Perioperative Management of Obstructive Sleep Apnea

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Yale Center for Sleep Medicine
Yale University School of Medicine
Outline

• The prevalence of OSA in patients presenting for surgery
• The perioperative complications in patients with known or suspected OSA
• The mechanisms implicated in these complications
• The techniques for adequate preoperative screening for OSA
• The management strategies to improve outcomes
Sleep-related Breathing Disorders: Prevalence

<table>
<thead>
<tr>
<th>Condition</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHI ≥ 5</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>AHI ≥ 5 + daytime somnolence</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
Prevalence of OSA in a Bariatric Surgical Patients

Prospective study 1368 pts evaluated for bariatric surgery, if ESS>9 pts had a PSG
25% of the pts had been diagnosed with OSA

40% of the pts who were confirmed to have OSA by PSG were undiagnosed before surgery

Surg Obes Relat Dis 2012; 8: 569
Prevalence of Undiagnosed OSA Among Surgical Patients in An Academic Medical Center

Prospective, observational study of adult surgical patients

2877 filled out questionnaires

↓

99 Incomplete

↓

2778 Complete

↓

2117 Not High Risk (76.3%)

↓

661 High Risk (23.7%)

↓

534 Without a prior diagnosis of OSA

↓

373 approached

↓

2 excluded

54 refused

↓

317 consented to use home sleep study

↓

78 dropouts

32 insufficient recording time

↓

207 valid studies

Finkel K, Sleep Med 2009
## Patients Characteristics and Comorbidities of Adult Surgical Patients

<table>
<thead>
<tr>
<th></th>
<th>Not high-risk (n = 2117)</th>
<th>High-risk (n = 661)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>56 (44–68)</td>
<td>53 (43–62)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Male gender</td>
<td>1218 (57.5%)</td>
<td>334 (50.5%)</td>
<td>0.002</td>
</tr>
<tr>
<td>BMI&lt;sup&gt;a&lt;/sup&gt;</td>
<td>26.6 (23.7–29.7)</td>
<td>36.9 (33.5–42.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Neck circumference (cm)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>38.1 (35.6–40.6)</td>
<td>43.2 (40.6–45.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Caucasian</td>
<td>1624 (76.7%)</td>
<td>482 (72.9%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>African American</td>
<td>429 (20.3%)</td>
<td>175 (26.5%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>64 (3.0%)</td>
<td>4 (0.6%)</td>
<td></td>
</tr>
<tr>
<td><strong>Comorbidities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hx hypertension</td>
<td>850 (40.2%)</td>
<td>386 (58.4%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hx CAD or valvular disease</td>
<td>275 (13.0%)</td>
<td>104 (15.7%)</td>
<td>0.080</td>
</tr>
<tr>
<td>Hx diabetes</td>
<td>222 (10.5%)</td>
<td>164 (24.5%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hx stroke</td>
<td>80 (3.8%)</td>
<td>15 (2.3%)</td>
<td>0.066</td>
</tr>
<tr>
<td>Hx OSA</td>
<td>46 (2.2%)</td>
<td>127 (19.2%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<sup>a</sup> Median (interquartile range), analyzed by unpaired Wilcoxon rank-sum. All others are number (percentage) analyzed by Fisher's exact test. OSA, obstructive sleep apnea; BMI, body mass index; cm, centimeters; CAD, coronary artery disease; Hx, history.
Prevalence of OSA in the Perioperative Population

• General surgical population

  25% of adult patients presenting for surgery screened high-risk for OSA
  
  the prevalence of undiagnosed OSA was 82% in this high-risk population

  Finkel KJ; J Sleep Med 2009; 10: 753

• Bariatric population

  71% of obese patients (mean BMI 47)

