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Preoperative Assessment for Ambulatory Surgery

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Abstract
Purpose of Review Ambulatory surgery has grown in recent decades in volume and represents a significant number of anesthetics delivered throughout the USA. Preoperative anesthetic assessment in the ambulatory setting has become important because patients with numerous complex comorbidities are now commonplace in this arena. Disease states involving the lungs, the heart, the kidneys, and subpopulations including those who are obese and the elderly commonly receive anesthetics in an ambulatory setting.
Recent Findings This review presents key aspects of current thinking with regard to preoperative assessment and considerations for different critical disease states and subpopulations that are now being managed under ambulatory surgery. Same day surgery centers require patient safety, and expectations are high for patient satisfaction. Advancements in surgical and anesthetic technique have allowed for more complex patients to partake in ambulatory surgery.
Summary Anesthesiologists must be familiar with guidelines, state-of-the-art pain management, and standards of preoperative patient evaluation to accurately stratify patient risk and to advocate for patient safety.

Keywords Ambulatory surgery · Obesity · Anesthesia · Geriatrics · Preoperative assessment

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Introduction

Preoperative evaluation of surgical candidates is an integral component of anesthetic practice. The American Society of Anesthesiologists (ASA) has published guidelines that provide a framework for preoperative evaluation. These include that anyone requiring an anesthetic be given: (1) an interview detailing medical, anesthesia, and drug history; (2) a physical examination; (3) appropriate diagnostic testing; (4) diagnostic data, including laboratories, electrocardiogram, radiographs, and consultations; assignment of ASA-physical status score; and finally, (5) formulation and discussion of an anesthesia plan with the patient or a responsible adult before obtaining informed consent [1, 2]. These guidelines help anesthesiologists quantify and stratify patient risk in the preoperative setting. Preoperative risk assessment is a vital component to anesthetic practice in ambulatory surgery settings. Ambulatory surgery currently accounts for 65–70% of all surgical procedures performed and its popularity will continue to grow in the future related to advancements in both surgical and anesthetic techniques [3, 4]. According to the Centers for Disease Control and Prevention, the number of outpatient surgery visits increased from 20.8 million in 1996 to 34.7 million visits in 2006 [5]. Advances in perioperative care, advancement in

postoperative pain management, and careful patient selection are responsible for the low rate of morbidity and mortality associated with ambulatory surgery [6, 7]. Distinguishing patients who are candidates for ambulatory surgery from those who are not candidates is essential to ensure patient safety and ambulatory center productivity. This review will highlight the most important aspects to preoperative anesthetic assessment in the ambulatory setting.

Elements of the Preoperative Assessment

The preoperative assessment is an integral part in preparing a patient for ambulatory surgery and consists of a complete history and physical evaluation. Elements of the history should include but are not limited to a basic medical history with review of symptoms, prior surgeries with any complications from previous anesthesia, medications and supplements, allergies, use of tobacco products, alcohol use, and illicit substance abuse. A thorough physical exam is recommended; however, an exam consisting of the airway, respiratory, and cardiovascular systems is always necessary. The dentition of each patient should also always be surveyed prior to surgery with proper documentation within the medical record [8].

The information collected during the preoperative assessment allows the practitioner to devise an anesthetic plan, make informed clinical decisions on preoperative testing, develop postoperative pain management strategies, and perform risk stratification. A main objective of the practitioner is to identify those patients whose outcomes might be improved by medical intervention prior to surgery from those that have substantial disease where the risks outweighs the benefits for the elective procedure [8]. Furthermore, the preoperative assessment provides an important opportunity for patients and their families to ask questions. Performing a preoperative assessment can be done in the clinic or by telephone. One study reported that 97% of patients preferred to complete their preoperative assessment over the phone [9]. One obvious disadvantage to this is the inability to perform a physical exam, which would then need to be done on the day of surgery.

