STOP Snoring with a Bang!: Reducing Postoperative Complications By Screening Patients for Obstructive Sleep Apnea (OSA) Risk Factors

What was the problem to be solved? How was it identified?

Obstructive sleep apnea (OSA) is the most common sleep-related disorder. It is characterized by reduced muscle tone in the upper airway structures with frequent episodes of apnea resulting from partial to complete airway obstruction. An estimated 12 to 18 million adults are suspected of having risk factors associated with OSA and remain undiagnosed.

Nearly 35 million patients undergo surgical procedures annually. Patients presenting for surgery with risk factors associated with OSA can be problematic for anesthesia providers to manage during the intraoperative and postoperative phases. It is suspected that up to 25% of surgical patients have undiagnosed OSA and 80% of surgical patients with a previous OSA diagnosis remain undocumented at the time of surgery. Less than 25% of hospitals nationwide screen patients for risk factors associated with OSA.

The best way to identify OSA is through a formal sleep study called a polysomnography (PSG), where the periods of apnea during sleep can be monitored and documented accurately for proper diagnosis. Unfortunately, the complexity of the sleep study, time commitment, and out-of-pocket expenses incurred present many challenges for patients to complete the testing. This may explain why so many patients presenting for surgery remain undiagnosed with OSA and why risk factors may often be disregarded. Even when patients are diagnosed with OSA, patient compliance to the prescribed regimen remains an additional challenge.

The rising incidence of OSA, both undiagnosed and diagnosed, continues to emerge on healthcare providers’ radar in the perioperative setting. Patients suspected of OSA have an increased incidence of perioperative morbidity and mortality, postoperative complications, difficult intubations, prolonged length of hospital stays, and higher rate of intensive care admissions. Medications commonly used in the perioperative setting worsen the upper airway collapsibility as well as blunt the arousal response in the post-surgical patients; therefore, postoperative complications of apnea, oxygenation desaturation, and cardiac dysrhythmias can occur in the presence of OSA. Many patients first experience complications related to OSA during recovery in the Post Anesthesia Care Unit (PACU).
The Perioperative Departments at University of Maryland Upper Chesapeake Health (UM UCH), a two-hospital system in Harford County, Maryland, were not screening patients for risk factors associated with OSA prior to undergoing general anesthesia for surgical procedures. We identified an opportunity to study our surgical patient population to better understand their risk factors for OSA and establish practices to prevent complications associated with OSA patients.

What baseline data existed?

We conducted a retrospective review on surgical-floor patients who were documented with postoperative complications resulting in a rapid response emergency (RRT) from April 2015 to April 2016. A total of 45 postoperative patients on the surgical floor experienced complications during the review period resulting in a RRT. Aggregated data was collected from this sample and evaluated using IBM SPSS software to assess specific risk factors associated with OSA as well as a previous diagnosis. The risk factors analyzed in our baseline data included hypertension, body mass index (BMI) > 35 kg/m², age > 50 years, and gender (male). These key risk factors are based on the criteria assessed in the evidence-based OSA screening tools.

Our retrospective review revealed that many patients presented with potential risk factors associated with OSA. Of the 45 patients included in the review, 88% did not have a previous diagnosis of OSA. The study showed that 97% of the surgical patients who experienced postoperative complications had a past medical history of hypertension (HTN). A total of 93% of the patients were over the age of 50. The mean BMI was g 29.9 and 53% of the patients were male. Upon conducting chart reviews, the data also revealed that 57.7% of surgical patients for whom a nurse called a RRT had three or more risk factors.

Figure 1. This chart shows the baseline data collected during the period of April 2015 to April 2016 for surgical patients who experienced postoperative complications and for whom a rapid response emergency (RRT) was called. Of the 45 patients, 57.7% had three or more risk factors for OSA yet only 11% were previously diagnosed with OSA. The most prevalent OSA risk factors observed were hypertension (HTN) and patients over the age of 50.
The retrospective review and data analysis helped to support our urgency to implement a process to screen patients for risk factors associated with OSA in the prior to any surgery. Early identification of at-risk patients should help prevent post-operative complications and promote the diagnosis and treatment of OSA in our surgical patient population.