  Frey WC, Obesity Surgery 2003; 13:676
Outline

• The prevalence of OSA in patients presenting for surgery

• The perioperative complications in patients with known or suspected OSA

• The mechanisms implicated in these complications

• The techniques for adequate preoperative screening for OSA

• The management strategies to improve outcomes
<table>
<thead>
<tr>
<th>Study</th>
<th>Diagnosis of OSA</th>
<th>Complications</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gupta</td>
<td>case control</td>
<td>PSG</td>
<td>reintubation, hypoxemia, acute hypercarbia, MI, delirium</td>
</tr>
<tr>
<td>(200 pts)</td>
<td>study</td>
<td></td>
<td>post op complications (39% vs 18%), increased hospital LOS</td>
</tr>
<tr>
<td>Sabers</td>
<td>case control</td>
<td>PSG</td>
<td>atrial fibrillation, pulmonary edema, upper airway obstruction</td>
</tr>
<tr>
<td>(468 pts)</td>
<td>study</td>
<td></td>
<td>no difference in the rate of hospital admissions</td>
</tr>
<tr>
<td>Kaw</td>
<td>cohort study</td>
<td>PSG</td>
<td>Afib, resp failure, CHF</td>
</tr>
<tr>
<td>(471 pts)</td>
<td></td>
<td></td>
<td>post-op hypoxemia (12.4% vs 2.1%), ICU transfer (6.7% vs 1.6%) hospital LOS</td>
</tr>
<tr>
<td></td>
<td>case control</td>
<td>PSG</td>
<td>encephalopathy</td>
</tr>
<tr>
<td>(37 OSA pts, 234 controls)</td>
<td></td>
<td></td>
<td>increased ICU LOS</td>
</tr>
<tr>
<td>Vasu</td>
<td>Historical cohort</td>
<td>STOPBANG</td>
<td>Hypoxemia, PNA, PE, atelectasis, A fib</td>
</tr>
<tr>
<td>(135 pts)</td>
<td>study</td>
<td></td>
<td>post op complications (19.6% vs 1.3%)</td>
</tr>
<tr>
<td>Stiener</td>
<td>prospective</td>
<td>questionnaire</td>
<td>Hypoxemia, reintubation, cardiac arrhythmia</td>
</tr>
<tr>
<td>(2139 pts)</td>
<td>cohort study</td>
<td></td>
<td>difficult intubation</td>
</tr>
<tr>
<td>Ambulatory surgery</td>
<td></td>
<td></td>
<td>intra-op tachycardia</td>
</tr>
</tbody>
</table>

J Clin Sleep Med 2012; 8:199
Perioperative Pulmonary Outcomes in OSA Patients after Noncardiac Surgery

Large national inpatient sample data
Retrospective case-control study of 282 OSA pts and 198 matched controls

Memtsoudis S, Anesth Analg 2011
OSA is an independent risk factor for perioperative pulmonary complications and the need for mechanical ventilation

Memtsoudis S, Anesth Analg 2011

<table>
<thead>
<tr>
<th>Procedure type and outcome</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General surgical</strong></td>
<td></td>
</tr>
<tr>
<td>Aspiration pneumonia</td>
<td>1.37 (1.33, 1.41)</td>
</tr>
<tr>
<td>ARDS</td>
<td>1.58 (1.54, 1.62)</td>
</tr>
<tr>
<td>PE</td>
<td>0.90 (0.84, 0.97)</td>
</tr>
<tr>
<td>Intubation/mechanical ventilation</td>
<td>1.95 (1.91, 1.98)</td>
</tr>
<tr>
<td><strong>Orthopedic</strong></td>
<td></td>
</tr>
<tr>
<td>Aspiration pneumonia</td>
<td>1.41 (1.35, 1.47)</td>
</tr>
<tr>
<td>ARDS</td>
<td>2.39 (2.28, 2.51)</td>
</tr>
<tr>
<td>PE</td>
<td>1.22 (1.15, 1.29)</td>
</tr>
<tr>
<td>Intubation/mechanical ventilation</td>
<td>5.20 (5.05, 5.37)</td>
</tr>
</tbody>
</table>
Perioperative Outcomes in Patients with OSA

Inpatient surgery

- Intraoperative complications
  - more problematic airway management with difficult intubations (24% vs 3%)
  - higher rate of post-operative complications

- respiratory events: acute hypercarbia, hypoxemia, atelectasis, ARDS, higher re-intubation rates and need for urgent non invasive ventilation
- cardiac: arrhythmias, myocardial injury, MI, pulmonary edema
- neuro: delirium, encephalopathy
- unplanned ICU transfer
- increased hospital length of stay

  Flink BJ, Anesthesiology 2012
  Kaw R; Chest 2011, Liao P; Can J Anesth 2009
  Gupta RM; Mayo Clin Proc 2001

