

# ARE PATIENTS WITH OBSTRUCTIVE SLEEP APNEA SYNDROME APPROPRIATE CANDIDATES FOR THE AMBULATORY SURGICAL CENTER?

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*Ambulatory surgery centers (ASCs) provide surgical care for patients not requiring hospital admission for their postoperative care. Obstructive sleep apnea syndrome (OSAS) is a disease process affecting every phase of anesthesia care delivery. The potential complications of OSAS and anesthesia care have been well documented in the preoperative, intraoperative and postoperative phases. Patients with OSAS undergoing procedures at ASCs may be at increased risk because they are discharged to home. The influence of residual anesthetics, analgesia, airway edema, and disruption of sleep cycles may result in signif-*

*icant postoperative apneic events in this patient population.*

*There is a lack of studies regarding the outcomes and management of patients with OSAS in the outpatient and ASC environments. Until there are more studies defining the risk and outlining safe and appropriate care for these patients, it would seem reasonable to remain conservative in our approach because the negative outcomes in this population can be catastrophic.*

**Key words:** Ambulatory surgery center, obstructive sleep apnea syndrome, respiratory complications.

**A**mbulatory surgery centers (ASCs) provide surgical care for patients not requiring hospital admission for their postoperative course. The advantages to the consumer include convenience, economic savings, and a high level of satisfaction. A wide variety of specialties are represented in ASCs, including plastic surgery, ophthalmology, gastroenterology, podiatry, urology, orthopedics, gynecology, and ear, nose, and throat surgery. Approximately 6 million surgeries are performed each year in more than 3,300 ASCs across the United States.<sup>1</sup>

Anesthesia providers working in an ASC recognize disease processes, identify risk factors associated with the disease, and plan and implement a safe course of action for the patient. Obstructive sleep apnea syndrome (OSAS) is one of the disease processes that anesthesia providers should strive to identify. It is important to identify OSAS during the preoperative interview to ensure patient safety in the intraoperative and postoperative periods.

## **OSAS prevalence**

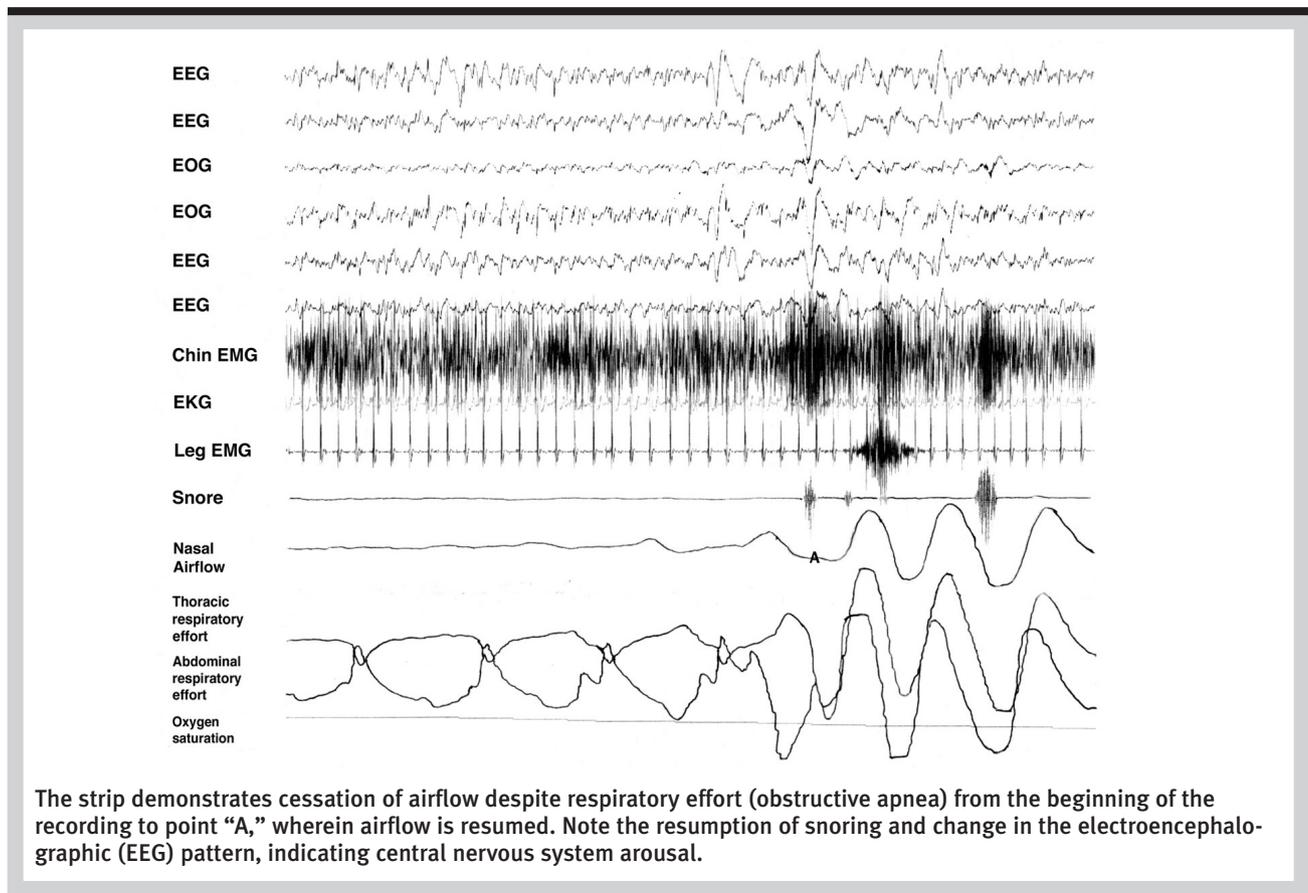
Obstructive sleep apnea syndrome is underdiagnosed in the United States. In a random sample of 602 men and women, aged 30 to 60 years and studied using polysomnography, the minimal diagnostic criteria for

