Evidence-Based Practices to Improve Monitoring for Surgical Patients with Obstructive Sleep Apnea

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Abstract

Introduction: Patients who have obstructive sleep apnea (OSA) are at higher risk for opioid-induced respiratory depression postoperatively. Many patients who have OSA are not diagnosed before having surgery and may not be monitored appropriately postoperatively.

Purpose: The purpose of this quality improvement project was to increase the number of preoperative patients screened for OSA and improve their postoperative monitoring through a novel OSA Protocol order set.

Methods: Screening for OSA risk is performed preoperatively using the STOP-Bang instrument. High-risk patients, as well as patients with existing OSA, are monitored postoperatively using a bundle of evidence-based practices to identify early respiratory compromise. If respiratory events occur, a treatment intervention will be triggered.

Outcome: Post-intervention chart reviews demonstrated 100% of the qualifying patients had OSA screening completed prior to surgery. The OSA Protocol was ordered for 28 patients. Patient harm may have been avoided through the use of continuous positive airway pressure (CPAP) triggered by actual respiratory events.

Conclusion: It is important to identify patients before surgery through preoperative screening. Identified patients should be monitored closely postoperatively for the detection of early respiratory compromise. A standing order for CPAP for patients with respiratory events can provide treatment rapidly to optimize patient outcomes. The process for monitoring high-risk patients on this postoperative unit could be considered for replication on surgical units in other hospitals.

Keywords: OSA, obstructive sleep apnea, OIRD, postoperative monitoring, STOP-Bang, OSA Protocol, capnography, quality improvement

Introduction

Over 12 million people in the United States have obstructive sleep apnea (OSA). There is a significant association between patients with OSA and Opioid-Induced Respiratory Depression (ORID), a potentially fatal consequence of opioid use or anesthesia which can lead to respiratory compromise and failure. [1,2] The objective of this project was to mitigate the risk to this patient population through preoperative identification, postoperative monitoring, and early intervention to prevent adverse patient outcomes.

OSA is a condition manifested by repetitive pauses in breathing which, in severe cases, can occur up to 600 times during an 8-hour sleep period. [1,3] During these pauses in breathing, hypoxia can become profound enough to cause the patient to awaken briefly. This awakening restores the airway patency as the patient takes a breath which relieves the obstruction. Anesthesia and postoperative medications further increase the relaxation in the airway of these patients, therefore the brief awakenings to restore airway patency are less likely to occur. These medications increase the risk of hypoventilation, apnea, hypoxemia, and bradypnea. Additionally, they significantly increase the risk for cardiovascular events postoperatively, including atrial fibrillation, myocardial injury, and stroke. [4]

Patients with OSA and those who are at high-risk for OSA should be identified preoperatively to ensure appropriate postoperative monitoring and interventions will be in place. These include intensive, continuous assessment of the respiratory system as well as interventions that are triggered when early signs of respiratory compromise are identified. Unfortunately, approximately 80% of patients who have OSA and are undergoing surgery have not previously been diagnosed with OSA, [2,5] therefore, identification of patients with OSA during the preoperative period is a critical first step. The STOP-Bang screening tool identify patients at risk

for OSA (appendix A). This instrument is valid, reliable, and is commonly used and recommended in the industry. [2,3,5-11] Patients who score 5 or greater on the STOP-Bang tool are considered to be at high-risk for having OSA.

The Prisma methodology was used to conduct a systematic review to identify the best evidence to monitor patients with OSA for OIRD after undergoing surgery. In addition to elevating the head of the bed and limiting the use of opioids, the literature also supports close respiratory monitoring postoperatively, including continuous pulse oximetry, respiratory rate, and apnea monitoring. [1,3,7,12] Additionally, capnography can be a valuable tool for monitoring of these patients.[3,10]

Continuous positive airway pressure (CPAP) is the treatment for OSA. CPAP forces the airway open using pressurized air which will prevent snoring (partial airway collapse) and apnea events (complete airway collapse). It is important for patients with a previous diagnosis of OSA who have a CPAP at home to bring the machine to the hospital with them on the day of surgery, so it can be used immediately postoperatively to decrease the risk of postoperative complications. [3,5,10] Also, it is suggested that implementing CPAP for high-risk patients could prevent adverse patient outcomes, starting if they experience postoperative respiratory events. [3,10]

The purpose of this quality improvement project was to 1) increase the number of preoperative patients screened for OSA and 2) to improve the postoperative care for patients with OSA or at high-risk for OSA through intensive monitoring and the integration of evidence-based practices.

