

# Patient Selection Criteria in Ambulatory Surgery – A Single-Center Experience to Reflect on Development, Implementation and Evaluation of its Impact

SG Pyne<sup>a</sup>, MS Gloff<sup>a</sup>, MA Kreso<sup>a</sup>, CI Spring<sup>a</sup>, JS Gewandter<sup>a</sup>, DM Lindenmuth<sup>a</sup>, BB Kamdar<sup>b</sup>, SB Karan<sup>a</sup>

## Abstract

**Aim:** To describe ready-to-use patient selection criteria developed and implemented in a busy ambulatory surgical center as a single-center experience.

**Methods:** Data from May 2015-Jan 2018 constituting 29,000 patients were retrospectively analyzed at the center for metrics including appropriate booking site, day of surgery cancellation rate, and rate of hospital transfer and hospital admission after ambulatory surgical care at the center. Convenience samples for analysis were used when appropriate.

**Results:** The majority of patients reviewed using the patient selection criteria were booked appropriately at the ASC, however more than 1/3 were more appropriate for booking at the hospital setting according to our patient selection criteria. The center has a low day of surgery cancellation rate and a low rate of hospital transfer and hospital admission after ambulatory surgical care.

**Conclusions:** The development and implementation of the Patient Selection Criteria for ambulatory surgery has helped our single center provide clinical guidance and appropriate patient triaging while still allowing us to safely meet the clinical demand of this growing outpatient surgical volume.

**Keywords:** Ambulatory surgery; Patient Selection Criteria for Ambulatory Surgery.

**Authors' Addresses:** <sup>a</sup>University of Rochester Medical Center, Rochester, NY. <sup>b</sup>Massachusetts General Hospital, Boston, MA.

**Corresponding Author:** Sonia G. Pyne, University of Rochester Medical Center, Rochester, New York.  
Email: sonia\_pyne@urmc.rochester.edu

## Introduction

Ambulatory surgery volume has dramatically increased over the past few decades (1). Causes for the shift from inpatient to outpatient care include a desire for increased efficiency, enhanced patient-centered experience, and improved cost control measures. In an effort to ensure safety, some evidence exists that identifies higher-risk patients who should be triaged out of the ambulatory surgery center environment (2-4). While many ambulatory surgical centers have developed their own processes to identify these high-risk patients, there remains no published ready-to-use clinical practice criteria to guide this process. A variety of patient comorbidities are known to increase perioperative morbidity and mortality and/or unanticipated hospital admission after ambulatory surgery, (2-4) such as increased body mass index (BMI) and a diagnosis of obstructive sleep apnea (OSA) (5,6). With respect to OSA, the ASA and the Society of Anesthesia and Sleep Medicine Task Force have formulated guidelines (5,6,8) and the Society for Ambulatory Anesthesia (9) has developed a consensus statement to address selection criteria for the ambulatory surgery setting. Other higher-risk patients (ASA 3-4) may also be suitable for low-risk surgery in the ambulatory setting, but processes to guide their care are not as clearly delineated. With an eye on this existing gap, we describe our experience at a busy ambulatory surgical center developing and implementing ready-to-use perioperative clinical practice criteria. The criteria guide decisions about the appropriateness of individual patients, including higher-risk patients, for ambulatory perioperative care in a facility that lacks overnight care.

The University of Rochester Medical Center is a large academic medical center serving the New

York State Finger Lakes region which includes an Ambulatory Surgery Center (ASC), named

Sawgrass Surgical Center, located two miles from Strong Memorial Hospital, the main university hospital. Sawgrass houses 11 operating rooms, two minor operating rooms and one endoscopy suite where approximately 11,000 anesthetics are performed annually. The anesthesia care-team model is utilized almost exclusively at Sawgrass with rare solo-anesthesiologist delivered care.

### Criteria Development for ASC Patient Selection

Sawgrass opened in 2009, and it rapidly became apparent that formal patient selection criteria were necessary. At the time, patients with significant comorbidities were booked into the center after a basic screen without filtration of higher-risk patients (eg patients who are super obese, have severe end organ failure, or have severe OSA patients noncompliant with CPAP). Prior to criteria development, trained preoperative clinic Registered Nurses (RNs) called all Sawgrass patients three days before the scheduled surgery and used a scripted survey to screen for issues that might affect day of surgery care. However, there was not a uniform or systematic method for decision making after the screen to determine candidacy for ambulatory surgery.

