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Shoulder and head elevation improves laryngoscopic view for tracheal intubation in nonobese as well as obese individuals

J Clin Anesth 2012;24:104-108
Lebowitz PW, Shay H, Straker T, Rubin D & Bodner S

Abstract

Purpose This study evaluated whether the sniff versus ramp position provided the best laryngoscopic view during intubation in a group of lean and obese patients.

Background Alignment of the oral, pharyngeal, and laryngeal axes is often difficult while attempting to place obese patients in the sniff position when completely supine. This clinical observation resulted in the development of the ramp position in which the head and shoulders are elevated so that the external meatus of the ear is horizontal to the sternum. It is unclear however what position provides the best intubating conditions across a full range of body mass indexes (BMI).

Methodology This was a prospective study of adult patients presenting for anesthetics that required standard oral endotracheal intubation (N=189). The study was a repeated measure, within subjects design. Data were collected on BMI, dentition, Mallampati classification, thyro-mental distance, neck circumference and atlanto-occipital extension. Prior to induction, each subject was placed on a Troop Elevation Pillow (a commercial device to elevate the shoulders and head) in addition to a 7 cm high foam head cushion. The patient was induced and paralyzed with muscle relaxant using doses at the discretion of the anesthetist. A Macintosh 3 or 4 blade was used for laryngoscopy. The laryngoscopic view was graded according to the Cormack and Lehane scale first with both Troop pillow and foam head cushion and second after the Troop pillow was removed and the foam head cushion remained. These positions were named “ramp” and “sniff” respectively. This order of positioning was not randomized; each subject served as his own control, always with the ramp view first followed by the sniff view.

The same anesthetist graded the laryngoscopic view in both positions. The vocal cords were sprayed with an undefined volume of 4% lidocaine while in the ramp position; this was the only intervention between laryngoscopic views. Data were collected on the subjective difficulty in lifting force and the need for external laryngeal manipulation during laryngoscopy.

Result There were no correlations found between the laryngoscopic grade and Mallampati classification, thyromental distance, neck circumference, neck extension, or dentition. The ramp laryngoscopic view was rated as equal to or better than the sniff position in 89% of patients (p < 0.0001). A lean, overweight, obese or morbidly obese BMI did not influence these results. The background
of the laryngoscopist (CRNA; 1st, 2nd or 3rd year resident; attending MD) also did not influence the results. No data were reported on lifting force or laryngeal manipulation.

**Conclusion** Elevating the head and shoulders in an attempt to align the external ear with the sternum is more likely to improve the laryngoscopic view than hinder it. An improved view in the ramp position is more likely as the patient’s BMI increases. The authors observed that short anesthetists were more likely to report a high-grade laryngoscopic view in the sniff position.

**Comment**

The key points were 1) that there was no correlation between laryngoscopic view and *any* of the routine preoperative airway assessments that we are taught to perform and 2) the ramp position is vastly superior for laryngoscopic view (and potentially ease of intubation) compared to the sniff position. The first conclusion is a slap in the face of anesthesia dogma along with previous research and clinical experience. I would have liked to see the actual data on this, but it was not provided. The second conclusion is somewhat believable. Maybe the ramp position improves the laryngoscopic view because it contributes to creating a larger space in the upper airway. How might this occur? Increased lung volume is thought to exert caudal traction on the upper airway, preventing its collapse. (1) If placing the patient in the ramp position effectively increases lung volume, then through this mechanism, it may be increasing the upper airway size and improving intubation conditions.

I have some issues with methodology in this study. Although relatively precise devices were used for positioning, the authors do not speak to the fact that a Troop pillow plus 7 cm aligns a 5-foot, 265 pound person differently than a 6-foot, 265 pound person. The authors did not report that, in each case, the elevation properly aligned the external auditory meatus to the horizontal plane of the sternum. Across a broad span of BMIs, it is hard to believe that the same device height will create the same alignment. Likewise, a standard 7 cm foam pillow does not always place patients of varying size in an accurate sniff position.