Methods

This quality improvement project utilized the Plan-Do-Study-Act methodology and the Influencer Model during the implementation phase. IRB approval was obtained through the

University of Massachusetts, Lowell. Prior support was obtained from each of the hospital departments impacted by this project, in addition to senior nursing leadership.

Setting

The project setting was a 200-bed, Magnet-designated community hospital located in northeastern Massachusetts. The areas impacted included Pre-Admission Testing (PAT), Department of Anesthesia, Post-Operative Care Unit, and the hospital's designated surgical unit. Support was given by Nursing Informatics, Biomedical Engineering, and Respiratory Therapy.

Interventions

Three separate interventions were included in this project: preoperative OSA screening, postoperative monitoring protocol, and patient education. Plan-Do-Study-Act (PDSA) was used during the rollout of each step. The PDSA is a methodology that can be used to assess the steps in a change on a small scale.[13] Small tests of change are implemented then evaluated for effectiveness. If the desired results are not achieved, a different action is attempted.

All adult outpatients whose surgical plan includes at least one postoperative night in the hospital were screened for OSA using the STOP-Bang by a PAT nurse. This tool requires the clinician to ask 8 simple yes or no questions regarding Snoring, Tiredness, Observed apnea, blood Pressure, Body mass index, Age, Neck circumference, and Gender (Appendix A). Patients with an existing diagnosis of OSA were exempt from screening and were asked to bring their CPAP to the hospital on the day of surgery.

Patients who scored a 5 or greater on the STOP-Bang, or who had a history of OSA, were to be ordered for the OSA Protocol by the department of anesthesia. The nurses in the postoperative unit monitored the patients using centralized continuous respiratory rate, apnea, and oxygen

saturation monitoring, as well as elevation of the head of the bed. For the first 24-hours postoperatively, these patients also had capnography monitoring. The OSA Protocol included a standing order for CPAP for patients experiencing respiratory events, defined as a respiration rate less than 8 per minute, an apneic episode of greater than 20 seconds, or an oxygen saturation of less than 88%.

To prevent high-risk patients from leaving the hospital without any additional treatment or follow-up, educational information was given to patients before discharge. The goal was to explain their OSA risk and to encourage follow-up with their primary care provider.

Implementation

The rollout encompassed all adult outpatients whose surgical plan included at least one postoperative night in the hospital. To ensure all appropriate patients would be screened and this practice would be sustained, the STOP-Bang rollout in PAT utilized the Influencer Model. The Influencer Model is a structured methodology used to create a change in behavior. The motto for this model claims to give you "the power to change anything" by focusing on behaviors that will directly impact the desired outcome. [14] This model has been used successfully in many industries to assist with change, including healthcare. [15-17]

Although the STOP-Bang tool was previously available to the nurses, the completion rates were low and the anesthesiologists were unable to find the results in the patient records. The Influencer Plan to increase the use of the STOP-Bang tool by the PAT nurses included: ensure PAT nurses know how to perform the STOP-Bang through education, impact the affective domain by sharing the adverse outcomes which can occur without screening or proper postoperative monitoring, make the electronic healthcare records (EHR) screens easier to use,

provide feedback on success/display data, identify nurse peer champions to act as peer coaches, and provide additional coaching by leadership as needed. Also, education with the anesthesiologist team was completed to ensure they knew where to find the results in the medical record so they could order the OSA Protocol based on the STOP-Bang results.

Once these steps were completed, education began with the postoperative nurses on the new postoperative OSA Protocol and the use of capnography, a new piece of equipment for them. Education was completed through a computer-assisted instruction program on capnography, which was available for four weeks before implementation. The Clinical Nurse Specialist also provided opportunities for demonstration and return demonstration on the use of the equipment with each of the postoperative nurses, in addition to at-the-elbow support for the first few weeks. Nurses were provided education on the OSA Protocol through computer-assisted instructions and huddles, which included the process for patient assessment with patient respiratory events.

Lastly, patient education was integrated into the EHR through the assistance of the Help Desk and Nursing Informatics. Permission was obtained through the American Thoracic Society for the use of their patient education materials.

Outcome Measurements

The process outcome measures assessed were 1) STOP-Bang completion before surgery, 2) ordering of the OSA Protocol for patients with OSA or at high-risk for OSA, and 3) the integration of the education into the EHR.