What were the goals — how would you know if you were successful?

The ultimate goal of our program is to reduce the number of rapid response emergencies (RRTs) due to postoperative complications for surgical patients who present with risk factors associated with obstructive sleep apnea (OSA).

In order to achieve our goal, the main intervention was to develop and implement a nurse-driven protocol to screen surgical patients for OSA risk factors prior to undergoing general anesthesia.

We also aspire to provide patient education to all surgical patients identified with OSA risk factors through the STOP-Bang questionnaire so that they can gain a better understanding of OSA and follow up with their primary care provider for proper diagnosis and treatment.

What methodology or process was used to develop the Solution?

UM UCH leverages the IMPRV methodology to work on problem solving and developing solutions. IMPRV (Identify, Measure, Process, Re-Think, and Validate) is a best-in-class methodology founded upon the key tenets of Lean, Six Sigma, project management, and change management theories. IMPRV provides a structured way for UM UCH teams to identify opportunities for improvement, analyze the situation, and develop a solution to solve the problem at hand. Starting in 2016, UM UCH formed a multidisciplinary team to better understand our surgical patient population, their risk factors associated with OSA, and how to prevent postoperative complications related to OSA.

**Identify:** The key objective of the Identify Phase is to clearly define the problem and develop a solid business case for executive and organizational sponsorship. Our multidisciplinary team consisted of key stakeholders from perioperative leadership, perioperative education specialists, perioperative nursing staff, and perioperative clinical documentation specialists. We worked on researching OSA risk factors and the correlation to postoperative complications.

A comprehensive literature review was conducted with a total of 22 relevant articles published between 2012 and 2016. The articles selected included both quantitative and qualitative evidence that supported the best practice of screening patients for OSA risk factors in the perioperative department. We used the Johns Hopkins Nursing Evidence-Based Practice Standard Grading Tool to assess the level of evidence and overall quality of the articles selected from the literature search. Many articles included professional opinions encouraging the need to standardize screening of patients for risk factors associated with OSA preoperatively, emphasizing that the benefits
outweigh the risk of not screening. Other articles discussed the efficiency of the different OSA screening tools available and advocated for standardized screening for OSA risk factors in the perioperative setting. The focus of these articles included best practices for the management of patients with suspected OSA during the intraoperative and postoperative phases, the need to increase the nurses’ level of understanding of OSA in relation to patients with suspected OSA, and the importance of optimizing patient oxygenation along with protecting the patient’s airway during recovery from general anesthesia.

**Measure:** The key objective of the Measure Phase is to understand the current state of the process and collect sound data on process performance. We analyzed baseline data for our surgical patient population showing that we have a high number of patients presenting risk factors for OSA and corroborating the trend that these patients are likely to have postoperative complications (Figure 1). The results of our analysis were presented to the Perioperative Operations Council. We also established ongoing performance metrics for the program.

**Process:** The key objective of the Process Phase is to analyze data to identify root causes and areas of opportunity, as well as any waste and inefficiency in the current process. Our team determined that undiagnosed OSA or unidentified risk factors for OSA in our surgical patients were among the root causes for postoperative complications. We determined the need to develop and implement an OSA screening process to identify patients with risk factors associated with OSA prior to undergoing general anesthesia. Extensive research was completed on OSA screening tools and best practices on how to manage OSA risk factors in a perioperative setting.

**Re-Think:** The key objective of the Re-Think Phase is to design our solutions and create a safer and more efficient process that will support attainment of our goals. During this phase, we developed the different interventions and improvement initiatives, as well as an implementation plan to roll out our solution. Our interventions include the STOP-Bang questionnaire, tools to flag OSA risk patients, education for Team Members, and education for patients to raise awareness about OSA, the risks that it presents for postsurgical recovery, and to promote the diagnosis and treatment of OSA among our patient population.