The methods reported however probably do reflect the real clinical world. I once came upon a difficult airway scenario in which a 400 pound patient was experiencing difficult mask ventilation following difficult and unsuccessful intubation attempts. The bed was reversed and with this patient’s weight on the longer and unsupported side, it appeared that the patient was in a slight Trendelenburg position along with her head well below her chest wall and protuberant abdomen. Sadly, when I suggested that we attempt to put the patient in a ramp position, the response was, “she already is!” Clearly, the presence of 3 or 4 folded blankets under the shoulders does not mean the ramp position is automatically achieved. This positioning technique requires a careful visual assessment prior to induction and often a lot of adjustment, which is probably why not everyone takes the time to do it.
No data were provided on sample group demographics; we don’t know the range of patient age, weight, or even BMI; just the mean and standard deviation were reported. This is a cardinal breach of research reporting, although the reviewers and editors are responsible for publication without it. No data were reported for the effects of lifting force or laryngeal manipulation, although data were reportedly collected. Last, if you are going to conclude that “short people got no reason,” (Randy Newman) provide the data to support it! Again, the editors should have caught these omissions. Unfortunately, for a research study, this was a relatively data-free report.

Penelope S. Benedik, PhD, CRNA, RRT

Difficult Airway Society Guidelines for the management of tracheal extubation

Anaesthesia 2012;67:318-340
Popat M, Mitchell V, Dravid R, Patel A, Swampillai C, Higgs A

Abstract

Purpose The aim of this paper was to suggest physiologically sound principles for guiding extubation practices in patients who have a difficult airway.

Background Planning intubation for patients with known or suspected difficult airway has been well described and forms an important part of anesthesia practice. On the other hand, no clear advice beyond “extubate awake” has been offered to help providers create optimal extubation conditions. The authors rightly point out that airway conditions around extubation are substantially different than conditions during a carefully controlled and planned intubation. Edema from intubation trauma, surgery, or positioning can compromise a previously intact tissue bed. Emergence from anesthesia is less controlled and may be prolonged by residual anesthetics contributing to airway compromise. Additionally, perioperative staff generally understand delay related to intubation, but are not as forgiving about “delay” around the extubation process.

Methodology Despite a review of the literature from 1970 to 2008, no randomized controlled trials or meta-analyses were identified on extubation complications and practice. These guidelines were based on expert opinion from editorials, textbooks, and solicited comments. The Difficult Airway Society (DAS) work group formed proposed guidelines and circulated the drafts to DAS members and international experts.

Result Potential issues during tracheal extubation were categorized as:

1. problems related to airway reflexes (exaggerated, diminished, or dysfunctional)
2. depletion of oxygen stores
3. airway injury
4. physiological system compromise
5. human factors

A key principle is that extubation is elective and should be planned and performed with care. The extubation guidelines describe how to plan, prepare for, and perform a safe extubation after difficult intubation and how to provide appropriate post-extubation care. Difficult Airway Society extubation planning is based on both airway risk factors and general risk factors; described in three algorithms.

The basic algorithm reviews both general and airway risk factors for a difficult extubation in which the patient is stratified to either a “low-risk” or “at-risk” category. Low-risk patients include fasted patients with an uncomplicated airway and no significant comorbidities. At-risk patients include those in whom...
the ability to oxygenate is questionable, reintubation is potentially difficult, and/or significant comorbidities are present. In all cases, the airway should be assessed for any changes that have occurred since the intubation (distortion, edema, bleeding, etc.).

Both “low-risk” and “at-risk” algorithms were developed that include detailed sequences for each. For a low-risk case, procedures are described for both an awake and a deep extubation. For awake extubation, patients should be:

- preoxygenated
- suctioned under direct vision
- positioned head-up or left lateral if empty stomach (especially in the obese)
- positioned head down if full stomach
- muscle relaxant reversed
- have an appropriate bite block in place (not an oral airway)

Deep extubation is an advanced technique requiring experience and the full attention of the anesthetist until the patient is fully awake in the operating room. Additionally, deep extubation should only be performed in a patient with no risk of aspiration and in whom reintubation would be easy.

The algorithm for at-risk extubation also includes careful evaluation and planning. The most important step in the at-risk extubation plan is answering the question “is it safe to remove the tube?” If not, either extubation should be postponed or a more permanent airway be used (e.g. tracheostomy). If extubation is deemed safe, two pathways are defined: awake extubation and advanced techniques. The appropriate use of advanced techniques including LMA-exchange, remifentanil infusion, or the use of an airway exchange catheter are described in detail. The guidelines note that advanced techniques require training and experience and should not be attempted by junior anesthetists or trainees.