Ambulatory surgery

- no increase rate of complications or unplanned admissions
- increase rate of respiratory (difficult intubations, hypoxemia) and cardiac complications (intra-operative tachycardia)

Meta-analysis of the association between obstructive sleep apnoea and postoperative outcome

R. Kaw¹,²*, F. Chung³, V. Pasupuleti⁴, J. Mehta³, P. C. Gay⁶,⁷ and A. V. Hernandez⁵

Conclusions. The incidence of postoperative desaturation, respiratory failure, postoperative cardiac events, and ICU transfers was higher in patients with OSA.
Outline

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Pathogenesis of Airway Obstruction

Promotion of airway collapse

- Negative pressure on inspiration
- Extraluminal pressure
- Fat deposition
- Small mandible

Promotion of airway patency

- Pharyngeal dilator muscle contraction
- Lung volume (longitudinal traction)

Lancet 2002; 360:237
Anesthesia

- Increases pharyngeal collapse
  - anatomically predisposed airway
  - unfavorable posture (supine and neck flexed)
  - increased muscle relaxation
- Decreases ventilatory response (propofol, opiates, pentothal, benzodiazepines)
- Facilitates Apneas
  - benzodiazepines decrease upper airway dilator muscle activity
  - opiates: central apneas
  - topical anesthetics can reduce genioglossus muscle activity
- Impairs arousal response

Surgical Stress

POD 1-2: fragmented sleep with decreased REM sleep and slow wave sleep
sleep deprivation

POD 3-5: REM-rebound  →  airway obstruction/apneas
Knill; Anesthesiology 1990, Cartwright; Sleep 1984
### OSA is Associated with Numerous Co-Morbidities

<table>
<thead>
<tr>
<th>Condition</th>
<th>Hazard Ratio</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension (AHI&gt;15/h)</td>
<td>2.89</td>
<td>Peppard N Engl J Med 2000</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.43</td>
<td>Botros Am J Med 2009</td>
</tr>
<tr>
<td>Coronary Artery Events</td>
<td>2.05</td>
<td>Shah Sleep Breath 2010</td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>4.02</td>
<td>Mehra AJRRCM 2006</td>
</tr>
<tr>
<td>Non-Fatal CV Diseases</td>
<td></td>
<td>Marin Lancet 2005</td>
</tr>
</tbody>
</table>
OSA is Associated with Increased Sympathetic Nerve Activity

J Clin Invest 1995; 96:1897-1904
Risk of nocturnal sudden death in OSA

Direct relationship between AHI and the risk of SCD

J Cardiovasc Electrophysiol 2008; 1
Anesthesia + OSA

THE PERFECT STORM
Is OSA Recognized before Surgery ?????

Some studies show that 81-87% of surgical patients had not been diagnosed in the preoperative period

Finkel KJ, Sleep Med 2009
Proportion of Surgical Patients with Undiagnosed OSA

Historical Cohort study over 4 yr, preoperative pts screened with the STOP-BANG questionnaire
58% of the pre-existing OSA pts were not diagnosed by the surgeons and 15% were not diagnosed by the anesthesiologists.

Anesthesiologists and surgeons failed to identify a significant number of pts with pre-existing OSA and symptomatic undiagnosed OSA before surgery.

Singh, Br J Anesthesiol 2013; 110
Outline

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Obstructive Sleep Apnea: Clinical Manifestations

- Loud snoring
- Excessive daytime sleepiness/sleep fragmentation
- Restless sleep
- Morning headaches (cerebral vasodilation)
- Neuropsychiatric symptoms
  - Depression
  - Short-term memory loss
- PE: elevated BMI, increased collar size, hypertension, retrognathia, crowded posterior pharynx
- Breathing pauses (bed partner history is key)
Clinical Presentation of Women with OSA

• Differential response of bed partner to symptoms of OSA
  • Female bedpartners lower threshold for symptom perception
  • Less likely to endorse “classic” symptoms:¹
    Snoring
    Witnessed apneas
  • More likely to report:²
    Daytime fatigue
    Morning headache
    Mood disturbance/depression

• Does this lead clinicians down a different diagnostic pathway?