OSAS were met in 2% of the women and 4% of the men.<sup>1</sup> Young et al<sup>2</sup> estimated that 93% of women and 82% of men with moderate to severe OSAS have not been diagnosed clinically. It has been estimated that 1 of 5 adults have mild OSAS and 1 of 15 adults have moderate OSAS.<sup>3</sup> The fact that OSAS is underdiagnosed implies that many patients may be admitted to ASCs for elective procedures. The anesthesia provider may be the last healthcare provider to identify OSAS before an elective procedure.

## **Definitions**

*Apnea* is the absence of airflow at the nose and mouth lasting for at least 10 seconds. *Hypopnea* is a 50% or greater decrease in airflow or respiratory movement that decreases oxygen saturation by 4% or more.<sup>4</sup> Obstructive sleep apnea syndrome is diagnosed by polysomnography using an apnea-hypopnea index. Figure 1 is an example of a polysomnography recording for a patient with OSAS. The apnea-hypopnea index is the number of apneic or hypopneic events that the patient experiences each hour of sleep. The severity of OSAS is graded as mild, moderate, or severe based on an apnea-hypopnea index of 5 to greater than 51 and the lowest percentage of oxygen saturation that occurred during these events.<sup>5</sup>

**Figure 1. A 30-second strip of a polysomnography recording from a patient with obstructive sleep apnea**



EKG indicates electrocardiogram; EOG, electro-olfactogram; and EMG, electromyogram.  
(Polysomnography strip courtesy of D.E.C.)

## Pathogenesis

In OSAS, apnea is caused by an obstruction to airflow in the oropharyngeal region. During an apneic event, the soft palate moves posteriorly, meeting the posterior pharyngeal wall and leading to occlusion.<sup>6-8</sup> Upper airway collapse occurs when excessive negative inspiratory pressure exceeds the opposing forces generated by the dilator abductor muscles of the upper airway due to excessive tissue pressure and ineffective tissue driving pressure. Continuing respiratory efforts worsen the situation.<sup>6,9</sup> The pharynx in patients with OSAS has been found to be more collapsible and narrow.<sup>10</sup> Negative oropharyngeal pressure from decreased upper airway muscle activity, a small pharyngeal cavity, high pharyngeal compliance, and increased resistance leads to upper airway collapse.<sup>6</sup> The results of airway occlusion and continued respiratory effort include arterial hypoxemia, hypercarbia, and a decrease in pH.<sup>6</sup> Central nervous system arousal mechanisms are secondary to chemoreceptor activation and upper airway mechanoreceptors; arousal