Data Collection

Once the PDSA processes were completed, a convenient sample of 100 records was selected for auditing, which occurred approximately 6 weeks after the implementation of the OSA Protocol. Before the start of the new processes, a similar sample was collected for baseline data.

Data Analysis

Data collection included whether the patient had a previous diagnosis of OSA (yes or no), whether the patient had all of the questions completed on the STOP-Bang (yes or no), and whether the OSA protocol was ordered postoperatively (yes or no). Additionally, pre-implementation data was compared with post-implementation data.

Results

The completion rates for the STOP-Bang OSA risk assessment tool were tracked initially using a convenience sample of ten charts per week. Completion rates increased from 40% to 100% by week 2 (Appendix B).

To assess for sustainability, an additional chart audit was performed approximately two months later using a convenience sample of 100 charts of adult patients whose surgical plan included at least one postoperative night in the hospital. One hundred percent (n=100) of the patients had been screened appropriately (Appendix C).

During the chart audit, the appropriate ordering of the OSA Protocol was also reviewed. That audit showed the following results:

- 17 patients met the criteria due to their previous diagnosis of OSA. 100% of these patients were ordered for the protocol.

- 17 additional patients had a STOP-Bang score of 5 or greater (at high-risk for OSA), however, only 5 of these patients were ordered for the protocol; 12 patients had missed opportunities for monitoring.
- 6 patients did not meet the criteria but were ordered for the monitoring as a result of clinical decision making.

During the first three months after implementation, at least two patients had respiratory events and were started on CPAP per the standing order on the OSA Protocol.

Patient education was successfully integrated into the EHR as planned and is available at discharge for all patients who were monitored on the OSA Protocol.

Discussion

The implementation of the STOP-Bang screening tool in PAT had a very successful rollout. This screening tool should trigger the anesthesiologists to order the OSA Protocol postoperatively for patients who are screened as high-risk and for those with an existing OSA diagnosis; this is an important first step of the cascade of processes which follow. Although the tool was available before this project rollout, the staff were inconsistently completing it. Using the components from the Influencer Model may have helped with the sustainability of this intervention. The commonly used, single intervention of providing education does not always have the impact of changing behavior, therefore utilizing multiple Sources of Influence can help to provide stability of practice changes. The support of Nursing Informatics, the PAT nurse manager, and the nurse champion were also critical in the sustainability of the STOP-Bang completion rates.

The integration of evidence-based practices in the postoperative OSA Protocol order set provided guidelines for the nursing staff to monitor these high-risk patients for OIRD. The med-surg

nurses were successfully able to monitor the patient's respiration rate, oxygen saturation, and Co2 levels. The integration of CPAP as a standing order into the order set was an essential piece of the implementation plan to prevent adverse patient events. Postoperative respiratory monitoring is important, but to prevent respiratory depression, the early intervention of CPAP through this standing order is an important step to directly impact patient outcomes. Had the patients not been monitored on the protocol, their apneic events may not have been captured and the early intervention may not have occurred. The OSA Protocol may have prevented adverse events, including transfer to the ICU, damage from prolonged hypoxia, or even death.

There was a notable difference between the observed and anticipated outcomes with the lack of consistent ordering of the OSA Protocol for patients with a STOP-Bang of 5 or greater. Nearly 40% of the patients who met these criteria were not ordered for the protocol by the anesthesiologist. This is in sharp comparison to the 100% ordered for the protocol with an existing OSA diagnosis. Using PDSA methodology and in collaboration with the anesthesiologist champions and Nursing Informatics, this process continues to a focus.

This quality improvement project has many strengths, including the implementation of the best evidence into practice and the utilization of the latest technology. The evidence gathered to create these new processes was obtained from reliable sources. The collaborative effort between nursing, anesthesia, and respiratory therapy in the creation of the processes creates further strength with buy-in and realistic expectations. Using Plan-Do-Study-Act during each phase of the implementation was also essential to adjust the interventions to achieve the desired outcomes.

Limitations

This project was implemented in a Magnet-designated, community hospital setting with a designated postoperative unit, a possible limitation. The population selected for this project were only adult patients with a surgical plan which included at least one planned overnight stay in the hospital. Unexpected stays, including patients having emergency surgery, pediatric patients, and those with a planned day surgical procedure were excluded.

