

## Patient Safety Tip of the Week

### August 18, 2015 Missing Obstructive Sleep Apnea

Our numerous columns on obstructive sleep apnea (OSA) have focused heavily on patients undergoing surgery (see the list of columns at the end of today's column). But we know that OSA is highly prevalent in the general population and even more so in hospital inpatients. In our July 2010 What's New in the Patient Safety World column "[Obstructive Sleep Apnea in the General Inpatient Population](#)" we noted a study using the STOP and Berlin questionnaires found a potential 60% prevalence of obstructive sleep apnea in patients admitted to general medicine units in an urban academic hospital, most of whom had never been diagnosed with OSA. Many of the patients were obese and most had comorbidities. A high percentage of these patients received intravenous narcotics or were prescribed benzodiazepines or both and none of these received any supplemental respiratory monitoring. The study highlights the risk of using such medications in potentially high risk patients and also highlights the potential benefits of using simple tools like STOP in identifying potential OSA candidates.

Now another study in a general medical (nonsurgical) inpatient population has confirmed a very high prevalence of OSA ([Sharma 2015](#)). Sharma and colleagues evaluated 754 consecutive medical inpatients who had a BMI  $\geq 30$  with the STOP questionnaire and overnight pulse oximetry. Of these, 636 were deemed to be at high risk for OSA. Subsequent polysomnography was performed on 149 patients and 87% of these had confirmation of OSA. They suggest that the use of the STOP questionnaire plus the overnight pulse oximetry may be a useful strategy to identify at-risk patients, a strategy similar to one previously suggested by Chung and colleagues (see our May 22, 2012 Patient Safety Tip of the Week "[Update on Preoperative Screening for Sleep Apnea](#)").

Another recent study in nonsurgical patients looked at sleep disordered breathing (SDB) in heart failure patients ([Khayat 2015](#)). The researchers found in over 1000 patients admitted with acute heart failure and LVEF  $\leq 45\%$  and not already diagnosed with SDB that 47% had obstructive sleep apnea (OSA) and 31% had central sleep apnea. They then followed those who survived to discharge to assess long-term mortality. They found that both central sleep apnea and obstructive sleep apnea were independently associated with post-discharge mortality. The same researchers had previously found sleep disordered breathing to be a risk factor for rehospitalization in patients with heart failure ([Khayat 2012](#)). Exploratory analysis in the 2015 study suggested that treatment of SDB leads to survival similar to those without SDB.

Litigation related to perioperative complications in patients with OSA seems to be increasing ([Fouladpour 2015](#)). Those researchers found most cases reaching verdicts in malpractice cases were relatively young (average age 41.7 years) and male (63%).

Complications occurred intraoperatively in 21%, in the PACU in 33%, and on surgical floors in 46%. The most common complications were respiratory arrest in an unmonitored setting and difficulty in airway management. Opioids were felt to play a role in 38% of cases and general anesthetics in 58%. Death occurred in 71% of the cases reviewed. Most cases were elective and some were relatively “minor” procedures (eg. dental extraction, revision of a pacemaker lead). The average financial penalty was \$2.5 million in cases where the plaintiff prevailed. The authors discuss the importance of postoperative monitoring in patients with OSA. They also, however, note that problems related to airway management and premature extubations were frequent. They note that ASA guidelines recommend tracheal extubation while the patient is awake and only once neuromuscular blockade has completely resolved, and in the semiupright or lateral position. They conclude that perioperative complications related to OSA are increasingly being reported as the central contention of malpractice suits. These cases can be associated with severe financial penalties.

Another recent study ([Weingarten 2015](#)) looked at patients who needed naloxone to reverse opioid-induced respiratory depression or sedation within 48 hours after discharge from anesthetic care (transfer from the postanesthesia care unit or transfer from the operating room to postoperative areas). While they found that a respiratory event in the PACU increased the risk of needing naloxone rescue 5-fold, they also found that obstructive sleep apnea (OSA) increased the risk 2.45 fold. Their findings suggest that these patients may benefit from more careful monitoring after being discharged from anesthesia care.

