

OSA Creates a Significant Perioperative Risk for Patients



Proper perioperative management of Obstructive Sleep Apnea (OSA) is critical to improved patient care and reduced liability exposure:

- As many as 45% of the patients who undergo general anesthesia have undiagnosed sleep disordered breathing and as many as 20% have moderate to severe OSA.
- Patients with OSA are four times as likely to have serious complications, two times as likely to have some post-surgical complications, and have significantly longer hospital stays.

Collapse of the upper airway is exacerbated during the perioperative period:

- Anesthetic, analgesic and sedative drugs aggravate or precipitate OSA by decreasing pharyngeal tone, depressing ventilatory responses to hypoxia and hypercapnia and inhibiting arousal responses to obstructions.
- Surgery of the thorax, upper abdomen or upper airway further complicates the perioperative risks associated with OSA. The force of gravity combined with a large neck circumference increases the OSA severity when a patient is supine, especially during the perioperative period.
- Surgery disrupts sleep architecture, frequently resulting in a significant REM rebound postoperatively. The REM rebound can induce and increase the number and severity of abnormal breathing events.

OSA may contribute to the following perioperative complications:

- **Intraoperative-** difficulty in mask ventilation, tracheal intubation, or laryngoscopic view.
- **Recovery room** – higher incident of persistent transient events such as: hypoxemia, high or low blood pressure, onset of cardiac dysrhythmia, aspiration pneumonia; and/or post-op atelectasis. Postoperative hypoxemia contributes to mental confusion, wound breakdown, myocardial ischemia, stroke, death and brain damage.
- **Hospital floor** - shortness of breath or chest pain; post-surgical chest x-ray abnormality; requirement for a specialist consultation; need for ICU or mechanical ventilation; cardiac arrest, congestive heart failure or arrhythmia; and/or coma or death.

The American Society of Anesthesiologists OSA Practice Parameters recommend:

Anesthesiologists screen all patients for OSA during the preoperative consultation. The severity of OSA should be accurately diagnosed, particularly supine-positional OSA. The anesthetic management plan should take into consideration the severity of OSA, the planned surgical procedure and the likely postoperative analgesic requirements. For mild or moderate OSA, an early recovering anesthetic should be combined with regional analgesics, close observation, and nursing in the lateral posture during the recovery. For moderate or severe OSA with substantial analgesic requirements, close supervision postoperatively should be combined with use of CPAP when sedated or otherwise asleep. Patients should be nursed in the lateral posture during recovery and postoperatively.

ARES - Validated Tools for the Management of OSA Perioperative Risk

ARES Screener: Triage patients with an increased risk of perioperative complications:

- Begin single page questionnaires from patients completed in less than 5 minutes.
- Input responses in less than 2-minutes using a desktop scanner and ARES software.
- Identify patients in need of a sleep study (OSA risk) and/or likely to have mild, moderate or severe (OSA severity).
- Print ARES Screener reports for documentation in the patient's medical record.

ARES Organizer: Hospital-based management of Perioperative OSA Risk:

- Upload ARES Screener patient information directly to the Unicorder to save time.
- Download the sleep study data and generate a preliminary sleep study report in less than 5-minutes in one simple step.
- Review preliminary reports to identify those likely to have changes in OSA severity (e.g., Moderate AHI changing to severe or severe AHI changing to moderate after review).
- Transmit the sleep study record automatically to a sleep professional for technical review by a sleep professional using the Download, Process and Send routine.
- Monitor the "status" of patients who have entered the OSA management pathway. Typical statuses include ARES Screener completed, study underway, preliminary or final report available.
- Access ARES Screener responses, predicted OSA risk and severity, and sleep study results with any computer networked to the ARES SQL database.

Hospital-based model with integrated sleep lab

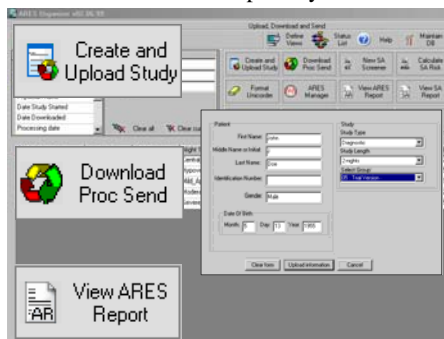
1. Scan Questionnaire for OSA Risk and Severity



