Preoperative Screening for Obstructive Sleep Apnea and Outcomes in PACU

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Purpose: *Practice guidelines from the perianesthesia community suggest that preoperative identification of patients with obstructive sleep apnea (OSA) and standardized longer observation in postanesthesia care unit (PACU) promotes safety after general anesthesia. The purpose of this study was to determine if longer monitoring of patients with OSA in the PACU improves patient outcomes after general anesthesia.*
Design: *Evidence-based best practices literature review.*
Methods: *PACU patient charts were retrospectively analyzed for the presence of OSA diagnosis and screening scores. Information was compared with the postoperative oxygen saturation in PACU and nursing respiratory assessment documentation.*
Findings: *Most patients (96.5%) did not experience oxygen desaturation regardless of OSA diagnosis or STOP (snore, tired, observed, pressure) score. There was no evidence extracted from this sample that suggested patients with OSA experienced a higher incidence of respiratory symptoms while in the PACU.*
Conclusions: *This study did not affirm that patients with OSA experienced a higher incidence of oxygen desaturation or respiratory symptoms despite receiving additional monitoring in PACU.*

Keywords: *obstructive sleep apnea, standard of care, respiratory symptoms, PACU.*

THE PREVALENCE OF OBSTRUCTIVE SLEEP APNEA (OSA) has fostered great discussion in the perianesthesia community in recent years. Questions have been raised concerning the safety of patients with OSA after receiving general anesthesia and impending risk for respiratory complications after surgery.

An estimated 25% of people may experience some form of OSA.[1] This number is rapidly increasing as more is learned about the incidence and prevalence of OSA. Incidence of the disorder may be underreported because of the lack of validated screening processes, complexity and expense of formal polysomnography for diagnostic testing, and compliance with testing and treatment modalities.[2]

OSA is believed to be a potentially life-shortening disorder, which has many health ramifications.[3] Public awareness of OSA is on the rise. Health care providers are cognizant of the risks associated with OSA in treatment of other illnesses and in predicting surgical outcomes.[4]

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Background

Many publications have suggested that patients with OSA experience a greater risk for respiratory complications after receiving general anesthesia. In 2006, the American Society of Anesthesiologists (ASA) published practice guidelines for the treatment of patients with OSA.[5] The guidelines included emphasis on the importance of preoperative screening for OSA. Evaluating risk preoperatively was suggested to help identify those at risk for OSA without a confirmed diagnosis.[5,6] Because the gold standard for diagnosing OSA is polysomnography, there are many who may have OSA but do not have an actual diagnosis because of complexity of testing.[7] Suggestions for longer monitoring of respiratory status and oxygen saturation postoperatively to ward off potential complications were also driven by the guidelines.[5]

In 2014, the ASA published an update to the OSA practice guidelines.[8] This review examined concerns over the lack of published evidence supporting the benefit of preoperative screening and longer postoperative monitoring of patients with diagnosed OSA.[8] There is insufficient evidence in the literature to support that extended postanesthesia care unit (PACU) monitoring is beneficial in reducing postoperative respiratory events. The ASA reviewers were unable to validate whether factors, such as postoperative analgesia, administration of oxygen, or patient positioning, had a significant impact on postoperative respiratory outcomes for patients with OSA.

In 2012, the American Society of PeriAnesthesia Nurses published guidelines for the care of patients with OSA.[9] These recommendations were in alignment with the ASA guidelines that patients with OSA might require additional time in the perioperative suite.

Strategies

Early identification of the presence of OSA can allow for enriched plans of care to improve patient outcomes in the recovery period.[5,10] Institutions across the country have developed standards of care for perioperative management of patients with OSA.[11] Standards of care are formulated with the goals of improving the communication of the presence of OSA as the patient presents for surgery and improving patient safety during recovery from anesthesia. Preoperative screening for OSA is recommended to facilitate identifying patients who may be at risk for complications after receiving general anesthesia.[12]