Long at the top of our list of hospital-based patient safety issues is opioid-induced respiratory depression (see the list below of our previous columns on opioid-related respiratory depression). Opioid use in the hospital setting is substantial and it’s not just surgical patients who are receiving opioids. In our May 6, 2014 Patient Safety Tip of the Week “[Monitoring for Opioid-induced Sedation and Respiratory Depression](#)” we noted that over half (51%) of medical inpatients receive opioids, often in high doses ([Herzig 2014](#)). And while parenteral opioids have received the most attention, opioids delivered via any route may contribute to respiratory depression, particularly in at-risk patients.

So knowing that a patient has OSA is extremely important in preventing disastrous outcomes. We keep coming back to a study by Lynn and Curry ([Lynn 2011](#)) that we discussed in our February 22, 2011 Patient Safety Tip of the Week “[Rethinking Alarms](#)”. That article cited 3 patterns of unexplained inpatient deaths, one of which is characteristic of patients with OSA.

But to complicate things even more, a new study from Frances Chung and her colleagues in Toronto shows that a substantial number of patients without preoperative sleep apnea develop moderate-to-severe sleep disordered breathing (SDB) after surgery ([Chung 2015](#)). Patients were invited to undergo sleep studies with a portable device preoperatively at home and postoperatively on the first and third night after surgery in the hospital or at home. Of 120 patients who did not have sleep apnea on the preoperative study, 31 (25.8%) were found to have AHI > 15 events/h on postoperative night 1 and/or

postoperative night 3. These were mostly driven by obstructive apneas and hypopneas rather than central apneas. Age and preoperative respiratory disturbance index (RDI) were significantly associated with the occurrence of postoperative moderate-to-severe SDB.

The Chung study basically warns us that **even patients who have previously tested negative for OSA may still be at risk for OSA when undergoing surgery**. The authors note that fluid shifts or medications (opioids or sedatives) may increase the apnea-hypopnea index. They noted that patients in the post-op SDB group were more prone to upper airway collapse in the supine position, which is common after surgery. They note that many may have had undetected upper airway resistance syndrome. They also suggested that the preoperative respiratory disturbance index (RDI) might be of value in predicting which patients will develop post-op SDB but note that further validation is necessary.

In our May 13, 2014 Patient Safety Tip of the Week “[Perioperative Sleep Apnea: Human and Financial Impact](#)” we noted a study ([Roggenbach 2014](#)) that looked at breathing patterns in 37 patients undergoing major surgery who had not already been diagnosed with OSA. While 59% of the patients had abnormal nocturnal breathing patterns (AHI = 5 or higher) on the pre-op night, they found increases on the third through sixth nights being significant. Previous observations had demonstrated a delayed increase in OSA after surgery, usually in conjunction with the return of REM sleep on the second or third post-op day. But this appears to be the first study to monitor for a longer duration and it shows a substantial increase in the risk of OSA in the late post-op period. Those authors speculate that the surgery itself may have a modulating effect on nocturnal breathing patterns. Their patients underwent major prostate or abdominal surgeries. They note that such surgeries are regularly associated with substantial fluid accumulation and speculate that peripharyngeal soft tissue edema might contribute to reduced airway patency.

Conventional wisdom has been that about 90% of patients with OSA have not yet been diagnosed as having OSA. While the screening methods noted above to identify patients with OSA make sense, inpatients would have already spent at least one night at risk while getting their pulse oximetry. We still think doing the STOP or STOP-Bang questionnaire is advisable but it’s obvious **we will still miss some cases of OSA**. And, given the new findings from Chung and colleagues, we can’t even be sure that patients with a previous sleep study negative for OSA won’t have OSA while an inpatient.

