

Message from the President



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The Society of Anesthesia and Sleep Medicine (SASM) has now been operating for over two years. The success of SASM is due, in no small part, to the leadership of David Hillman, past president and the board. David's wisdom and foresight have steadily guided SASM in the past few years. SASM is also grateful to Norman Bolden, who steps down from the Board this year after a 2-year term as secretary. Norman has established the administrative infrastructure of SASM and its website.

There are now nine member elected directors. Peter Gay is the president-elect. Babak Mokhlesi is the secretary. Girish P. Joshi, MBBS, MD, FFARCSI is the treasurer. David Hillman is the past president. Other board members are Roop Kaw, Dennis Auckley, Bhargavi Gali, and Mervyn Maze. For 2013-2015, Peter Gay is the chair of

the CME committee with Girish P. Joshi, MBBS, MD, FFARCSI as the co-chair. Anthony Doufas is the scientific abstracts chair whereas Susana Vacas is the scientific update chair. Starvos Memtsoudis is the membership chair with Babak Mokhlesi as the co-chair. Krishna Ramachandran is the chair of the newsletter committee and Michael Pilla is the chair of the website committee. Roop Kaw is the chair of the research committee and Norman Bolden is the chair of the OSA registry. Dennis Auckley and Bhargavi Gali are co-chairs of the clinical committee. Kimmo Murto is the chair of SASM pediatric subcommittee.

Our Annual Scientific meeting in October 2013 under the direction of Babak Mokhlesi and the committee was a huge success with over 160 registrants. There were two workshops on Thursday with a Friday main

meeting. The workshop on basic science in sleep and the workshop on practical protocols for management of sleep apnea were hugely popular. This year's theme – Opioids, Respiratory Depression and Sleep Disordered Breathing – takes us into new territory with a closer examination of the interplay between sleep, opioids and ventilatory control. There were 30

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Editor's File

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A New Year: New Starts and Opportunities in Perioperative Sleep Medicine

Through several discussions over the last few years, perioperative scientists and professionals have converged on a few key programmatic safety measures to reduce risk related to sleep disordered breathing. As we transition from one year to the next, these themes remain pertinent and need rigorous testing in traditional randomized studies, observational studies and more advanced methods of outcome analyses. 2013 was a landmark year for our society as described by our incoming President Frances Chung. Her boundless energy and drive will undoubtedly serve to accelerate the development of our society, with the ultimate aim of providing knowledge and methods for safer patient care. As part of this transition, it is my great pleasure and privilege to contribute to you as the editor of the newsletter. Girish P. Joshi, MBBS, MD, FFARCSI, my predecessor, has left me with a wealth of resources and continues to be a tireless champion of the society's cause. I look forward to the upcoming two years to work with Michael Pilla and consolidate a plan of more effective outreach to professionals and the general public. Along those lines, I look forward to your submissions for newsletter articles that capture current trends in basic science, mechanisms of disease modification, clinical management of difficult cases, process or protocol development and

implementation.

This newsletter contains articles that span preoperative screening, implementation of a screening tool in the electronic health record and the development of a PCA safety checklist. Michael Wong and Lynn Razzano present the findings of their 2013 survey of 40 hospitals regarding PCA safety and propose the development of a PCA safety checklist. They identify significant safety gaps in knowledge, screening, ongoing assessment and monitoring of patients on PCA. Such work is crucial to our refinement of monitoring standards and lays the platform for future observational research.

Preoperative screening with STOP-Bang is explored in further detail by Mandeep Singh who summarizes the major challenges and opportunities in implementation of screening processes in patients with high risk of OSA. For instance, in a recent survey, although two-thirds of respondents routinely provided care for patients with OSA, three-fourths reported lack of departmental or institutional policies for their care. Jonathon Wanderer and colleagues present the incorporation of SOA screening in the electronic health record, a process which opens the door for concurrent clinical decision support, alerts, and development of a database for further

evaluation of outcome modification.

Toby Weingarten reports the postoperative strategy used to manage risk in patients undergoing bariatric surgery at Mayo Clinic. Phase 1 PACU discharge readiness is established only if patients who develop post extubation respiratory-specific events subsequently have two 30-minute evaluation periods free of recurrent events. High-risk patients subsequently transferred to a standard postsurgical ward are monitored with continuous pulse oximetry for the first 48 hours after surgery.

Through their contributions, these authors have highlighted the clinical challenges with implementation of population screening or monitoring and describe protocol-driven innovative methods to provide safer care. While these interventions reflect our collective expert opinions, the foreseeable future promises to provide greater insight into the actual value of these various elements that form a perioperative care pathway for OSA. It will also be interesting to see how the development of the perioperative surgical home impacts the implementation of OSA care pathways. In closing I wish you and your families a very happy new year and look forward to your renewed enthusiasm in developing our society's goals. ❖

scientific abstracts with 5 awards given to the best abstracts. SASM is grateful for the leadership of Yandong Jiang as the chair of abstract committee for past three years. For the meeting in New Orleans 2014, the theme will be on safety.

The Research Committee, under its chair, Roop Kaw, adjudicated our first research award of 10,000 dollars. Congratulations to Susana Vacas with the University of California-San Francisco, for winning the first Society of Anesthesia and Sleep Medicine (SASM) Research Grant! The project title is Obstructive Sleep Apnea and Postoperative Cognitive Decline. For 2014, SASM will be giving a research award of 20,000 dollars to the best application in the area of sleep medicine and anesthesia.

Another exciting project by the research committee is the development of a white paper articulating a research agenda for sleep medicine and anesthesia. Roop Kaw is providing the leadership in this important project.

Norman Bolden leads the project on the obstructive sleep apnea registry. This project is to register sentinel events relevant to postoperative deaths and near misses in OSA patients. This involves collaboration with the Seattle group who have extensive experience with the ASA closed claims project.

