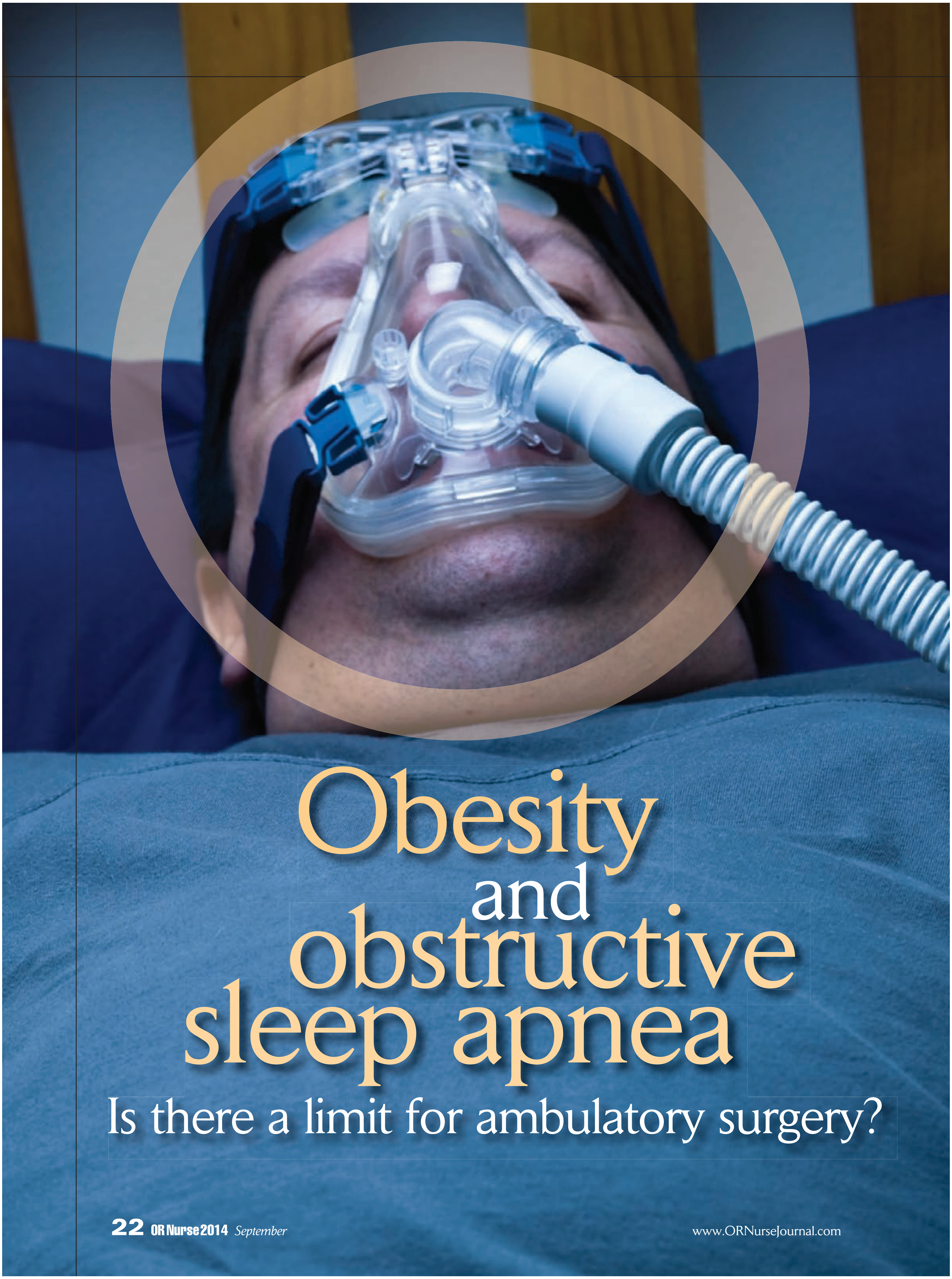

Obesity and obstructive sleep apnea

Is there a limit for ambulatory surgery?