The research articles compared the OSA screening tools rating the tools for their specificity and sensitivity in identifying patients with risk factors associated with OSA. The STOP-Bang questionnaire was identified as the most reliable screening tool available for healthcare providers to use to identify patients with risk factors associated with OSA for the perioperative setting. The STOP-Bang questionnaire is an evidence-based scoring model consisting of questions based on yes/no answers. It is concise, simple, and easy to integrate into electronic health records.

STOP-Bang is an acronym that incorporates the OSA risk factors, as seen in Figure 2. A STOP-Bang score of ≥ 3 identifies patients with risk factors associated with OSA prior to undergoing general anesthesia and has been a key predictor of postoperative complications. The STOP-Bang tool was found to strengthen collaboration and communication between healthcare providers, improving patient outcomes. The STOP-Bang tool was selected as the screening tool for UM UCH based on the level of research and evidence conducted nation-wide.
STOP-Bang Questionnaire

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snoring</td>
<td></td>
</tr>
<tr>
<td>Tiredness</td>
<td></td>
</tr>
<tr>
<td>Observed Apnea</td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td></td>
</tr>
<tr>
<td>Body Mass Index &gt; 35 kg/m²</td>
<td></td>
</tr>
<tr>
<td>Age &gt;50 years</td>
<td></td>
</tr>
<tr>
<td>Neck Circumference &gt; 40 cm</td>
<td></td>
</tr>
<tr>
<td>Gender = Male</td>
<td></td>
</tr>
</tbody>
</table>

Score: For each risk factor that the patient presents (“Yes” answer), add 1 to the total score. STOP-Bang scores range from 0 to 8, where the risk for OSA is categorized as:
- **Mild**: 0-2
- **Moderate**: 3
- **Severe**: 4-8

**Figure 2.** The STOP-Bang questionnaire was selected as UM UCH’s screening tool for OSA risk factors. A STOP-Bang score of ≥ 3 identifies patients with risk factors associated with OSA prior to undergoing general anesthesia and has been a key predictor of postoperative complications.

**Validate:** The key objective of the Validate Phase is to complete solution implementation, ensure process accuracy, and provide comprehensive training for improvement, sustainment, and ownership. Nurse champions were identified to encourage and support the new nurse-driven protocol and assist other nurses who may develop questions about the new screening process. Prior to the implementation of the perioperative screening of patients for risk factors associated with OSA, presentations were given to the hospital-wide Nursing Practice Council, Perioperative Unit Based Nursing Practice Council, Patient Safety Quality Improvement Council, and Anesthesia providers. The implementation dates for our program were November 1st, 2016 at UCMC and January 1st, 2016 at HMH.

**Solution**

**What Solution was developed? How was it implemented?**

In the Re-Think Phase of our process methodology, our team utilized information gained during the research and literature review to begin thinking about what would work for our preoperative teams. The following interventions were found to be the most beneficial for our specific patient population and preventing complications of surgery.

**Intervention 1: OSA, STOP-Bang, and Capnography Education for Team Members**

OSA, STOP-Bang, and Capnography education was developed and distributed to Team Members as part of our initial implementation. Ongoing education is provided to key stakeholders to promote sustainability of this program.

Obstructive sleep apnea education was developed and distributed with a post-test through UM UCH’s online learning management system for the nursing staff hospital wide. The education includes pathophysiology and interventions for the nursing staff responsible to care for these identified surgical patients.
STOP-Bang education was also developed and distributed with a post-test through UM UCH’s online learning management system for the nursing staff in the perioperative department responsible for assessing surgical patients prior to undergoing general anesthesia. In addition to the online education provided, one-on-one education was given to each nurse to allow questions to clarify the purpose and effectiveness of the screening. Education for the new nurse-driven protocol, used to screen all surgical patients for risk factors associated with OSA, was also implemented in the perioperative department via one-on-one training.