Our Clinical committee, co-chaired by Dennis Auckley and Bhargavi Gali have been extremely active. The committee has finalised two important documents: (a) the SASM Recommendations for Management of Obstructive Sleep Apnea in the Perioperative Period (an educational

tool for health care providers who wish to develop institutional protocols for patients with known or suspected OSA); and (b) the SASM Education Brochure 2013 (a short document to be used as a quick reference regarding perioperative management of OSA). These useful references will foreshadow the eventual development of formal guidelines.

SASM is pleased to accept new members and encourages Gold Patron membership. We are a unique society in that 70% of the members are from anesthesiology speciality while 30% are from other specialities like sleep medicine, research scientists, ENT specialists etc. We have now established a firm track record of successful CME meetings, articulated a research agenda, and informed clinical practice. The next phase requires us to broaden our membership base. Stavros Memtsoudis as chair of the membership committee will be leading the SASM membership drive.

Communication is a key to growth. Girish P. Joshi, MBBS, MD, FFARCSI has worked extremely hard in providing excellent SASM newsletter three times a year for over two and a half years. Satya Krishna Ramachandran is the editor of SASM newsletter for the coming two years. This is an essential communication and educational tool for SASM members. New initiatives will be undertaken. Another important communication tool is the monthly literature updates by the Scientific Updates subcommittee under leadership of Susana Vacas. Michael Pilla has

assumed the chair of SASM website committee. He will play a significant role in modernization of SASM communication via social media such as Facebook or twitter. We are looking forward to introducing these innovations.

Pediatric OSA brings its own challenges. It is of major interest to many anesthesiologists and ENT surgeons as, among other things, surgery has a far greater role in OSA treatment in children than in adults. The SASM Pediatric subcommittee was newly established in October 2013 with Kimmo Murto as the chair of this subcommittee and we are looking forward to the new dimension they will bring to SASM.

The board of SASM has met with the Board of Trustees of IARS in May and October 2013. We are exploring a closer collaboration with them. They are keen to give sleep prominence in their programs and to have us as an affiliate. We are keen to share ideas and resources, including CME and to explore the possibility of expanding the presence of sleep-related matters in Anesthesia and Analgesia, the IARS journal.

SASM has a lot of talented, dedicated and devoted members. The success of SASM is due to their energy and enthusiasm. I look forward to work with the board, the committee chairs and the committee members in the next two years to further develop SASM and the fascinating field with which it is engaged. ❖

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Identifying Risk of Respiratory Compromise for Patients Using Patient-Controlled Analgesia: Lessons Learned from a National Hospital Survey

Assessing patients for respiratory compromise prior to commencement and during use of patient-controlled analgesia (PCA) ensures that patients start and continue on a continuum of safe care. Although PCA use has become standard practice to help patients manage their pain, ensuring safe use has been emphasized repeatedly. As Robert Stoelting, MD (President, Anesthesia Patient Safety Foundation) [explains](#):

“Clinically significant drug-induced respiratory depression (oxygenation and/or ventilation) in the postoperative period remains a serious patient safety risk that continues to be associated with significant morbidity and mortality.”

At the [Patient, Safety Science & Technology Summit](#), Dr. Stoelting stated more than 13 million patients each year receive PCA in the United States and estimates of respiratory depression range from 0.16 percent to 5.2 percent. This means annually between 20,800 to 676,000 PCA patients experience unnecessary opioid-induced respiratory depression, arrest and significant compromise. Estimates of respiratory depression are evidenced in the number of Code Blue and failure to rescue events. Fifty percent of Code Blue events involve patients receiving

opioid analgesia. Unrecognized and unassessed postoperative respiratory failure resulting in cardiopulmonary arrest is a daily clinical occurrence at healthcare facilities. Since cardiopulmonary arrest often results in death or anoxic brain injury, these events have been termed “failure to rescue.” Failure to rescue is the first and third most common cause of adverse events related to patient safety, [accounting for 113 events per 1,000 at-risk patient admissions](#).

Many healthcare organizations have provided warnings that safe PCA use starts with selecting suitable patients. The Pennsylvania Patient Safety Authority [cautions](#):

“... candidates for PCA should have the mental alertness and cognitive ability to manage their pain and communicate their pain level to their caregiver.”

The Joint Commission in Sentinel Event Alert #49 sets forth the patients characteristics showing higher risk for over-sedation and respiratory depression:

Assessing respiratory compromise involves doing so consistently in a

Characteristics of patients who are at higher risk for oversedation and respiratory depression

