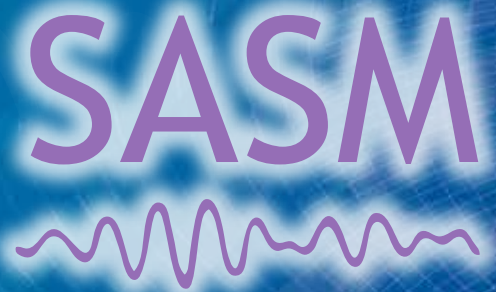


SASM



Recommendations for the Perioperative Evaluation and Management of Patients with Sleep Apnea

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Perioperative Management of Obstructive Sleep Apnea

Obstructive sleep apnea (OSA) is a common condition^{1,2} in surgical patients and is associated with higher risk of perioperative complications.^{3-9,32} Early identification of patients with known or suspected OSA allows implementation of a treatment plan to improve safety. Consensus guidelines for perioperative care of OSA patients have been developed.¹⁰⁻¹⁶ Recent guidelines advocate for routine screening for OSA as part of standard risk assessment prior to elective surgery³³.

Preoperative Screening for Obstructive Sleep Apnea

Screening for OSA before surgery is recommended as part of a pre-anesthesia and pre-surgical plan.¹⁰ Various diagnostic approaches are available.

- **Questionnaires:** The STOP-Bang Questionnaire (SBQ)^{17,18} has a high sensitivity and specificity to identify OSA. A SBQ of < 2 predicts a very low likelihood of OSA. A SBQ of 5-8 indicates a high probability of moderate-severe OSA.¹⁸ Other screening questionnaires include the Berlin Questionnaire,¹⁹⁻²¹ the American Society of Anesthesiologists Checklist,²¹ the Sleep Apnea Clinical Score (SACS),²² the P-SAP.²³ Many institutions favor the STOP-Bang Questionnaire⁹ due to its ease of use and growing data on its utility in the preoperative arena.
- **Oximetry:** By using the desaturation index, overnight oximetry can be a sensitive and specific tool to detect sleep-disordered breathing in surgical patients.^{24,25} Oximetry is a screening tool, and does not establish a diagnosis of OSA for purposes of prescribing positive airway pressure therapy (i.e. CPAP).
- **Limited Channel Home Sleep Apnea Testing (HSAT):** HSAT can successfully identify OSA in 82% of adult surgical patients.²⁶ HSAT provides a valid diagnosis of OSA for most insurance carriers, which is necessary for patients to obtain CPAP. Its utility in patients with significant cardiac, pulmonary, or neurologic conditions may be limited. In addition, a negative home sleep test in a patient highly suspected of having OSA should warrant further testing, usually in-lab polysomnography.
- **Polysomnography (PSG):** PSG is considered the gold standard for diagnosing OSA.²⁷ It may be the preferred modality if the patient has comorbid medical conditions (such as cardio-pulmonary disease), or if the timing of surgery is not an important factor. CPAP titration in the sleep laboratory allows for precise determination of settings. PSG is expensive and access to testing may be limited.

Additional SASM Best Preoperative Practice Recommendations³³

- All members of the healthcare team and the patient should understand diagnosed OSA and suspected OSA may be associated with increased perioperative morbidity.
- If resources allow, facilities should consider having PAP equipment for perioperative use, or have patients bring their own PAP equipment with them to the surgical facility.
- Patients with known OSA, partially treated/untreated and suspected OSA with optimized co-morbid conditions may proceed to surgery provided strategies for mitigation of postoperative complications are implemented.
- The use of PAP therapy in previously undiagnosed but suspected OSA patients should be considered case by case, although evidence from randomized trials is not currently available.

Intraoperative Management of Obstructive Sleep Apnea

- Local or regional anesthesia should be considered whenever possible.^{10,28}
- Continuous capnography is required for moderate-deep sedation.¹⁰
- General anesthesia with control of the airway may be safer than deep sedation.¹⁰
- If general anesthesia is planned, providers should preferably use a technique that allows early emergence (i.e. short acting agents with adequate of reversal of muscle relaxants).
- Planning for difficult airway management is important.
- Extubation in a position other than supine is desirable. The semi upright position can decrease upper airway collapsibility.¹⁰
- Ready-availability of CPAP is important either during sedation or post-extubation.
- Consideration should be given to a non-opioid multimodal analgesia approach (i.e. local/regional analgesia, non-steroidal anti-inflammatory drugs, acetaminophen, and steroids).
- If opioids are required, use short-acting agents when possible.

