Screening for Obstructive Sleep Apnea in the Hospitalized Patient

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Hospital Admission Trends

Admitting Diagnosis

- 4.2 million admissions for heart disease
  - Congestive heart failure most common
- 46 million procedures performed on IP’s
  - 22% of procedures were cardiovascular
  - Cardiac catheterization was the most frequent procedure performed on males
- Fractures and orthopedic procedures
  - Knee replacements procedures have more than doubled since 2000
Current Status of SDB

- 50% of men, 25% of women snore
- 24% of middle-aged men and 9% of middle-aged women have SDB
- 4% of men, 2% of women have overt OSA
- Increase in incidence in the elderly, some estimates as high as 50%
- Over 80% of people suffering from SDB are undiagnosed

Implications for Acute Care

- OSA is commonly encountered in patients hospitalized for conditions that may or may not be directly associated with SDB
- Acute medical or surgical illness and treatments may amplify SDB manifestations
- Hospitalization of a patient with OSA presents an opportunity for diagnosis and a challenge in management

Sleep-Disordered Breathing
Obstructive Sleep Apnea
Obesity Hypoventilation Syndrome

Gas Exchange
Impaired nocturnally

Complicating hospital illness

Worse Outcomes
Delirium
Prolonged stay
Mortality

Sleep Fragmentation
Circadian disruption
Restriction
Sleep in the ICU Patient

- Decreased TST
- Decrease in SWS, REM, increase in Stage I
- Disturbances = 56/24 hr.
- Noises caused 53%
- Patient factors caused 45%

1 Pt over 48 hrs

Sleep in the SICU Patient

- 9 post-op SICU pts with 4 days continuous PSG
- Severely decreased TST (83-228 min sleep/day)
- Only half of arousals attributed to noise
- Stage 1 =40%, REM =5% over 4 days
- RN estimated sleep averaged "normal" ...Way off

CV Diseases with OSA Links

- Hypertension (systemic and pulmonary)
- Heart failure (systolic and diastolic)
- Rhythm disturbances
- ST segment changes
- Atrial fibrillation
- Metabolic syndrome
- Left ventricular systolic function
- Myocardial infarction
- Diabetes
- Stroke
- TIA's
## Sleep Apnea Prevalence in Cardiovascular Disease Patients

<table>
<thead>
<tr>
<th>Disease</th>
<th>Prevalence</th>
<th>OSA Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug-Resistant Hypertension</td>
<td>80%+</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>70%</td>
<td></td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>50-70%</td>
<td></td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>~50%</td>
<td></td>
</tr>
<tr>
<td>All Hypertension</td>
<td>35-45%</td>
<td></td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>~30%</td>
<td></td>
</tr>
<tr>
<td>Angina</td>
<td>~30%</td>
<td></td>
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</tbody>
</table>

## Disease Management Expenditures

<table>
<thead>
<tr>
<th>Disease</th>
<th>Prevalence</th>
<th>Cost</th>
<th>OSA Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>73.6 million</td>
<td>$73.4 billion</td>
<td>35% - 25.8 million</td>
</tr>
<tr>
<td>Diabetes</td>
<td>23.6 million</td>
<td>$174 billion</td>
<td>58% - 13.7 million</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>16.8 million</td>
<td>$165.4 billion</td>
<td>30% - 5 million</td>
</tr>
<tr>
<td>Obesity</td>
<td>97 million</td>
<td>$147 billion</td>
<td>40% - 38.8 million</td>
</tr>
<tr>
<td>Stroke</td>
<td>6.5 million</td>
<td>$68.9 billion</td>
<td>50% - 3.3 million</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>5.7 million</td>
<td>$37.2 billion</td>
<td>50% - 2.9 million</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>2.2 million</td>
<td>$15.7 billion</td>
<td>50% - 1.1 million</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>681.6 billion</strong></td>
<td><strong>681.6 billion</strong></td>
<td><strong>681.6 billion</strong></td>
</tr>
</tbody>
</table>

**Not calculated due to unknown overlap.**

**Data adapted from American Heart Association – Heart Disease & Stroke Statistics Update 2009.**

## US Practice Guidelines Recognizing SDB

### American Heart Association (AHA) SDB Guidelines 2005

- Sleep apnea can present with non-functional cardiovascular disease, coronary artery disease, congestive heart failure, and arterial hypertension.
- Cardiac event risk is increased in patients with sleep apnea.
- Sleep apnea can cause left ventricular hypertrophy.
- Sleep apnea is associated with increased blood pressure and greater cardiovascular risk.
- Sleep apnea treatment can lower blood pressure and improve cardiovascular outcomes.