2. Dispense Unicorder



3. Auto-process an ARES Sleep Study



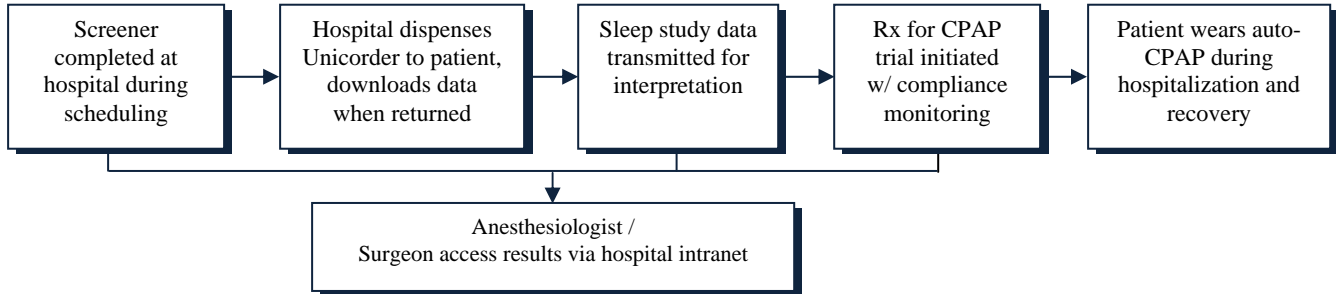
4. Prepare the Unicorder for Reuse



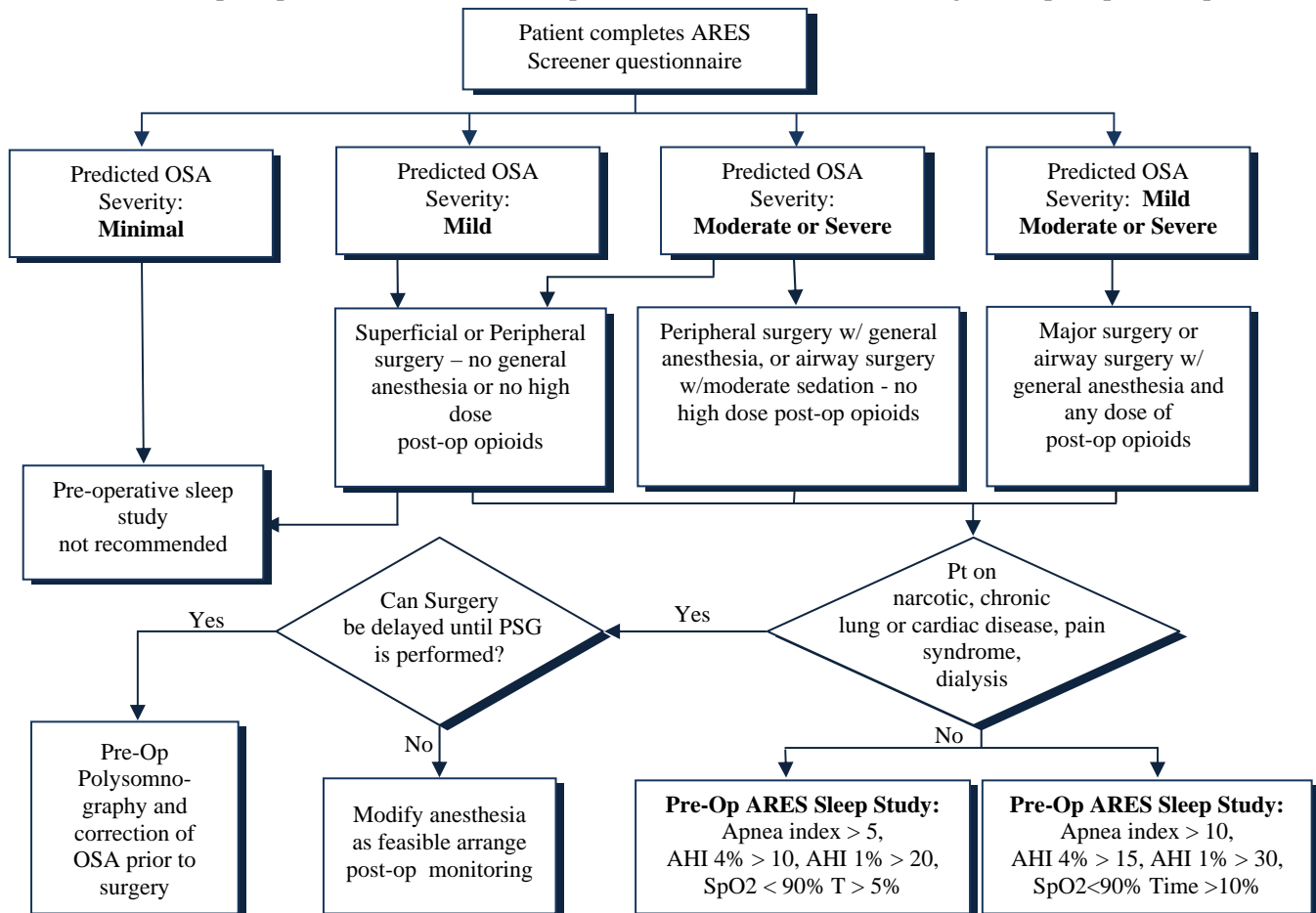
ARES Quest: Web-based management of Perioperative OSA Risk:

- Allow primary care physician offices (PCP) to enter ARES questionnaire responses, determine OSA risk and severity, and print an ARES Screener report during the Physical and History workup.
- Provide preliminary sleep study reports for download to authorized recipients (e.g., PCP, surgeon, anesthesiologist, treatment (CPAP) provider).
- Access contact information, such as patient name, address and phone number, by authorized recipients to schedule an ARES sleep study or initiate a CPAP trial.
- Initiate a CPAP trial within the short pre-op time-window by automatically sending an order to the CPAP provider based on the ARES preliminary report findings.
- Monitor patient "status" for those who have entered the OSA management pathway by automatically combining updates from the hospital-based SQL database and web-based application.

