

Assessment Tools Help Diagnose Obstructive Sleep Apnea

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ABSTRACT

Obstructive sleep apnea (OSA) is a common sleep disorder that may first be diagnosed when a surgical patient presents for preadmission testing. OSA is characterized by partial or complete obstruction of the upper airway during sleep and can present significant problems in the perioperative period, including difficult airways, increased sensitivity to anesthetic agents, and postoperative adverse events. Analysis of reports submitted to the Pennsylvania Patient Safety Authority over five years identified 99 OSA-related events. Thirty-three reports were classified as Serious Events associated with patient harm. An article published on OSA and the risk it places on positive postoperative outcomes was presented in the September 2007 issue of the Pennsylvania Patient Safety Advisory. The article offered an OSA screening tool to use during preoperative evaluation. Since 2007, additional assessment tools, such as the STOP-Bang questionnaire, have become available to help facilities identify and manage patients at high risk for this condition. (Pa Patient Saf Advis 2014 Dec;11[4]:168-71.)



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INTRODUCTION

Obstructive sleep apnea (OSA) is a syndrome characterized by periodic, partial, or complete obstruction of the upper airway during sleep.¹ It is the most prevalent sleep disorder in the adult population, and studies have found the frequency of OSA is higher in patients presenting for surgery than in the general population.² In the perioperative period, both pediatric and adult patients with OSA, even if asymptomatic, present special challenges that must be addressed to minimize the risk of morbidity or mortality.¹

Chung et al. indicate that OSA affects 2% to 26% of the general population.³ Symptoms associated with OSA include snoring, excessive daytime somnolence, and restless sleep. Risk factors associated with OSA include male gender, smoking, alcohol consumption, older age, larger neck circumference, and obesity. OSA is associated with a number of medical comorbidities, including hypertension, heart failure, myocardial infarction, diabetes, and stroke.⁴

Events reported through the Pennsylvania Patient Safety Reporting System (PA-PSRS) indicate that OSA conditions that are not detected during the preoperative screening and assessment process may place patients at increased risk for postoperative complications requiring hospital admission.

An article published on OSA and the risk it places on positive postoperative outcomes was published in the September 2007 issue of the *Pennsylvania Patient Safety Advisory*. Analysis was performed on about 250 reports in which OSA was identified over approximately three years. About 20% of these reports were classified as Serious Events, including three deaths. The article indicated that sleep apnea was present in the medical history in the majority of the reports.⁵

As a result of the analysis, the article offered an OSA preoperative screening tool to use during preoperative evaluation. Since 2007, assessment tools, such as the STOP-Bang questionnaire,⁶ have become available to help facilities identify and manage patients at high risk for this condition.⁷

METHODS

To determine the scope of recent OSA events within the database and how OSA affected postoperative outcomes, a search of PA-PSRS was performed of events occurring from January 2009 through 2013. Using the keywords “sleep apnea” and “PAP” (positive airway pressure), about 1,500 records were returned for analysis.

The reports included medical and surgical patients in both ambulatory surgical facilities and hospitals. OSA was either present in the patient's medical history or was identified after an event occurred. Analysis of the reports showed OSA was identified in 99 reports of an OSA-related event. Thirty-three (33.3%) of the reports were classified as Serious Events associated with patient harm.

A comparison of the data analyzed in the September 2007 article was considered, but the search terms and data fields in the 2007 analysis were not comparable to the analysis for this article. A literature search was also performed for studies completed after 2007 (i.e., since the analysis conducted for the September 2007 *Advisory* article) to review any information published after that time about OSA. Several studies were returned that provided OSA assessment tools, such as the American Society of Anesthesiologists checklist, STOP questionnaire, and the STOP-Bang questionnaire, to help prevent OSA-related events.

RESULTS

Analysis of event reports showed a downward trend, with 27 OSA-related events occurring in 2009, 23 in 2010, 20 in 2011, 14 in 2012, and 15 in 2013. Review of the event narratives suggests OSA conditions that are not detected during the preoperative screening and assessment process may place patients at increased risk for postoperative complications.