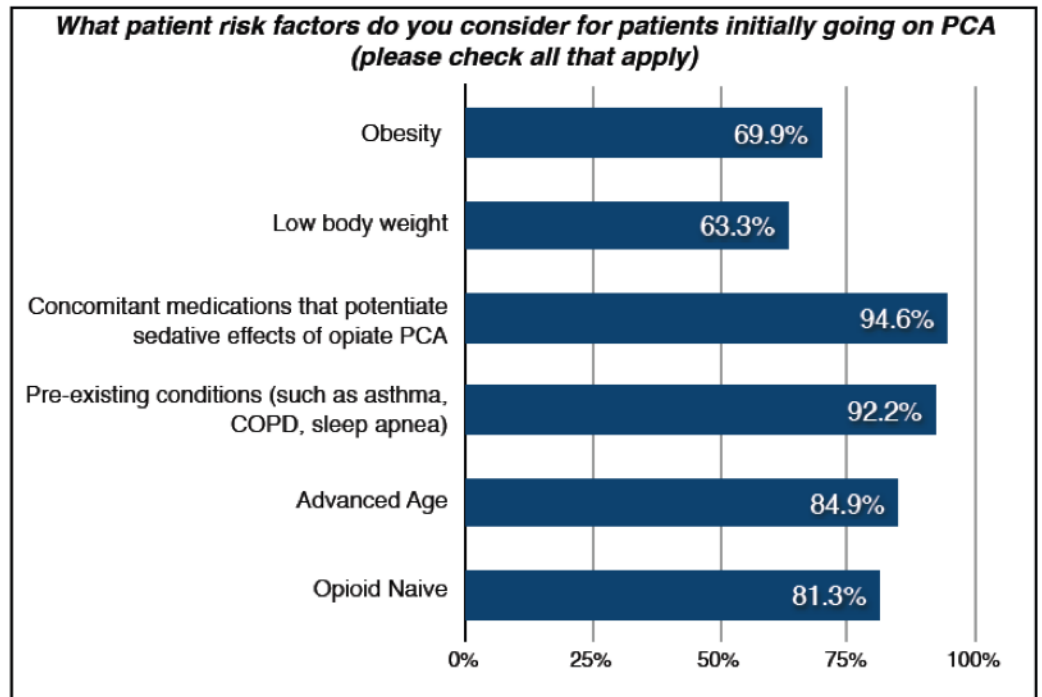
- Sleep apnea or sleep disorder diagnosis^{5,6,19}
- Morbid obesity with high risk of sleep apnea^{5,6}
- Snoring^{5,6}
- Older age; risk is
 - 2.8 times higher for individuals aged 61-70
 - 5.4 times higher for age 71-80
 - 8.7 times higher for those over age 80^{5,12,20}
- No recent opioid use^{6,21}
- Post-surgery, particularly if upper abdominal or thoracic surgery^{5,22}
- Increased opioid dose requirement⁶ or opioid habituation
- Longer length of time receiving general anesthesia during surgery^{5,23}
- Receiving other sedating drugs, such as benzodiazepines, antihistamines, diphenhydramine, sedatives, or other central nervous system depressants^{5,6,8,12}
- Preexisting pulmonary or cardiac disease or dysfunction or major organ failure^{5,6}
- Thoracic or other surgical incisions that may impair breathing^{5,6}
- Smoker^{5,6}

standardized manner with each and every patient.

However, a 2013 national survey of hospitals conducted among almost 200 hospitals in 40 states found that, although patient risk factors are considered, this is not being done by every hospital, with every patient. The chart below indicates the percentage *continued on next page*

of hospitals that, prior to PCA initiation, are assessing patients for the six major risk factors considered by organizations, such as The Joint Commission and ISMP, and which form the risk factor assessment in the PCA Safety Checklist:

Less than 40 percent consider all six patient risk factors, with almost two of three hospitals considering five or less of these factors. The importance of assessing patients is strikingly apparent when three of these factors are examined in depth.



Opioid naive patients

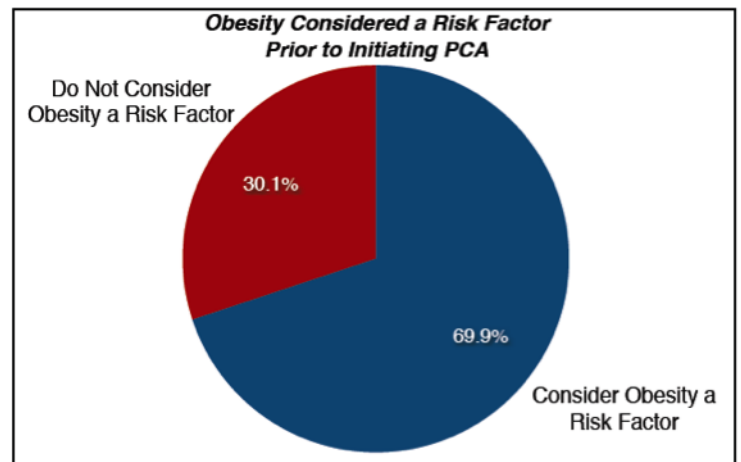
National Comprehensive Cancer Network defines opioid naive patients as those “who are not chronically receiving opioid analgesic on a daily basis.” The Joint Commission recommends taking “extra precautions with patients who are new to opioids or who are being restarted on opioids.” Yet, the PCA Survey indicates that almost one out of five hospitals are not assessing patients for being opioid naive. This suggests that some opioid naive patients may be receiving PCA when perhaps they should not be. Consider the case of 18-year old Amanda Abbiehl, who was admitted for “severe strep throat”. Although opioid naive, she was placed on PCA and tragically most likely died from opioid-induced respiratory depression.

Obesity

The number of people considered obese has reached epidemic-like proportions in the United States. Many studies have shown the increased risk of using anesthesia with

obese patients. As researchers have stated:

One of the many problems in providing anaesthesia for morbidly obese patients is the influence of obesity on pharmacokinetics and pharmacodynamics. Drug administration in obese patients is difficult because recommended doses are based on pharmacokinetic data obtained from individuals with normal weights; therefore, mistakes in the determination of the appropriate dose are often made. Because of comorbidity in these patients, the function of organs involved in drug elimination (e.g. kidney, liver) can be affected making pharmacokinetics more difficult and complex.



However, the PCA Survey indicates about three out of 10 hospitals do not consider obesity as a major risk factor. This suggests some obese patients may be receiving PCA when perhaps they should not be.

Advanced Age

According to The Joint Commission, risk of respiratory depression increases substantially for patients over 60 years of age and is:

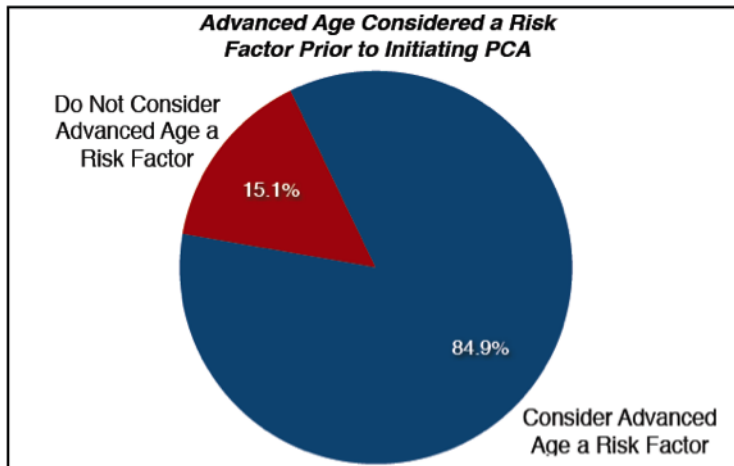
2.8 times higher for individuals aged 61-70

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5.4 times higher for age 71-80

8.7 times higher for those over age 80

Yet, not all healthcare facilities consider this a risk factor, with about three out of every 20 hospitals not



appropriately assessing patients for advanced age.