After completing the medical history and physical exam, the practitioner can then designate an ASA's physical classification number. The ASA-Physical classification is used to preoperatively stratify a patient based on their underlying comorbidities. There have been concerns about the subjectivity of the ASA-Physical classification system; however, in 2014 the ASA published examples to help guide clinicians and reduce variability. There are currently six classifications that are as follows: 1 is a normal healthy patient; 2 is a patient with mild systemic disease; 3 is a patient with severe systemic disease; 4 is a patient with severe systemic disease that is a constant life threat; 5 is a moribund patient who is not expected to survive without the operation; and 6 is a brain-dead patient who is undergoing organ procurement [10]. The bulk of patients will fall under an ASA-Physical status of a 2 or 3. It is relevant to note that active smokers and social alcohol use are designated an ASA 2.

Assessing a patient's risk during anesthesia is dependent upon many different factors. Things that must be considered when assessing a patient's risk for surgery are their age, underlying comorbidities, and type of procedure [10]. In addition, these factors will also influence the anesthetic plan and type of anesthetic used. In this regard, patients who are on opioid medications require best practice strategies to ensure that their postoperative pain is managed appropriately. The type of procedure can also influence risk in regard to the incidence of cardiac death and non-fatal myocardial infarction. Procedures are generally stratified into three categories of low, intermediate, and high risk. Low-risk procedures are those that have been shown to have an incidence of cardiac risk < 1%. These include most minor procedures such as endoscopic, ambulatory surgery, breast, and cataracts. Intermediate-risk procedures have a reported cardiac risk between 1 and 5%, and consist of orthopedic, prostate, head and neck, intrathoracic, Intraperitoneal, and carotid surgery.

Procedures with the highest reported cardiac risk are vascular procedures which can be on peripheral vessels, the aorta, or other major vessels and carry a risk of > 5% [11]. With this in mind, the anesthetic plan chosen for a particular procedure and the inherent risks the patient may encounter in the perioperative period must be discussed. Informed consent is always necessary for non-emergent surgeries and involves discussing medical terms in a way a layperson can understand with potential proposal of alternative measures [10].

Laboratory Assessment

The need for preoperative laboratory testing prior to ambulatory surgery has been an area of controversy that has both patient safety and financial implications. Preoperative testing is estimated to cost approximately $18 billion dollars in the USA alone, thus limitation of unnecessary testing can result in huge cost savings [3, 4]. Commonly ordered tests include but are not limited to complete blood counts, metabolic profiles, coagulation studies, and electrocardiograms. A routine test is defined as a test ordered without a specific indication or purpose while an indicated test is one that is ordered for a specific indication or purpose [12]. ASA practice guidelines state that routine preoperative testing for ambulatory surgery does not make a valuable contribution, although indicated testing may help for perioperative decision making [3, 12].

Despite these data, views among practicing anesthesiologists vary widely. A 2004 survey found that 40% of anesthesiologists had no concern with eliminating preoperative lab testing for ambulatory surgery [13]. A retrospective study done by the Mayo clinic found that 4% of patients undergoing

ambulatory surgery had abnormal laboratory results and that no association was found between any testing abnormality and adverse perioperative outcomes [14]. A 2009 prospective, single blind, randomized controlled study sought to determine if indicated preoperative testing can be eliminated without increasing perioperative adverse events [3]. The study included 1061 patients undergoing ambulatory surgery and found no increase in perioperative complications between groups who underwent testing and those who did not receive any tests [3]. The prevalence of abnormalities found via preoperative testing varies widely but only influenced perioperative management in less than 5% of cases [3]. Even when abnormalities are found, it has been found that 30–60% were never investigated further prior to surgery [15]. These findings suggest that clinician ordering of preoperative lab testing should be predicated strongly by the history and physical with consideration of risks associated with the surgery and choice of anesthetic.