Seven issues of concern when OSA was diagnosed during the perioperative or postoperative periods were identified. The following are examples of the reports in these categories:

1. Cancellation on the day of surgery
Patient presented for surgery in an outpatient setting. Has a history of sleep apnea, so procedure cancelled at this time. To be rescheduled for a later date at the hospital.
2. Extended length of stay in the post-anesthesia care unit (PACU)
While in PACU, patient experienced periods of apnea and had a difficult time maintaining her oxygen saturation levels despite numerous attempts to encourage deep breathing. Patient presents as morbidly obese. Surgeon and anesthesia notified.
3. Postoperative reintubation
The patient was reintubated when the oxygen saturation levels dropped. Patient was monitored and then extubated prior to leaving PACU. It is noted the patient has a history of significant sleep apnea and in the past had respiratory distress following anesthesia and sedatives.
4. Postoperative transfer from ambulatory care center to acute care for further treatment
Patient had tonsillectomy, uvulopharyngopalatoplasty due to diagnosis of severe sleep apnea. When extubating patient in the operating room after the procedure was finished, the patient became very combative and then became limp. Patient was reintubated.

Patient was unable to maintain patent airway without mask and nasal trumpet. Transferred to hospital ICU [intensive care unit] for observation and pulmonary consult.

5. Undiagnosed sleep apnea contributing to cardiac arrest
Patient with severe sleep apnea previously undiagnosed. Restless and thrashing in bed upon PACU arrival. Required three people to contain for safety. Patient pulled monitors off. Apnea continued lasting 10 to 25 seconds. Saturation in the 90s with O₂ facemask at 10 liters per minute and dipping to the 70s with apnea periods. Cardiac arrest. ACLS [advanced cardiac life support] applied. Pt [patient] returned to sinus rhythm. Admitted to intensive care.
6. Unplanned ICU admission
Patient seen pre-op by preanesthesia clinic and had positive sleep apnea screening using the STOP-Bang tool. Patient previously undiagnosed. No pulmonology consult and no sleep study ordered. Patient had surgery and oxygen desaturation in PACU to 50% to 70% several times. Patient had to be admitted to intensive care and followed by pulmonology.
7. Use of reversal agents following narcotic administration
Patient given Dilaudid® 2 mg prior to extubation and Dilaudid 2 mg postextubation prior to coming out to PACU. Pt was very somnolent and had difficulty with breathing and airway due to sleep apnea, requiring nasal trumpet and high humidity O₂. Patient given Narcan®.

RISK REDUCTION STRATEGIES

Preoperative Evaluation

A critical element in reducing the risk of surgical complications for OSA patients is the initial preoperative screening evaluation. The preoperative evaluation includes (1) a comprehensive review of previous

medical records, (2) an interview with the patient and/or family, and (3) a physical examination.¹

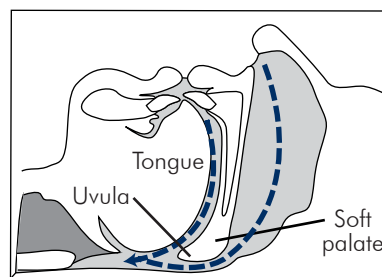
The evaluation may be initiated in a preanesthesia clinic (if available) or by direct consultation of the operating surgeon with the anesthesiologist. After the evaluation, if OSA is suspected, the anesthesiologist and the surgeon work together to decide whether to obtain formal polysomnography or empirically treat the patient as though they have OSA.¹ See “Figure. Anatomy of Obstructive Sleep Apnea.”

Medical Record Review and Physical Examination

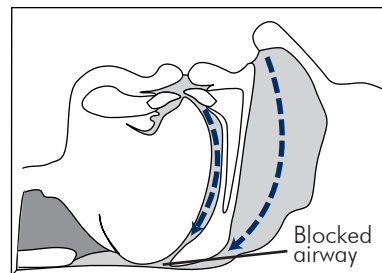
The anesthesia provider’s review of the patient’s medical record focuses on any previous airway difficulty with anesthetics, hypertension or other cardiovascular problems, and other congenital or acquired medical conditions. Also considered are the results of any sleep studies, if available. The physical examination includes

Figure. Anatomy of Obstructive Sleep Apnea

Normal breathing during sleep



Obstructive sleep apnea



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an evaluation of the airway, nasopharyngeal characteristics, neck circumference, tonsil size, and tongue volume.¹

Assessment Tools Used during the Interview

Proper screening and OSA diagnosis before surgery may reduce anesthesia-related risks associated with this condition. Since a significant number of patients arrive for surgery lacking a formal diagnosis, it is suggested that the preoperative process include the incorporation of available OSA screening tools.