Conclusion

- Bundling best practices into a novel OSA Protocol can provide early identification and treatment for respiratory events.
- Capnography can be successfully implemented in the medical-surgical area.
- The ability to rapidly implement CPAP may optimize patient outcomes postoperatively.
- It is important to empower patients with education on their condition before discharge.

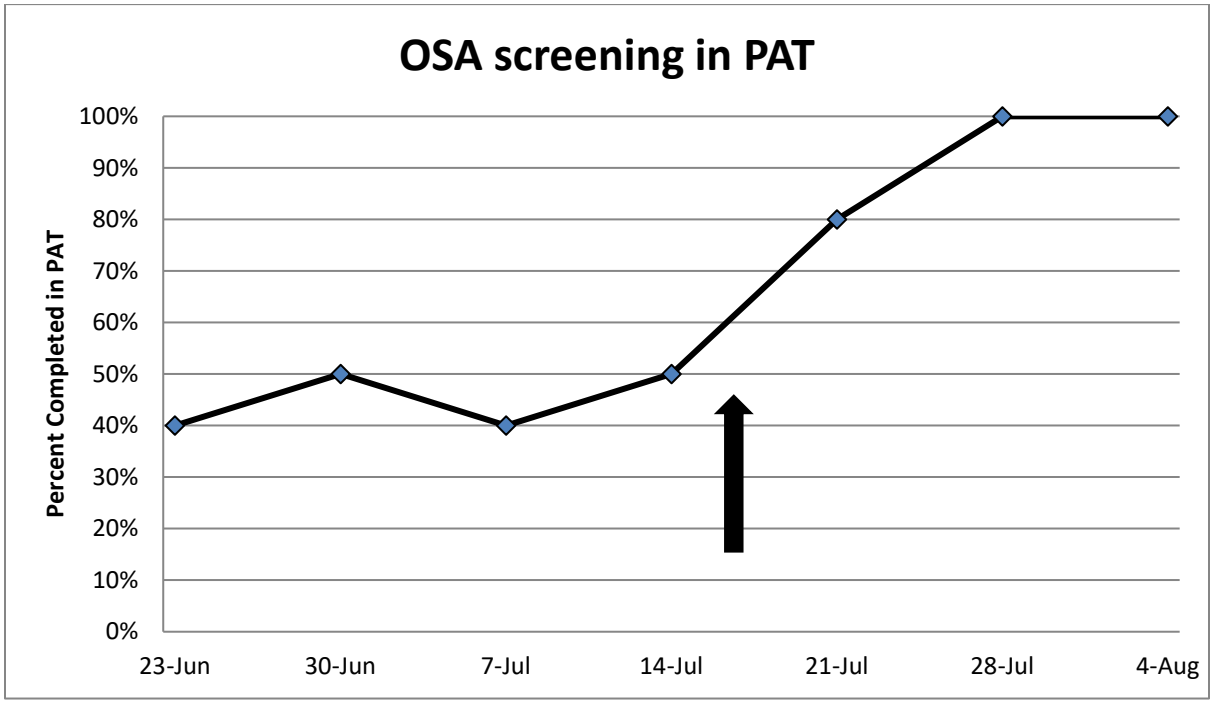
Appendix A: STOP-Bang Questionnaire

Select "yes" or "no" after each question:

- **S**noring (Do you snore loudly?)
- **T**iredness (Do you often feel tired, fatigued, or sleepy during the daytime?)
- **O**bserved apnea (Has anyone observed you stopped breathing, choke, or gasp during your sleep?)
- High blood **P**ressure (Do you have, or are you being treated for, high blood pressure?)
- **B**MI (Is your BMI greater than 35kg/m2?)
- **A**ge (Are you older than 50 years?)
- **N**eck circumference (Is your neck circumference greater than 40cm or 16 inches?)
- **G**ender (Are you male?)

Score 1 point for each "yes"
Scoring risk for OSA: 0-2 = low risk, 3-4 = intermediate risk, 5 or greater = high risk

Appendix B: OSA Screening in PAT



Appendix C: Preoperative OSA Screening

	Baseline (Mar- Apr)	**Post-intervention (Sept – Oct)**
Number of charts reviewed	100	100
Number of patients with existing OSA diagnosis	23	17
Number of patients without an OSA diagnosis screened using the STOP-Bang	18	83
Number of patients screened appropriately	41	100

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