Our institution implemented the use of the STOP (snore, tired, observed, pressure) questionnaire in the preoperative holding area. Body mass index (BMI), age, and gender were also a component of the nursing assessment. When it was determined that a patient was at risk for OSA, the anesthesiologist was notified before surgery, and an in-depth assessment was performed. Neck circumference measurements were not obtained. This initiative resulted in an 8% increase in the identification of patients with potential risk for OSA in the absence of confirmed diagnosis.[11] The STOP questionnaire, developed by Chung et al,[1] has previously been validated as a reliable tool in determining predicted probability for having OSA in patients who have not undergone a formal sleep study.[1,13] The STOP questionnaire asks four questions that address snoring, tiredness, observed apnea, and high blood pressure.[13] Approximately two-thirds of the population may be considered at risk for OSA. Adding an additional component to the assessment, BANG (BMI, Age, Neck Circumference, Gender), can increase screening sensitivity.[14] Despite the use of questionnaires to establish OSA risk, polysomnography remains as the gold standard for diagnosing OSA.[14,15]

Observation time in our PACU was lengthened to include three additional hours of monitoring, as suggested by the guidelines.[11] This was to allow for longer respiratory and oximetry monitoring before the patient transitioned to the inpatient unit. The standard also included recommendations for extended monitoring in the PACU for patients who experienced moderate or severe hypoxia within the lengthened observation time. Generally, oxygen desaturations down to 90% were considered mild, the 80% to 89% range were considered moderate, and below 80% was considered severe desaturation.[16]

Problem

After introduction of the new standard of care, clinical observation time in PACU increased. However, staff observed very few patients experiencing oxygen desaturation and respiratory symptoms as a result of apneas. Respiratory symptoms were defined as shortness of breath, difficulty breathing at rest, intubated, persistent cough, obstruction, or other. When respiratory complications were noted, it was determined that other significant factors had greater influence in producing the respiratory event.

To evaluate the effectiveness of longer monitoring in PACU, an interdisciplinary team was assembled to examine the impact of the new practice changes in the clinical setting. The question was formulated "Does preoperative screening and longer monitoring in PACU improve outcomes for patients with OSA? The topic was approved as an interdisciplinary evidence-based project by the institution's Quality Initiative committee and identified as a priority for the organization. Examining the benefit of best practice initiatives for patients with OSA can justify the cost of extended monitoring and longer length of stay for patients with OSA. It allows for an opportunity to reflect on current practice and determine if care initiatives result in improved patient safety and quality outcomes.

The Iowa Model of Evidence-Based Practice was used as a framework for the project. The Iowa Model allows for the analysis of current nursing research to guide clinical practice. This model fosters interdisciplinary practice decisions and encourages dissemination of findings to shape evidence-based practice.[17]

Literature Review

A systematic review was completed using Cochrane Library, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, ScienceDirect, and Internet search and resulted in 27 articles. Key word search for Obstructive Sleep Apnea, surgery, postoperative complications, desaturation, anesthesia, and nursing revealed no current published information regarding the proven effectiveness of longer PACU monitoring for patients with OSA after general anesthesia.

Relevant publications were used to extract information to answer the formulated question. Several studies have made an attempt to address safety concerns for patients with OSA after general anesthesia and discuss ways to improve outcomes for this population. The impact of these initiatives in clinical practice and confirmation that patient outcomes are improved when actually implemented is not evident in the current literature. There is no information in the nursing literature that supports longer observation in PACU as beneficial for patients with OSA.[18]

Severity of OSA may influence postoperative outcomes. Patients may be categorized as having mild, moderate, or severe OSA.[1,14] Tailored approaches to match treatment to disease severity in patients with OSA may be most beneficial.[14] Patients with OSA who experience airway obstruction in the PACU should receive longer postoperative monitoring.[19] A multidisciplinary customized approach to care of the patient with OSA is necessary in the perioperative suite.[19]

Surgical patients are generally at high risk for respiratory complications in the first 24 hours after surgery.[20] This high risk makes it challenging to correlate respiratory symptoms directly to OSA. In fact, several studies demonstrated that there were no significant mortality differences between patients with OSA risk and the rest of the surgical population.[21] Patients may be cared for safely in a general ward as opposed to an intensive care unit setting with continuous monitoring.[22] OSA risk score did not predict cardiac events, need for postoperative ventilatory assistance, reintubation, or unplanned hospital admission.[23]