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By Laura Palmer, DNP, MNEd, CRNA, and
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Establishing limits for the types of patients and procedures in the ambulatory surgery (AS) setting can be challenging. There is often a lack of quality evidence to support scripted guidelines, and patient variability is considerable among disease processes with varying opinions from professional organizations and providers regarding practice standards. Defining guidelines for obstructive sleep apnea (OSA) patients in the AS setting has numerous challenges. OSA is characterized by a collapse of airway supporting structures during sleep and presents with wide range of symptoms. In addition, the condition is considerably underdiagnosed.

The various clinical settings that are considered AS further complicate instituting guidelines, as there are several definitions and parameters. AS patients arrive on the day of their procedure, which can take place in a hospital or a freestanding facility (geographically removed from an inpatient facility). In the most recent large-scale study, 53.3 million procedures (surgical and nonsurgical) were performed during 34.7 million AS visits with about 19.9 million in hospitals and 14.9 million in freestanding ambulatory surgery centers (ASC). The number of hospital-based surgery centers remained constant within the study period (1996 to 2006), but freestanding ASCs increased by 300%.[1] This trend brings safety concerns because of the types of patients and procedures that will be seen in the AS setting should this growth continue. Patients and providers often favor the ASC setting due to convenience, satisfaction, and economic benefits.[2] Using mandates to restrict the type of patient or surgery at these centers may not be welcomed in the absence of clear evidence of need.

Patients can receive care for up to 23 hours prior to being discharged in hospital-based situations, and it is still categorized as an outpatient procedure (an alternative term for AS). The process is much easier when this type of patient requires hospital admission for continued care because the OR is located within a hospital. Freestanding ASCs rely on efficient progression from admission to discharge, and any requirements to monitor patients postoperatively for a longer than average time frame can lead to economic repercussions via disturbances in through-flow. Hospital admission from an ASC is more complicated, involving prearranged agreements with facilities and emergency transportation issues, and may be a reportable event at the state or federal level.[3]

Obesity and OSA

A July 2013 report by the Robert Wood Johnson Foundation noted that the adult obesity rates in the United States are beginning to stabilize at 31.8%, just slightly below Mexico, and have considerable statewide and age range variation.[4] Men and women are now identical, compared with a 6% difference 10 years ago. Morbid obesity (BMI greater than 40) rates have risen 350% within the last 30 years.[4]

A systematic review from 2013 evaluated whether or not obesity alone should have limits for patients at ASCs; the literature was inadequate in supporting strong recommendations. Patients considered "super obese" (BMI greater than 50) present an increased risk for perioperative complications, but patients with a BMI of less than 50 and comorbidities that are minimal or optimized don't present with an increased risk for perioperative complications.[5] An individualized approach may be more valuable than arbitrary BMI limits considering the variability in types of facilities and procedures. Optimal selection must also include practical considerations, such as the capacity of the OR table, equipment issues, staffing, patient mobility, and transport. The strong correlation between OSA and obesity should be considered in this decision. One standard deviation difference in BMI was accompanied with a fourfold increase in the prevalence of OSA in the Wisconsin Sleep Cohort Study.[6] Although it's estimated that 70% of patients with OSA are obese and conversely, the prevalence of OSA in the obese is about 40% to 70%, body fat distribution may be a better predictor for the severity of OSA.[6] Central obesity, determined by a high waist-hip ratio commonly referred to as the "apple shape" obesity, is correlated with OSA even with a normal BMI.[7] Excessive upper airway tissue and an increased neck circumference also correlate to OSA. Difficult intubation occurs more often in OSA patients than in controls—up to an 8x increase with no relationship between difficult intubation and the severity of OSA.[8]