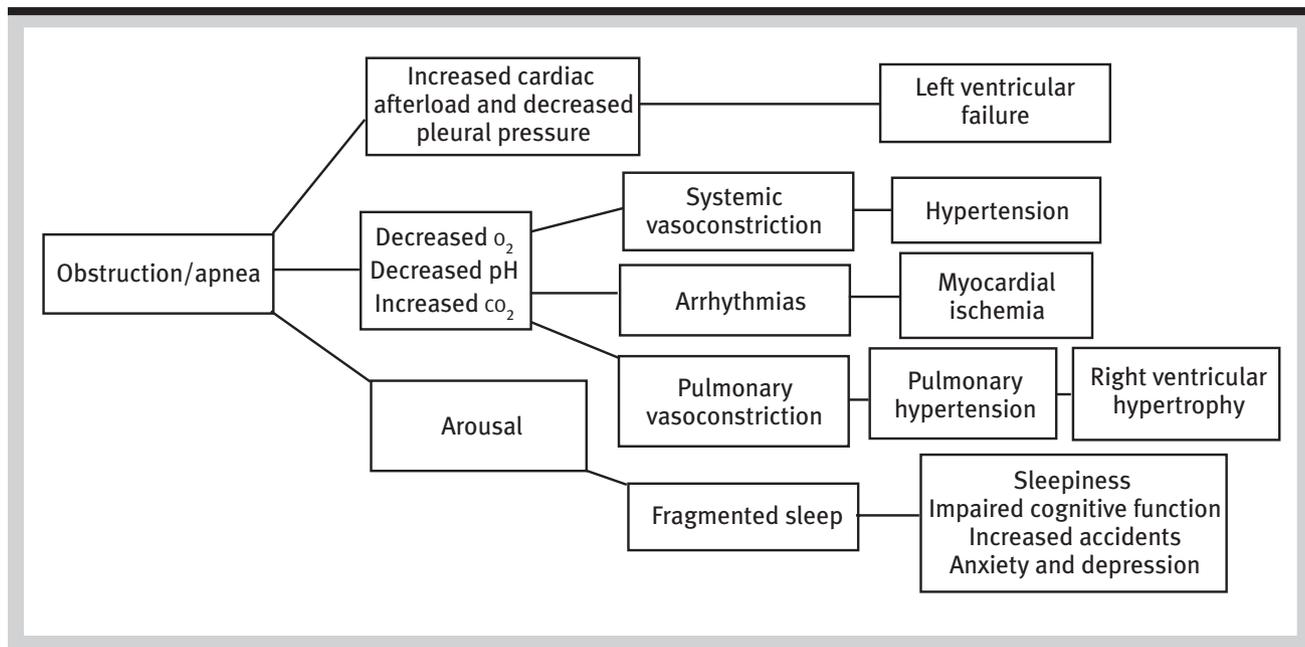
ends the obstruction.<sup>6,11</sup> As arousal decreases, the cycle is repeated multiple times each night, resulting in frequent arousal and the absence of sustained, restorative sleep.

The Starling resistor model has been proposed to explain the upper airway mechanics and treatment of patients with OSAS. This model views the oropharynx as a collapsible tube that remains open, partially closed, or fully closed. The state of the oropharynx is dependent on pressure at the nose and mouth, the trachea, or tissue pressure surrounding the oropharynx.<sup>12</sup>

## Systemic effects of OSAS

OSAS can affect the cardiopulmonary, neuropsychological, and endocrine systems (Figure 2). The continuous cycles of frequent apnea and obstruction result in systemic vasoconstriction, arrhythmias, and pulmonary vasoconstriction. Systemic vasoconstriction results in systemic hypertension.<sup>6</sup> Systemic hypertension is found in 50% of patients with OSAS<sup>13</sup> and ultimately may result in left ventricular failure.<sup>6</sup> Arrhythmias from hypoxia and hypercarbia include

**Figure 2. Pathophysiology of obstructive sleep apnea (OSA)**



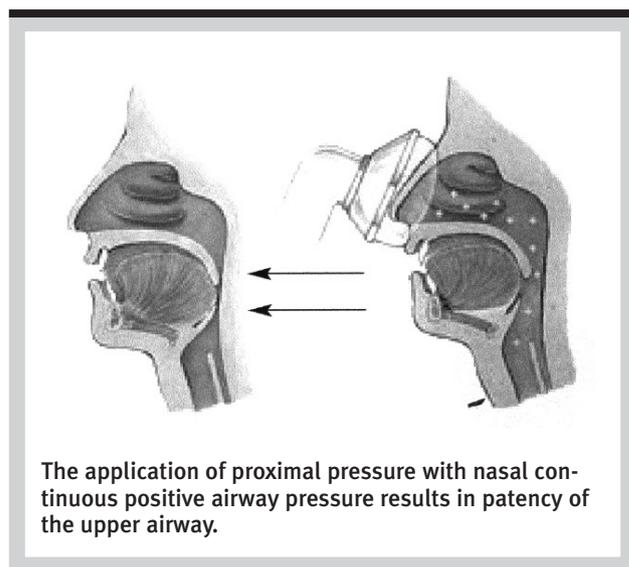
vagal bradycardia, ventricular ectopy, sinus pauses, and second-degree blocks.<sup>13</sup> There is an increased incidence of nocturnal angina and myocardial infarction in patients with OSAS. This may be associated with the arrhythmias that occur with hypoxia experienced by the patient with OSAS.<sup>14</sup> Hypoxia leads to pulmonary vasoconstriction and increases the systemic and pulmonary pressures.<sup>14</sup> Over many years, these events conspire to produce pulmonary hypertension and right ventricular hypertrophy.<sup>6</sup> The pickwickian syndrome may be found in a small subset of patients who have severe OSAS.<sup>15</sup>