Assessing Respiratory Compromise: Lessons Learned from the PCA Survey

PCA Survey findings indicate areas that hospitals would like to improve their ability to assess patients for respiratory compromise.

Training: More than half of hospitals (52.9 percent) would like to see more clinical training. The survey shows that more training indeed helps - at those hospitals that provide on-going training in PCA administration, advanced age was more likely to be considered a patient risk factor.

Recommendations on assessing patients:

Almost half of the respondents (44.6 percent) would like “recommendations on how best to easily make such assessments” of patients. Two available risk assessment

tools are the PCA Safety Checklist

which considers the six major patient risk factors mentioned above and

STOPBang

for identifying patients with obstructive sleep apnea. Perhaps

a scoring system for the inclusion or exclusion of patients using PCA might be of assistance. Moreover, a “real-time” technological assessment of respiratory compromise would provide a continuous evaluation of the patient.

Assessment tool. Seven out of 10 hospitals (70.7 percent) would like “a single indicator that accurately incorporates key vital signs, such as pulse rate, SpO₂, respiratory rate, and etCO₂.” To incorporate multiple physiological parameters into a single assessment reduces the need for nursing staff to collect data from multiple sources and then extrapolate from the data an assessment of respiratory compromise. Moreover, a single indicator of respiratory compromise could be of great aid to busy nursing staff caring for multiple patients on busy wards.

Monitoring: 65 percent of hospitals that monitor their patients with oximetry or capnography or both, have experienced positive results -- either in terms of a reduction of adverse events or a return on investment when measured against costs and expenses (including litigation costs). The remaining 35 percent that monitor say it is “too early to determine or have not determined” whether they have seen similar results. Continuous monitoring, in a sense, is the canary in a cage once used by miners. When all else fails, continuous monitoring could provide a technological safety net for patients.

Suggestions for the Future

The PCA Survey strongly results suggest both human and technological tools to ensure patients get on and stay on continuum of care that is safe. A single assessment tool, assessment recommendations, continuous monitoring – all point to the desire of hospitals to find and use tools to detect respiratory compromise. Moreover, the experience of hospitals also strongly recommends the use of continuous monitoring in catching at the earliest moment the onset of opioid-induced respiratory depression. ❖



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Undiagnosed Obstructive Sleep Apnea in the Surgical Setting: A Challenge and an Opportunity for the Anesthesiologist

The Challenge

A recent editorial highlighted the perioperative obstructive sleep apnea (OSA) epidemic and served as a potent reminder to perioperative physicians.¹ Diagnosis of this condition during the perioperative period is challenging. OSA is characterized by episodes of apnea or hypopnea during sleep, resulting in varying severity of hypoxemia and/or hypercapnia. The “gold standard” for diagnosis is a laboratory polysomnography (PSG), that helps classify and quantify the severity of the disorder based on apnea-hypopnea index (AHI).^{2,3} This poses major resource and cost concerns as the prevalence of OSA is deemed to be far more than can be handled by the available sleep laboratories.

In the general population, prevalence estimates for OSA range from 9 to 24% of the general population, where 80% of men and 93% of women with moderate to severe OSA remain undiagnosed.^{4,5} The disparity between a high prevalence of undiagnosed OSA and the low level of clinical recognition exists in the general population.⁶ The prevalence of undiagnosed moderate to severe OSA amongst surgical patients is difficult to assess⁷ but seems to be higher than general population and

varies with the different surgical populations such as bariatric surgery.^{8,9} Recently, a historical cohort study was conducted to determine the proportion of undiagnosed OSA in the perioperative period.¹⁰ Of 819 patients coming for predominantly orthopedic and general surgeries, 58% (64/111) and 15% (17/111) of patients with pre-existing OSA were not diagnosed by the surgeons and anesthesiologists, respectively. Based on PSG results blinded to the physicians, 92% (n=245) and 60% (n=159) of patients with moderate to severe OSA were not diagnosed by the surgeons and the anesthesiologists preoperatively, (Figure 1).

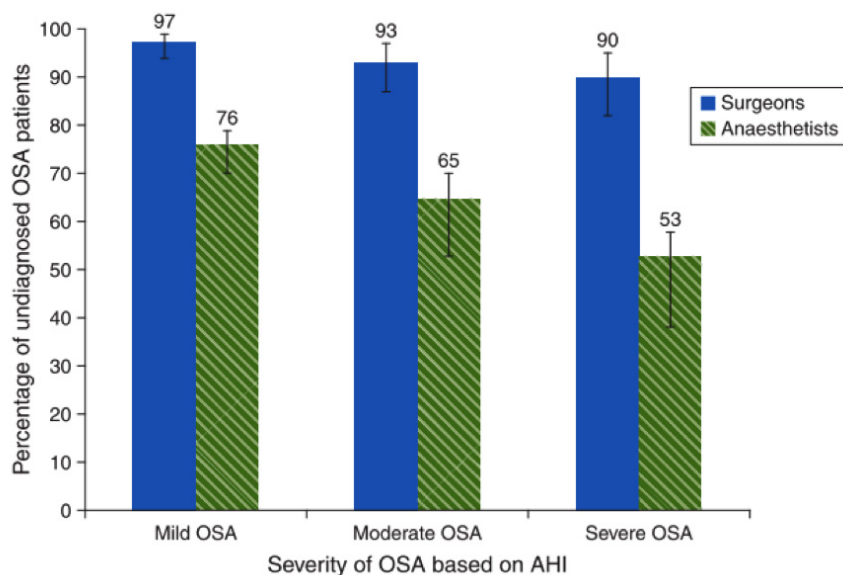
Perioperatively, untreated OSA patients are known to have a higher incidence of difficult intubation,¹¹ postoperative hypoxemia, postoperative complications, increased admissions to intensive care unit, and longer duration of hospital stay.¹²⁻¹⁵ In a large population-based study, OSA was associated with a significantly higher adjusted OR of pulmonary complications after orthopedic and general surgical procedures.¹⁶ Needless to say, decreasing the percentage of undiagnosed OSA is a critical component of perioperative management of OSA patients.