A screening tool helps to reduce the likelihood that an unrecognized OSA patient presents for surgery, creates a heightened awareness of which patients may be at increased risk, and identifies poorly compliant and inadequately treated patients.⁸

There are several OSA questionnaires available as screening tools to identify patients at risk before a surgical

procedure. They vary in the number of questions asked and the time required for staff to either administer or analyze the results. The questionnaires are meant as screening tools and are not meant to replace a history and physical or a formal polysomnogram.⁹

STOP questionnaire. The STOP questionnaire is described as an easy-to-use screening tool for OSA. It was validated in surgical patients at preoperative clinics. The interviewer asks the following questions: Do you snore loudly? Do you often feel tired, fatigued, or sleepy during the daytime? Has anyone observed you stop breathing during sleep? Do you have or are you being treated for high blood pressure? Answering yes to two or more questions indicates a high risk of OSA, while answering yes to one or zero questions indicates a low risk of OSA.^{7,10}

STOP-Bang questionnaire. The STOP-Bang questionnaire⁶ further improves

the sensitivity of the STOP questionnaire to detect OSA, especially moderate and severe forms of OSA. The additional questions are as follows: Is body mass index greater than 35? Is patient age greater than 50? Is neck circumference greater than 40 centimeters? Is gender male? Answering yes to five to eight questions signals a high risk of OSA, answering yes to three to four questions indicates an intermediate risk, and answering yes to zero to two questions signifies a low risk of OSA.^{3,7}

See <http://www.stopbang.ca/screen.php> for the STOP-Bang questionnaire online screening tool.

Berlin questionnaire. The Berlin questionnaire is a 10-question test validated in the primary care setting and organized into three categories: snoring, excessive daytime sleepiness, and hypertension.⁷

Additional tools. Other assessment tools are also utilized to screen for OSA.⁷ See the Table for information about the

Table. Obstructive Sleep Apnea (OSA) Assessment Tools and Key Characteristics

ASSESSMENT TOOL	KEY CHARACTERISTICS
American Society of Anesthesiologists checklist ¹	Composed of three categories: predisposing physical characteristics, history of apparent airway obstruction during sleep, and somnolence.
Apnea Score ²	Asks three questions about pauses while sleeping, frequency of loud snoring, and history of adenoidectomy.
Berlin questionnaire ³	The patient is instructed to answer questions in three categories. If the patient scores positive in at least two of the three categories, the patient is found to be at a high risk for OSA. If the patient scores positive in only one or none of the categories, the patient is deemed to be at a low risk for OSA.
Haraldsson's questionnaire ²	Asks five questions about snoring, pauses while sleeping, midsleep awakening, and fatigue.
STOP questionnaire ⁴	Asks yes/no questions. Examines snoring loudness, daytime fatigue, pauses while sleeping, and treatment for high blood pressure.
STOP-Bang questionnaire ^{4,5}	Enhances the sensitivity of the STOP questionnaire. Described as concise and easy to use. Incorporates body mass index, age, neck circumference, and gender into the scoring model of the STOP questionnaire.
Wisconsin questionnaire ²	Identifies the habitual snorer versus the nonhabitual snorer. Examines the snorer's frequency and loudness, as well as pauses while sleeping.

Notes

1. Chung F. Screening for obstructive sleep apnea syndrome in the preoperative patients. *Open Anesthesiol J* 2011;5(Suppl 1-M2):7-11.
2. Abrishami A, Khajehdehi A, Chung F. A systematic review of screening questionnaires for obstructive sleep apnea. *Can J Anesth* 2010 May;57(5):423-38.
3. Netzer NC, Stoohs RA, Netzer CM, et al. Using the Berlin questionnaire to identify patients at risk for the sleep apnea syndrome. *Ann Intern Med* 1999 Oct 5;131(7):485-91.
4. Chung F, Yegneswaran B, Liao P, et al. STOP questionnaire: a tool to screen patients for obstructive sleep apnea. *Anesthesiology* 2008 May;108(5):812-21.
5. Chung F, Subramanyam R, Liao P, et al. High STOP-Bang score indicates a high probability of obstructive sleep apnoea. *Br J Anaesth* 2012 Mar; 108(5):768-75.

STOP, STOP-Bang, Berlin, and other questionnaires and tools.

Nursing's Role

With training, nurses can administer the questionnaires during the preoperative phase of assessment. In a quality improvement project, 15 preoperative nurses at an acute care facility were taught to use the STOP-Bang scoring model.¹¹

Evaluation of the nurses using the tool included completion of a learning competency; comparison of patients' diagnosis of OSA before and after using the screening tool; and analysis of critical events involving respiratory or cardiac arrests, near arrests, opioid reversal agents, and pulse oximeter readings less than 90%.¹¹

A step-by-step team process was then implemented to evaluate the practice change. As a result of incorporating an OSA questionnaire, the pilot project concluded that

patient advocacy improved and a safer perioperative environment was created.¹¹

PACU nurses. In an interview conducted by Authority analysts, Dr. William Brian Somerset, assistant professor, anesthesiology, Temple University, said nurses have an especially important role in the safe management of OSA patients.¹² Given the high prevalence of OSA and the large number of undiagnosed patients, nurses (particularly PACU nurses) have an especially important role in the safe management of OSA patients, according to Somerset.