Neuropsychological manifestations may include sleepiness, impaired cognitive function, an increase in accidents due to decreased vigilance, anxiety, and depression.<sup>4,16</sup> The endocrine system is affected by decreases in testosterone and growth hormone levels and glucose instability in people with diabetes.<sup>16</sup>

### Treatment

Modification of risk factors such as obesity, alcohol use, smoking, and nasal congestion and estrogen replacement can be initiated to improve airway patency.<sup>4</sup> The most common intervention for patients with moderate to severe OSAS is continuous positive airway pressure (CPAP).<sup>17</sup> Positive pressure is applied to the upper airway by nasal mask, nasal prongs, or a full face mask. Continuous positive airway pressure works as a pneumatic splint by maintaining a fixed airway pressure throughout the respiratory cycle.<sup>9</sup> The positive airway pressure prevents upper airway

**Figure 3. Tissue collapse results in an obstruction and apnea despite continuing respiratory effort.**



(Reprinted with permission from Stalford.<sup>12</sup>)

collapse and apnea. The level of pressure the patient requires usually is determined by titration of pressure during polysomnography.<sup>9</sup> Figure 3 illustrates nasal CPAP. Surgical interventions such as tracheostomy and palate and maxillofacial surgery are reserved for the most severe cases of OSAS in which more conservative interventions have failed.<sup>17</sup> Tolerance of CPAP depends primarily on the ability of the individual to adapt to the mask interface and the pressure and air-

flow generated by the device. Definitions of compliance vary in the literature but have been reported to range from 67% to 80%.<sup>18-20</sup> It is important for anesthesia providers to document CPAP settings during the preoperative interview.

### **Effects of anesthesia on the pharynx**

The impact of general anesthesia on the upper airway results in multiple sites of airway collapse within the pharynx. Nandi et al<sup>7</sup> studied the effects of general anesthesia on the pharynx in healthy elderly men. Following induction of anesthesia, it was found that a significant posterior displacement occurred in the soft palate, base of the tongue, and epiglottis. This resulted in airway occlusion in the majority of subjects. After the reestablishment of spontaneous ventilation, a slight anterior movement of the epiglottis was noted. Significant posterior displacement of the soft palate and base of the tongue remained. Inspiration resulted in pharyngeal collapse with the tongue touching the pharyngeal wall and epiglottis in the majority of the subjects. Tongue traction was found to be effective in moving the tongue base anteriorly but did not change the other effects of general anesthesia on the soft palate. The primary source of airway obstruction was found to be the soft palate.

Eastwood et al<sup>8</sup> compared the incidence of upper airway collapse in patients during general anesthesia and sleep. Anesthetized patients who required positive pressure to maintain airway patency had a propensity for more severe sleep-disordered breathing than those who did not require positive pressure.

Anesthetic medications that blunt the action of the pharyngeal dilator muscles result in pharyngeal collapse in obese patients with OSAS. Propofol, thiopental, opioids, small doses of neuromuscular blocking agents, potent inhalational agents, and nitrous oxide have demonstrated this effect.<sup>21</sup>

Topical anesthesia to the upper airway has been found to contribute to airway occlusion in patients with OSAS. The application of a local anesthetic blocks the upper airway mechanoreceptors in some patients with OSAS, contributing to airway collapse.<sup>22,23</sup>

### **OSAS and anesthesia**

Obstructive sleep apnea syndrome affects every phase of anesthesia care. In the preoperative phase, centrally acting depressants promote pharyngeal collapse in obese patients with OSAS.<sup>24</sup> Some suggest avoiding the use of sedative premedications in patients with OSAS due to the possibility of obstruction.<sup>16,25,26</sup>

A thorough airway assessment should be done during the preoperative period. This assessment

should include temporomandibular joint function, Mallampati classification, mobility of the neck, and thyroid-mandibular length.<sup>26</sup> The periods of induction with intubation and emergence with extubation must be planned and executed carefully by the anesthesia provider.