1. Redline; Am J Respir Crit Care Med 1994
3. Breugelmans, Am J Respir Crit Care Med 2004
Retrognathia
Macroglossia
Redundant soft palate
## Predisposing Conditions to Obstructive Sleep Apnea

<table>
<thead>
<tr>
<th>Condition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>Adult obesity</td>
</tr>
<tr>
<td>Age</td>
<td>More than 50 years</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
</tr>
<tr>
<td>Neck circumference</td>
<td>More than 40 cm</td>
</tr>
<tr>
<td>Nasal obstruction</td>
<td>As in septal deviation</td>
</tr>
<tr>
<td>Pharyngeal obstruction</td>
<td>Tonsillar and adenoidal hypertrophy</td>
</tr>
<tr>
<td>Laryngeal obstruction</td>
<td>Laryngomalacia, tracheomalacia</td>
</tr>
<tr>
<td>Craniofacial abnormalities</td>
<td>Down’s, micrognathia, achondroplasia, acromegaly, macroglossia</td>
</tr>
<tr>
<td>Endocrine and metabolic causes</td>
<td>Hypothyroidism, Cushing's disease</td>
</tr>
<tr>
<td>Neuromuscular disorders</td>
<td>Stroke, cerebral palsy, head injury, poliomyelitis, myotonic dystrophy</td>
</tr>
<tr>
<td>Connective tissue disorders</td>
<td>Marfan’s</td>
</tr>
<tr>
<td>Genetic predisposition</td>
<td>Benzodiazepines, anesthetics and narcotics</td>
</tr>
<tr>
<td>Alcohol, sedatives and smoking</td>
<td></td>
</tr>
<tr>
<td>Medications and anesthesia</td>
<td></td>
</tr>
</tbody>
</table>

*Curr Opin Anesthesiol 2009; 22:405*
Screening Tools for Identifying Obstructive Sleep Apnea in the Preoperative Setting

Goal: a practical and sensitive screening tool to identify patients at high risk of having obstructive sleep apnea

Incorporate:
- clinical symptoms
  + physical examination
  + risk factors
  + Preoperative screening questionnaire

OSA ????
The STOP Questionnaire

177 surgical pts, the score from the STOP questionnaire was validated against the AHI using PSG

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Questions</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Snoring: Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>2</td>
<td>Tired: Do you often feel tired, fatigued, or sleepy during daytime?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>3</td>
<td>Observed: Has anyone observed you stop breathing during your sleep?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>4</td>
<td>Blood pressure: Do you have or are you being treated for high blood pressure?</td>
<td>Yes, No</td>
</tr>
</tbody>
</table>

High risk of OSA, answering yes to two or more questions. Low risk of OSA, answering yes to less than two questions. Adapted from [13••].

Sensitivity 65%-79% for different AHI cut-offs

The STOP questionnaire has a moderate level of sensitivity for OSA screening

Curr Opin Anesthesiol 2009; 22:405
Chung F, Anesthesiology 2008; 108
### The STOP-BANG Scoring Model

**Surgical pts undergoing elective surgery**

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Questions</th>
<th>Questions</th>
<th>Answer</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Snoring: Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?</td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Tired</td>
<td>Do you often feel tired, fatigued, or sleepy during daytime?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Observed</td>
<td>Has anyone observed you stop breathing during your sleep?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Blood pressure</td>
<td>Do you have or are you being treated for high blood pressure?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>BMI</td>
<td>BMI more than 35</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Age</td>
<td>Age over 50 years</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>Neck circumference</td>
<td>Neck circumference greater than 40 cm</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>Gender</td>
<td>Male</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

High risk of OSA, answering yes to three or more items. Low risk of OSA, answering yes to less than three items. Adapted from [13**].