Special Patient Populations

Careful patient selection for ambulatory procedures is one of the most important components to providing optimal perioperative care. Advancements in surgical, anesthetic, and recovery techniques have allowed for patients with complex medical histories to undergo outpatient surgical procedures with a low rate of complications [6, 16]. Mathis et al. recently identified several independent risk factors related to ambulatory surgery by studying over 200,000 ambulatory surgeries. Risks included obesity, chronic obstructive pulmonary disease, history of cerebral vascular incident, hypertension, previous cardiac surgical intervention, and prolonged surgery time [6]. Other special patient populations include those aged 65 years and older. The most important aspects of some of these patient populations will be discussed in the next sections.

Cardiovascular Disease

Patients with a history of cardiovascular disease or prior cardiac intervention require special consideration for risk stratification to establish appropriateness for ambulatory surgery. Tools to help estimate clinical risk for major adverse cardiac events include the Revised Cardiac Risk Index (RCRI) and the American College of Surgeons' National Surgical Quality Improvement Project (ACS NSQIP) risk calculator [11, 17]. Surgical risk for major adverse cardiac events can either be low or elevated, with a < 1% risk or > 1% risk, respectively. The RCRI identifies six different risk factors which include high-risk surgeries such as intraperitoneal or intrathoracic, patients with a history of ischemic heart disease, heart failure, stroke ,or transient ischemic attack, insulin-dependent diabetes, and renal insufficiency defined as a serum creatinine > 2.0 mg/dL [18]. Each risk factor is worth 1 point with a score of 0–1 being considered low risk and a score of 2 or more having an elevated risk. The ACS NSQIP includes input of 21 patient-specific variables to predict the probability of adverse outcomes [17]. The type of surgical procedure also carries inherent risks. Low-risk surgical procedures include endoscopic, superficial, cataract, breast, and those done in an ambulatory setting [19••]. Procedures with an elevated risk include vascular, intraperitoneal, intrathoracic, head and neck surgery, orthopedic, and prostate surgery [19••]. Clinicians should only pursue further cardiac testing and evaluation when the results will directly impact the patient's perioperative management. Thus, clinicians need to be cognizant of those patients at an elevated risk for major adverse cardiac events and determine whether ambulatory surgery should proceed as planned, be delayed for medical optimization, or if the patient is better suited via inpatient surgery and postoperative management.

Clinicians also need to be aware of the anticoagulation recommendations for patients presenting after recent cardiac percutaneous interventions. Elective ambulatory procedures should be postponed at least 1 month for patients with bare metal stents and at least 12 months for patients with recent placement of drug-eluting stents [20]. Recommendations are based on the risk of stent thrombosis associated with prematurely stopping dual antiplatelet therapy of thienopyridine derivatives and aspirin [20]. If thienopyridine therapy needs to be interrupted, it is recommended that aspirin should be continued throughout the perioperative period and thienopyridine should be restarted as soon as possible postoperatively [20].

Obesity and Obstructive Sleep Apnea

Obesity and its associated comorbidities can have significant implications in perioperative ambulatory surgical care. Obesity is defined as a body mass index of 30 kg/m^2 and greater. The prevalence of obesity has risen dramatically in recent years, with more than one third of adults and almost 17% of children qualifying as obese in the USA [21]. The estimated incidence of anesthesia-related major adverse intraoperative events related to obesity is approximately 0.9% [22]. A cohort study found that obesity by itself did not increase cardiovascular risk but did significantly increase the risk of both intraoperative and postoperative respiratory complications [22]. Risk increases linearly with increased severity of obesity with the super morbid obese (BMI > 50 kg/m^2) having the greatest risk of death, venous thrombus embolism, and prolonged hospital stay [23].