Capnography was defined in the literature as best practice initiative to assess the immediate ventilatory status of our patients when coming out of surgery and recovering from anesthesia. Capnography education was developed and distributed with a post-test for the nursing staff in the perioperative department responsible for patients recovering from general anesthesia. The annual nursing hands-on competency was used as a platform to assess the nurse’s knowledge and aptitude of capnography used to recover patients postoperatively.

**Intervention 2: STOP-Bang Questionnaire**

The STOP-Bang questionnaire was incorporated into nursing clinical documentation in UM UCH’s EMR system for the Perioperative Department to help ensure screening sustainability and ease of use. We did not want to add to the nursing workload by asking our Team Members to complete the STOP-Bang questionnaire for all patients. We wanted to make sure that we spent our time screening the appropriate, at-risk patients. In order to do this, we implemented two questions prior to the eight STOP-Bang questions. The first question is to verify if the patient had a previous diagnosis of OSA, and the second is to verify if the patient snores. If the answer to “Do you snore?” is “Yes” or “Unknown,” then the STOP-Bang questionnaire is automatically opened and the perioperative nurse completes the assessment with the patient. If the answer is “No,” then there is no need to proceed with the STOP-Bang questionnaire, and the documentation is automatically minimized. We felt comfortable with this initial decision question due to our statistical analysis of the STOP-Bang questions where we found that snoring is the risk factor that is most highly correlated with a “Severe” STOP-Bang score (p value = 0.003 using Pearson’s Chi Square test). Again trying to avoid adding more to the nursing workload, we were able to work with IT to automate the calculation of the STOP-Bang score (Figure 3).
Figure 3. This image shows the STOP-Bang questionnaire implemented in UM UCH’s electronic medical record system. Perioperative nurses complete this for all patients prior to surgery.

**Intervention 3: Flagging OSA Risk Patients**

A light blue OSA sheet was developed as a visual aid to help the anesthesia providers and nurses to identify the patients who were identified with OSA risk factors. The OSA sheet is placed on the patient’s chart and is to remain on the chart throughout the patient’s stay in the Perioperative Department. The OSA sheet included pertinent information such as the STOP-Bang score (populated from the nursing documentation above), previous diagnosis of OSA or CPAP at home, and a section to identify if the patient had any postoperative complications. These OSA sheets are collected weekly in the PACU and further evaluated to assess the effectiveness and sustainability of the OSA screening process.

In addition, the perioperative SBAR (Situation, Background, Assessment, and Recommendation) hand-off communication tool was modified to include the STOP-Bang score to be communicated between nurses during patient report to the floors. The hand-off tool is sent with the patient’s paper chart when being transferred to the surgical floor.

Figure 4. This image shows the light blue OSA sheet included in the patient’s chart for patients who present with OSA risk factors.
**Intervention 4: Clinical/Treatment Interventions for Patients with OSA Risk Factors**

For patients who have been identified with OSA risk factors, our care team works to monitor and intervene in our patients care to help prevent postoperative complications. We created a standard operating procedure (SOP) to define the staff roles within this process of screening and tailoring care to patients with OSA risk factors.

Once the STOP-Bang questionnaire is completed and a patient is identified as having risk factors of OSA, the completed light blue OSA form is added to the Anesthesia chart to facilitate communication and precaution. Anesthesia then considers tailoring their sedation based upon the patient’s STOP-Bang score, as well as tailoring postoperative assessments and postoperative treatment. This treatment may include prescribing CPAP and ordering capnography before the patient is discharged from the PACU.

When the patient comes out of the operating room and goes into PACU with the light blue OSA sheet on their chart, the nurse knows that the patient has higher risk for postoperative complications due to their OSA risk factors. The nurse therefore monitors the patient closer, performing more frequent respiratory, cardiac, and neurology focus assessments. The PACU nurse keeps a keen eye out for any post-operative complications like narcotic-induced hypoventilation, and initiating capnography when appropriate.