**Sensitivity to identify moderate-severe OSA is 93%, NPV 90%**
Predictive Parameters of Various Questionnaires for OSA

<table>
<thead>
<tr>
<th></th>
<th>STOP</th>
<th>STOP-Bang</th>
<th>Berlin</th>
<th>ASA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AHI &gt; 5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>65.6</td>
<td>83.6</td>
<td>68.9</td>
<td>72.1</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>60.0</td>
<td>56.4</td>
<td>56.4</td>
<td>38.2</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>78.4</td>
<td>81.0</td>
<td>77.9</td>
<td>72.1</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>44.0</td>
<td>60.8</td>
<td>44.9</td>
<td>38.2</td>
</tr>
<tr>
<td>Odds ratio</td>
<td>2.857</td>
<td>6.587</td>
<td>2.855</td>
<td>1.559</td>
</tr>
<tr>
<td><strong>AHI &gt; 15</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>74.3</td>
<td>92.9</td>
<td>78.6</td>
<td>78.6</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>53.3</td>
<td>43.0</td>
<td>50.5</td>
<td>37.4</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>51.0</td>
<td>51.6</td>
<td>50.9</td>
<td>45.1</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>76.0</td>
<td>90.2</td>
<td>78.3</td>
<td>72.7</td>
</tr>
<tr>
<td>Odds ratio</td>
<td>3.293</td>
<td>9.803</td>
<td>3.736</td>
<td>2.189</td>
</tr>
<tr>
<td><strong>AHI &gt; 30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>79.5</td>
<td>100</td>
<td>87.2</td>
<td>87.2</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>48.6</td>
<td>37.0</td>
<td>46.4</td>
<td>36.2</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>30.4</td>
<td>31.0</td>
<td>31.5</td>
<td>27.9</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>89.3</td>
<td>100</td>
<td>92.8</td>
<td>90.9</td>
</tr>
<tr>
<td>Odds ratio</td>
<td>3.656</td>
<td>&gt;999.999</td>
<td>5.881</td>
<td>3.862</td>
</tr>
</tbody>
</table>

Data are presented as mean. AHI, apnea–hypopnea index; ASA, American Society of Anesthesiologists; NPV, negative predictive value; PPV, positive predictive value.

None of these questionnaires are particularly useful in excluding mild OSA.
Identifying Obstructive Sleep Apnea in the Preoperative Setting

- Persistent snoring during conscious sedation is a predictor of OSA

- Oximetry:
  - Patients with a clinical features of OSA and higher number of episodes per hour of desaturation (ODI 4%>5/h, n=172pts)
  - OR of 7.2

Hwang D, Chest 2008
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The Management Strategies to Improve Outcomes: Pre-operative Management

- **History**
  - risk factors for OSA, clinical symptoms
  - identification of comorbidities (HTN, DM, CHF, MI, CVA)
- **Physical Exam**

- **STOP-BANG questionnaire**
  - score $\geq 6$ (higher score gives a higher probability of severe OSA)

- **Preop sleep consult**
  - presumptive diagnosis of OSA
  - established preop OSA pts with non-optimized comorbid medical conditions may not be good candidate for ambulatory surgery

- **Preop education and acclimation to CPAP**
  - established OSA pts should bring their CPAP to the ambulatory care facility
  - the one who are unwilling to use CPAP may not be appropriate for ambulatory surgery
- **preop discussion regarding post operative pain management**

- **There are no trials on the efficacy of various premedication drugs in OSA patients undergoing surgery**
  - Premedication for anxiety should be done with great caution

Joshi G, Anesth Analg 2012
Society for Ambulatory Anesthesia Consensus Statement on Preoperative Selection of Adult Patients with Obstructive Sleep Apnea Scheduled for Ambulatory Surgery

Joshi G, Anesth Analg 2012

Preoperative Evaluation

Patient With Known OSA
- Optimized Comorbid Conditions
  - AND
  - Able to use CPAP after discharge
- Proceed With Ambulatory Surgery

Patient With Presumptive Diagnosis of OSA
- Patients With Non-optimized Comorbid Conditions
- Not Suitable For Ambulatory Surgery, may benefit from diagnosis and treatment

- Optimized Co-morbid Conditions
  - AND
  - Postoperative pain can be managed predominantly by using non-opioid analgesic techniques
- Proceed With Ambulatory Surgery

Preoperative Considerations:
- Comorbid conditions include hypertension, arrhythmias, heart failure, cerebrovascular disease, and metabolic syndrome.
- If OSA is suspected during the preoperative evaluation, one could proceed with a presumptive diagnosis of OSA albeit with caution.
- Educate surgeon, patient and family (see the text for details)

Intraoperative Considerations:
- Non-opioid analgesic techniques, when possible.