Overall, a 20% risk for respiratory complications is observed in the average surgical patient.[19] Respiratory symptoms experienced in the PACU may actually be as high as 40% in non-OSA patients.[19] Respiratory symptoms are influenced by length and type of surgery, ASA classification, and comorbidities. The most common respiratory events occur in patients who undergo the highest risk procedures, identified as abdominal, vascular, and thoracic.[19] A high incidence of OSA in patients with mental illness and OSA appears more frequently in patients with psychiatric disorders.[24]

Methods

A retrospective analysis of patient information extracted from the electronic patient record (EPR) was used for investigation. Patients who presented to the operating suite during a 6-month period from July to December 2013 were considered for inclusion in this study (N = 6,759). The group consisted of all patients presenting for elective and emergent surgery at a suburban level I trauma center in New York.

Patient charts were reviewed and examined for the presence of confirmed diagnosis of OSA, or a STOP score obtained by nurses in the preoperative holding area. Additional data were extracted from the PACU nursing record, including nursing respiratory assessment on admission to PACU, O_2 saturation on admission, age, gender, BMI, and PACU length of stay. Patients with a STOP score of 0 or 1 were excluded from the database. Patients younger than 18 years (n = 108) were extracted from the sample for separate analysis.

A sample of 602 patients remained for evaluation. The sample was composed of 64% males and 36% females. Average age was 60 (±16) years. Mean BMI for the group was 32 (±9) kg/m^2. Of the 602 patients, 8% had a confirmed diagnosis of OSA (n = 51) and 3% had presumptive symptoms documented in the medical history (n = 17). Presumptive symptoms were documented from the nursing admission history as disruptive sleep patterns, including snoring, witnessed apnea (in the absence of diagnosis), and use of continuous positive airway pressure on admission. The confirmed and presumptive history of OSA cases were combined to simplify analysis, totaling 11% (n = 68).

Some patients in the sample (n = 101) had missing information in the respiratory assessment section of nursing documentation in the database. These patients were looked at individually through manual audit. This audit revealed that documentation was sufficient for these patients to be added back into the sample. There were slight variations in documentation in the EPR from registered nurse (RN) to RN. Reports showed a 5-minute variance in PACU arrival to RN documentation time used to generate the initial Excel report. Patients were admitted on 100% nonrebreather and weaned immediately as tolerated to room air.

Statistical Analysis

Data were imported to an Excel spreadsheet and SPSS software (IBM, Armonk, NY) for statistical analysis. A statistical expert was consulted to determine the validity of the data, sample size, and organize the data. Groups were created by age and BMI cutoff scores. Crosstabulations were calculated to determine the incidence of variables. χ^2 tests examined differences and associations between study variables. Continuity correction and Fisher exact tests were used to determine the statistical significance with maximum sensitivity in small samples.

Results

Respiratory Symptoms and OSA Risk and Diagnosis

Of the 602 patients in the sample, 96.5% (n = 566) did not experience respiratory symptoms, regardless of suspected or confirmed history of OSA while in the PACU. A remaining 3.5% (n = 36) experienced respiratory symptoms in the PACU. Of these, 15 were patients who remained intubated on admission to PACU. These patients were analyzed separately with a full chart review to determine if expert opinion could establish the indicated reason for respiratory complications requiring prolonged intubation. Analysis could not establish if OSA was a contributing factor resulting in prolonged postoperative intubation. This subset of patients presented with multisystem organ failure, tethered spinal cord, and severe trauma, which expert opinion determined was the necessity for prolonged intubation. The remaining patients with respiratory symptoms (n = 21) had resolution of symptoms, such as shortness of breath, with the next nursing assessment, which was documented 15 minutes after the first assessment. As recovery progressed, these symptoms remained resolved in this subset, indicating a normal predictable recovery from anesthesia.

Although proportionally greater in the patients with an OSA diagnosis (4.5%) compared with undiagnosed patients (2.3%), respiratory symptoms occurred in only three patients of the 68 with an OSA diagnosis (Table 1). Eighty percent of those who experienced respiratory events did not have a diagnosis of OSA. Higher STOP scores did not associate with a higher incidence of respiratory complications. As the STOP score increased, there was a decrease in the number of patients

Table 1. Incidence of Respiratory Symptoms by OSA Diagnosis (Absent/Present)

Respiratory Symptoms	OSA Diagnosis (Absent)	OSA Diagnosis (Present)	Total
Absent, *N* (%)	503 (97.7)	63 (95.5)	566
Present, *N* (%)	12 (2.3)	3 (4.5)	15

OSA, obstructive sleep apnea.