The Barriers

There is limited literature evaluating knowledge and attitudes amongst Anesthesiologists towards OSA. A survey conducted amongst anesthesiologists in Canada had indicated that there was a need for uniform guidelines in handling patients with OSA.¹⁷ Sixty-seven percent of respondents provided perioperative care to one to five patients with OSA per month, and 72% reported not having departmental policies for care of OSA patients. Eighty two percent reported that perioperative guidelines were needed to assist management of these patients. Knowledge and attitude towards OSA amongst anesthesiologists was tested in a survey conducted in China.¹⁸ The authors used the OSAKA questionnaire¹⁹ that has been validated and used amongst pediatricians and cardiologists in the USA. They found that the total knowledge correct score ratio was lower amongst the Anesthesiologists in China (62%) compared to the primary care physicians at the Washington University (76%)¹⁹, but similar to Latin American physicians (60%)²⁰. Moreover, only 51% of the anesthesiologists felt confident in identifying patients at risk for OSA indicating need for future interven-

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Figure 1



Legend: The percentage of undiagnosed OSA cases among the PSG study-identified OSA subjects, according to the severity of OSA ($n=4485$). The severity of OSA based on AHI, with mild (AHI .5–15), moderate (AHI .15–30), or severe OSA (AHI .30). The error bars represent the 95% CIs. OSA, obstructive sleep apnoea; PSG: polysomnography

From: Singh M, Liao P, Kobah S, Wijeysondera DN, Shapiro C, Chung F. Proportion of surgical patients with undiagnosed obstructive sleep apnoea. *Br. J. Anaesth.* 2013;110(4):629–36.

tions. The study however is limited by questionable external validity as the knowledge scores may be different amongst the anesthesiologists in North America due to a heightened awareness about perioperative issues with OSA.

The Opportunity

Anesthesiologists could potentially impact a significant public health burden and reduce the percentage of undiagnosed OSA patients in major ways: proper implementation of screening guidelines, optimization of interventional therapy (e.g., continuous positive airway pressure, CPAP) perioperatively and ensuring follow up by sleep physician postoperatively.²¹

A perioperative diagnosis of OSA can happen at any time during the patient's hospital stay (Figure 2). A

preoperative diagnosis is the most important clinical decision point, as it can determine the future interventions and management strategies during the hospital stay. A number of simple preoperative screening tools have been described,^{22,23} validated and independently reviewed to look at their respective diagnostic properties in screening for OSA.^{24,25} In a historical cohort study, 10 of the 159 patients with moderate and severe OSA and not identified by the anesthesiologists, 147 (92.5%) patients were classified as at risk of OSA by the STOP-BANG questionnaire.²⁶ Thus, had the STOP-BANG questionnaire been used for these patients, the percentage of undiagnosed OSA would have decreased significantly. Other tools may be used as aid to diagnosis in high-risk OSA patients such as overnight

oximetry,²⁷ or laboratory tests such as a serum bicarbonate more than 28mmol/L.²⁸

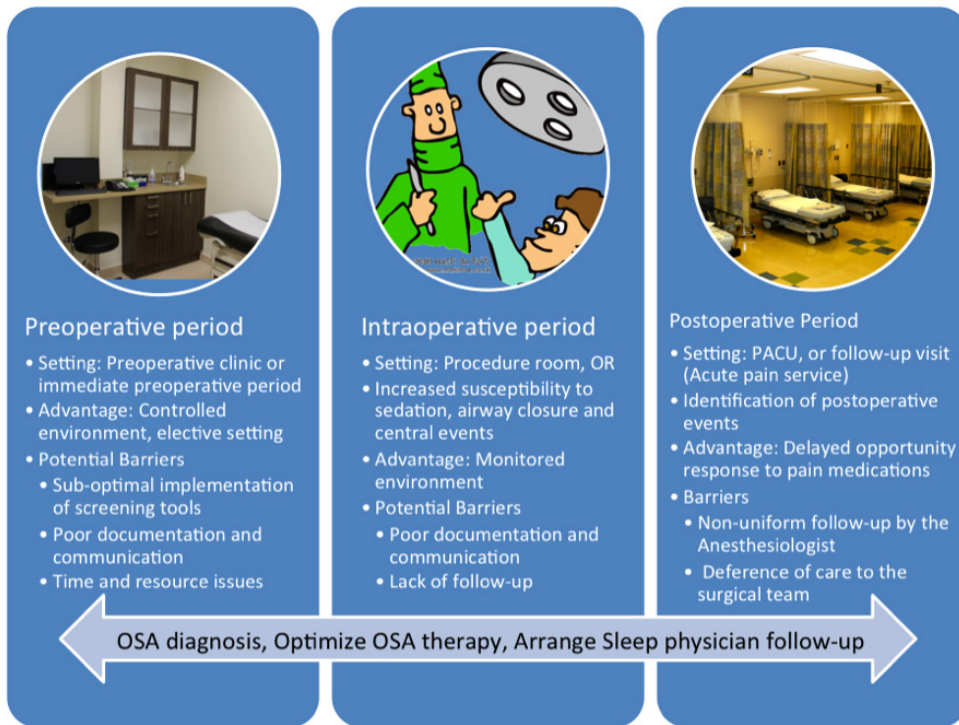
Inside and outside the OR, Anesthesiologists are at a great advantage to experience and evaluate the increased susceptibility of OSA patients under various levels of sedation and opioid administration. Any indication that the patient may be at a higher risk of airway collapse or opioid induced respiratory side effects should be identified as high-risk. It is known that with timely preoperative CPAP therapy and appropriate monitoring led to reduced incidence of postoperative complications in a bariatric surgical population with OSA.²⁹

