Optimizing Selection Criteria for Outpatient Anesthesia

Objectives

- Discuss factors that influence ambulatory surgery outcomes.
- Review updated perioperative cardiovascular evaluation guidelines.
- Review latest perioperative OSA evaluation guidelines.
- Discuss outpatient surgery selection of special populations.

Growing Trend

- Of the 70+ million procedures performed annually in the USA, more than 30% occur at free-standing ambulatory surgical centers (ASCs).
- The number of outpatient surgery visits in the United States increased from 20.8 million visits in 1996 to 34.7 million visits in 2006, according to a report from the Centers for Disease Control and Prevention.
- Outpatient surgery visits accounted for about half of all surgery visits in 1996 but nearly 2/3 of all surgery visits in 2006.
- Now, some sources state as high as 4/5 surgeries performed in US are outpatient surgeries.

Outpatient Surgery Benefits

- Increased throughput of patients
- Reduction in staff and surgical costs
- More personalized care
- Recovery at home
  - using increasingly specialized anesthesia techniques
  - increased complexity of cases
  - increased numbers of patients with more complex medical problems
Cost containment

But…

- The decreases in cost must be balanced with:
  - Increased preoperative assessment and preparation for those with complex medical conditions
  - Increased need for intraoperative tools to treat complex medical conditions
  - Unplanned hospital admissions to treat postoperative complications
  - Increased need for postoperative medical and social support
Outpatient Surgery Pitfalls

- The following factors identified in the literature predict an increased risk for hospital admission or death following outpatient surgery:
  - Patient age greater than 85 years
  - Peripheral vascular disease
  - Operating room (OR) time greater than one hour
  - Malignancy
  - Positive HIV status
  - Heart disease
  - A requirement for general anesthesia
  - Obstructive sleep apnea
  - Cardiovascular disease
  - Hyperactive reactive airway disease
  - Obesity
  - End-stage renal disease (ESRD)

ACC/AHA Clinical Practice Guideline

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines


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Surgical Risk

- Surgical risk is now classified as either low (< 1% risk of major adverse cardiac events)
  - endoscopic procedures, superficial procedures, cataract surgery, breast surgery, and ambulatory surgery
- or elevated (≥ 1%)
  - vascular surgery, intraperitoneal and intrathoracic surgery, head and neck surgery, orthopedic surgery, and prostate surgery

Updates

- (Recommends preoperative cardiac testing only when the results may influence the patient's management)
- Preoperative intervention is rarely necessary just to get the patient through surgery, unless it is otherwise indicated independent of the need for surgery
- Modified algorithm for preoperative risk assessment and management
- Suggests using a new calculator of surgical risk
- Updates information on the timing of surgery after percutaneous coronary intervention, as well as on antiplatelet therapy, other medical therapy, and biomarkers.

Estimating Clinical Risk

- Suggest incorporating the Revised Cardiac Risk Index (RCRI) with an estimation of surgical risk or
- Using the surgical risk calculator derived from a database of the American College of Surgeons' National Surgical Quality Improvement Project (ACS NSQIP)
RCRI

- RCRI is based on six risk factors, each worth 1 point:
  - High-risk surgery
  - Ischemic heart disease
  - Heart failure
  - Stroke or transient ischemic attack
  - Diabetes requiring insulin
  - Renal insufficiency (serum creatinine > 2.0 mg/dL)

Reconstructed RCRI

- Reconstructed RCRI
  - Serum creatinine level greater than 2 mg/dL in the original RCRI is replaced by a glomerular filtration rate less than 30 mL/min
  - Diabetes is eliminated
  - May outperform the standard RCRI
  - A patient with a score of 0 or 1 would be considered to be at low risk
  - A patient with two or more risk factors would have an elevated risk

ACS NSQIP Risk Calculator

- Provides an estimate of procedure-specific risk
- Based on Current Procedural Terminology code
- Includes 21 patient-specific variables to predict death, major adverse cardiac events, and eight other outcomes
- More comprehensive
- Yet to be validated outside of the ACS NSQIP database
OSA

- Obstructive sleep apnea (OSA) is undiagnosed in an estimated 80% of affected patients.
- The incidence of presumed or diagnosed OSA is predicted to rise five- to tenfold during the next decade.