We are currently working on raising awareness of patients with OSA risk factors beyond the Perioperative Department. We have seen some challenges working with surgical patients who bypass the preoperative Department as an add-on or emergency procedure. The OSA screening program is not currently implemented at UM UCH outside of the Perioperative Department. Our next steps are to develop and implement a standard nursing protocol incorporating the light blue OSA sheet and prompting our care team to monitor these patients more closely. Inpatient staff will help to complete specific interventions that can help minimize their risks for complications due to OSA risk factors (e.g., raise the head of the bed, nocturnal pulse oximetry, etc.). Nursing “buy-in” is critical to the success of the program’s sustainability. We needed to make sure Nursing understands the value of the screening for OSA risk factors as a key step in the pre-operative interview process and that we provide additional evidence-based strategies to support patient care and help reduce postoperative complications.

**Intervention 5: OSA Patient Education and Follow Up**

An OSA patient education brochure was developed and approved by Perioperative Leadership, including the Chief of Surgery and the Anesthesia. The patient education brochure explains the definition, symptoms, and health risks of OSA. In addition, the brochure explains that the patient has been identified with risk factors associated with OSA, and recommends that the patient follow up with their primary care provider for proper diagnosis. The PACU nurse will document that the OSA patient brochure was given and reviewed with the patient in the education intervention in the EMR once the patient has been discharged (Figure 5). If the patient is sent to the inpatient unit, the inpatient nurse will again review this information and help to promote better awareness of OSA follow-up.
What are the results of implementing the Solution? Provide qualitative and/or quantitative results to data. (Please include graphs, charts, or tools.)

As previously stated, the ultimate goal of our program is to reduce the number of rapid response emergencies (RRTs) due to postoperative complications for surgical patients who present with risk factors associated with obstructive sleep apnea (OSA). After implementing our OSA screening program, we saw a 62% decrease in the number of RRTs in our inpatient surgical unit when comparing our baseline data with a one-year period after the implementation of our program (Figure 6).
Figure 6. This graph shows a 62% decrease in the number of rapid response emergencies (RRTs) initiated for our surgical patient population before and after implementation of the OSA screening program. Some of the OSA risk factors are displayed for comparison. Both data collection periods consist of one year, where the “Before” period is from April 2015 to April 2016 (baseline) and the “After” period is from November 2016 to November 2017. Note that for our 2016-2017 data there were 13 patients with 17 RRTs, where one patient had three RRTs and two patients had two RRTs initiated.

In order to gain additional insight into our OSA screening program, a three-month review was conducted for the period of November 1st, 2017 to January 31st, 2017 to assess how many patients were identified with risk factors associated with OSA and the STOP-Bang scores assigned. Chart reviews were completed by our team’s primary investigators to assess and collect aggregated data using the OSA risk factors, OSA diagnosis, and postoperative complications. The review also included an assessment of the light blue OSA sheets collected in the PACU.

A total of 1,878 surgical patients were screened using the STOP-Bang questionnaire during the three-month period. Of the 1,878 patients screened, 276 patients (15%) were identified with risk factors associated with OSA. Out of the 276 patients, 20 patients (7%) experienced postoperative complications in the PACU recovering from surgery. PACU complications included prolonged PACU stay, oxygenation desaturations, hypoventilation, atrial fibrillation, chest pain, and stroke. Descriptive statistics, frequency, and Chi Square analysis were conducted for the eight OSA risk factors identified, OSA diagnosis, and postoperative complications using the IBM SPSS 24 program. Figures 7 and 8 display STOP-Bang score results and measurable OSA risk factors identified with screening.
It is evident that a higher volume of patients with “Severe” STOP-Bang scores experienced complications in the PACU (Figure 7). This supports the need to provide additional attention to the patients with “Severe” STOP-Bang scores to help prevent postoperative complications.