### American Academy of Sleep Medicine (AASM) Guidelines 2006

- Sleep apnea is a common disorder that affects people of all ages and can cause serious health problems.
- Sleep apnea can lead to daytime fatigue, memory problems, and other health issues.
- Sleep apnea should be identified and treated to prevent serious health problems.

### American Society for Anesthesiologists (ASA) Guidelines for the Perioperative Management of Patients with Sleep Apnea 2005

- Sleep apnea is associated with increased perioperative risk.
- Sleep apnea should be identified and treated to reduce perioperative risk.
- Patients with sleep apnea should be referred to a sleep medicine specialist for evaluation.

### American Academy of Otolaryngology-Head and Neck Surgery (AAOMS) Guidelines for the Management of Sleep-Disordered Breathing 2005

- Sleep apnea is a common disorder that affects people of all ages and can cause serious health problems.
- Sleep apnea should be identified and treated to prevent serious health problems.
- Sleep apnea treatment can lower blood pressure and improve cardiovascular outcomes.

### American Thoracic Society (ATS) Guidelines for the Management of Sleep-Disordered Breathing 2005

- Sleep apnea is a common disorder that affects people of all ages and can cause serious health problems.
- Sleep apnea should be identified and treated to prevent serious health problems.
- Sleep apnea treatment can lower blood pressure and improve cardiovascular outcomes.
Apnea and Recovery after Stroke
- 61 stroke patients followed from admission to discharge from a rehabilitation center
- 60% with OSA, 12% with CSA
- Patients with SDB had lower function (FIM scores) at end of rehabilitation
- SDB spent 14 days longer in rehabilitation (p<.005)

Undiagnosed OSA in a Surgical Population
Methods
- In-lab or full portable PSG device (Embletta X100) at home
- 234 pts had in-lab PSG and 585 pts had portable PSG. Surgeons and anesthesiologists were not informed of PSG results. Clinical diagnosis of OSA by surgeons and anesthesiologists were noted
Results
- Overall, 86% (118/138) pts with severe OSA (AHI>30) were not diagnosed by surgeons, and 47.1% (65/138) of severe OSA were not diagnosed by anesthesiologists.

Conclusion
- More than 80% of patients had at least one symptom suggestive of OSA. Implementation of screening procedures would significantly reduce the proportion of undiagnosed OSA among surgical patients.
Perioperative Considerations - OSA

- Likely that majority of OSA patients not diagnosed
- OSA increases risk of anesthetic and sedative complications
  - Increased tendency for upper airway collapse
  - Impaired normal arousal mechanisms
  - Supine position increases vulnerability
  - Increased REM sleep postoperatively increases severity of OSA
- Systematic approach to identify patients at risk needed

American Society of Anesthesiologists
Practice Guidelines for the Perioperative Management of Patients with OSA

- Approved October 2005
- Published May 2006
- Provide basic recommendations on:
  - Preoperative evaluation
  - Preoperative preparation
  - Intraoperative management
  - Postoperative management
  - IP versus OP Surgery and criteria for discharge

Practice Guidelines for the Perioperative Management of Patients with OSA

- Preoperative Evaluation
  - Medical record review, patient/family interview, physical exam, sleep studies. In absence of sleep study consider: increased BMI, neck circumference, snoring, observed apneas, airway abnormalities, ECG, inability to visualize soft palate, tonsillar hypertrophy
- Preoperative Preparation
  - Preoperative use of PAP, oral appliances, medications, weight loss
- Intraoperative Management
  - Choice of anesthetic agent, airway management, and patient monitoring
- Postoperative Management
  - Choice of analgesia, oxygenation, patient positioning, and monitoring
- IP vs. OP surgery and Criteria for discharge
  - High risk patients not generally good candidates for OP surgery.
  - OSA pts need to be monitored for a median of 3 hours longer than non-OSA
  - Monitoring should continue for a median of 7 hours after last episode of obstruction or hypoxemia
Screening Tools
Use of any screening tool improves the likelihood of identifying OSA