It is important for PACU nurses to be familiar with screening questionnaires in order to have a high index of suspicion for OSA patients. Patients with suspected or diagnosed OSA should not be discharged to an unmonitored setting until they are no longer at risk for postoperative respiratory depression. PACU nurses are frequently the last gatekeepers prior

to patients moving to an unmonitored environment; therefore, they are an integral step in the safe care of these patients, according to Somerset.

CONCLUSION

Identifying patients with OSA prior to a surgical procedure appears to help diminish the potentially negative outcomes associated with OSA and anesthesia administration during surgery. A standardized approach to the management of these patients may reduce harm. Encouraging clinicians to be acquainted with specific risk factors for OSA remains an important aspect of quality healthcare. Incorporating a screening tool into the preoperative period appears to help identify OSA patients.

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NOTES

1. American Society of Anesthesiologists. Practice guidelines for the perioperative management of patients with obstructive sleep apnea: an updated report by the American Society of Anesthesiologists Task Force on Perioperative Management of patients with obstructive sleep apnea. *Anesthesiology* 2014 Feb;120(2):268-86.
2. UC San Diego School of Medicine. Perioperative management of OSA patients: practical solutions and care strategies [online]. 2011 Apr [cited 2014 Feb 14]. https://cme.ucsd.edu/OSAonline/osa%20monograph_web.pdf
3. Chung F, Subramanyam R, Liao P, et al. High STOP-Bang score indicates a high probability of obstructive sleep apnoea. *Br J Anaesth* 2012 Mar;108(5):768-75.
4. Lurie A. Obstructive sleep apnea in adults: epidemiology, clinical presentation, and treatment options. *Adv Cardiol* 2011;46:1-42.
5. Obstructive sleep apnea may block the path to a positive postoperative outcome. PA PSRS Patient Saf Advis [online] 2007 Sep [cited 2014 Sep 23]. [http://patient.safetyauthority.org/ADVISORIES/AdvisoryLibrary/2007/sep4\(3\)/Pages/91.aspx](http://patient.safetyauthority.org/ADVISORIES/AdvisoryLibrary/2007/sep4(3)/Pages/91.aspx)
6. The official STOPBang questionnaire website [website]. [cited 2014 Aug 5]. Toronto (ON): Toronto Western Hospital, University Health Network, University of Toronto. <http://www.stopbang.ca>
7. Abrishami A, Khajehdehi A, Chung F. A systematic review of screening questionnaires for obstructive sleep apnea. *Can J Anaesth* 2010 May;57(5):423-38.
8. Sherrill WC. Developing a perioperative sleep apnea safety program [slide presentation online]. 2012 May 5 [cited 2014 Feb 14]. http://www.carolinasleepsociety.org/documents/presentations/2012_may/sherrill_perioperative_sleep_apnea_program.pdf
9. Ohio Sleep Medicine Institute. Sleep questionnaires [online]. [cited 2014 Feb 14]. <http://sleepmedicine.com/content.cfm?article=26>
10. Chung F, Yegneswaran B, Liao P, et al. STOP questionnaire: a tool to screen patients for obstructive sleep apnea. *Anesthesiology* 2008 May;108(5):812-21.
11. Lakdawala L. Creating a safer perioperative environment with an obstructive sleep apnea screening tool. *J Perianesth Nurs* 2011 Feb;26(1):15-24.
12. Somerset, William B (Assistant Professor, Anesthesiology, Temple University Hospital). Conversation with: Pennsylvania Patient Safety Authority. 2014 Jul 21.

Reviewer Commentary

Many patients with suspected obstructive sleep apnea (OSA) without a formal diagnosis or optimization will continue to undergo surgical procedures. This will likely continue secondary to the number of patients with OSA exceeding the number of sleep laboratories, the urgent nature of many surgical procedures, the finite economic resources available, and the compliance issues. If we accept the reality that patients with OSA need procedures and frequently will not be diagnosed or treated, then I would argue that we begin to consider extended postanesthesia care unit stays, transfer to higher level of care, and even some unplanned intensive care unit admissions as providing the necessary due diligence.

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PENNSYLVANIA PATIENT SAFETY ADVISORY

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