**Figure 7.** These graphs show the distribution of STOP-Bang scores in surgical patients with risk factors associated with OSA prior to undergoing general anesthesia during a three-month period from November 1st, 2016 to January 31st, 2017. (a) A total of 276 of our surgical patient population presented with OSA risk factors and 67% of them scored as “Severe.” (b) Out of the 276 patients, 20 experienced postoperative complications in the PACU and 80% of those had “Severe” STOP-Bang scores. This demonstrates the need to provide additional attention to the patients with “Severe” STOP-Bang scores to help prevent postoperative complications.

When analyzing the distribution of OSA risk factors for our surgical patients assessed through the STOP-Bang questionnaire, we can see that the most prevalent risk factors are snoring, hypertension, and age > 50. Again, the patient population who experienced postoperative complications in the PACU showed higher percentages of patients with OSA risk factors in each of the eight STOP-Bang risk factors (Figure 8).
Figure 8. The graph displays the distribution of the OSA risk factors obtained through the STOP-Bang questionnaire in the surgical patients identified with OSA risk factors prior to undergoing general anesthesia during the period of November 1st, 2017 to January 31st, 2017. It is evident that the patients who had postoperative complications in the PACU had more positive answers in the STOP-Bang questionnaire and therefore more risk factors associated with OSA. The highest OSA risk factors in patients with and without postoperative complications were snoring, hypertension, and age > 50.

After implementing the OSA screening program at UM UCH, we have seen a sizable decrease in postoperative complications in our inpatient surgical unit. The number of RRTs decreased from 45 to 17 (62% decrease) for comparable one-year periods assessed before and after implementation of the program. The most prevalent OSA risk factors among our surgical patient population were snoring, hypertension, and age > 50. It is important to proactively identify patients with “Severe” STOP-Bang scores and provide additional attention throughout their care to help prevent postoperative complications. When looking at our patient population, we noted that the average BMI for patients who experienced complications in the PACU was 29.7 kg/m². In the future we might consider lowering the BMI used for screening from 35 kg/m² to 30 kg/m² to more readily capture patients who might present with this risk factor. We need to conduct additional research in order to officially propose this change to our current evidence-based practice for OSA screening.
What measures are being taken to ensure that results can be sustained and spread?

Prior to implementation of our program, an OSA screening policy was created by the Director of Perioperative Services and the Perianesthesia Education Specialist. This policy has helped to support sustainability of our process to screen patients for OSA risk factors using the STOP-Bang tool and implement interventions accordingly. The policy was approved by Perioperative Leadership and became effective at UCMC as of November 1st, 2016.

Another way in which we are ensuring sustainability includes the integration of the questionnaire into the nurse’s preoperative assessment clinical documentation in UM UCH’s electronic medical record system. Results of the STOP-Bang screen are documented in the light blue OSA sheet which must be placed on the patient’s chart by the pre-surgical or preoperative nurse. The light blue OSA sheet creates visual awareness and promotes better communication between the anesthesia providers, surgical team, and all perioperative nurses. When any Team Member sees the light blue OSA sheet, they now know that the patient is suspected of having risk factors associated with OSA or that the patient has a previous diagnosis of OSA.

The light blue OSA sheets remain on the patient’s chart in the Perioperative Department and the team continues to collect them weekly upon the patient’s discharge or transfer from the PACU. These sheets are reviewed by the education specialist, ensuring accuracy and compliance of the screening.

For our same-day surgical patients that are discharged from the PACU, the PACU nurse is responsible for providing the OSA patient education brochure and explaining the screening results to both the patient and designated responsible family member. The PACU nurse assesses the patient’s level of understanding using the teach-back method and completes the patient discharge education documentation screen within the electronic medical record system. This nursing documentation includes a specific section addressing OSA education and ensuring that the brochure was given upon discharge.