ARES model for the perioperative management of OSA risk



- Combine the results of a screening questionnaire capable of predicting OSA severity with the type of surgery, anesthesia and sedative to identify high risk patients.
- Conduct pre-op sleep studies whenever possible to confirm OSA severity.
- Initiate a pre-op CPAP trial with at-risk patients; utilize auto-CPAP during entire perioperative period.



Recommendations for non-CHF patients with expected hospital stay ≥ 48 hrs for major surgery:

1. Initiate Auto-CPAP trial > 2 nights pre-surgery for non-CHF patients. CHF patients should not be placed on auto-CPAP.
2. Monitor Auto-CPAP compliance and efficacy prior to admission. If non-compliant, delay surgery or modify anesthesia and arrange for post-operative monitoring.
3. Require Auto-CPAP use during hospitalization and in-home while patient is prescribed high dose opioids.
4. If pre-op Auto-CPAP trial not feasible, monitor cardiorespiratory status continuously during post-op period. Supplemental oxygen may be insufficient to control desaturation events related to OSA.
5. If pre-op sleep study is not feasible, assume a post-test AHI1% > 20 for predicted OSA of moderate or severe.
6. Patients on high dose narcotic or with congestive heart failure should be studied by PSG prior to surgery.
7. Follow-up clinical evaluation to determine if long-term CPAP treatment is required.

Obstructive Sleep Apnea: The Silent Pandemic

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Introduction

Obstructive sleep apnea (OSA) afflicts 2-4% of the U.S. adult population.¹ Eighty to 90% of people with OSA are thought to be undiagnosed.² This is likely owing to poor awareness of OSA, a lack of routine screening, and the costly and time-consuming process of diagnostic sleep studies. Patients with OSA may be vulnerable during the perioperative period, particularly if they receive general anesthesia and opioid analgesia. The protective arousal reflexes are diminished thereby increasing the risk for prolonged periods of apnea and respiratory arrest during sleep. The prevalence of OSA among surgical patients is unknown. We designed a prospective observational study to discover the extent of diagnosed and undiagnosed OSA among surgical patients at our institution.

Methods

During their preoperative evaluation, patients are asked to complete a screening questionnaire that assigns them a risk level for OSA. All patients who screen high-risk are offered an ARES Unicorder® to take home. This is a validated portable diagnostic device worn at home during sleep; its results compare favorably with formal sleep studies.³ A computer chip stores continuous data on oxygen saturation, pulse rate, air flow, head position, and decibel level of snoring. The patient returns the Unicorder® on the day of surgery. The data are downloaded and a report is generated that details the respiratory disturbance index (RDI) during sleep. The RDI is the number of abnormal breathing events per valid hour of recording time and indicates the severity of OSA.

Results

One thousand eight hundred ninety eight consecutive patients have been screened thus far over 4 months. Twenty four percent (n=458) have been found to be at high risk, 23% (n=445) at moderate risk, 27% (n=506) at low risk, and 26% (n=489) at no risk. Of the 458 high-risk patients, 88 had a prior diagnosis of OSA. Of the remaining 370, 231 (62%) have taken Unicorders® home. One hundred fifty four Unicorders® have been returned, and 21 did not use the device. One hundred eleven Unicorders® had valid studies, in which at least 2 valid hours of data were collected. Unicorders showed 84/111 (76%) were confirmed to have OSA. The median "RDI overall" (supine & non-supine) was 26 (IQR = 16 to 43.5) and the "RDI supine" was 37 (IQR = 23.5 to 64.5). The regression coefficient between the RDI overall and RDI supine was 0.52 (p<0.001).

Discussion

Based on our results, we have found that an alarming 19% of the adult surgical population at our institution has OSA. Data from the Unicorders® suggest that most patients who screen high-risk truly have moderate, severe, or very severe OSA. Furthermore, 15% of our surgical patients have undiagnosed OSA, and the severity of the OSA is worsened by the supine position, a common post-operative position. If these results are confirmed and are reflective of the general surgical population in the USA, it is essential to develop a practical process for OSA screening and to establish guidelines for perioperative management of OSA.

References

1. Young T et al. *NEJM* 1993;328:1230-1235.
2. Young T et al. *Sleep* 1997;20:705-706
3. Westbrook P et al. *Chest*. 2005; 128:2166-2175