Percentages are calculated vertically within a particular OSA diagnosis group. Twenty-six cases are omitted for insufficient data leaving 581 patients: 15 cases were intubated, and 1 was indicated as unable to assess.

experiencing respiratory symptoms. Only one patient with STOP score of 4 experienced a respiratory event. χ^2 analysis of respiratory events by STOP score category was not significant because of the low incidence of cases with respiratory symptoms.

Desaturation

Patients were sorted according to ordinal STOP risk scores of 2, 3, 4, and OSA diagnosis, respectively. Figure 1 shows the distribution of patients according to STOP score and diagnosis of OSA as compared with oxygen saturation less than 95%. Crosstabulation showed a proportional risk for oxygen desaturation, independent of STOP score or OSA diagnosis. The average risk for oxygen desaturation was 18.8% for the total sample. The likelihood of oxygen saturation less than 95% in patients with a STOP score greater than 2 is not statistically significant in this sample. Regardless of OSA status, all patients were at a similar risk for oxygen desaturation postoperatively. Patients with a diagnosis of OSA did not experience oxygen desaturation more than other patients in this sample.

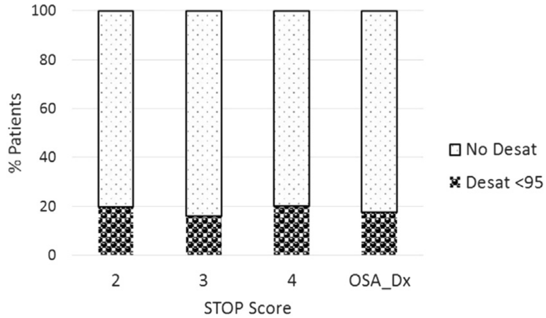

Figure 1. Oxygen saturation less than 95% as compared with STOP/OSA diagnosis. Dark-shaded boxes show that regardless of STOP/OSA, the occurrence of desaturation less than 95% is similar in all groups. OSA, obstructive sleep apnea; STOP, snore, tired, observed, pressure.

Mean oximetry was 97% (P = nonsignificant) in this group.

Pulse oximetry of those with an OSA diagnosis on nonrebreather on admission shows that 14 of 85 patients experienced periods of desaturation less than 90% on admission to the PACU. These 14 patients were examined individually in a separate study.[25] Fifty percent (n = 7) of the subset had comorbid factors other than OSA that potentiated postoperative desaturation, including chronic obstructive pulmonary disease, asthma, and emphysema. Of the remaining seven, two of the patients had surgery involving the pulmonary system and three patients remained intubated from the operating room. One patient presented with oxygen saturation of 81%. Chart review revealed that this patient was moribund. One patient with a confirmed diagnosis of OSA experienced desaturation of 85%, which resolved as the patient recovered from anesthesia.

Hypoxic desaturations ranged from 81 to 89. The desaturations occurred within a few minutes of arrival in PACU. Three patients (21.4%) were put on a nonrebreather circuit, and nine patients (64.3%) were given oxygen by nasal cannula. Most patients returned to normal saturation levels (greater than 95%) within 5 minutes. Two patients experienced a second episode of desaturation during PACU stay, which took 40 minutes and 105 minutes to resolve, respectively. The first of these patients was intubated; the second was a trauma patient.

BMI, Age, and Gender

Gender distribution showed a slightly greater risk for males (n = 107) to females (n = 79) in those with BMI ≥35. We noted that gender distribution varies by BMI. As BMI increases, gender differences decrease and are more evenly distributed between groups.

In examining those with BMI ≥40, there was an even distribution of females (n = 43) to males (n = 44; P = .017).