Post-extubation care and follow-up are an important part of anesthesia. The guidelines review appropriate staffing, observation and identifying warning signs, availability of the difficult airway cart, safe transfer procedures, respiratory care, and documentation of clinical details and the recovery plan.

**Conclusion**  
A thoughtful plan for extubation should be a required component of every anesthetic and may be more important than the intubation plan. By the time of extubation, airway conditions are generally much worse than during intubation.

**Comment**  
Guidelines are generally the most helpful in critical but rare situations; here is a sorely needed guideline to support a crucial part of an anesthetic—the END! The vast majority of extubations occur in low risk, fasted, easy to intubate patients. These guidelines help us plan and prepare for extubating at risk patients who have difficult airways that are more compromised for extubation than for intubation. They also provide support for a decision to delay extubation if the conditions are not deemed to be safe. Some caveats have already been pointed out about these guidelines (see reference below). First, some of the recommended techniques will require further education and training because anesthetists may not be familiar with them. LMA exchange and airway...
exchange catheters in particular are not commonly practiced. Second, oral airways are not usually effective bite blocks and may fail if used for this purpose. Rolled gauze--taped to the endotracheal tube--should be placed between the molars; placement between the front teeth is ineffective.

Penelope S. Benedik, PhD, CRNA, RRT

The August 2012 issue of the journal, Anaesthesia (volume 67, number 8) contains letters to the editor about these guidelines beginning on page 917.

Editor’s Note: The editors of Anesthesia Abstracts strongly encourage readers to examine the extubation algorithms on the difficult airway society web site. We have not included them here in observance of copyright laws.

The Difficult Airway Society Guidelines for the management of tracheal extubation can be accessed at http://www.das.uk.com/content/das-extubation-guidelines.
Intraoperative acceleromyography monitoring reduces symptoms of muscle weakness and improves quality of recovery in the early postoperative period

Anesthesiology 2011;115:946-954
Murphy GS, Szokol JW, Avram MJ, Greenberg SB, Marymont JH, Vender JS, Gray J, Landry E, Gupta DK

Abstract

Purpose This study was designed to determine whether acceleromyographic monitoring of neuromuscular function would reduce the signs and symptoms of residual paralysis in the recovery room compared to conventional train-of-four (TOF) monitoring.

Background It has been clearly demonstrated that a large proportion of patients (38% to 64%) who receive intermediate-acting neuromuscular blockers during surgery have residual neuromuscular blockade in the postanesthesia recovery room even after receiving reversal agents. The updated standard defines residual blockade as present if the train-of-four ratio (TOF Ratio) is less than 0.9. This residual blockade occurs even when 4 of 4 apparently equal twitches are present by conventional peripheral nerve stimulator monitors, demonstrating the lack of sensitivity of conventional PNS monitoring. The TOF Ratio is measured by acceleromyography, a technique now available outside the research lab. A TOF Ratio between 0 and 0.9 is associated with a myriad of objective signs including airway obstruction, hypoxemia, difficulty swallowing and speaking, visual disturbances, and facial and generalized weakness. To what extent a patient feels uncomfortable with these signs and symptoms and how they affect the patient’s recovery has not yet been studied.

Methodology This was a randomized, double-blind study of 155 ASA class I to III patients older than 18 years who were scheduled for elective surgery at least 60 minutes in duration requiring neuromuscular paralysis. Patients who had any disease that interfered with neuromuscular function, renal disease or hepatic disease were excluded. Access to the ulnar nerve for neuromuscular monitoring was required. Prior to entering the operating room, patients were randomized to conventional TOF monitoring (TOF-PNS group) or acceleromyography monitoring (TOF-Ratio group). Both groups used the TOF-Watch peripheral nerve stimulator. The TOF-PNS group were blinded to the TOF Ratio information and had access only to visual or tactile TOF counts. The TOF Ratio group had access to the train-of-four ratio throughout the case.

A standardized anesthetic was provided to both groups and normothermia maintained. Intubation was facilitated with rocuronium 0.6 to 0.8 mg/kg IV. Both groups kept a visual TOF count of 2 to 3 during the case with rocuronium boluses of 5 to 10 mg given prn. No rocuronium was administered during the last 20 to 30 minutes of the case. All patients received reversal with neostigmine 50 mcg/kg when a TOF count of at least 3 occurred. In the TOF-PNS group, patients were extubated only after no fade was seen on
the TOF count and clinical criteria were met (sustained head lift, stable ventilatory pattern, following commands). In the TOF Ratio group, patients were extubated only after a TOF Ratio greater than 0.8 was achieved and the same clinical criteria were met.