Even though OSA is frequently associated with obesity, patients with certain anatomical characteristics are also predisposed to OSA regardless of their size. Craniofacial changes such as severe underbite, lingual tonsillar hyperplasia, and chronic nasal obstruction place nonobese patients at risk.[9] Recent evidence suggests that genetics may play a role, although the specific genes haven't yet been identified.[10] There's a higher risk of OSA in first-degree relatives of OSA patients, and susceptibility increases with the number of affected relatives.[11] Other contributing risk factors for OSA include male gender, middle age, evening ingestion of alcohol, smoking, and drug-induced sleep.[12]

Pathophysiology

It's necessary to review some basic anatomy of the upper airways to fully understand the mechanics involved in OSA. (*See Upper airway structures.*) There are three potential airway structures prone to collapse during sleep in adults: the nasopharynx, the oropharynx, and the laryngopharynx. There's no skeletal support for these structures; muscle tone maintains patency. Relaxation via normal sleep or sedatives can result in obstruction.

The Apnea-Hypopnea Index (AHI) was developed to categorize the severity of the OSA.[13] OSA is diagnosed via polysomnography (PSG) using the AHI to determine the severity of the disease.[9] Patients are divided into three groups: mild, moderate, or severe OSA based on the frequency of apnea and hypopnea episodes within an hour (see *Severity rating of OSA*).

Positive airway pressure (PAP) delivered through multiple methods is the gold standard for the treatment for OSA. Continuous positive airway pressure (CPAP) is the most common treatment and involves the use of a facemask or nasal mask securely fitted to the patient.[14,15] Surgical interventions for OSA vary in complexity, and the reduction of symptoms is inconsistent.[14]

OSA is associated with several problems affecting perioperative management. Hypertension, heart failure, valvular dysfunction, pulmonary hypertension, pulmonary embolism, myocardial infarction, stroke, venous thrombosis, and postoperative airway obstruction are consequent comorbidities of chronic hypoxic episodes and interrupted sleep patterns. Forty percent of morbidly obese patients have both gastric esophageal reflux and OSA. OSA has been shown to improve when patients are prescribed a proton pump inhibitor for esophageal reflux. Conversely, esophageal reflux has been reduced when patients are treated for OSA.[16]

Patients with OSA may have a more serious disorder known as obesity hypoventilation syndrome (OHS). Obesity, OSA, and daytime hypoventilation are characteristics of OHS. This is a complex disease entirely different from obesity and OSA.[15] Breathing regulation via central nervous system control centers is thought to be impaired with the resultant hypercarbia, causing hypersomnolence and chronic hypoxemia, which lead to compensatory polycythemia. This increase in red blood cell counts causes the circulating blood to be thicker and more sluggish, predisposing the patient to an embolic event. The increased workload on the heart can lead to ventricular hypertrophy, heart failure, pulmonary hypertension, valvular dysfunction, and systemic hypertension. It's estimated that the incidence of OHS in the general population is between 0.15% to 0.3% and 10% to 20% in the morbidly obese population (although often undiagnosed).[15] An increase in the serum bicarbonate level reflecting metabolic compensation for chronic respiratory acidosis is a simple clinical indicator that can be an alert for the need to screen for OSH in patients with suspected moderate-to-severe OSA.[15,17] An arterial blood gas (ABG) is the definitive test for OHS with the patient breathing room air when awake. After OSA is confirmed by PSG, the patient is diagnosed with OHS if the ABG result demonstrates an elevated $Paco_{2,}$ which would indicate chronic hypercarbia.[15]