In order to continue promoting better patient outcomes and recognition of OSA, we didn’t want the screening tool to stop in the PACU. For the patient population that gets admitted to the inpatient floors, the PACU nurse records the STOP-Bang score on the SBAR handoff communication tool for the inpatient units. Our current process is then to integrate the OSA patient education brochure in the chart and to be given by the floor nurse upon hospital discharge. Just in case the original brochure was misplaced, all inpatient floors are now stocked with the OSA patient education brochures. Our next steps within our work are to implement this screening to all patients on the inpatient floors prior to receiving sedation and general anesthesia for procedures.
What role did teamwork and collaboration play in the Solution? What partners and participants were involved? Was the organization’s leadership engaged and did they share the vision for success? How was leadership support demonstrated?

Teamwork and collaboration were essential to the success achieved through this initiative. From the beginning, we had a multidisciplinary team review the baseline postoperative RRT data and evaluate the available evidence-based literature to support the need to screen patients for risk factors associated with OSA. We presented our proposal to the Perioperative Operations Council, which included hospital senior leadership, and obtained approval for the project. The project also received support from the Chief of Surgery and Anesthesia and it was presented in to the Anesthesia Quality Council. We continued to engage with perioperative team and key stakeholders throughout the duration of the project, making sure to include their input and maintain their buy-in for our program.

The Perioperative Information Technologist Specialist was involved since the beginning of the project and was instrumental in building the STOP-Bang questionnaire into the nurse’s documentation in our electronic medical record system, as well the question “Do you have OSA?” into a separate focus assessment to increase the likelihood of capturing more patients with a previous OSA diagnosis. The integration of the STOP-Bang questionnaire screening tool was presented to the Clinical Documentation Change Control Committee, who provided support and approved the final build into the hospital’s electronic medical record system.

Weekly meetings between the Director of Perioperative Services and the Perianesthesia Education Specialist helped to ensure continuous collaboration, maintain the perioperative team’s buy-in, and continued input from key stakeholders. The collaboration between these Team Members led to the creation of the OSA screening policy. The policy was taken to the Perioperative Leadership, who were very enthusiastic and provided their final approval on October 28, 2016.

The project was also presented to our Nursing Practice Council prior to implementation and received support from our nursing leadership. A final presentation was given to the Patient Safety and Quality Council who again supported our OSA screening program as a way to promote safe, high-quality patient outcomes.

What makes this Solution innovative? What are its unique attributes?

The STOP-Bang questionnaire has been around for some time and used for predicting patient outcomes for postoperative patients. Our solution is innovative, not do to the screening tool, but because of how we have used the question “Do you snore?” to help narrow down and capture the most accurate patient population and avoided the overburden of nursing documentation.
Due to the screening, the PACU nurses have the autonomy to implement capnography during the patient’s recovery, increase the patient’s length of stay in the PACU to ensure the patient is safe for discharge or transfer to another level of care, or request for the anesthesia provider to reassess and evaluate the patient during recovery from general anesthesia.

Screening patients for OSA risk factors prior to surgery serves as a proactive approach to identify patients who could develop postoperative complications, however it is essential to use the screening STOP-Bang score to implement necessary interventions that mitigate patient complications and promote better patient outcomes. The implementation of perioperative screening of patients has been adopted into the preoperative nurses’ normal practice, but in addition and due to proactive and aggressive buy-in for the process, our anesthesia providers have also adopted this score into their way of thinking and professional practice. Anesthesia has incorporated the STOP-Bang score onto all patient anesthesia records. Anesthesia providers have an opportunity to create an effective and safe plan of care for the surgical patients. These plans can include application of CPAP, as well as appropriate placement for level of care following the surgery.

**Culture of Safety**

**What impact did the solution have on the culture of safety within the organization?**

The implementation of screening patients for risk factors associated with OSA has helped reduce the amount of RRT initiated on the surgical floor for postoperative patients. The early identification of patient who are at-risk for postoperative complications related to OSA has created great awareness among the anesthesia providers, surgeons, and perioperative nursing staff. Additional interventions have come about since the new OSA screening process. During our evaluations of the light blue OSA sheets, we revealed that the PACU nurses are comfortable initiating the use of capnography, requesting the application of CPAP, and prolonging patients stay in the PACU for closer monitoring during recovery. The light blue OSA sheet and STOP-Bang score has also helped facilitate better communication of concerns to the anesthesia providers. This solution helped to promote collaboration among departments and specialties though placing an even bigger emphasis on a culture of safe care delivery.