Immediately after entry into the PACU, and at 20, 40, and 60 minutes after PACU admission, the TOF Ratio was determined using a TOF-Watch PNS. Subsequent to this determination, a blinded research assistant assessed patients for objective signs of muscle weakness (11 tests of muscle strength) or patient-reported subjective symptoms of muscle paresis if the previous 11 tests were difficult or uncomfortable to perform. Patients also quantified their overall feeling of muscle weakness. Aldrete scores were taken every 10 minutes by the recovery nurses who were blinded to both the actual TOF Ratio and the group assignment. The time until the Aldrete score was ≥ 8 of 10 was achieved was noted, indicating readiness for discharge. Patients also completed a “quality of recovery” score (QoR-9), an instrument with accepted validity and reliability in patients undergoing a variety of surgical procedures.

Result No differences in demographics were found. No differences in duration of surgery, temperature, rocuronium total dose, or time from neostigmine administration to PACU were found.

Neuromuscular recovery for each group at the time of PACU admission is shown in table 1.

The patient’s self-reported overall weakness score, from 0 (extreme weakness) to 10 (no weakness) is illustrated in figure 1. The two groups differed in overall weakness across all time points (P< 0.0001). This chart reflects the fact that 10 of 76 TOF Ratio patients were extubated before a TOF Ratio > 0.8 was achieved because they were not tolerating the endotracheal tube. Of these, 3 patients had TOF Ratios < 0.7 on entry to the PACU and still had not reported full recovery from overall weakness at 60 minutes.

![Figure 1: Self Reported Weakness Score](image)

**Table 1: Neuromuscular Recovery on PACU Admission**

<table>
<thead>
<tr>
<th></th>
<th>Control Group (TOF-PNS)</th>
<th>Acceleromyography (TOF Ratio) Group</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean TOF Ratio in PACU</td>
<td>0.88</td>
<td>0.98</td>
<td>0.004</td>
</tr>
<tr>
<td># patients TOF Ratio &lt; 0.9</td>
<td>50% (n=37)</td>
<td>14.5% (n=11)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td># patients TOF Ratio &lt; 0.7</td>
<td>19% (n=14)</td>
<td>4% (n=3)</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Note: scale from 0 (extreme weakness) to 10 (no weakness).
The number of **signs** of muscle weakness had a low sensitivity of only 43% for a TOF Ratio < 0.9. In fact, the median number of signs (objective tests) of muscle weakness in both groups for all times in the PACU was zero. Subjective testing simply did not reliably gauge residual neuromuscular blockade.

The number of **symptoms** of muscle weakness had a relatively high sensitivity of 87% and a specificity of 82% for a TOF Ratio < 0.9. Figure 2 compares the median number of symptoms reported by patients on PACU admission and at 20, 40, and 60 minutes after admission. Only the acceleromyography group had no symptoms of muscle weakness at both 40 and 60 minutes post-PACU admission.

By the 60 minute PACU evaluation, 36% of all subjects still reported an overall generalized weakness. The Aldrete scores did not predict muscle weakness nor were they affected by residual muscle weakness. The use of acceleromyography improved the overall quality of recovery by patient self-report but did not alter length of stay.

**Conclusion**  Compared with conventional TOF monitoring, patients monitored with acceleromyography have lower incidence of residual muscle weakness and report fewer symptoms of muscle weakness during the postoperative recovery period.

**Comment**  
**Signs** are objective measures and include testable characteristics like the ability to accomplish a 5-second head lift or 5-second tongue protrusion; have the ability to swallow, speak or cough; or the ability to breathe deeply. **Symptoms** are subjective measures and rate the patient’s experience of trying to perform the objective measure. So a potential sign of poor neuromuscular recovery is a tidal volume measured at 175 mL in a 70 kg patient; a symptom of the same is a patient who states, “I can’t breathe.” Thus, if a patient feels weak and uncomfortable, it is likely that they are still partially paralyzed. Absent the ability to accurately measure a TOF Ratio (you don’t have a TOF-Watch), how the patient feels seems to be a more accurate assessment of neuromuscular function than our currently used “objective” clinical tests!