There are two more dimensions to the role of Anesthesiologists in identifying patients at risk or with formal diagnosis of OSA. Firstly, apart from the clinical setting, the implications for OSA diagnosis exist for future research. Adverse outcomes are very rare in line with the current advances in perioperative care. Population based prospective or retrospective cohort studies thus are more suitable at this point as there is paucity of published large trials. However, a high percentage of undiagnosed OSA corrupts the true control group and makes comparison difficult. This measurement bias is a major limitation of these studies and calls for a proper diagnosis of OSA.

Secondly, the role of a perioperative physician does not stop within the confines of the operating room or the PACU. Specialist sleep physician referral and appropriate therapy are crucial in long term cardiac and cerebrovascular outcomes, espe-

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Figure 2



Legend: The diagnostic window for patients with obstructive sleep apnea encompasses the complete perioperative period providing multiple opportunities to the anesthesiologists and the perioperative team to modify care. Despite three discrete clinical settings, there is shared ground for heightened vigilance and channeled care improving not only immediate outcomes, but also sleep specialist referral and optimization of therapy.

OR: Operating room, OSA: Obstructive sleep apnea

cially in patients with severe OSA in the general population.^{30,31} Among patients (n=88) receiving CPAP following a new OSA diagnosis perioperatively, the CPAP compliant patients (45%,n=40) had a greater reduction in medication used for comorbidities than the other treatment groups.³² Interestingly, adherence rates of patients placed on CPAP therapy have been found to be surprisingly low postoperatively.³³ It remains to be seen whether implementing a multimodal approach to OSA patients is useful in increasing the proportion of CPAP adherence postoperatively as has been seen in the general population.³⁴

Finally, as one of Albert Einstein's famous quotes states, "In the middle of difficulty lies an opportunity".³⁵ We should be hopeful that as perioperative physicians and researchers we shall live up to this challenge and deliver solutions aiming to increase the precision and accuracy of OSA diagnosis perioperatively. ❖

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Implementation of the STOP-Bang Screening Tool within a Perioperative Information Management System

Introduction

One of the key goals in performing a preoperative assessment is the identification of risk factors that can be mitigated to reduce perioperative risk and improve patient safety. Obstructive sleep apnea (OSA) has become increasingly recognized as an important co-morbid condition for surgical patients.¹ Once OSA is diagnosed, appropriate treatment including utilization of continuous positive airway pressure (CPAP) can be instituted in the postoperative period in an effort to reduce pulmonary complications. The gold standard for diagnosing OSA is an overnight sleep study. Thus, identification of patients at risk for OSA is essential to determine which patients might benefit from further evaluation. Without a structured risk assessment, the diagnosis is frequently missed.²

The STOP-Bang OSA screening tool has become an accepted instrument for identifying patients at risk of OSA.^{3,4} The mnemonic represents snoring loudly, daytime somnolence,

observations of apnea during sleep, elevated blood pressure, body mass index above 35, age greater than 50, neck circumference greater than 40 cm and male gender. Risk factors are evaluated as binary conditions and added together to produce a score that ranges from 0 to 8. An electronic version of this screening tool is available online (<http://stopbang.ca>). Integrating this questionnaire into clinical practice, however, requires bringing together data from multiple parts of the visit: vital signs, history, and physical examination.

Implementation

At Vanderbilt University Medical Center, we have internally developed and maintain a suite of applications called the Vanderbilt Perioperative Information Management System (VPIMS). These applications give us the ability to implement custom features into our perioperative workflow without the constraints common with 3rd party commercial systems; rather, we are able to modify all portions of our electronic documentation system to meet our

needs for patient care.

A subcommittee was tasked with determining how to build the STOP-Bang score into our preoperative evaluation clinic workflow. While height, weight and blood pressure were already captured during our intake process, neck circumference was not and was subsequently added to the vital signs module of our VPIMS preoperative application. Age and gender were already available through baseline demographics, and structured documentation of hypertension was an existing portion of our cardiovascular history module. The screening questions for snoring, daytime somnolence, and observed apneas were added to our pulmonary history module (Figure 1).

In addition to building in individual components of the STOP-Bang screening tool, we incorporated the score into the initial screen of our preoperative application (Figure 2). This provides a high level of visibility for the score, as well as a description of which factors were

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included in individual patient's calculation. While a threshold score of 3 out of 8 was suggested as a positive screen, our system used a threshold score of 5 to flag patients as high risk since a threshold of 3 would have been overly inclusive given our patient population. No distinction in the threshold is made between genders.

Evaluation

Our VPIMS-based STOP-Bang screening implementation has been successful at capturing risk factors for OSA. Since the inception of the program 8 months ago, we have record neck circumference on over 12,500 patients. Identification of high-risk patients has provided broad input on patient risk assessment. Due to the high number of patients at-risk without prior screening, implementing an automatic referral program for preoperative sleep study has not been feasible, but in several instances, surgeries have been postponed for preoperative workup of OSA.