- Berlin questionnaire
- ASA checklist
- Stop-Bang questionnaire

Berlin Questionnaire

ASA Checklist

Category 1: Predisposing Physical Characteristics

- BMI \( \geq 35 \text{ kg/m}^2 \)
- Neck circumference \( \geq 43 \text{ cm}/17 \text{ inches (men)} \) or \( \geq 40 \text{ cm}/16 \text{ inches (women)} \)
- Craniofacial abnormalities affecting the airway
- Anatomical nasal obstruction
- Tonsils nearly touching or touching the midline
ASA Checklist

Category 2: History of Apparent Airway Obstruction during Sleep
Two or more of the following are present (if patient lives alone or sleep is not observed by another person, then only one of the following need be present):

- Snoring (loud enough to be heard through closed door)
- Frequent snoring
- Observed pauses in breathing during sleep
- Awakens from sleep with choking sensation
- Frequent arousals from sleep

ASA Checklist

Category 3: Somnolence
One or more of the following are present:

- Frequent somnolence or fatigue despite adequate "sleep"
- Falls asleep easily in a nonstimulating environment (e.g., watching TV, reading, riding in or driving a car) despite adequate "sleep"
- Parent or teacher comments that child appears sleepy during the day, is easily distracted, is overly aggressive, or has difficulty concentrating
- Child often difficult to arouse at usual awakening time

ASA Checklist

Scoring:

- If two or more items in category 1 are positive, category 1 is positive.
- If two or more items in category 2 are positive, category 2 is positive.
- If one or more items in category 3 are positive, category 3 is positive.
- * Items in brackets refer to pediatric patients.

High risk of OSA: two or more categories scored as positive
Low risk of OSA: only one or no category scored as positive
Stop-Bang Questionnaire

<table>
<thead>
<tr>
<th>TABLE 2: STOP-BANG questionnaires*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STEP</strong></td>
</tr>
<tr>
<td>5 (snored) Did you snore loudly?</td>
</tr>
<tr>
<td>Exerting or loud enough to be heard through closed doors?</td>
</tr>
<tr>
<td>T (tired) Do you often feel tired, fatigued, or sluggish during the day?</td>
</tr>
<tr>
<td>O (observed) Has anyone observed you stop breathing during sleep?</td>
</tr>
<tr>
<td>R (blood pressure) Did you have or are you being treated for high blood pressure?</td>
</tr>
</tbody>
</table>

**BANG**
- B Body mass index (BMI)
- A Age > 50 years
- N Neck circumference > 40 cm
- A (apnea) Sleep Apnea
- G (glottis) Gender male

*At least 3 questions indicate high risk of obstructive sleep apnea.
*At least 5 questions indicate very high risk of obstructive sleep apnea.
*Adapted from Cheung et al.
Admission Forms

Date & Time

1. Diagnosed with sleep apnea?
   □ Yes □ No

2. Height:__________ inches; Weight:__________ lbs
   Calculate Body Mass Index (BMI) from chart on back of page.
   Is BMI score 35 or greater?
   □ Yes □ No

3. History of LOUD snoring?
   □ Yes □ No

4. Has sleep partner observed episodes of apnea (pauses in breathing)?
   □ Yes □ No

5. History of excessive daytime sleepiness?
   □ Yes □ No

6. Neck circumference 17” or greater (men) or 16” or greater (women)?
   □ Yes □ No

TOTAL SCORE:__

If patient a) has a diagnosis of sleep apnea or b) meets two or more of Criteria 2–6 above, nurse will notify anesthesiologist prior to surgery and initiate OMC Sleep Apnea Protocol.

R.N. Signature:_________________________

Date

OSA Prevalence in Hospital Patients

Study from Case Western Reserve University, Cleveland, Ohio, Dennis Aukley, MD

Sample of 311 IP’s newly admitted to general medicine departments during a 4 month period
Assessed with STOP and BQ
60.2% positive on both questionnaires
81.8% never diagnosed as having OSA
40.2% had orders for IV narcotics
None had orders for supplementary respiratory monitoring