**Penelope S. Benedik, PhD, CRNA, RRT**
Practice guidelines for central venous access

Anesthesiology 2012;116:539-573

Abstract

Purpose  The purpose of this article was to present systematically developed recommendations for central venous catheterization.

Background  Central venous access practice guidelines provide information about placement and management that may improve patient safety and decrease the risk of adverse outcomes.

Methodology  These practice guidelines were formulated by a Task Force of the American Society of Anesthesiologists (ASA). The Task Force evaluated the literature to identify findings related to central line placement as well as the strength of the evidence presented. Meta-analysis of multiple trials was considered stronger evidence than single randomized controlled trials. Findings were considered supportive if statistically significant differences were reported. If the research was observational in nature the level of evidence was considered only suggestive. Areas for which no clear pattern emerged were classified as mixed results. For some areas of concern, the available evidence was insufficient to draw a conclusion. Surveys were conducted to describe the opinions of identified experts and society members. Open forums were held to obtain comments regarding clinical feasibility of the proposed recommendations.

Result  Recommendations focused on prevention of infection and mechanical injuries such as arterial puncture, thromboemboli, or hematoma.

Supported recommendations related to mechanical injuries included use of upper body site and confirmation of placement using continuous electrocardiography. The use of ultrasound before or during cannulation of the internal jugular, subclavian, or femoral veins was found to have literature support. Additional recommendations based on suggestive studies were Trendelenburg positioning for insertion,
use of small gauge catheters, methods to verify venous placement, and surgical removal of arterially placed catheters. Additional recommendations were made based on conflicting literature results or opinions. All of the recommendations relating to mechanical injuries are listed in Table 2.

**Conclusion** The above information describes the strength of evidence supporting many aspects of central line placement. This evidence may be used to formulate functional guidelines for central line placement.

**Comment**
This information provides us with a foundation upon which to make evidence based decisions regarding insertion and management of central venous catheters. It is important to remember that these studies are limited to elective catheter insertions. They do not address peripherally inserted central catheters, pulmonary artery catheters, or tunneled central lines.
such as permacaths or portacaths. Although the original article does contain information regarding pediatric patients, only the recommendations related to adults are summarized here.

This information relates to practice guidelines; meaning that scientific review supports some of these management practices, but the evidence is not strong enough to make them practice standards. While

<table>
<thead>
<tr>
<th>Table 2 Recommendations to Reduce Risk of Mechanical Injuries</th>
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<tbody>
<tr>
<td><strong>Recommendation</strong></td>
</tr>
<tr>
<td>Upper body insertion site</td>
</tr>
<tr>
<td>Static ultrasound pre-prep for internal jugular insertion</td>
</tr>
<tr>
<td>Real time ultrasound for internal jugular insertion</td>
</tr>
<tr>
<td>Real time ultrasound for subclavian insertion</td>
</tr>
<tr>
<td>Real time ultrasound for femoral insertion</td>
</tr>
<tr>
<td>Post operatively or when clinically appropriate, verify catheter tip position using continuous electrocardiography</td>
</tr>
<tr>
<td>Internal jugular or subclavian insertion performed in Trendelenburg</td>
</tr>
<tr>
<td>Use smallest appropriate catheter size</td>
</tr>
<tr>
<td>During thin-wall-needle Seldinger technique insertion, verify venous placement of wire using ultrasound, or transesophageal echocardiography</td>
</tr>
<tr>
<td>During insertion, verify venous placement of catheter or thin-wall-needle using manometry</td>
</tr>
<tr>
<td>Before catheter use, verify venous placement using manometry</td>
</tr>
<tr>
<td>Post operatively or when clinically appropriate, verify catheter tip position using chest radiography or fluoroscopy</td>
</tr>
<tr>
<td>Consult surgeon or interventional radiologist for removal of unintended arterial placement of large bore dilator or catheter</td>
</tr>
<tr>
<td>Static ultrasound pre-prep subclavian insertion</td>
</tr>
<tr>
<td>During insertion, verify venous placement of catheter or thin-wall-needle using ultrasound, pressure waveform analysis, or venous blood gas</td>
</tr>
<tr>
<td>Static ultrasound pre-prep femoral insertion</td>
</tr>
<tr>
<td>During thin-wall-needle Seldinger technique insertion, verify venous placement of wire using continuous electrocardiography or fluoroscopy</td>
</tr>
<tr>
<td>Before catheter use, verify venous placement using pressure waveform</td>
</tr>
<tr>
<td>Use of thin-wall-needle Seldinger or catheter-over-the-needle modified Seldinger technique</td>
</tr>
<tr>
<td>Maximum number of insertion attempts based on clinical judgment</td>
</tr>
</tbody>
</table>
practice standards are generally accepted principles that should be followed under most circumstances, guidelines may be modified or rejected as determined by individual clinical need. As we apply a guideline to an individual situation, it is prudent to take its level of evidentiary support into account. Recommendations based on opinion do not carry the weight of those supported by properly conducted research studies. Consequently, it is more likely that a decision to perform a catheter insertion using a non-standardized equipment tray would be more reasonable than failing to give prophylactic antibiotics to an immunocompromised patient.