OSA: Adverse Events?

- Prospective cohort study of patients undergoing outpatient anesthesia found increased:
  - numbers of laryngoscopy attempts
  - difficult laryngoscopic grade view
  - use of fiberoptic intubation
  - use of intraoperative ephedrine, metoprolol, labetalol
  - use of postoperative oxygen
- No difference in unanticipated hospital admission between the two groups.
Practice Guidelines for the Perioperative Management of Patients with Obstructive Sleep Apnea

An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Obstructive Sleep Apnea

Factors to be considered:
- Sleep apnea status
- Anatomical and physiologic abnormalities
- Status of coexisting diseases
- Nature of surgery
- Type of anesthesia
- Need for postoperative opioids
- Patient age
- Adequacy of postdischarge observation
- Capabilities of the outpatient facility

The literature is insufficient to offer guidance regarding which patients with OSA can be safely managed on an inpatient versus an outpatient basis. The consultants and ASA members strongly agree that before patients at increased perioperative risk from OSA are scheduled to undergo surgery, a determination should be made regarding whether a surgical procedure is most appropriately performed on an inpatient or outpatient basis.

Points
- Preoperative evaluation important, especially if coexisting diseases are present
- Determine what time/preparation/risk seems acceptable for your group
- "Preoperative initiation of CPAP should be considered, particularly if OSA is severe. For patients who do not respond adequately to CPAP, NIPPV should be considered."
Obesity Statistics

- BMI of
  - 30 kg/m² and above: obese
  - 40 kg/m² and above: morbidly obese
  - 50 kg/m² and above: super-obese
- Incidence has been increasing around the world
  - USA
    - more than one-third of adults
    - nearly 17% of youth

Obesity: Adverse Events?

- Estimated the incidence of anesthesia-related major adverse intraoperative events at 0.9%
- Bariatric patients undergoing bariatric surgeries in the USA
- Systematic review of ambulatory surgeries in the obese by Joshi, et al.
  - 20 studies (11 prospective and nine retrospective)
- Obesity is not a predictor of unplanned admission
- Retrospective study of 235 obese patients scheduled for ambulatory surgery in a tertiary medical center.
  - Morbidity was more frequent in the obese cohort.
  - Obesity is not a significant independent risk factor for unplanned admission after ambulatory surgery

Obesity: Adverse Events

- Cohort study of 17,638 patients:
  - 2,779 had a BMI of greater than or equal to 30 kg/m²
  - did not experience increased cardiovascular risk
  - significantly increased risk of intraoperative events, including desaturation and bronchospasm
- Four times more likely to develop postoperative respiratory complications
- Super obesity (BMI >50 kg/m²)
  - higher complication rate in ambulatory surgery (particularly with coexisting medical conditions)
  - death
  - various thromboembolism
  - increased length of hospital stay

Obesity: Cardiac Evaluation

- Dyspnea with exertion and lower-extremity edema occur commonly in the obese and are often nonspecific
  - Pedal edema may signal the presence of elevated right ventricular filling pressure
- Electrocardiographic signs
  - Right-axis deviation and right bundle-branch block suggest pulmonary hypertension
  - Left bundle-branch block configuration is unusual in uncomplicated obesity and raises the possibility of occult coronary heart disease
- The threshold for further testing is not altered just because the patient is obese as there are not enough data as yet to suggest otherwise
- Patients at elevated surgical risk, as defined in the Revised Cardiac Risk Index, or diagnosed coronary heart disease may only require additional noninvasive testing if the results will change management
- Functional capacity, cardiac risk factor analysis and the presence or absence of potential cardiovascular symptoms will minimize whether further testing beyond electrocardiography is required

Obesity: Adverse Events

- Prevalence of obesity among U.S. adults by state and territory, BRFSS, 2013

Prevalence of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2013
Obesity: Pulmonary Evaluation