Preoperative evaluation of obese patients should consist of a thorough history and physical with special attention to potential unrecognized cardiopulmonary disease. One of the most important diseases to screen for is obstructive sleep apnea (OSA). While OSA does not solely affect obese patients, it is much more prevalent in this population. Preoperative

screening is critical because OSA is estimated to be undiagnosed in up to 80% of affected patients [24]. Over the next decade, the incidence of presumed or diagnosed OSA is expected to increase five to ten fold [24]. Preoperative screening for OSA should include the validated STOP-bang questionnaire. The questionnaire includes a series of elements from both the history and physical. Each positive response is valued at 1 point. A score of 0–2 indicates a low probability, a score of 3–4 indicates an intermediate risk, and a score of 5–8 represents a high risk of having undiagnosed OSA [25••]. Patients with OSA undergoing ambulatory surgery have been found to have increased attempts at laryngoscopy, increased difficulty with mask ventilation and proper laryngeal mask airway fit, increased need for postoperative oxygen, and increased use of vasoactive medications intraoperatively [26•]. Moderate and deep sedation in the prone position can also significantly increase potential ventilatory issues in this subpopulation of patients because of limited reserve, increased oxygen consumption, and pulmonary mechanics effects of the lungs. Postoperatively, patients with OSA should resume use of continuous positive airway pressure devices. Patients with a high probability of having OSA will also likely require supplemental oxygen prior to discharge home. Pain control should focus on a multi modal approach to avoid excessive opioid administration that can further exacerbate postoperative somnolence and lack of respiratory drive [25••].

Geriatrics

Patients aged 65 years old and greater are one of the most rapidly growing surgical populations. Current statistics show that the US population less than 65 years old is increasing by 1% each year, while the population aged 65–79 and 80 years plus is growing by 2 and 3%, respectively [27]. A decline in both mortality and fertility has contributed to this trend. Statistics from the US Census Bureau report that the elderly population in 2009 consisted of 12.9% of the population with that number expected to grow to 19% by 2030 [28•]. Patients aged 80 years old and up are the most rapidly growing age group for ambulatory surgery [28•]. Some of the most common procedures being done as an outpatient include hernia repairs, cholecystectomies, breast biopsies, and cataract procedures [28•]. Studies have yet to show any increased risk of adverse perioperative events linked specifically with age but there have been identified benefits. Benefits associated with ambulatory surgery include a decrease in postoperative cognitive decline at 1 week and possible reductions in thrombosis, adverse respiratory events, and nosocomial infections [29].

Reactive Airway Disease

Chronic obstructive pulmonary disease (COPD) has been found to be an independent risk factor that increases morbidity and mortality related to same day surgery by almost two times [6]. Patients with COPD have an increased rate of postoperative respiratory complications including reintubation and pneumonia [6]. Preoperative evaluation should focus on severity of symptoms, limitations in functional capacity, and history of medication compliance. Preoperative pulmonary function tests may also have some utility in managing the patient throughout the perioperative period. A decreased FEV1 of less than .75 vital capacity has been shown to be a predictor of respiratory complications and mortality [30]. Patients with significant symptomatology should delay outpatient surgery with a focus on medical optimization with antibiotics, steroids, leukotriene antagonists, and beta 2-agonists.

Patients with reactive airway disease have a greater risk of bronchospasm associated with airway manipulation. Clinicians should document a careful history focused on compliance with medications, severity and frequency of symptoms, and previous hospital admissions. Perioperatively, patients should also be optimized by using beta 2-agonists, steroids, and avoidance of bronchial irritants. Other modifiable risk factors such as tobacco abuse should also be considered. Asthmatic patients who also smoke have been found to have a four times greater risk of adverse postoperative respiratory events [31•]. Benefits of smoking cessation include a decrease in carboxyhemoglobin levels within 24 h of cessation with decreased bronchial secretions and reactivity after 4 to 6 weeks of cessation.

Conclusion

Ambulatory surgery has quickly grown to become one of the most popular options for patients in the USA. Same day surgery centers have been found to be lucrative, while still ensuring patient safety and high levels of patient satisfaction. Advancements in surgical and anesthetic technique have allowed for more complex patients to partake in ambulatory surgery. Anesthesiologists need to be familiar with the guidelines and standards of preoperative patient evaluation to accurately stratify patient risk and to advocate for patient safety.

Compliance with Ethical Standards

Conflict of Interest Amit Prabhakar, Erik Helander, Nikki Chopra, Aaron J. Kaye, and Alan David Kaye declare that they have no conflict of interest.

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Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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