Postoperative Considerations:
- Exercise caution in OSA patients who develop prolonged and frequent severe respiratory events (e.g., sedation analgesic mismatch, desaturation, and apneic episodes) in the postoperative period.
The Management Strategies to Improve Outcomes: Intra-operative Management

• induction: slow titration of anxiolytics

• preoxygenation with CPAP 10 cm H2O x 5 minutes with the patient in a 25 degree head-up position

• emergency airway devices should be available

• The type of anesthesia

  regional anesthesia is preferred

  the use of short-acting anesthetic agents should be encouraged

  propofol
  volatile anesthetics (desflurane, sevoflurane)
  analgesic remifentanil

Adesanya Chest 2010
The Management Strategies to Improve Outcomes: Post-operative Management

- close monitoring in the post anesthesia recovery unit
  severe OSA pts should have continuous monitoring

- monitor for hypoxemia and acute hypercarbia

- semi-upright position (30 degree head-up)

- prompt application of CPAP and use for several days post op

- extreme caution in use of sedative medications/opiates
  avoid use of opiates in OSA patients

- encourage use of analgesic adjuncts
  Ketamine
  NSAIDS and Tylenol, dexamethasone

- OSA patients should be observed for an additional 3 hours before discharge home
  or 7 hours if episodes of airway obstruction were witnessed after ambulatory surgery or
  regional anesthetic block
Obesity Hypoventilation Syndrome and Anesthesia

Suspected OHS patient

- Screening using STOP-Bang questionnaire
- SpO2 and serum HCO3− level

High risk for OHS
- STOP-Bang ≥ 3
- SpO2 < 90%
- Elevated HCO3−

Major elective surgery
- Consider referral to sleep medicine
  - Polysomnography
  - PAP therapy titration
  - Consider echocardiogram to assess RV dysfunction and pulmonary hypertension

Low risk for OHS
- STOP-Bang < 3
- SpO2 > 90%
- Normal HCO3−

Routine management

Emergency surgery
- Perioperative OHS precautions
  - Potential difficult airway
  - Rapid emergence
  - Opioid-induced ventilatory impairment
  - Postextubation PAP therapy

Sleep Med Clin 2013; 8
Focused history and physical examination

PLUS

OSA preoperative screening tool (STOP-Bang, Berlin or ASA)

- Low risk for OSA
  - Proceed to surgery with usual perioperative care

- High risk for OSA
  - Identify patient with wrist or arm alert band

- Patient with known OSA

Intraoperative Management
- Consider regional anesthesia or peripheral nerve block with minimal sedation if appropriate
- Prepare for difficult airway management. Consider CPAP and 25 degree head position prior to induction to improve FRC. Use short acting anesthetic, opioid or sedative medications.
- Consider invasive monitoring for respiratory and hemodynamic management.
- Extubate trachea after patient is completely awake and neuromuscular blocking drugs reversed

Postoperative Anesthesia Recovery Management
- Careful observation of oxygen saturation and hemodynamics in the post anesthesia recovery room.
- Observe at 30 degree head-up position and/or lateral position for a minimum of 2 h in most patients
- Consider use of non-opioid analgesics, opioid adjuncts and regional anesthesia. Use opioids judiciously.
- Use PAP early in case of desaturation

In Hospital Management
- Monitor in an appropriate medical-surgical floor that provides continuous oxygen saturation monitoring.
- Continue PAP therapy if known diagnosis of OSA and compliant use of PAP therapy preoperatively.
- Consider auto-PAP therapy if high risk of OSA or known OSA but non compliant with preoperative PAP therapy or known OSA but PAP pressure settings unknown.

Discharge Management: Follow-up with sleep medicine specialist for diagnostic PSG testing or PAP management
Future Research is Needed

• large prospective trials to assess the suitability of OSA patients for ambulatory surgery

• studies to assess clinically significant outcomes after surgery

• studies to assess the influence of opioids on perioperative outcomes

• studies that evaluate the contribution of factors that can influence perioperative outcomes

pre- and post-op CPAP use, type of surgery, anesthetic intervention, intra and postoperative use of opioids

Joshi G, Anesth Analg 2012
The prevalence of OSA in surgical patients is high

The majority of patients with OSA are not recognized preoperatively

The OSA patients are at increased risk of post operative complications, especially if they have significant associated comorbidities

The STOP-BANG questionnaire should be used to identify patients at risk for OSA

The presence of known or presumed OSA should trigger the use of modified strategy for Preoperative care, anesthesia, pain management and post operative monitoring

The identification of OSA among the surgical population might offer long-term benefits