3/3	3/3
d. Severe Risk of OSA		

Table 2. Provider Knowledge Scores

Providers	Pre Score	Post Score
1	75%	25%
2	50%	75%
3	50%	100%
Averages	58.33%	66.67%

The perceptions of providers were also assessed with a pre and post implementation survey that addressed their current perceptions, practices, and barriers to screening. All providers agreed and acknowledged that OSA has an impact on cerebrovascular and cardiovascular systems and that screening patients with hypertension is important. One provider changed in the post to agreeing that all patients with hypertension should be screened for OSA. In the pre-implementation phase, one provider did not feel that there was a valid and reliable screening tool but this changed after the intervention. Again, all providers in the pre and post phases were comfortable with screening patients for OSA. In the pre-implementation, none of the providers reported using any screening tools and in the post self-reported an increase in the use of the STOP-BANG tool. Finally, perceptions of these three providers related to the reason screenings did not occur was simply that there was lack of clinical time to complete a screening most of the time. Non-compliance of patients and lack of reimbursement were also factors in why screenings did not occur.

The demographic information from the charts that were reviewed were a part of the STOP-BANG screening tool and include age, gender, and BMI. In the pre-implementation group, there were 100 charts reviewed that met the inclusion criteria. The mean age was 58.5 years old (SD= 10.2) and 89% were females. The average BMI was 33.7. In the post-implementation charts, there were 100 charts reviewed that met inclusion criteria. The average age was 56.5 years old (SD= 9.1) and 58% were males. The mean BMI was 33.5 (see Table 3).

Age was similar for both groups but gender distribution was significantly different with a shift from mostly females to a more even split with the majority being males.

Table 3. Descriptive statistics of the study samples

	Pre N=100 *Mean* (SD) or %	Post N=100 *Mean* (SD) or %	*p*
Age	58.5 (10.2)	56.5 (9.1)	0.14
Sex Male Female	 11% 89%	 58% 42%	<.001
BMI	33.7 (7.1)	33.5 (6.9)	0.82

Data that was extracted from the chart reviews included questions that would be reviewed from administering the STOP-BANG screening tool. Overall, there were only 2% of people screened with STOP-BANG in the pre and 7% in the post phase (see Table 4).

Table 4. Audit tool for chart reviews

	Pre N=100	Post N=100	*p*
Screened with STOP-BANG Yes No	 2% 98%	 7% 93%	0.09
Snoring No Yes Not Assessed	 1% 28% 71%	 1% 37% 62%	0.40
Tired No Yes Not Assessed	 3% 35% 62%	 5% 37% 58%	0.71
Apnea No Yes Not Assessed	 3% 19% 78%	 14% 20% 66%	0.01

As there was no increase in the use of the STOP-BANG tool the primary investigator determined potential scores that would have been elicited if the STOP-BANG tool had been performed using information that was found in the patient's chart. Scores ranged between one and seven with a median of three in both phases of the study (see Table 5). For patients in the post-implementation phase, 27% had potential scores that would be considered high risk that would need further evaluation by polysomnography or a referral to a pulmonologist. Twenty-two percent of patients scored a four on the STOP-BANG tool and would be considered moderate risk. More clinical information would need to be determined by asking all of the questions in the STOP-BANG tool as they may score higher if more information was available. Overall, in the post-implementation phase, there are 78% of these patients that if screened may have warranted polysomnography. The pre-implementation phase was similar with 58% of patients needing further evaluation. Potential STOP-BANG scores can be found in Table 6.

Table 5. Mann-Whitney U test for STOP-BANG scores

	Median	Lower Quartile	Upper Quartile	Minimum	Maximum
Pre	3	2	4	1	7
Post	3	3	5	1	7

p= 0.002

Table 6. Potential STOP-BANG scores

	STOP-BANG Scores	Pre n=100	Post n=100
LOW RISK FOR OSA	1	5%	2%
	2	37%	20%
	TOTAL %	42%	22%
MODERATE RISK	3	28%	29%
	4	12%	22%
	TOTAL %	40%	51%
HIGH RISK	5	10%	11%
	6	6%	11%
	7	2%	5%
	8	0%	0%
	TOTAL %	18%	27%

Discussion

The results did not show a significant difference in the implementation of the use of the STOP-BANG screening tool. There were two patients out of one hundred screened in the pre-implementation phase, one of which was done by a provider outside of the primary care office. The other screening was done by a provider in the selected primary care office. In the post cohort of this study, there were seven patients that were screened using the STOP-BANG tool. Of the seven patients, five patients scored as high risk for sleep apnea and two were considered moderate risk. Of the five that were considered high risk, three were appropriately referred for sleep studies. For the moderate risk patients, the provider would need to refer based on their clinical judgment on factors such as comorbidities.