Complete data capture for patients who are not evaluated in our preoperative evaluation clinic was one of the challenges of rolling out our STOP-Bang screening tool. Altering medical assistant and nurse practitioner workflows in the clinic was straightforward, but changing our anesthesia providers' workflow has not yet been successful. While some of the variables can be derived from demographics and patient history, obtaining neck circumference measurements and asking the additional screening questions adds extra time to the immediate preoperative assessment. Without a systematic change in management based on the screening

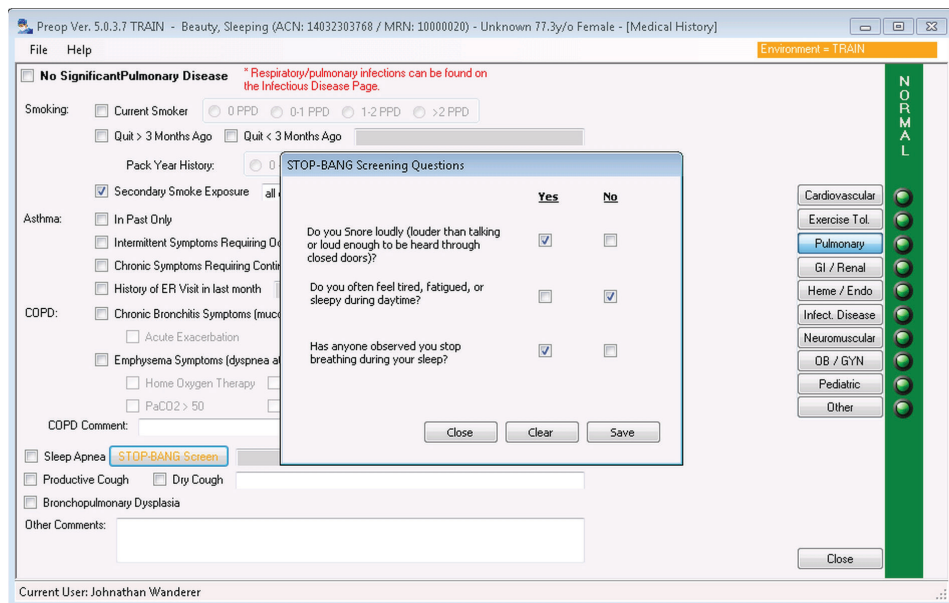


Figure 1: STOP-Bang screening questions for 'STO' in VPIMS pulmonary module.

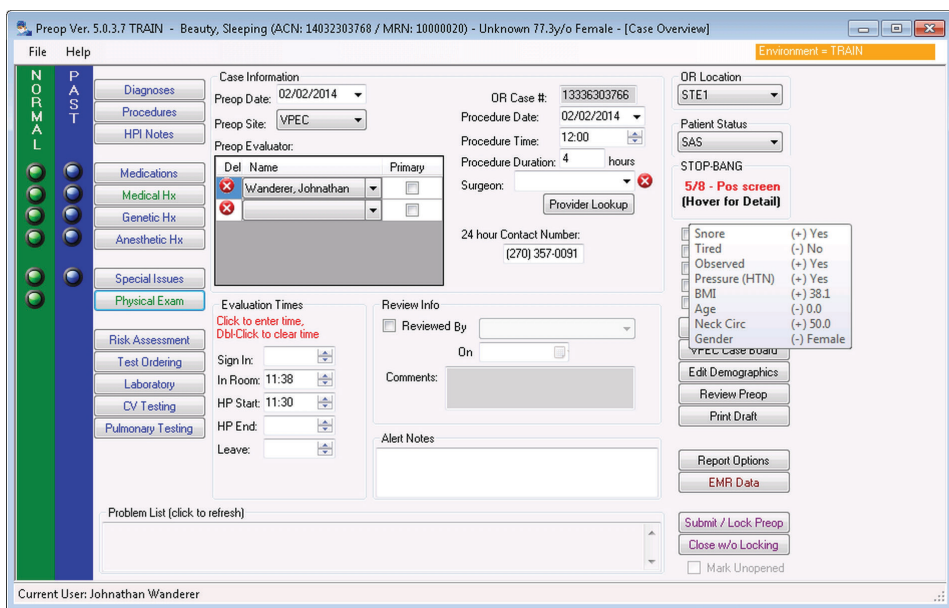


Figure 2: Initial VPIMS preoperative application screen with STOP-Bang screening status and detail.

results, completion of the screen is not yet a mandatory portion of the day-of-surgery preoperative evaluation.

Future directions

In an effort to improve patient satisfaction and improve workflow efficiency, some centers have experimented with telemedicine preoperative evaluations.⁵ To this end, we have incorporated patient

airway images into our evaluation. These images may permit us to develop an equivalent measurement to neck circumference, obviating the need to perform a physical measurement to complete the screening process on the day-of-surgery.

Implementation of the STOP-Bang screening tool within a perioperative information management system
continued on next page

may also permit the development of a tool with better sensitivity and specificity. The tool's current approach is to use simple binary thresholds, set to aid in provider recollection rather than maximize tool performance (Frances Chung, personal communication, September, 2013). Some of the relationships between risk factors and OSA risk, particularly age, appear to be non-linear, and thus may be used to estimate risk more effectively if not dichotomized. Use of restricted cubic splines, for instance, can improve model performance by accurately representing non-linear relationships.⁶ While these statistical techniques are time prohibitive for a paper tool, they could easily be

implemented within an electronic system and thus provide more accurate results compared with the present tool.

Conclusion

Integration of screening tools such as the STOP-Bang questionnaire into an existing workflow requires careful planning and adaptation at an institutional level to ensure success. Once implemented, the resulting screening tool score can be used to trigger decision support and prompt clinicians to have appropriate risk conversations with patients. Additionally, electronic versions of screening tools offer the ability to develop more precise assessments by incorporating complex statistical

methods that are not practical for bedside, paper questionnaire-based approaches. Future iterations of the STOP-Bang and other perioperative screening tools can be added to the existing perioperative information management system without disruption of workflow. ❖

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Research Grant & Abstract Award Winners



2013 Research Grant Recipient, Dr. Susana Vacas, pictured with Drs. Frances Chung and Roop Kaw.



2013 Annual Meeting Best Basic Research Award First Place Winner, Dr. Francis Goldner, pictured with Drs. Frances Chung and Yandong Jiang.