- Higher demand for ventilation and breathing workload
- Higher closing capacity as well as reduced functional reserve capacity and expiratory reserve volume
- Results in increased atelectasis, especially in supine position
- The prevalence of OSA in the obese population is higher than in the general population, ranging between 70 and 95%


STOP-bang questionnaire

<table>
<thead>
<tr>
<th>STOP</th>
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<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Do you SNORE loudly (harder than talking or loud enough to be heard through closed doors)?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Do you often feel WORRIED, tired, or sleepy during daytime?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Has anyone OBSERVED you stop-breathing during your sleep?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Do you have or are you being treated for high blood PRESSURE?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<table>
<thead>
<tr>
<th>BANG</th>
<th></th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>BMI &gt; 35 kg/m²?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Age over 50 years old?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Neck circumference &gt; 56 inches (40 cm)?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>GENDER: Male?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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</tbody>
</table>

TOTAL SCORE

Obesity Hypoventilation Syndrome

- Characterized by:
  - Obesity
  - Deeply decreased inspiratory threshold pressure (partial pressure of arterial carbon dioxide >45 mmHg at sea level)
  - Hypoxemia (partial pressure of arterial oxygen <70 mmHg at sea level)
- In the presence of sleep-disordered breathing without other known causes of hypoventilation
- Is 90% of cases of OHS; the sleep-disordered breathing present is OSA

- Prevalence of OHS is 11% in patients with known OSA and 8% in bariatric surgical patients
- Compared with the eucapnic obese patient:
  - Severe upper airway obstruction
  - Impaired respiratory mechanics
  - Blunted central respiratory drive
  - Increased incidence of pulmonary hypertension


Obesity Hypoventilation Syndrome

- Definitive test for alveolar hypoventilation is an arterial blood gas performed on room air during

- Screening approach has been suggested on the basis of serum HCO₃⁻ (>= 27 mmol/l)
- Increased serum HCO₃⁻ level caused by metabolic compensation of chronic respiratory acidosis is common in patients with OHS
- Highly sensitive (92%)
- Can be used together with the presence of hypoxemia (SpO₂ < 90%) during wakefulness
- Highly specific (95%)
- If these predictors are present, an arterial blood gas to confirm hypercapnia awake should be done to prompt referral to sleep medicine
- No data looking at the safety of operating on OHS patients as day surgical patients
- Surgical mortality rate in high-risk patients with OHS undergoing bariatric surgery is between 2 and 8%


Points

- Everyone should fill out a STOP-Bang questionnaire
- Consider evaluating a serum HCO₃⁻ and a resting room air SpO₂ measurement on every obese patient, but especially morbidly and supramorbidly obese patients
- Consider evaluating an ECG on every obese patient with reduced exercise tolerance and/or any cardiac risk factors (or those who are morbidly obese or suprmorbidly obese).
The Obese Airway

Recent multicenter analysis of 450,000 patients found that BMI greater than 30 kg/m² is an independent risk factor for the combination of difficult mask ventilation with difficult laryngoscopy.

Obesity is a predictor of difficult mask ventilation, supraglottic airway device placement failure, and difficult emergency surgical airway.

The United Kingdom Fourth National Audit Project:
- Four-fold increase in the risk of serious complications in the morbidly obese patient when compared with nonobese patients
- Eight of the 23 cases of aspiration of gastric contents during anesthesia occurred in obese patients


Obesity and LMAs

In a study population of over 15,000 patients:
- Obesity was found to be an independent predictor of failed use of a laryngeal mask airway requiring device removal and endotracheal intubation
- Inadequate ventilation due to leak (42.4%)
- Airway obstruction (30%)


Geriatric Population

- The global population is aging as a result of the parallel decline in mortality and fertility rates
- US population less than 65 years of age is increasing by 1% per year, the population aged 65–79 years is increasing by more than 2% per year and the population aged at least 80 years is increasing by 3% per year
- The number of elderly population (>65 years) has tripled over the last 50 years and will more than triple again over the next 50 years.