Treatment /Monitoring Plans

Study from Edward Hospital, Naperville, IL, Evans Castor, MBA

Assembled team from medical staff, nursing, respiratory care, information systems, risk management, pre-admission testing, and quality excellence
Based on screening questions and physical assessment, medical and surgical patients received additional OSA-related care when warranted
   - Anesthesiologists provided interventions for surgical patients
   - Nursing and RCP’s worked together to provide interventions for medical patients
   - Potential OSA was identified by reports generated by Information systems based on admission database
   - Algorithms and standing order sets were developed in order to provide consistency
Treatment /Monitoring Plans

Edward Hospital Results

- Despite identifying a significantly larger OSA population, morbidity and mortality was reduced by elimination of OSA adverse events and OSA cardio-respiratory arrests.
  - Decreased unplanned ICU admissions, OSA-related intubations
  - Improved patient compliance with CPAP
  - Decrease average LOS of CPAP patient by 7%

Treatment Protocols

Challenges in the Hospital Setting

- Many OSA patients are undiagnosed
- Failure to identify and adequately monitor patients at high risk of OSA increases probability of adverse perioperative events
- PAP therapy may be poorly tolerated and not accepted by the acutely ill patient
- Patients with prescribed PAP therapy may require adjustments in settings during their acute illness and recovery
Confirmation of Diagnosis

- Portable or limited sleep studies may have value in selected patients
- Limitations
  - Hospital environment is disruptive to sleep
  - Pain, anxiety, patient care/monitoring routines, noise, medications
  - May be poor reflection of patient's sleep at home
- Confirmation of OSA diagnosis after recovery is essential

In Patient Testing

- Cleveland Clinic Anesthesiology Institute uses wireless PSG to study perioperative outcomes after cardiac surgery in patients not previously known to have OSA
- Ohio University Davis Heart & Lung Research Institute includes sleep testing with a type 3 portable monitor in admission orders for every patient admitted with acute heart failure
  - More than 57% of the HF patients receive an OSA diagnosis

Sleep Apnea Management

- Thorough screening to uncover unknown sleep apnea or high risk
- Anesthesiologist, surgeon, physician alert policies and procedures to modify anesthesia protocol
- Post-surgery/procedure sleep apnea assessment and monitoring by PACU staff
- Post PACU discharge evaluation and monitoring to decrease rebound sedation complications
- Development of policies/protocols for care of OSA/high risk patient in the hospital
Sleep Apnea Management

- Use of home CPAP if available
- Empiric use of CPAP if previously undiagnosed
  - Key features of successful CPAP use lacking in IP environment
  - Titration to optimal levels requires careful monitoring, observation
  - Auto PAP may be useful in some instances
- Sleep apnea patient referral process for sleep study evaluation and CPAP treatment if indicated
- Use of PAP after discharge until formal study may be indicated
Sleep Apnea Management

Potential Perioperative Plan

- Develop a universal pre-op protocol for surgical patients
- Decide on a monitor scheme
- Decide what to do with alarms  
  - HAVE AN ACTION PLAN
- Seek Outcome data
Potential Action Plan

- Flag Pts with High SACS like an ‘Allergy’ to alert Nurses, Pharmacists, other staff
- Automatic behaviors
  - Block hypnotics and bolus opioids
  - Automatic triggers from alarms to RRT
  - Identify hypoxemia before apnea- change ACLS focus
- Interventions
  - Wake them up, reassess vitals
  - Raise head of bed, increase oxygenation

Conclusions

- “Payment for Performance” is here
- Clinicians and hospitals who address this issue will be the winners
- SDB in the hospital is ripe target for improved healthcare delivery
- Identifying OSA patients at risk and knowing how to prevent problems is more important than just identifying OSA

Future Considerations

- Need for prudent monitoring is not at issue
- Widespread monitoring without purpose
  - Can lead to excessive costs
  - Potentially worse outcomes from unnecessary procedures or delays in treatment
- Those who offer comprehensive solutions to the problems of peri-operative gas-exchange problems will be the winners
- Focus on protocols for management of sleep disordered breathing in the surgical patient seems a good starting point for improved healthcare delivery
Questions?

References

- 2006 National Hospital Discharge Survey, National Health Statistics Reports, Number 5, July 30, 2006, US Department of Health and Human Services, Center for Disease Control and Prevention
- Day P. Sleep and Sleep-Disordered Breathing in the Hospitalized Patient. Respir Care 2010;55(9):1240-1251.

References

- Kaneko et al. Relationship of sleep apnea to functional capacity and length of hospitalization following stroke. Sleep 2003; 26, 293-297.