Postoperative and PACU Considerations

- Patients are best recovered in a semi-upright, non-supine position.
- Patients who are considered high risk for OSA (based upon pre-operative screening or observations intraoperatively or postoperatively) should be identified to all members of the care team, including bedside staff and pharmacy personnel, in order to monitor for requests for long acting opioids and additional sedating medications. Identification will allow

appropriate OSA management algorithms to be enacted.

- Observe patients for apneic episodes, increased FiO_2 requirements, pain-sedation mismatch, or episodes of desaturation.²² These patients should receive extra vigilance. This may include enhanced monitoring (i.e. continuous pulse oximetry and/or placement in a step-down unit) or interventions (i.e. head of the bed elevation, use of nasal trumpets or the implementation of positive airway pressure).
- Consider a sedation scale (i.e. Richmond Agitation Sedation Scale²⁹) to help guide management.
- Avoid systemic opioids, if possible. If necessary, titrate long acting opioids (i.e. hydromorphone) to the lowest dose that works.
- Patients with known OSA on therapy should be placed on PAP therapy (either home machine, hospital machine adjusted to home settings, or auto-CPAP).
- If oxygen desaturation occurs while on oxygen therapy, use of PAP therapy should be considered.
- Oxygen therapy may be needed to prevent hypoxemia. However, oxygen therapy should be used with caution and a search for potential underlying causes is recommended (i.e. one should not assume that hypoxia is due only to untreated OSA). Additional caveats include:
 - Oxygen may prolong apneas in some individuals.
 - Use of supplemental oxygen therapy may also mask the development of hypercapnia. Patients with obesity hypoventilation syndrome or overlap syndrome (OSA and chronic obstructive lung disease) are at higher risk of hypercapnia with oxygen therapy.
- The ideal locations for monitoring, and the parameters to be monitored, have not been clearly established. Due to factors such as postoperative sleep disruption resulting in subsequent nights of REM rebound, the lingering effects of anesthesia, and the concomitant use of opioids, OSA can be greatest on postoperative night 3 and may not normalize for several more nights. It is therefore imperative that patients with known and suspected sleep apnea are provided with appropriate follow-up care.
 - Monitoring locations may include intensive care units, stepdown units and general ward beds with additional monitoring capability. In some patients, no additional monitoring is needed. Numerous factors (i.e. type of surgery, type of anesthesia, postoperative analgesic requirements, co-morbidities, OSA severity and treatment, PACU course) should play a role in decision making.
 - Continuous pulse oximetry is often recommended for monitoring. Guidelines for how best to utilize pulse oximetry have not been established, though data is beginning to emerge in this area.³⁰ Monitoring oximetry alone can fail to detect significant hypercapnia. Continuous capnography (carbon dioxide monitoring) is an emerging technology that may assist in management in certain cases.
- Outpatient facilities should be prepared for respiratory care and have transfer agreements with inpatient facilities.

Management of Significant Respiratory Depression

- Appropriate resuscitation should be initiated - including noninvasive positive-pressure ventilation, tracheal intubation, or appropriate use of opioid reversal agents such as naloxone.
- Consider transfer of ambulatory patients to an inpatient facility for additional monitoring.
- Hospitalized patients should be on a unit experienced in treating OSA patients, with a system capable of providing appropriate monitoring. The Anesthesia Patient Safety Foundation recommends continuous remotely monitored pulse oximetry as appropriate monitoring for high risk patients. Continuous capnography monitoring may assist in the management of some cases.
- If possible, inspection of the patient's home CPAP equipment should be performed by a respiratory therapist to verify proper working condition, adequate mask fit, etc.

Home Treatment and Follow-Up

- Patients suspected of having OSA based on clinical criteria are encouraged to follow up with primary care or sleep medicine physicians to consider a sleep study.
- Patients on PAP therapy, and their families, should be educated at discharge to use their PAP therapy whenever sleeping, and to avoid opiates as much as possible due to their adverse effects on breathing.
- Patients cannot be discharged home with CPAP or BPAP equipment unless a diagnosis of OSA has been made with HSAT or PSG. Use of HSAT or portable PSG could be a consideration for diagnosis in the postoperative period. Identification and treatment of OSA patients early in the perioperative process can assist with both immediate postoperative management and post-discharge planning.³¹
- If a patient with known OSA is non-compliant with therapy, efforts should be made to provide appropriate education regarding risks of untreated sleep apnea, identify barriers that have resulted in non-compliance, and to ensure that follow up with an appropriate provider is arranged.