Geriatric Statistics

- According to the US Census Bureau, the elderly population numbered 39.6 million in 2009, or 12.9% of the population. By 2030, there is expected to be approximately 72.1 million elderly population (or 19% of the US population)
- According to Medicare statistics, the frequency of preoperative consultation for cataract surgery increased from 11.3% in 1998 to 18.4% in 2006 and was primarily related to the increasing age of the population (75–84 years old vs. 66–74 years old)

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Population 65+ by Age: 1900-2050
Source: U.S. Bureau of the Census

Optimizing Selection Criteria for Outpatient Anesthesia

Piehl, Estee, MD

Population 65+ by Age: 1900-2050
Source: U.S. Bureau of the Census
Geriatric Surgery

- Increasing evidence now suggests that the elderly benefit from ambulatory surgery.
- Patients who are at least 80 years old are currently the most rapidly growing age group in ambulatory surgery.
- Avoidance of hospitalization results in a reduction of postoperative cognitive dysfunction and early postoperative complications.
- Given the economic and social pressure to reduce healthcare expenditures, anesthesiologists will be required to treat an increasing number of elderly as outpatients.

Benefits

- Elderly patients are less able to adapt to unfamiliar environments and recover faster in their familiar “home” environment.
- A study by Canet et al. suggested that the avoidance of hospitalization in elderly patients undergoing minor surgery resulted in less postoperative cognitive dysfunction (POCD) at 1 week.
- Possible reduction in respiratory events, nosocomial infections, and early postoperative complications (thrombosis, etc.).
- Bed rest induces functional decline in elderly patients after only 2 days of hospitalization.
- Paradoxically, the worse the patient’s functional status is preoperatively, the greater the expected benefit of avoiding hospitalization.

Adverse Events?

- A recent study could not find any age-related effect on recovery time after knee arthroscopy under general anesthesia in a population aged more than 65 years.
- Even elderly patients with significant comorbidities, with the exception of acute heart failure, can successfully undergo ambulatory surgery.
- Data from the Veterans Affairs Surgical Quality Improvement Program showed that functional capacity for ASA-III patients aged more than 80 years was a significant independent predictor of mortality.

Table 1. Top 10 ambulatory surgery procedures in patients over the age of 65 years

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number of surgical procedures in thousands (phlebectomy’s percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resection of ganglion (e.g., parotid)</td>
<td>25 (43)</td>
</tr>
<tr>
<td>Excision of carotid artery</td>
<td>28 (42)</td>
</tr>
<tr>
<td>Carotid endarterectomy</td>
<td>31 (42)</td>
</tr>
<tr>
<td>Neck dissection</td>
<td>35 (47)</td>
</tr>
<tr>
<td>Carotid endarterectomy</td>
<td>38 (47)</td>
</tr>
<tr>
<td>Carotid endarterectomy</td>
<td>41 (63)</td>
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<tr>
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<td>44 (63)</td>
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<tr>
<td>Carotid endarterectomy</td>
<td>49 (63)</td>
</tr>
<tr>
<td>Carotid endarterectomy</td>
<td>51 (63)</td>
</tr>
</tbody>
</table>

Points

- Optimize all comorbid conditions and give clear explanations of medication regimens.
- Evaluate the elderly for “frailty” or functional capacity.
- Future studies are needed to determine whether it is better to treat the frail elderly as outpatients (vs. inpatient care) with the attendant risk of loss of autonomy, POCD, nosocomial infections, and thrombotic complications, as well as the functional decline because of bed rest in the hospital setting.
- Determine that elderly patients have sufficient supportive networks to administer postoperative care.

References:
- “Increasing evidence now suggests that the elderly benefit from ambulatory surgery.” Geriatric Surgery.
- “A study by Canet et al. suggested that the avoidance of hospitalization in elderly patients undergoing minor surgery resulted in less postoperative cognitive dysfunction (POCD) at 1 week.” Geriatric Surgery.
- “Bed rest induces functional decline in elderly patients after only 2 days of hospitalization.” Geriatric Surgery.
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