This includes new information pertinent to guidance of catheter placement. Point of care ultrasound is a relatively new technology, but it is quickly becoming widely available. This review demonstrates that the usefulness of ultrasound during central venous catheterization is supported by the literature, and may merit adoption as a best practice.

Even the best supported evidence presented here does not constitute a standard to be adopted verbatim. Instead, it provides us with up-to-date information that we can use in the evaluation and revision of our departmental policies and in our clinical practice decisions. When making those decisions, we should incorporate both research findings and patient specific information.

Cassandra Taylor, DNP, DMP, CRNA, CNE
A meta-analysis of the use of nonsteroidal anti-inflammatory drugs for pediatric postoperative pain

Anesth Analg 2012;114:393-406

Abstract

Purpose The purpose of this meta-analysis was to look at the effect of combining opioids and nonsteroidal anti-inflammatory drugs (NSAIDs) in treating postoperative pain in pediatric patients. The specific factors analyzed were the effects of NSAIDs on dose of opioid used, the quality of analgesia, and the side effects.

Background The use of morphine for treatment of postoperative pain management is well established. Unfortunately, just as well known are the opioid-related side effects of respiratory depression, nausea and vomiting, pruritus, constipation, and urinary retention. Evidence has shown NSAIDs to improve postoperative pain relief in both adults and pediatric patients. With adults, the addition of NSAIDs results in an opioid-sparing effect, which might reduce the associated side effects. In the pediatric population, the reduction in the use of opioids when combined with NSAIDs is a matter of debate.

Methodology According to established guidelines, the researchers culled studies from two databases: PubMed and Embase. They searched on "name of the NSAIDs and children or infant." A manual search was also conducted for articles that were cited by the studies identified in the literature search. Studies were examined for relevance to the purpose and strict inclusion criteria were established, including: 1) postoperative opioid treatment in both groups, 2) a control group without NSAID treatment, and 3) standardized analgesia protocols. Studies were also screened for possible bias. The outcomes statistically analyzed were:
  - quantity of opioid use
  - pain quality
  - nausea and vomiting (PONV)
  - urinary retention
  - pruritus

The adjusted standardized mean difference and the Mantel-Haenszel odds ration (OR) were calculated for each outcome from each included study. The researchers also plotted outcome of published and unpublished studies to assess for publication bias, as a study producing negative results may have been less likely to have been published.

Result Originally 299 articles were identified related to NSAIDs and children or infants. Closer examination decreased the number of studies to 125. The examination for methodology bias and unusable results (outcomes in median and ranges) reduced the number of articles included in the meta-analysis to 27 randomized clinical trials. These studies included 567 patients receiving NSAIDs and 418 patients who did not.
Statistical analysis of the outcomes revealed that NSAIDs decreased opioid use in the postoperative care unit (PACU) and during the first 24 hours postoperatively. NSAIDs decreased pain quality or intensity in the PACU and decreased PONV in the first 24 hours. However, NSAIDs did not change the pain quality in the first 24 hours. Neither did NSAID use decrease PONV in the PACU. NSAIDs also did not decrease the incidence of pruritus or urinary retention.

The researchers further analyzed outcomes of subgroups of patients based on type of surgery (tonsillectomy and adenoidectomy versus orthopedic or general surgery) and timing of NSAID administration, intraoperatively vs. postoperatively. Pain intensity during the first 24 hours was no different in this sub-analysis based on type of surgery or timing of NSAID administration. However, subgroup analysis did show that the incidence of PONV was decreased in the first 24 hours postoperatively in patients who had tonsillectomy and adenoidectomy more than for other surgery types. This may have been due to the high risk of PONV in this patient population which may have been more responsive to opioid-sparing.