This document references other available tools, guidelines, and protocols to assist in identifying and treating these patients [Joshi GP: The adult patient with morbid obesity and/or sleep apnea syndrome for ambulatory surgery. American Society of Anesthesiologists Refresher Courses in Anesthesiology 2012; 40: 80-86.]³³

References

1. Young T, Hutton R, Finn L, Badr S, Palta M: The gender bias in sleep apnea diagnosis. Are women missed because they have different symptoms? *Arch Intern Med* 1996; 156: 2445-51
2. Young T, Evans L, Finn L, Palta M: Estimation of the clinically diagnosed proportion of sleep apnea syndrome in middle-aged men and women. *Sleep* 1997; 20: 705-6
3. Kaw R, Golish J, Ghamande S, Burgess R, Foldvary N, Walker E: Incremental risk of obstructive sleep apnea on cardiac surgical outcomes. *J Cardiovasc Surg* 2006; 47: 683-9
4. Liao P, Yegneswaran B, Vairavanathan S, Zilberman P, Chung F: Postoperative complications in patients with obstructive sleep apnea: a retrospective matched cohort study. *Can J Anaesth* 2009; 56: 819-28
5. Hwang D, Shakir N, Limann B, Sison C, Kalra S, Shulman L, Souza Ade C, Greenberg H: Association of sleep-disordered breathing with postoperative complications. *Chest* 2008; 133: 1128-34
6. Kaw R, Pasupuleti V, Walker E, Ramaswamy A, Foldvary-Schafer N: Postoperative complications in patients with obstructive sleep apnea. *Chest* 2012; 141: 436-41
7. Gupta RM, Parvizi J, Hanssen AD, Gay PC: Postoperative complications in patients with obstructive sleep apnea syndrome undergoing hip or knee replacement: a case-control study. *Mayo Clin Proc* 2001; 76: 897-905
8. Stierer TL, Wright C, George A, Thompson RE, Wu CL, Collop N: Risk assessment of obstructive sleep apnea in a population of patients undergoing ambulatory surgery. *J Clin Sleep Med* 2010; 6: 467-72
9. Memtsoudis S, Liu SS, Ma Y, Chiu YL, Walz JM, Gaber-Baylis LK, Mazumdar M: Perioperative pulmonary outcomes in patients with sleep apnea after noncardiac surgery. *Anesth Analg* 2011; 112: 113-21
10. 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; 120(2): 268-86
11. Meoli AL, Rosen CL, Kristo D, Kohrman M, Gooneratne N, Aguillard RN, Fayle R, Troell R, Kramer R, Casey KR, Coleman J, Jr.: Upper airway management of the adult patient with obstructive sleep apnea in the perioperative period—avoiding complications. *Sleep* 2003; 26: 1060-5
12. Seet E, Chung F: Management of sleep apnea in adults - functional algorithms for the perioperative period: Continuing Professional Development. *Can J Anaesth* 2010; 57: 849-64
13. Joshi GP, Ankichetty SP, Gan TJ, Chung F: Society for Ambulatory Anesthesia Consensus Statement on Preoperative Selection of Adult Patients with Obstructive Sleep Apnea Scheduled for Ambulatory Surgery. *Anesth Analg* 2012; 115:1060-8
14. Horlocker TT, Burton AW, Connis RT, Hughes SC, Nickinovich DG, Palmer CM, Pollock JE, Rathmell JP, Rosenquist RW, Swisher JL, Wu CL: Practice guidelines for the prevention, detection, and management of respiratory depression associated with neuraxial opioid administration. *Anesthesiology* 2009; 110: 218-30
15. Mokhlesi B, Hovda MD, Vekhter B, Arora VM, Chung F, Meltzer DO: Sleep-disordered breathing and postoperative outcomes after elective surgery: analysis of the Nationwide Inpatient Sample. *Chest* 2013
16. Mokhlesi B, Hovda MD, Vekhter B, Arora VM, Chung F, Meltzer DO: Sleep-Disordered Breathing and Postoperative Outcomes After Bariatric Surgery: Analysis of the Nationwide Inpatient Sample. *Obes Surg* 2013
17. Chung F, Yegneswaran B, Liao P, Chung SA, Vairavanathan S, Islam S, Khajehdehi A, Shapiro CM: STOP questionnaire: a tool to screen patients for obstructive sleep apnea. *Anesthesiology* 2008; 108: 812-21
18. Chung F, Subramanyam R, Liao P, Sasaki E, Shapiro C, Sun Y: High STOP-Bang score indicates a high probability of obstructive sleep apnoea. *Br J Anaesth* 2012; 108: 768-75