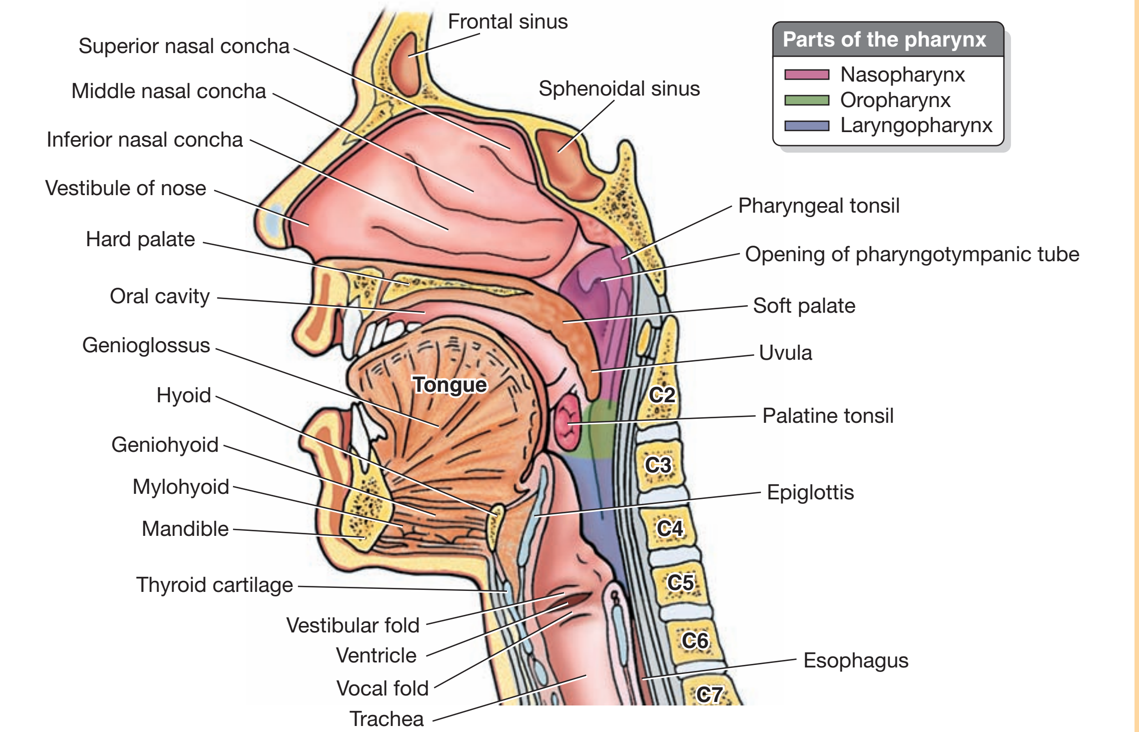
Severity rating of OSA[21]

Categories	Apnea and hypopnea episodes per hour
Mild	5-15
Moderate	16-30
Severe	>30

Current recommendations

The American Society of Anesthesiologists (ASA) developed a task force to produce the 2006 practice guidelines for perioperative management of OSA because of the growing awareness of OSA as a disease process and the implications for anesthesia

Upper airway structures



Source: Moore KL, Agur AM, Dalley AF. *Essential Clinical Anatomy*. 4th ed. Philadelphia, PA: Wolters Kluwer/Lippincott Williams & Wilkins; 2011.

management.[18] Although these guidelines were global in nature for perioperative management of all types of patients, they included limited recommendations–specifically for selecting AS with OSA–due to insufficient literature. Their AS selection recommendations are based solely on the consensus of the 12 members of the task force, with the only clear agreement that AS can be safely performed with regional or local anesthesia and that airway surgery and upper abdominal laparoscopy weren't acceptable for OSA patients in the AS setting. There was no consensus about general anesthesia for superficial procedures, pediatric surgery, and laparoscopic gynecologic surgery. Preoperative screening tools weren't endorsed; however, a scoring criterion for assessing OSA was included without provision of instrument validity. There was a recommendation that the need for postoperative opioids and the ability to manage a difficult airway should be a consideration when selecting patients for AS. OSA patients should be monitored for hypoxemic/apneic episodes post procedure for a minimum of 3 hours longer than usual and a median of 7 hours after the last desaturation event prior to discharge.