When looking at elements that were not assessed, 62% of patients were not assessed for snoring, 58% were not assessed for being tired, and 66% were not assessed for having any observed apnea. These scores account for the 80% of people who are undiagnosed. While not all of these patients would have sleep apnea or be at risk for sleep apnea there were many patients

that were scored as a 4 which is considered a moderate risk that needs more information obtained by asking the questions from the STOP-BANG tool. It is likely that many would fall into a higher risk group. For patients in the post-implementation phase, there were 22% of patients that scored a 4. Many of these patients would be considered as a missed opportunity because if the provider had gotten more information then they might have become a 5 and be now considered as a high-risk patient. Many patients would be able to tell you if they snored or if they do not feel rested or are tired during the day although observed apnea may be harder to know unless there is a partner sleeping next to the patient to help answer this question. Assessing all risk factors and elements of the STOP-BANG tool is essential to elicit a score to determine the risk for sleep apnea.

There were no potential STOP-BANG scores of a maximum score of 8 because 96% of patients did not have a documented neck circumference. Many of the patients who received a score of 7 may have been an 8 if there was one documented. Neck circumference is also a missed opportunity for many of the patients that scored a 4 on their STOP-BANG screening as this may have bumped them into the high-risk category. Many patients who were obese and would get a point for this would also get a point for their larger neck sizes. Knowing this piece of information would also help to identify those who are more a high risk.

Limitations

Limitations that were identified in this study include a small sample size, study design, and the educational intervention. There were only three providers that participated in this study. Assessing their knowledge and perceptions gives us a narrow view of all providers as this may vary. Also, evaluating only one practice site makes it difficult to generalize the results from this study to other potential practices.

The study design is also a limitation in that additional information should have been extracted from the charts. Discussing other comorbidities such as myocardial infarction and stroke would place a larger emphasis on the importance of screening patients with OSA. This could also be used as a marker for more patient populations that should be screened in the primary care setting.

Finally, the educational intervention is a limitation due to the fact that there should have been multiple modes of content delivery to enhance the retention rates of the education provided. Education was given in a face to face manner. Handouts should be considered as well as a teach-back method to make sure that the information was heard and received by the participants. Also, the intervention should have had better reinforcement. In this study, the primary investigator visited the site at the midway mark to check to see if there was any additional information needed for screening patients. During this time, education was reinforced verbally. The timing of the follow-up education was done at the beginning of the day before patients were seen or in between patients individually with each of the participating providers. Determining what time was best for the providers to hear this information may have helped them be more engaged.

Practice Implications

Patients with hypertension need to be screened for sleep apnea. This study showed the feasibility of the use of the STOP-BANG tool and that providers are open to this screening method. There currently is no specific tool that has been adopted by the healthcare organization. This needs to occur in order for all providers to know what the standard for their organization is surrounding sleep apnea. With the adoption of one tool, there also needs to be a specific place to document this information as there is currently no template in the electronic medical record. This makes it difficult to document and keep track of what screenings have been performed.

Anesthesia providers currently use the STOP-BANG tool in the perioperative setting. Once they have documented a score it is not easily seen or transferred into the primary care setting for further evaluation. By adopting one tool and having a specific place to document this transfer of information may increase diagnosis of sleep apnea in patients.

Finally, this screening tool should be performed on patients at their annual well visits. In this study, the screening was to take place at any appointment where a patient's hypertension may have been addressed. With many competing priorities the screening tool may have been left out due to lack of time to address all of the patient's needs. At annual well visits, many other screening tools are addressed and this could be an addition to those to ensure that it is performed.

Conclusion

Sleep apnea is an essential disease process that needs to be screened for in the primary care setting. Results of this study indicate that providers concur with the importance of screening and are conscious of the tie between sleep apnea and hypertension. Overall, this study did not improve screening rates of sleep apnea and had poor compliance of screening patients. However, providers acknowledged the importance of screening patients with hypertension, were open to using a screening tool and showed potential. Effective screening tools exist but effective strategies to bring this evidence to practice need to be explored further.

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