**Patient and Family Integration**

**How did the solution include the patient and family?**

We developed a brochure to educate patients and families regarding what OSA is as well as how to get properly diagnosed. We involved patients and family members who had severe OSA risk factors in reviewing the materials to gauge their level of understanding and the effectiveness of the brochure in encouraging them to seek help with their primary care provider. Our Marketing
Department also reviewed the materials to assess the reading level and provide and aesthetically pleasing look and feel for our educational content.

Upon discharge from the PACU or from the inpatient surgical floor, the primary nurse is responsible for distributing an OSA patient education brochure to the patient and responsible family member caring for the patient. The nurse explains and discusses the information in the brochure. The emphasis and recommendation is then for patient to follow up with their primary care provider for proper diagnosis and treatment of OSA. During the three-month period from November 1st, 2016 to January 31st, 2017 alone, a total of 276 patients were identified with risk factors for OSA and received our educational brochure.

While consulting with a patient and family member to review the OSA education brochure, the patient’s wife identified her husband as having risk factors associated with OSA and encouraged him to follow up with his primary care physician. The patient underwent a PSG sleep study and was diagnosed with severe OSA. The patient and his wife are thankful for the OSA education and contributes his well-being to having been properly identified and diagnosed with OSA. This is one of many patient stories that we hope to hear as we continue to educate our patient population and raise awareness about OSA in our community.

**Related Tools and Resources**


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Addendums & Contact Information

Contact Person: Melissa Hunter, DNP, RN, CCRN  
Title: Perianesthesia Education Specialist  
Email: mhunter@uchs.org  
Phone: 443-643-2907

Contact Person: Lisa Campbell, MHA, BSN, CNOR  
Title: Director of Perioperative Services  
Email: lcampbell1@uchs.org  
Phone: 443-643-1616
Application Form Deadline: November 13, 2017

Organization: University of Maryland Upper Chesapeake Health
Contact Person: Melissa Hunter/ Lisa Campbell
Title: Perianesthesia Education Specialist/ Director of Perioperative Services
Address: 500 Upper Chesapeake Drive, Bel Air, MD 21014
Email: mhunter@uchs.org / lcampbell1@uchs.org
Phone: 443-643-2907 (mhunter) / 443-643-1616 (lcampbell)

Solution Title: STOP Snoring with a Bang! Reducing Postoperative Complications By Screening Pat

Focus Area: (please check all that apply)

☑ Communication
☐ Competency Assessment
☐ Core Measure
☐ Crisis Prevention
☐ Culture
☐ Diversity
☑ Education
☐ Emergency Department
☐ Environment
☐ Event Reporting
☐ Falls
☐ Hand Hygiene
☐ Infection Prevention
☐ Information Technology
☐ ICU
☐ Laboratory
☐ Labor & Delivery
☐ Lean Operations
☐ Medical Equipment
☐ Medication Safety
☑ Patient Assessment
☑ Patient/Family Involvement
☐ Pediatrics
☐ Pressure Ulcer
☐ Process Redesign
☐ Surgical Services
☑ Teamwork
☐ Workforce
☐ Other (Please Specify)

Please indicate your interest in the following:

☑ Yes, the Maryland Patient Safety Center has permission to publish this Solution and place it on its public website.

☑ We are interested in displaying a storyboard and participating in lunch time presentations. (storyboards will be displayed on easels, and cannot be larger than 3 ft wide x 4 ft tall.)

Please complete the Submission and Application Form, including related tools and resources as attachments, and send to: lcatsos@marylandpatientsafety.org by November 13, 2017.

If you are unable to insert information, have any questions or need further information, please contact: lcatsos@marylandpatientsafety.org