The Society for Ambulatory Anesthesia (SAA) published their consensus statement (2012) on preoperative selection of adult patients with OSA for AS because the society believed that the ASA recommendations were outdated and new evidence was available to evaluate several screening tools.[19] The SAA guidelines differ from the ASA in several important areas. The SAA recommended using the STOP-Bang questionnaire for preoperative OSA screening and considered the patient's comorbid conditions in the selection criteria (not addressed in the ASA consensus statement). The SAA believes that known OSA patients who are optimized for comorbid conditions and are able to use a PAP device in the postoperative period can be considered for AS. In addition, the SAA disagrees with the ASA recommendation that upper abdominal procedures aren't appropriate for AS based on new evidence. The SAA offers no recommendations for airway surgery in patients with OSA due to insufficient evidence.[19] There's congruence with the belief that patients with diagnosed or presumed OSA who will require opioid pain management in the postoperative period should be carefully scrutinized for surgery in the outpatient setting. The SAA doesn't offer a scripted timeframe for postoperative monitoring or criteria for discharge.

In October 2012, the ASA collected new evidence to support or change their previous guidelines. This updated report, published in February 2014, reevaluated the literature and stated that their findings didn't necessitate a change in recommendations;[20] however, the previous guidelines that recommended specific types of surgery that shouldn't be performed, as AS have now been generalized to warrant an evaluation of the nature of the surgery among the nine considerations (see *Factors to be considered to determine appropriateness of AS*).[20]

The nonprofit American Sleep Apnea Association (ASAA) website has a position statement that supports that AS may not be suitable for some patients with sleep apnea. The association also recommends a professional evaluation for screening with development of a treatment plan to prevent undesired sequelae.[21]

The issue of airway surgery in patients with OSA performed in an ASC has been controversial and without evidence to establish recommendations. A more recent study evaluated the safety of airway surgery in adult OSA patients, both in the hospital and AS, with a retrospective cohort study. The authors reported that the observed catastrophic complication rate among ambulatory patients was zero. Pain-related ED visits were the most common adverse outcome with no statistical significance between the groups. The author concludes that routine postoperative admission of all OSA patients following airway surgery isn't supported.[22]

Factors to be considered to determine appropriateness of AS[20]

- Sleep apnea status
- Anatomical and physiologic abnormalities
- Status of coexisting diseases
- Nature of surgery
- Type of anesthesia
- Need for postoperative opioids
- Patient's age
- Adequacy of post-discharge observation
- Capabilities of the outpatient facility

Considerations for preoperative evaluation and screening

OSA is a common breathing disorder affecting 22% of men and 9% of women overall with estimates higher in the surgical population.[23-25] Ideally, patients at risk for sleep apnea should be evaluated for this disease by their primary care provider before any surgical interventions. Unfortunately, as few as 10% to 20% of patients are diagnosed with OSA preoperatively and optimized, leaving as much as 90% of patients undiagnosed.[12] PSG, an expensive procedure conducted in a sleep lab requiring an overnight stay, is the definitive test to determine OSA. Long waiting lists for diagnostic testing are common, with initiation and evaluation of treatment being additional limitations. However, severity and adherence to treatments such as PAP are critical to determine suitability for AS when a patient has previously been diagnosed with OSA. The overall rate of nonadherence to PAP treatment is estimated to be as high as 50% at 1 year, and unfortunately, as severity increases, the adherence rates fall.[26,27]

Several questionnaires were developed for general use due to the benefits of identifying patients at risk for OSA, each having its own strengths and limitations. The ASAA estimates that 90 million Americans snore, with half categorized as "simple" snoring.[21] Snoring is of considerable interest and is highly sensitive, but it has low specificity; therefore, additional information must be obtained to evaluate OSA risk.[12] Preoperative screening prior to surgery is suggested because many patients may be unaware of the disease and associated risks in the AS environment.[19,20]