Hiremath et al<sup>27</sup> studied the relationship between difficult intubation and OSAS and found that OSAS and difficult intubation were related significantly. In obese patients with OSAS, this is due to physical characteristics such as a short, thick neck and excess tissue on the lateral aspects of the pharyngeal wall.<sup>24</sup> This mechanism of obstruction specifically affects obese patients with OSAS. The cause of airway obstruction in nonobese patients generally is related to anatomical abnormalities including craniofacial and orofacial abnormalities, nasal pathology, and tonsillar hypertrophy. Excess adipose tissue in the pharynx has been found in nonobese patients with OSAS.<sup>14</sup>

Selection of the intubation technique should be based on physical examination findings and history in relation to general anesthesia. This may include conventional induction and intubation or fiberoptic intubation (awake vs asleep). The ASA Difficult Airway algorithm should be used for any difficulties encountered during this phase.<sup>14</sup>

Extubation of the patient requires advance planning and meticulous execution. The amount of intraoperative opioid administered has been correlated with complications during the immediate postextubation period. Inhalational anesthetics should be eliminated well in advance of extubation. Inhalational anesthetics attenuate ventilatory responses to carbon dioxide and abolish responses to hypoxemia.<sup>26</sup> Residual anesthetic levels may significantly impair airway reflex response, especially in patients with OSAS. The decision to extubate the patient who is awake vs continuing postoperative airway and ventilatory support needs to be made at this time.

Several criteria must be met before extubation. First, the patient should be fully awake, orientated, and able to follow commands. Second, full recovery from neuromuscular blockade is imperative and is indicated by a sustained head lift for more than 5 seconds as well as an adequate vital capacity and peak inspiratory pressure. Third, a respiratory rate of less than 12 per minute may indicate an unacceptable amount of circulating opioids.<sup>21</sup>

In preparing for extubation, the patient should be placed in the reverse Trendelenburg position to minimize diaphragmatic compression. The patient should have an oropharyngeal or nasopharyngeal airway in place. Ideally, a second person skilled in airway man-

agement should be present for extubation to provide assistance if necessary. Preparations for 2-person ventilation should be made. If any difficulties were encountered with intubation, the endotracheal tube should be removed over a fibroscope or airway exchange catheter.<sup>21</sup>

Postoperative management for the patient with OSAS can be problematic. Postoperative analgesia has been associated with respiratory arrest and successful and unsuccessful resuscitations.<sup>28-30</sup> The effects of analgesia attenuates arousal and awakening, leading to airway obstruction, hypoxemia, and respiratory depression.<sup>26,28</sup>

Postoperative monitoring should be done in the postanesthesia care unit, intensive care unit, or an observational unit that allows for close monitoring.<sup>14,26,31</sup> The patient should be monitored with continuous electrocardiography, blood pressure, and pulse oximetry. Direct observation of the patient is ideal. Supplemental oxygen should be administered as needed. The recovery nurse must be judicious in the use of postoperative opioids and monitor the patient for signs of airway obstruction. The patient who uses CPAP at home should continue to use CPAP for the postoperative course.<sup>26,29,32,33</sup> Continuous positive airway pressure is the treatment for natural sleep and should be used during rest periods after general anesthesia. Because CPAP may inhibit access for suctioning, make communication difficult, and impair assessment of facial color and level of consciousness, it should not be placed on the patient immediately on arrival in the postanesthesia care unit.<sup>21</sup>

The location of the patient postoperatively depends on the severity of the OSAS, the patient's body mass index, any associated cardiopulmonary disease, and postoperative opioid requirements. If any of these factors are considerable, the patient should be considered a candidate for admission to an intensive care unit or a high-acuity monitoring environment. If these factors are mild, an environment such as the ward may suffice. The placement of patients with conditions between these categories requires good judgment with respect to the risk and benefits.<sup>21</sup>

### **ASCs and obstructive sleep apnea**

When reviewing the complications of anesthesia and OSAS, one must question the appropriateness of caring for patients with OSAS in an ASC. The ASC environment differs from a hospital setting because patients are discharged to the home environment. The first 24 hours postoperatively are a critical time for patients with OSAS.<sup>34</sup> Residual anesthetics, analgesia, and airway edema may result in significant apnea in patients who may not have exhibited significant apnea

in the preoperative phase.<sup>34</sup> The patient with OSAS is at risk for prolonged apnea during sleep for up to 1 week postoperatively. The first few days after surgery are marked by suppression of deep sleep. The increase in analgesic requirements related to surgical trauma leads to a risk of drug-induced apnea. The next few days are marked by rebounds in rapid eye movement sleep, which was deprived during the early postoperative course, that may result in natural deep sleep-induced apnea.<sup>21</sup> Choosing the setting that would provide for optimal preoperative, intraoperative, and postoperative care is an important step for this patient population.