Finally, the analysis suggested a significant publication bias related to quantity of opioid use in the first 24 hours and level of pain intensity in the PACU. This suggested that some studies that found negative results related to these two outcomes may not have been published.

**Conclusion**  The overall outcomes of this analysis of 27 studies related to the effect of NSAIDs combined with opioids for postoperative pain management were:
- opioid-sparing effects in the PACU and in the first 24 hours
- decreased pain intensity in the PACU
- decreased PONV during the first 24 hours but not in the PACU

Adenotonsillectomy patients had reduced PONV for the first 24 hours. The outcomes also suggested that the combination of NSAIDS and opioids in the perioperative period had no beneficial effect on urinary retention or pruritus.

**Comment**

The stress effect of pain is well documented along with the negative side effects of opioids. This meta-analysis of studies looking at the combination of NSAIDs and opioids for postoperative pain management helps anesthesia providers untangle the evidence to support the use of NSAIDs. Especially when studies have different outcomes, a meta-analysis is very useful to gain more clarity in what the entire body of evidence suggests. This evidence suggests the combination of NSAIDs and morphine can have some beneficial effects such as decreased opioid required for analgesia and decreased PONV during the first postoperative day.

It is important to note that patients for whom NSAIDs were contraindicated were excluded from the studies included in this metaanalysis. Excluded were patients with risk factor such as: active bleeding, history of gastric ulcers, impaired renal function, or
severe asthma. Clinicians can use the positive information from this study, but must integrate foundational knowledge of NSAIDs and their indicated and contraindicated use. In my practice, the use of NSAIDs with tonsillectomy and adenoidectomy patients is restricted by surgeon preference due to the potential for postoperative bleeding.

It was interesting that the timing of the NSAID administration did not have an effect on the outcomes. The concept of preemptive analgesia suggests early administration to minimize the stress response to pain. However, the two time points identified were intraoperative and postoperative. I would be interested to seek further information related to preoperative administration, and I would suggest that negative outcomes such as increased bleeding would need to be analyzed as well.

The specific NSAIDs administered in the studies included in this metaanalysis were not specified. The original search included both selective and non-selective cyclooxygenase inhibitors. The number of studies would likely have been reduced if the researchers had been more selective in the drugs used in the included studies; however the outcome might be more applicable clinically. In my clinical practice, the use of NSAIDs is incorporated into even minor cases such as myringotomy cases with excellent results. Especially in outpatient surgery centers were patients are monitored for a relatively brief time postoperatively, the benefits of NSAIDs when combined with opioids can reduce inconveniences and increase patient and family satisfaction.

Terri M. Cahoon, DNP, CRNA
Abstract

Purpose Obstructive sleep apnea (OSA) has emerged as a significant perioperative risk due to both its prevalence in the American population and its serious comorbidities. Coupled with the fact that a majority of operative and therefore anesthetic experiences occur in an outpatient setting, the Society for Ambulatory Anesthesia (SAMBA) charged a task force to develop clinical practice guidelines to assist in the selection of OSA patients appropriate for outpatient surgery.

Background Practice guidelines for the perioperative management of OSA patients were published in 2006. These guidelines were not based on randomized controlled trials or meta-analyses, but primarily upon expert opinion and consensus agreement among committee members. The committee recommended a scoring system for perianesthesia management based on OSA severity, the invasiveness of proposed surgery and anesthetic, and the need for postoperative opioid use. To date, the ASA scoring tool’s validity has not been established by even a single published study. Since that time, not only has an alternative screening questionnaire for OSA been developed and validated, but several studies have been published about OSA and the perioperative factors that influence patient outcomes.

Methodology A systematic review of the literature was done on adult OSA patients undergoing ambulatory surgery using the usual methods (Cochrane Central Register, MEDLINE, EMBASE). Two reviewers evaluated the identified studies for eligibility, focusing on randomized controlled trials, prospective observational trials, and retrospective trials that reported intraoperative events, postoperative complications, hospital admission and mortality in the target population. Strength of evidence was evaluated before inclusion in the review. Data extraction included associated comorbidities, method of OSA diagnosis, procedure, type of anesthesia, and any abnormal perioperative events whenever available. After review of these data, the task force used the Delphi method to formulate their recommendations.