Seventy-five percent of patients with diagnosed OSA had a BMI < 40 (n = 50), and only 25% of patients (n = 17) had a BMI ≥40, which was statistically significant in the sample (P = .016). Those with a diagnosis of OSA had a mean age of 56 years (P = .039), 4 years younger than the sample average. STOP risk scores were then analyzed in relation to BMI. Seventy patients who had STOP risk scores of 2, 3, or 4 (13.9%) had a BMI ≥40. It was noted that the patients with BMI ≥40 were more likely to have higher STOP scores in this group (P < .001).

In reviewing those with an OSA risk and a BMI ≥40, only two patients experienced respiratory symptoms in this subset. One was male, with a STOP score of 4, and one female with a STOP score of 2. Both had documented resolution of symptoms within the first hour of recovery with no further documented respiratory events in PACU. There was no significant difference by t test for age, BMI, and respiratory symptoms. The incidence of oxygen saturation less than 95% is not related to age or BMI in this sample.

Limitations

In patients with OSA, hypercarbia is of concern. Our institution does not currently have a process that requires capnography monitoring of patients who are not on ventilatory support. This information was not available for consideration in determining patient compromise. Neck circumference values were not available for analysis in this data set. This value, a component of the extended STOP-BANG tool, could not be compared in this patient set.

It is unknown from this sample if patients with a higher BMI have other comorbid factors that required them to seek medical attention to the point where formal sleep study is obtained for OSA diagnosis. In addition, factors such as the inconvenience of sleep studies and access to health care and insurance coverage may also influence OSA diagnosis. Those with OSA and actual respiratory complications and desaturations produced a very small sample for observation in this study.

Discussion

The results of this study suggest that the presence of OSA does not imply that patients will experience postoperative oxygen desaturations in the PACU. Patients in this study who experienced hypoxia had other potential life-threatening risks, which had a greater impact in respiratory compromise. Oxygen saturation less than 95% is not related to having a diagnosis of OSA in this sample.

Overall, patients in this study had an 18.8% risk for oxygen desaturation regardless of OSA status. This coincides with findings in the literature, which suggest that the average risk for respiratory complications in the general surgical population is approximately 20%.[23] These findings suggest that it is possible that those with OSA are not at a greater risk for hypoxia than the average surgical patient. In addition, this study returned a very small percentage of patients who actually experienced respiratory symptoms related to OSA in the PACU.

Manual chart audits of patients with OSA from this sample exposed a common underlying theme. Patients with an OSA diagnosis also had a high incidence of anxiety, depression, and/or bipolar disorder (14%) documented in their medical history. When we looked at the entire sample, the incidence of these disorders increased to 21%. These conditions may contribute to feelings of shortness of breath in the recovery period as patients experience anxiety related to surgical outcomes, pain, and fear of the unknown.

This study demonstrated opportunity to improve on the quality of nursing documentation defining respiratory symptoms in the EPR. We identified a need to streamline the location of data in the medical record so that all can easily locate it. As a result of this study, we have worked with information technology to develop a communication tablet that imports all pertinent patient information into one central location for easy access. This has assisted with the communication of the presence of OSA as the patient transitions through the perioperative arena. Staff education on continuing to identify those with hypoxia and respiratory symptoms related to OSA and implementing safety protocols as needed remains essential in postoperative patient care.

These findings do not agree with other larger studies, which found that high OSA risk was associated with an increase in number of oxygen desaturations and respiratory symptoms after general anesthesia.[22] The PACU may be a stimulating environment, which keeps patients aroused, therefore masking apneas. Further analysis of a larger sample is needed to confirm the findings in this study. However, these findings did help confirm suspicions that PACU may not be the time frame that patients with OSA are most vulnerable. Observations of OSA patient care after leaving the PACU may authenticate the time frame in which patients experience periods of apnea.

A standard of care for patients with OSA may be an effective tool in raising awareness that potential problems may arise in the perioperative period for select patients. Broad generalized standards, which require the allocation of additional resources for a large population, may not influence patient safety as the previous literature suggests. A patient-specific approach to managing postoperative respiratory complications may be similarly effective in managing high-risk individuals. Patient-specific care may promote safety while allowing for successful cost containment. Preoperative identification of patients with OSA can raise awareness of the potential complications that may present when the patient is in the PACU postoperatively.

Conclusion

Patient-specific postoperative observation time in PACU based on clinical presentation, surgical outcomes, along with multimodal pain management may ensure safety as patients transition to the next level of care.

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