The bottom line is that appropriate monitoring is needed for any inpatient you intend to treat with opioids or sedative agents. And, as per our multiple columns on opioid-induced respiratory depression (see list below), assessing the patient’s level of arousal before and after doses of such drugs is important but obviously can’t be done on a continuous basis. We’ve also noted numerous times that patients with OSA, when wakened, likely have a normal level of arousal and normal oxygen saturation. Monitoring with only pulse oximetry is inadequate and leads to a false sense of security. So you really need to monitor such patients with capnography or apnea monitoring.

Just about every hospital we've been to can recall a patient who died suddenly and unexpectedly ("found dead in a bed"). And when such cases are analyzed we usually find they had risk factors for OSA and were receiving opioids or sedative agents without monitoring. So don't just consider opioid-induced respiratory depression a problem on surgical services. You probably have just as many patients on medical services that are at risk.

### **Some of our prior columns on obstructive sleep apnea:**

June 10, 2008	<a href="#">"Monitoring the Postoperative COPD Patient"</a>
August 18, 2009	<a href="#">"Obstructive Sleep Apnea in the Perioperative Period"</a>
August 17, 2010	<a href="#">"Preoperative Consultation – Time to Change"</a>
July 2010	<a href="#">"Obstructive Sleep Apnea in the General Inpatient Population"</a>
July 13, 2010	<a href="#">"Postoperative Opioid-Induced Respiratory Depression"</a>
November 2010	<a href="#">"More on Preoperative Screening for Obstructive Sleep Apnea"</a>
February 22, 2011	<a href="#">"Rethinking Alarms"</a>
November 22, 2011	<a href="#">"Perioperative Management of Sleep Apnea Disappointing"</a>
March 2012	<a href="#">"Postoperative Complications with Obstructive Sleep Apnea"</a>
May 22, 2012	<a href="#">"Update on Preoperative Screening for Sleep Apnea"</a>
February 12, 2013	<a href="#">"CDPH: Lessons Learned from PCA Incident"</a>
February 19, 2013	<a href="#">"Practical Postoperative Pain Management"</a>
March 26, 2013	<a href="#">"Failure to Recognize Sleep Apnea Before Surgery"</a>
June 2013	<a href="#">"Anesthesia Choice for TJR in Sleep Apnea Patients"</a>
September 24, 2013	<a href="#">"Perioperative Use of CPAP in OSA"</a>
May 13, 2014	<a href="#">"Perioperative Sleep Apnea: Human and Financial Impact"</a>
March 3, 2015	<a href="#">"Factors Related to Postoperative Respiratory Depression"</a>

### **Our other columns pertaining to opioid-induced respiratory depression:**

- January 4, 2011 ["Safer Use of PCA"](#)
- July 13, 2010 ["Postoperative Opioid-Induced Respiratory Depression"](#)
- May 12, 2009 ["Errors With PCA Pumps"](#)
- September 21, 2010 ["Dilaudid Dangers"](#)
- November 2010 ["More on Preoperative Screening for Obstructive Sleep Apnea"](#)
- February 22, 2011 ["Rethinking Alarms"](#)
- May 17, 2011 ["Opioid-Induced Respiratory Depression – Again!"](#)
- September 6, 2011 ["More Tips on PCA Safety"](#)
- December 6, 2011 ["Why You Need to Beware of Oxygen Therapy"](#)
- February 21, 2012 ["Improving PCA Safety with Capnography"](#)
- September 2012 ["Joint Commission Sentinel Event Alert on Opioids"](#)
- September 2012 ["FDA Warning on Codeine Use in Children Following Tonsillectomy"](#)

- July 3, 2012 “[Recycling an Old Column: Dilaudid Dangers](#)”
- February 12, 2013 “[CDPH: Lessons Learned from PCA Incident](#)”
- February 19, 2013 “[Practical Postoperative Pain Management](#)”
- May 6, 2014 “[Monitoring for Opioid-induced Sedation and Respiratory Depression](#)”
- March 3, 2015 “[Factors Related to Postoperative Respiratory Depression](#)”
- June 2, 2015 “[Reminders of Dilaudid Dangers](#)”
- August 11, 2015 “[New Oxygen Guidelines: Thoracic Society of Australia and NZ](#)”
- Tools: [PCA Pump Audit Tool](#) and the [PCA Pump Criteria](#)