There is a lack of studies regarding management of the patient with OSAS in outpatient and ASC settings. Sabers et al<sup>35</sup> studied the rate of unanticipated admissions in patients with OSAS undergoing outpatient surgery. A retrospective analysis was done of 234 cases of obstructive sleep apnea, confirmed through the use of polysomnography. These patients were compared with a control group of patients who did not have a diagnosis of OSAS. The patients were matched by age, sex, body mass index, and surgical procedure. No statistical differences were found in unplanned admissions or other adverse events. Some design elements in this study make extrapolation of results to ASCs difficult. First, the patients in the control group did not have polysomnography to rule out the diagnosis of OSAS. It is possible that because OSAS is underdiagnosed, some patients with OSAS could have been included in the control group. Second, the study was done in a tertiary care setting, not a freestanding ASC, which may have introduced a bias in scheduling for the outpatient setting. Third, an outpatient department that is part of a tertiary care setting has a different set of resources and personnel available compared with a freestanding ASC. It is difficult to extrapolate the results of this study to a freestanding ASC.

The results of Sabers et al<sup>35</sup> are in contrast with those in a study by Gupta et al,<sup>36</sup> who found an approximate 2-fold increase in adverse perioperative complications in patients with OSAS undergoing total joint replacement. Complications included the need for reintubation, acute hypercapnia, episodic desaturation, arrhythmias, myocardial ischemia, myocardial infarction, and postoperative delirium. Although this patient population was older and had more comorbid conditions than the population generally seen at a freestanding ASC, the distinct possibility of an increased risk exists. The complications related to anesthesia in hospital settings have been well documented for the preoperative,<sup>26</sup> intraoperative,<sup>26,27,30</sup> and postoperative phases.<sup>10</sup>

## Implications of OSAS in the ASC

Concerns have been expressed about OSAS and ambulatory surgery in the *Anesthesia Patient Safety Foundation (APSF) Newsletter*.<sup>37-39</sup> Benumof<sup>37</sup> stated: "the most major and urgent problem areas are a failure to recognize the disease preoperatively, uncertainties regarding perioperative airway management, and the scheduling and management of obstructive sleep apnea patients for outpatient surgery."

Eshleman<sup>38</sup> questioned the appropriateness of ambulatory surgery in patients with OSAS. He raised several unanswered questions including the following: How does the diagnosis of OSAS impact the surgical setting? Is there a difference in the choice of setting and anesthetic care for mild and severe OSAS? Does the type of surgical procedure affect the complication rate? Is there a difference between monitored anesthetic care and general anesthesia?

The American Sleep Apnea Association is a non-profit organization that informs and distributes information about sleep apnea. Its position indicates that "there is a concern that same day surgery may not be appropriate for some sleep apnea surgical patients."<sup>40</sup>

The American Association of Nurse Anesthetists, American Society of Anesthesiologists, and the Society for Ambulatory Anesthesia have no practice guidelines concerning OSAS and ambulatory surgery. The ASA is formulating practice guidelines for OSAS and anesthesia, which may include information concerning ambulatory surgery (Christin Engelhardt, February 2004, oral communication).

The American Academy of Sleep Medicine (AASM) recently published a statement concerning the upper airway management of patients with OSAS in the perioperative period.<sup>34</sup> The Clinical Practice Review Committee did not develop an AASM standards of practice recommendation but used available data to make a statement. The AASM reviewed the risk factors for OSAS and anesthesia that contribute to perioperative morbidity. Literature was reviewed pertaining to the risk of anesthesia in diagnosed and undiagnosed patients, intubation and extubation issues, and general principles related to the postoperative period. The AASM stated: "care should be taken in selecting patients for outpatient procedures."<sup>34</sup> Patient care protocols should be reviewed by individual institutions to help determine whether they are appropriate for the care of patients with OSAS. Alterations in protocols should be made if current protocols do not provide for adequate postoperative monitoring. The AASM concluded that the important concepts in perioperative care of patients with OSAS include "a high index of suspicion, constant control of the airway,

judicious use of medications, and proper postoperative monitoring." Detailed study is needed for specific details regarding patient management because there is a lack of studies.<sup>34</sup>