A review of the literature in 2009 showed remarkably little published evidence about the establishment or use of patient selection criteria for ambulatory surgery centers. Evidence pertaining to risk factors for ambulatory surgery has grown over the last ten years; though, in 2009, ambulatory surgery center leadership at Sawgrass used the available literature, which is in part cited below (4,8,10,11). Thus, the evidence available at the time of criteria development was extrapolated primarily from in-hospital settings. Criteria

development followed an iterative approach with limited outpatient data to mine. Once preliminary criteria were developed, they were shared with surgical and nursing leadership, and with the anesthesiology-run preoperative clinic as the Center for Perioperative Medicine (CPM) for further review and critique. The criteria were finalized in their original form in February 2010. Since the first version, they have been updated at first quarterly, and then biannually. The latest version of the criteria is illustrated in Figure 1. In 2016, Pediatric Patient Selection Criteria were also developed using a similar process (Figure 2).

The criteria divide patient risk factors into Absolute Contraindications, which are contraindications deemed severe enough to preclude proceeding with surgery in the ambulatory setting, or Consultative Considerations, which are comorbidities that warrant further evaluation and/or optimization. Comorbidities identified as Absolute Contraindications are a “hard stop” for proceeding with surgery in the ambulatory setting. Patients with comorbidities that fall under Consultative consideration are then reviewed by the preoperative clinic anesthesiology team, and may proceed for ambulatory surgery if deemed appropriate after the consultation.

After criteria development, RNs continued to phone-screen patients with a new script developed by the preoperative clinic Physician Director with the criteria in mind. When patients screened positive based on the new patient selection criteria, screening RNs would contact an Anesthesiology physician (a resident or attending) or Nurse Practitioner for additional consultation. This consultation generated a more thorough patient chart review that could elicit an in-person patient assessment. In 2016, we began performing telemedicine video evaluations in order to expand our scope given some patients’ limited access to our physical facilities (e.g. transportation issues, large distances from the center). An attending ambulatory anesthesiologist who is intimately knowledgeable about the criteria and able to adjudicate on ultimate patient triage staffs every consult, chart review, and in-person patient assessment.

### ***Methods to Evaluate the Criteria***

Utilizing a database from the electronic medical records between May 2015 (when EMR was first instituted) until January 2018, which constituted approximately 29,000 patients, we assessed the following quality indicators in order to evaluate the criteria and its implementation at our single center: appropriate booking site, day-of-surgery cancellation rate, and postoperative transfer to hospital or admission to hospital.

### ***Appropriate Booking Site***

In order to evaluate whether patients were appropriately booked to the ambulatory surgical center based on the criteria, decisions at CPM regarding patient selection for Sawgrass were reviewed. Anesthesiology residents and nurse practitioners documented decision-making about patient selection from March-October 2017 in the Research Electronic Data Capture (REDCap) tool<sup>12</sup> hosted at the University of Rochester, constituting 131 charts. The documentation included why the patient was not accepted for ambulatory surgery; whether the reason was due to an absolute contraindication or consultative criteria, and included patient specifics as to the reason for exclusion (e.g. severe OS noncompliant with CPAP and BMI >45). The Physician Director at CPM also reviewed this same convenience sample of 131 charts in REDCap during the same timeframe to validate the process and confirm the documentation. Documentation from these two sources revealed the reasons higher-risk patients were triaged to have their procedure in the hospital setting and away from the ambulatory surgery center.

### ***Day of Surgery Cancellation Rate***

Day of surgery cancellations are tracked at Sawgrass via the EMR

since its availability in 2015.

Rate of Hospital Transfer and Admission to the Hospital after ASC discharge

Quality leaders at Sawgrass have internally tracked patient transfers from the ASC to the main hospital since 2015, as a metric to monitor trends.

In order to capture hospital readmission to the hospital after ASC discharge, a convenience sample of 8997 records (January-Nov 2017) in the EMR were reviewed.

## **Results/Metrics to Evaluate Progress**

### ***Appropriate Booking Site***

From May 2015 until January 2018, Sawgrass performed about 29,000 surgeries utilizing anesthesia care. 131 out of 6,845 patients (1.9%) scheduled for surgery at Sawgrass were not approved for ambulatory surgical care during a convenience sample of March-October 2017. The majority (98%) were approved for surgery at Sawgrass after surgical booking. Details regarding what portion of the criteria excluded the 131 patients from ambulatory surgical care are included in the following table.