The 10-item Berlin questionnaire (BQ) with inclusion of physiologic details such as age, gender, weight, height, and neck circumference, allows stratification of patients as high- or low-risk for OSA.[28] The number of questions and complicated scoring procedure may limit the practical use in a fast-paced AS environment.[29]

The ASA developed a risk assessment and scoring system within their consensus guidelines in 2006, and the recent update contained no substantial changes. Their checklist consists of 14 items, including physical characteristics, symptoms, and surgical considerations. This tool has considerable limitations in the outpatient screening process because the information is gathered by the provider, and the tool itself is complex.[29]

Chung et al. developed and validated the STOP questionnaire, a condensed and modified screening tool, for use as a widespread screening tool for OSA.[30] This tool only uses four questions that assess for snoring, tiredness, observed apnea, and hypertension. Four additional parameters (STOP-Bang) refined the tool to include BMI, age, neck circumference, and gender to increase sensitivity.[28] The ease of these tools is desirable for an outpatient setting, with the ability to gather much of this information from patients prior to surgery.

So how do they compare? Chung et al. validated the BQ, ASA, STOP, and STOP-Bang tools specifically in the preoperative setting and concluded that all of the tools have a moderately high sensitivity in identifying patients at risk for OSA. The ASA checklist and the STOP questionnaire were able to identify patients likely to develop postoperative complications.[29] Although other screening tools exist, they haven't been validated in the surgical population.

A costly diagnostic process, which improves the recognition of OSA with a less expensive method, could be a valuable preoperative adjunct, since not all individuals identified by the questionnaire as "high risk" are confirmed with PSG. Improved technology and the development of high-quality portable sleep monitors has shown to be a sensitive and specific tool for detecting undiagnosed sleep disordered breathing in surgical patients at a reduced cost.[31,32]

Using a questionnaire for preoperative screening for OSA risk is inexpensive, simple, and effective. The consensus guidelines support that patient selection for AS should ideally be jointly decided between the surgeon and anesthesiologist prior to scheduling; however, the logistics of communication and conducting the screening haven't been specifically addressed. The choice lies with the admitting physician in cases where the anesthesiologist is not involved.

The literature does not address the questionnaire's accuracy—especially in the AS environment. Information obtained over the phone may cause BMI to be underestimated. Questions that involve observing the patient, such as for snoring or apneic events, requires a reliable individual to provide this information and may not be available for the patient who lives alone. Other physical characteristics can't be evaluated until the patient is visually observed, such as neck circumference and anatomic distribution of body weight.

What are the outcomes of OSA?

Even mild OSA has significant morbidity with an increased likelihood of accidental injury or death.[13,23] Moderate-to-severe OSA is independently associated with a large increased risk of all-cause mortality as well as an increased rate of motor vehicle accidents, hypertension, diabetes mellitus, heart failure, stroke, and a known risk factor for mortality in patients with cardiovascular disease.[23,33,34] Complication rates are higher in patients with OSA compared with those without in the inpatient surgical population.[35] A 2012 systematic review summarized that surgical patients with sleep apnea are at increased risk for hypoxemia, pneumonia, difficult intubation, myocardial infarction, pulmonary embolism, atelectasis, cardiac dysrhythmias, and unanticipated admission to the ICU.[34] Anesthetic agents, including opioids and sedatives, have shown to increase pharyngeal collapse, decrease ventilatory response, and impair the arousal response, leading to worsening of sleep apnea in the perioperative period.[35]

The literature is scarce for AS patients with limited population-based studies evaluating the impact of OSA on overall postoperative outcomes.[12] Desaturation is the most common postoperative problem with OSA and alone may not be significant, but it could be a predictor of the potential for respiratory complications.[12]

Unexpected hospital admission rates in AS are estimated at 1% to 2% without a significant difference seen in patients with OSA in the ASC setting.[36,37] Accurate determination of OSA as a causative factor can be compromised because the number of unexpected AS admissions for all causes is low, and there is projected to be a considerable number of AS patients with undiagnosed OSA in the comparison data.