Benumof<sup>37</sup> stated: "There is a desperate need for all same day surgery/ambulatory/outpatient facilities to write policies and procedures for acceptable outpatient surgery candidates that take into consideration the special problems and risks of OSA patients." Ambulatory surgery centers should seek to create policies and procedures related to the care of patients with OSAS. Policies should include the definition of appropriate candidates for elective ambulatory procedures for general anesthesia, monitored anesthesia care, regional anesthesia, and local anesthesia. The endoscopy suite should be included in policies because procedures requiring topical local anesthetics to the oropharynx could lead to airway obstruction. Patients who require conscious sedation should be included because centrally depressant medications promote pharyngeal collapse in patients with OSAS<sup>24</sup> and alter the normal respiratory response to hypoxemia and hypercarbia.<sup>28</sup> Sharma et al<sup>41</sup> prospectively studied 26 patients undergoing outpatient bronchoscopy and colonoscopy procedures, under conscious sedation, who did not have a previous diagnosis of OSAS. Of the patients who fell asleep, 74% had values on an 8-channel polysomnographic reading that met the minimum criteria for the diagnosis of sleep apnea.<sup>41</sup>

Until there is more substantial information available, it is reasonable to remain conservative in our approach to patients with OSAS in the ASC environment. St Boniface Hospital, Winnipeg, Manitoba, Canada, has published a protocol for patients who have OSAS.<sup>39</sup> The protocol states that patients "having low risk procedures performed under local or regional anesthesia with no or little sedation and no neuraxial opioids can be discharged home the same day."<sup>39</sup>

A formal evaluation of ASC environments should be undertaken to determine whether they are prepared to care for patients with OSAS. Are there policy and procedures in place to ensure safety of patients with OSAS? Are the nurses proficient with CPAP machines? Is there a fiberoptic scope, and are staff members proficient in its use? Is there the ability to mechanically ventilate a patient postoperatively? Are all care providers trained in advanced cardiac life support? Does the ASC have staff to closely monitor patients for a prolonged period?

## Identification of undiagnosed OSAS

The anesthesia provider may be the last healthcare provider to identify undiagnosed OSAS before surgery.

Patient advocacy and patient safety should always remain at the forefront of our care. Because OSAS is underdiagnosed, a high index of suspicion should be maintained. A patient who exhibits signs and symptoms of OSAS, yet is undiagnosed, may present a challenge to the anesthesia provider.<sup>42</sup>

A presurgical screening tool would be helpful in identifying patients who may be at risk for OSAS. The first principle is that the anesthetist must have a high index of suspicion, be knowledgeable of the characteristics of OSAS vs other sleep disorders, conduct a careful patient history, and be aware of the signs that the patient may exhibit in the preoperative and postoperative period. There are a number of standardized screening tools proposed for primary care practice settings to identify patients that may have abnormal results on sleep studies. Combinations of clinical variables and patient self-report symptoms have good sensitivity but modest specificity given the common presentations of many sleep disorders. Some are used just to collect a common symptom database, so the clinician can be more efficient in follow-up questions. This approach can fail in common clinical practice for a variety of reasons.<sup>43</sup> Specifically for the anesthetist, anesthetizing the patient is not neurologically equivalent to naturally falling asleep, just as anesthesia is not equivalent to coma. The appearance of obstructive events related to sedatives and anesthetics does not mean that a patient has OSAS. Snoring and obesity are common in the general population. The patient undergoing a surgical procedure will be exposed to sedatives and analgesics that can alter the patient's ability to compensate for changes in respiratory controls and mechanics.

The Berlin Questionnaire has been found to be specific and sensitive in identifying patients who have increased apneic activity during sleep studies in the primary care setting<sup>44,45</sup> (Figure 4). The questionnaire is divided by symptom categories. The first category contains 5 questions concerning symptoms of snoring and apnea. The second category contains 3 questions concerning the symptoms of fatigue. The third category contains 2 questions concerning hypertension and body mass index. The first 2 categories are considered positive if there are 2 or more positive responses in each category. The third category is considered positive if there is hypertension present and/or a body mass index greater than 30. If 2 or more categories are positive then there is a high likelihood of sleep-disordered breathing.<sup>44</sup>

A recent abstract used the Berlin Questionnaire for preoperative screening. It identified 23.9% of the patients presenting for elective surgical procedures as

being at risk for clinically significant sleep apnea. In addition, the Berlin Questionnaire correctly identified patients that have been previously diagnosed with OSAS, representing 13% of the at risk group.<sup>46</sup> A modification of the Berlin Questionnaire called the sleep apnea preoperative screen (SLAPS) has recently been tested. SLAPS contains 4 questions related to the presence of snoring and apnea during sleep, presence of daily fatigue, and the presence or treatment of hypertension for patients under the age of 50. It was found that SLAPS identified 11% of the patients as potentially being at risk for sleep apnea vs 23.9% for the Berlin Questionnaire. Both questionnaires correctly identified patients that had a previous diagnosis of OSAS.<sup>47</sup> Both questionnaires need to be studied in depth to determine which tool may be valid and useful during preoperative screening. It appears that significant progress is being made in this area, and a preoperative screening tool may be available to the anesthetist in near future.