## References:

Sharma S, Mather PJ, Efird JT, et al. Obstructive sleep apnea in obese hospitalized patients: a single center experience. J Clin Sleep Med 2015; 11(7): 717–723  
<http://www.aasmnet.org/jcsm/ViewAbstract.aspx?pid=30090>

Khayat R, Jarjoura D, Porter K, et al. Sleep disordered breathing and post-discharge mortality in patients with acute heart failure. Eur Heart J 2015; 36(23): 1463-1469 First published online: 30 January 2015  
<http://eurheartj.oxfordjournals.org/content/36/23/1463>

Khayat R, Abraham W, Patt B, et al. Central sleep apnea is a predictor of cardiac readmission in hospitalized patients with systolic heart failure. J Card Fail 2012; 18: 534-540  
<http://www.onlinejcf.com/article/S1071-9164%2812%2900154-6/abstract>

Fouladpour N, Jesudoss R, Bolden N. et al. Perioperative Complications in Obstructive Sleep Apnea Patients Undergoing Surgery: A Review of the Legal Literature. Anesthesia & Analgesia 2015; Published ahead of print June 23, 2015  
[http://journals.lww.com/anesthesia-analgesia/Abstract/publishahead/Perioperative\\_Complications\\_in\\_Obstructive\\_Sleep.98257.aspx](http://journals.lww.com/anesthesia-analgesia/Abstract/publishahead/Perioperative_Complications_in_Obstructive_Sleep.98257.aspx)

Weingarten TN, Herasevich V, McGlinch MC, et al. Predictors of Delayed Postoperative Respiratory Depression Assessed from Naloxone Administration. Anesth Analg 2015; 121(2): 422-429

[http://journals.lww.com/anesthesia-analgesia/Abstract/2015/08000/Predictors\\_of\\_Delayed\\_Postoperative\\_Respiratory.22.aspx](http://journals.lww.com/anesthesia-analgesia/Abstract/2015/08000/Predictors_of_Delayed_Postoperative_Respiratory.22.aspx)

Herzig SJ, Rothberg MB, Chekung M, et al. Opioid utilization and opioid-related adverse events in nonsurgical patients in US hospitals. *Journal of Hospital Medicine* 2014; 9(2): 73-81

<http://onlinelibrary.wiley.com/doi/10.1002/jhm.2102/abstract>

Lynn LA, Curry JP. Patterns of unexpected in-hospital deaths: a root cause analysis. *Patient Safety in Surgery* 2011, 5:3 (11 February 2011)

<http://www.pssjournal.com/content/pdf/1754-9493-5-3.pdf>

Chung F, Liao P, Yang Y, et al. Postoperative Sleep-Disordered Breathing in Patients Without Preoperative Sleep Apnea. *Anesth Analg* 2015; 120(6): 1214-1224

[http://journals.lww.com/anesthesia-analgesia/Abstract/2015/06000/Postoperative\\_Sleep\\_Disordered\\_Breathing\\_in.11.aspx](http://journals.lww.com/anesthesia-analgesia/Abstract/2015/06000/Postoperative_Sleep_Disordered_Breathing_in.11.aspx)

Roggenbach J, Saur P, Hofer S, et al. Incidence of perioperative sleep-disordered breathing in patients undergoing major surgery: a prospective cohort study. *Patient Safety in Surgery* 2014; 8: 13

<http://www.pssjournal.com/content/8/1/13>



Healthcare Consulting  
[www.patientsafetysolutions.com](http://www.patientsafetysolutions.com)

<http://www.patientsafetysolutions.com/>

[Home](#)

[Tip of the Week Archive](#)

[What's New in the Patient Safety World Archive](#)