Management issues

Patients who arrive for AS with high risk or known OSA present a challenge. Although preoperative determination of diagnosis and severity of OSA–whether confirmed or suspected is ideal to determine the suitability for AS–many patients with OSA can be effectively managed in the ASC environment.[12] Postponing surgery for a full diagnostic workup for a definitive OSA diagnosis and treatment plan is the conservative approach. However, without consensus to define the specific additional risk OSA poses, this may be viewed as unreasonable by the patient and surgeon. In some situations, the surgery may not be considered an emergency, but a delay could have consequences, such as early diagnosis of malignancy.[13] However, in the most high-risk situations, a patient with OHS and/or severe OSA, morbid obesity, nonadherence to PAP, requiring opioids for pain management may benefit from a delay to reevaluate for the suitability for AS when general anesthesia is required.

Patients with diagnosed or suspected OSA should have a plan of care that minimizes complications, and several essential strategies are critical to the successful outcomes in this population group. Surgery should be scheduled as early in the day as possible if OSA is known to allow adequate recovery observation, particularly if receiving a general anesthetic.[13]

It's essential to limit opioids as well as judiciously using sedative agents in the perioperative period.[19,20] Although the use of nonopioid multimodal pain management strategies is becoming increasingly popular in AS, it's especially important in the patient with OSA. When possible, regional anesthesia is preferred to general anesthesia because it's not associated with increased risk related to OSA.[38] Although postoperative pain management should include the use of regional blocks (when possible) as an alternative to opioids, the safety of neuraxial opioids can't be determined by the existing literature for managing OSA-related pain.[39]

The ASA guidelines recommend postoperative recovery in the nonsupine position with oximetry to determine the number and severity of desaturation events. The use of PAP is advised during sedation and recovery if possible. General anesthesia is preferred over deep sedation, and difficult airway is to be anticipated.[20]

The mandated time for recovery observation before transfer to home is controversial among the published consensus statements.[19,20] Increased stays in ASCs can significantly affect the productivity of the facility and reduce revenue. A recent study of endoscopy patients with known OSA using PAP receiving moderate procedural sedation noted that many patients elected to leave the facility prior to the 3-hour time period with no incidence of readmission or ED visit.[40] This may illustrate the importance of adherence to PAP and use in the perioperative management.

Sleep disturbance in all surgical patients is common on the first postoperative night because of a reduction in rapid eye movement (REM) sleep; however, a rebound of REM sleep on day 3 demonstrated a significant increase in frequency of OSA events.[41] Patient education may be a considerable factor in preventing complications outside of the immediate postoperative period. The importance of maintaining continued use of PAP for several days after surgery should be emphasized with discharge instructions.

Preoperative screening tools can be an effective method for improving the quality of life in individuals found to be at high risk for OSA. Fifty percent of patients identified as high risk via preoperative screening with the STOP-Bang tool (of those that were confirmed by PSG and prescribed PAP) were adherent to PAP and noted a significant improvement in snoring, sleep quality, and daytime sleepiness.[42]

Moving forward

Should limits be established for OSA in the obese for AS? This is frequently asked question, and although recently investigated, evidence remains inconclusive or inconsistent to support defined parameters. Scripted guidelines can have economic problems if they are too conservative, which can increase healthcare costs. Careful management currently demonstrates good outcomes in AS with OSA.[12]

It's difficult to determine if the current low complication rate is the result of improved awareness of OSA and judicious choices about the suitability of patients for AS. As clinicians continue to increase their knowledge about the condition, it's hoped that this success will continue as the use of AS increases, the population grows older, and obesity remains significant. Identifying high-risk or severe patients, adherence to PAP in the perioperative period, and limiting opioids via multimodal therapy are fundamental components for success. Educating all staff members is important to be effective in recognizing at-risk patients along with being skilled in the identification of postoperative apneic/hypoxemic events, educating patients prior to discharge, and appropriate follow up. **OR**

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