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Toby N Weingarten
Associate Professor of Anesthesiology
Mayo Clinic

The Secret to Successful Postoperative Management of Bariatric Surgical Patients May Be Found in the PACU

Encountering a morbidly obese surgical patient in the preoperative area without any assessment for obstructive sleep apnea (OSA) is a common dilemma faced by all anesthesiologists. For me this is frustrating because OSA often goes undiagnosed despite its substantial implications to anesthetic and postoperative management. Anesthetic agents, sedatives and opioids exaggerate airway obstruction and hypoventilation in patients with OSA, and subsequent, tragic postoperative respiratory complications such as hypercapnic respiratory arrest have been well documented.(1) Surgical patients with OSA have a several-fold higher risk of postoperative tracheal intubation and mechanical ventilation than those without OSA.(2) Surgical patients with unrecognized OSA are even more concerning and have higher rates of postoperative complications, intensive care unit admissions, and longer hospital stays.(3) Worrisome is that only 15% of bariatric surgical patients carry the diagnosis of OSA but if they undergo overnight sleep studies with polysomnography, approximately three quarters are found to have OSA!(4,5) When the diagnosis of OSA is known the perioperative management can be tailored to mitigate the impact of

OSA on the postoperative course. At the Mayo Clinic we demonstrated that when bariatric surgical patients were preoperatively assessed with polysomnography and subsequently diagnosed patients with OSA were optimally managed with perioperative noninvasive ventilation devices combined with vigilant monitoring, the postoperative complication rate was low and not associated to the presence or severity of OSA.(5,6)

The major impediment to preoperative evaluation for OSA in the bariatric surgical population is that for many patients preoperative polysomnography is impractical because of its expense and limited availability. Some patients have overnight oximetry to screen for OSA(7), but this assessment tool lacks diagnostic accuracy and if a high index of suspicion for OSA remains, patients still need confirmatory polysomnography.(8) A variety of assessment tools that screen for OSA at the bedside are available such as STOP BANG(9,10), American Society of Anesthesiologist's sleep apnea screening tool(6), and Flemons criteria or sleep apnea score (SACS) (11). These can help the anesthesiologist to increase the level of suspicion for the presence of OSA, but like overnight oximetry, they have

limitations of accuracy.(12) Equivocal screening test results can leave the anesthesiologist in a bind as how to best manage and postoperatively triage bariatric or other morbidly obese surgical patients with a high clinical suspicion for OSA.

A possible solution to this dilemma is to supplement preoperative screening or testing for OSA with structured respiratory assessments during Phase I recovery from anesthesia. Gali et al described a distinctive, 2-phase evaluation process that combines a preoperative OSA screening assessment with structured recovery room nursing assessments of patients for four specific respiratory abnormalities or events during Phase I recovery from anesthesia.(13,14) These respiratory events are: hypoventilation (defined as three episodes of < 8 respirations/min), apnea (single apneic spell of \geq 10 seconds), oxyhemoglobin desaturation (three episodes of pulse oximetry readings < 90% or < preoperative oxyhemoglobin saturation with or without supplemental oxygen), or "pain/sedation mismatch" (Richmond Agitation-Sedation Scale(15) score \leq -2 with a numeric pain scale rating > 5 of 10). In those studies, surgical patients without a prior diagnosis of OSA were screened

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for OSA. Patients who had respiratory specific events during any two 30-minute periods during Phase I recovery were categorized as having had recurrent respiratory events. Following discharge from Phase I recovery; patients were monitored for oxyhemoglobin desaturation events or meaningful postoperative respiratory complications. Patients who had either a positive screen for OSA or recurrent respiratory events had more frequent episodes of desaturation events and the likelihood of respiratory complications was 3.5-fold greater in patients suspected OSA and was 21-fold greater in patients with recurrent respiratory events. Thirty-three percent of patients with a positive OSA screen and who had recurrent respiratory events during Phase I recovery had postoperative respiratory complications such as admission to the intensive care unit for respiratory failure, unplanned use of noninvasive ventilatory support, or development of pneumonia.(14)

At Mayo Clinic, we have incorporated assessments of respiratory specific events as part of our discharge criteria from Phase I anesthesia recovery (in addition to using a modified Aldrete discharge criteria(16)). Patients who have respiratory-specific events 30 minutes after extubation must subsequently have two 30-minute evaluation periods free of recurrent events before discharge from Phase I recovery. In addition, any patient who has a positive screen for or known diagnosis of OSA and has recurrent respiratory events but is identified as appropriate for discharge to a standard post-surgical ward is monitored remotely with continuous pulse oximetry

for the first 48 postoperative hours. Though this approach has not been validated in prospective studies, we feel this 2-phase assessment strategy has been an important component of our successful management strategy for our bariatric surgical patients and may be the key as why we have not found associations between OSA and postoperative complications in this patient population.(5) ❖

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Abstract Award Winner



2013 Annual Meeting Best Clinical Research Award First Place Winner, Dr. Kimmo Murto, pictured with Drs. Frances Chung and Yandong Jiang

Society of Anesthesia and Sleep Medicine (SASM) 2014 Grant Program

The Society of Anesthesia and Sleep Medicine (SASM) is announcing guidelines for a grant application to be selected on Friday, October 10th, 2014 (the SASM Annual Meeting). The grant is scheduled for funding starting on January 1st, 2015. The award is for up to \$20,000 for a study to be conducted over a maximum of one year.

The Society of Anesthesia and Sleep Medicine grant program supports research directed towards areas in anesthesia, sleep and pulmonary medicine. **Submissions are due online no later than July 1st, 2014.**

Please see www.SASMhq.org for grant outlines and additional information.

Frances Chung, MBBS

President, Society of Anesthesia and Sleep Medicine

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