Characteristics of patients at high risk for OSAS include: males, body mass index greater than 25 kg/m<sup>2</sup>, neck circumference of more than 17 inches for men or more than 16 inches for women, habitual snoring or gasping, daytime somnolence, and hypertension.<sup>34</sup>

A careful history can help identify patients at risk. Careful questioning of the patient is essential. When exploring symptoms of OSAS the anesthetist should focus questioning on symptoms of snoring, waking up short of breath or gasping, witnessed apnea, fatigue, headaches upon awakening, nasal congestion, and falling asleep easily at inappropriate times.<sup>34</sup> The patient's sleep partner can be helpful in identifying some of these symptoms.

The physical examination may reveal obesity, ecchymoses or petechiae of the soft palate, macroglossia, macrouvula, micrognathia, glottic deformities, nasal obstruction, and retrognathia.<sup>9,16</sup> Consideration should be given to delaying elective procedures in patients suspected of having undiagnosed OSAS. Consultation should be sought with the patient's primary physician. Sleep studies should be sought based on the individual's symptoms. OSAS can be diagnosed definitively only with polysomnography.<sup>16,29,37,40</sup>

## Summary

Anesthesia providers who work in an ASC should be aware of the potential complications presented by patients with OSAS. Obstructive sleep apnea syndrome affects every aspect of anesthesia delivery. There is a need for more studies to determine the

**Figure 4. Berlin Questionnaire self-reported patient characteristics**

<p><b>Category 1 (Purpose: Elicit risk associated with persistent snoring)</b></p> <p>1. Has anyone told you that you snore? Yes* No Don't know</p> <p>2. Snoring loudness? Loud as breathing Loud as talking Louder than talking* Very loud*</p> <p>3. Snoring frequency? Almost every day* 3-4 times a week* 1-2 times a week 1-2 times a month Never or almost never</p> <p>4. Does your snoring bother other people? Yes* No</p> <p>5. How often have your breathing pauses been noticed? Almost every day* 3-4 times a week* 1-2 times a month Never or almost never</p>	<p><b>Category 2 (Purpose: Elicit risk of sleepiness)</b></p> <p>6. Are you tired after sleeping? Almost every day* 3-4 times a week* 1-2 times a week 1-2 times a month Never or almost never</p> <p>7. Are you tired during wake time? Almost every day* 3-4 times a week* 1-2 times a week 1-2 times a month Never or almost never</p> <p>8. Have you ever fallen asleep while driving? Yes* No</p> <p><b>Category 3 (Purpose: Elicit risk according to body habitus and cardiovascular sequella)</b></p> <p>9. Do you have high blood pressure? Yes* No Do not know</p> <p>10. Body mass index &gt; 30 kg/m<sup>2</sup> as calculated from self-reported height and weight? Yes* No</p>
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\* Indicates a positive response

Category 1 is positive if there are 2 or more positive responses.

Category 2 is positive if there are 2 or more positive responses.

Category 3 is positive if there is a positive response and/or a BMI > 30 kg/m<sup>2</sup>.

Two or more positive responses in each Category and being positive in 2 of the 3 categories is considered high likelihood for sleep apnea.

(Adapted with permission from Netzer NC, Stoohs RA, Netzer CM, Clark K, Strohl KP. Using the Berlin Questionnaire to identify patients at risk for the sleep apnea syndrome. *Ann Intern Med.* 1999;131:485-491. Disclaimer: The Berlin Questionnaire's copyright is held by iONSLEEP LLC. It can be used for academic, research, and teaching purposes without cost. The Berlin Questionnaire is not a diagnostic tool. iONSLEEP LLC waives any and all liability, which may result from the use of this information by any individual or institution.)

types of procedures and precautions that are appropriate for patients with OSAS who seek surgery in the ASC environment. This is of paramount importance because the patient is discharged to the home environment. The first 24 hours are a critical time for these patients.

Ambulatory surgery centers should create policies and procedures specifically for this patient population and remain conservative in their approach. Extensive patient education should be undertaken to inform patients and families of the increased risks of anesthesia for patients with OSAS. If an anesthesia provider is suspicious that a patient may have OSAS, it is appropriate to delay the procedure until a proper workup is done. Until there are more studies defining the risk and outlining the appropriate care for patients with OSAS, it would seem reasonable to remain conserva-

tive in our approach because the negative outcomes can be catastrophic.

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