Result From an initial search of 1,905 articles, only 7 fulfilled the complete search criteria; two prospective observational studies and five retrospective chart reviews. Interestingly, there seemed to be no correlation between events that are commonly used as surrogates for adverse outcomes; such as desaturation, need for oxygen, or atelectasis;
and actual adverse outcomes such as the need for surgical airway, anoxic brain injury, delayed discharge or unanticipated hospital admission, or death. The seven studies reviewed used different methods for identifying OSA patients and different definitions of complications. Within this limited framework, the task force developed the following recommendations, some of which are inconsistent with the 2006 ASA guidelines.

First, preoperative screening for OSA should be performed using the STOP-Bang screening questionnaire, not the older ASA checklist (table 1). If 3 or more answers to STOP–Bang questions are “yes” there is a high risk of moderate to severe OSA. STOP-Bang has been clinically validated as the screening tool with the highest sensitivity for identifying OSA patients in several studies. It is not only acceptable but recommended to treat a patient as if he/she has OSA on a presumptive basis when identified with this tool.

SAMBA's report stressed the avoidance of opioids in OSA and recommends that ambulatory procedures should not be performed in OSA patients who cannot be managed with local, regional, or NSAIDs alone. That is, OSA patients who need opioids for painful procedures should be admitted and monitored appropriately.

OSA patients who use CPAP or BiPAP should use it postoperatively after discharge. If the patient is unable or unwilling to do so, careful consideration should be given to avoidance of ambulatory surgery. Patients and families should be educated about the disease and use of CPAP and the possibility of overnight hospitalization. Patients should be advised not to sleep in the supine position. In the special case of upper airway surgery, limited evidence was available and SAMBA declined to make specific recommendations.

Conclusion In the setting of either known or presumptive OSA combined with non-optimized comorbidities, the OSA patient is not recommended for ambulatory surgery. OSA patients with optimized

<table>
<thead>
<tr>
<th>Table 1: STOP-BANG Questionnaire²</th>
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<tbody>
<tr>
<td>Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?</td>
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<tr>
<td>Do you often feel tired, fatigued, or sleepy during daytime?</td>
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<tr>
<td>Has anyone observed you stop breathing during sleep?</td>
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<tr>
<td>Do you have or are you being treated for high blood pressure?</td>
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<tr>
<td>BMI &gt; 35 kg/m²?</td>
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<tr>
<td>Age &gt; 50 years?</td>
</tr>
<tr>
<td>Neck circumference &gt; 40 cm?</td>
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<tr>
<td>Gender male?</td>
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**NOTE:** If 3 or more answers are “yes” there is a high risk of moderate to severe OSA. In the truncated version (use only the first 4 questions): if 2 or more answers are “yes” there is a high risk of OSA.
comorbidities who are either able to use CPAP at home or whose pain will require only non-opioids may be acceptable for ambulatory surgery.

**Comment**

Obstructive Sleep Apnea is an old and well-described phenomenon. Comorbidities of OSA include hypertension, coronary events, stroke, and the risk of motor vehicle accidents. Most importantly, the OSA patient has an increased sensitivity to central nervous system depressants including neuraxial opioids. Guilleminault and Dement from Stanford University wrote a treatise on OSA in 1978 but obesity was not an epidemic 30 years ago and the general medical community paid little attention to OSA as a disease. As far back as 1991, the Stanford group found that self-reporting frequent snoring was a highly sensitive indicator of OSA. These and other reports were relatively ignored by the anesthesia community despite the fact that neurologists were publishing regularly about the adverse effects of sedatives and opioids in this population. It has taken several case reports of severe morbidity and mortality in postoperative OSA patients combined with a 32% obesity rate to get our attention. And it has taken even longer to develop a serious and educated approach to the anesthetic care of an OSA patient.

It is likely that retrospective and prospective reviews and case studies will continue to provide much perspective on OSA. In light of the well known risks of OSA, randomized controlled trials which rely on a control group for comparison are probably not possible or even ethical to conduct. Very large prospective studies would be a helpful addition to our knowledge base, particularly if the design included a 30-day follow-up looking for adverse events that may occur from residual anesthetic effects. In the meantime, it is clearly prudent to be very careful and conservative in our care of the OSA patient using not only published guidelines but common sense.

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