19. Auckley D, Steinel J, Southwell, et al. Does screening for sleep apnea with the Berlin Questionnaire predict elective surgery postoperative complications? *Sleep* 2003;26(S):A238-239.
20. Chung F, Ward B, Ho J, Yuan H, Kayumov L, Shapiro C: Preoperative identification of sleep apnea risk in elective surgical patients, using the Berlin questionnaire. *J Clin Anesth* 2007; 19: 130-4
21. Chung F, Yegneswaran B, Liao P, Chung SA, Vairavanathan S, Islam S, Khajehdehi A, Shapiro CM: Validation of the Berlin questionnaire and American Society of Anesthesiologists checklist as screening tools for obstructive sleep apnea in surgical patients. *Anesthesiology* 2008; 108: 822-30
22. Gali B, Whalen FX, Schroeder DR, Gay PC, Plevak DJ: Identification of patients at risk for postoperative respiratory complications using a preoperative obstructive sleep apnea screening tool and postanesthesia care assessment. *Anesthesiology* 2009; 110: 869-77
23. Ramachandran SK, Kheterpal S, Consens F, Shanks A, Doherty TM, Morris M, Tremper KK: Derivation and validation of a simple perioperative sleep apnea prediction score. *Anesthesia and analgesia* 2010; 110: 1007-15
24. Malbois M, Giusti V, Suter M, Pellaton C, Vodoz JF, Heinzer R: Oximetry alone versus portable polygraphy for sleep apnea screening before bariatric surgery. *Obes Surg* 2010; 20: 326-31
25. Chung F, Liao P, Elsaid H, Islam S, Shapiro CM, Sun Y: Oxygen desaturation index from nocturnal oximetry: a sensitive and specific tool to detect sleep-disordered breathing in surgical patients. *Anesth Analg* 2012; 114: 993-1000
26. Finkel KJ, Searleman AC, Tymkew H, Tanaka CY, Saager L, Safer-Zadeh E, Bottros M, Selvidge JA, Jacobsohn E, Pulley D, Duntley S, Becker C, Avidan MS: Prevalence of undiagnosed obstructive sleep apnea among adult surgical patients in an academic medical center. *Sleep Med* 2009; 10: 753-8
27. Epstein LJ, Kristo D, Strollo PJ, Jr., Friedman N, Malhotra A, Patil SP, Ramar K, Rogers R, Schwab RJ, Weaver EM, Weinstein MD: Clinical guideline for the evaluation, management and long-term care of obstructive sleep apnea in adults. *J Clin Sleep Med* 2009; 5: 263-76
28. Memtsoudis SG, Stundner O, Rasul R, Sun X, Chiu YL, Fleischut P, Danninger T, Mazumdar M: Sleep apnea and total joint arthroplasty under various types of anesthesia. *Reg Anesth Pain Med* 2013; 38: 1-8
29. Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O'Neal PV, Keane KA, Tesoro EP, Elswick RK: The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care unit patients. *Am J Respir Crit Care Med* 2002; 166: 1338-44
30. Taenzer AH, Pyke JB, McGrath SP, Blike GT: Impact of pulse oximetry surveillance on rescue events and intensive care unit transfers: a before-and-after concurrence study. *Anesthesiology* 2010; 112: 282-7
31. O'Gorman S, Horlocker TT, Huddleston J, Gay PC, Morgenthaler T: Does self-titrating CPAP therapy improve postoperative outcome in patients at risk for obstructive sleep apnea syndrome? A randomized controlled clinical trial. (abstract). *Chest* 2011; 140: 1071A
32. Opperer M, Cozowicz C, Bugada D, Mokhlesi B, Kaw R, Auckley D, Chung F, Memtsoudis SG. Does Obstructive Sleep Apnea Influence Perioperative Outcome? A Qualitative Systematic Review for the Society of Anesthesia and Sleep Medicine Task Force on Preoperative Preparation of Patients with Sleep-Disordered Breathing. *Anesth Analg* 2016;122(5):1321-34
33. Chung F, Memtsoudis SG, Ramachandran SK, Nagappa M, Opperer M, Cozowicz C, Patrawala S, Lam D, Kumar A, Joshi GP, Fleetham J, Ayas N, Collop N, Doufas AG, Eikermann M, Englesakis M, Gali B, Gay P, Hernandez AV, Kaw R, Kezirian EJ, Malhotra A, Mokhlesi B, Parthasarathy S, Stierer T, Wappler F, Hillman DR, Auckley D. Society of Anesthesia and Sleep Medicine Guidelines on Preoperative Screening and Assessment of Adult Patients With Obstructive Sleep Apnea. *Anesth Analg*. 2016;123(2):452-73