The percentage of patients who had medical comorbidities upon surgical booking, prompting CPM decision for non-ASC care is outlined (Table 1).

### ***Day of Surgery Cancellation Rate and Day of Surgery Transfer to Hospital***

The day of surgery cancellation rate was below 1.02% for the time period selected (May 2015-December 2017). The day of surgery transfer rate to the hospital at Sawgrass was between 0.18% and 0.22% for the same time period (Table 2).

### ***Readmission to the Hospital after ASC discharge***

Review of the convenience sample (Jan-Nov 2017) revealed a 0.8% (n= 71) rate of hospital readmission within four days of ASC discharge.

## **Discussion**

At our single center, we developed Patient Selection Criteria that we implemented one year after the opening of Sawgrass Surgical Center. To our knowledge, this is the first report on the development and implementation of ready-to-use criteria for this setting.

Sawgrass has a low day of surgery cancellation rate, a low transfer rate to the hospital or admission to the hospital after ASC discharge despite a high volume of patients (more than 11,000 anesthetics annually), and a wide variety of patients with multiple comorbidities (ASA class I-IV). More than one-third of patients booked at Sawgrass have comorbidities that are categorized as an absolute contraindication based on the criteria, and precluded them from having surgery at Sawgrass.

Day of surgery cancellation rate in same day surgical suites or ASC’s have been reported in the literature to be anywhere from 5.1%-13.6% reflecting a significantly higher rate than Sawgrass (13,14). Though we are unable to associate the implementation of criteria to this downward trend, a robust preoperative screening and evaluation process has been described in the literature as having a similar impact on day of surgery cancellations (13,14). The post-surgical transfer rate to an inpatient facility from Sawgrass compares favorably with published rates. The average national ambulatory surgery center

**Figure 1** Adult Patient Selection Criteria for URMedicine Ambulatory Surgery.

ABSOLUTE Contraindication	CONSULTATIVE Consideration (Give chart to CPM NP)
<b>Cardiovascular</b>	
Unstable Angina	Stable Angina / Ischemia on stress test
NYSHA CHF Class III or IV	History of CHF
AICD	Pacemaker
MI within 3 months; coronary intervention (PTCA) within 6 weeks	Stent within 12 months
Ejection Fraction <30%	History of CAD with poor functional capacity (<4 METS) or symptoms
Severe or Critical Aortic Stenosis	History of congenital heart disease of any kind
Patients with pending cardiac intervention	
Uncontrolled / Refractory Hypertension (>200/110 or poorly treated)	
Cyanotic, complex, or palliated congenital heart disease	
<b>Neuro</b>	
Seizures refractory to standard medical therapy	TIA/Stroke within last 12 months AND/OR with persistent deficit
<b>Pulmonary</b>	
Home Oxygen dependent (excluding sleep use)	Home oxygen use for sleep
<b>Organ Failure</b>	
ESRD on Hemo- or Peritoneal- Dialysis	CKD Stage III or IV
ESLD listed for Liver Transplant	Cirrhosis with decreased liver function or ascites
Severe uncontrolled DM (HbA1C >12)	Bleeding / Coagulation disorders / on anticoagulation (besides aspirin)
<b>Morbid Obesity / Airway Concerns</b>	
BMI >50	BMI >40 (Exception--if they had prior surgery at SG within the last year)
BMI >45 with untreated sleep apnea or newly diagnosed sleep apnea (either by: STOP-BANG criteria or a new diagnosis with sleep study and no therapy yet initiated)	OSA patients
BMI >45 for ANY patient requiring shoulder surgery	History of cervical spine issues, T-spine or L-spine precautions
BMI >40 with known / suspected difficult airway / ventilation	Craniofacial abnormalities
BMI >35 and moderate OSA AND surgery precluding CPAP in postop period	Moderate OSA and BMI <35 AND surgery precluding CPAP in postop
Severe OSA AND surgery precluding CPAP in postoperative period (BMI independent)	History of difficult airway
C-Spine precautions (neck collar or halo)	
<b>Miscellaneous Anesthesia Concerns</b>	
Pregnancy	Personal and/or Family History of Malignant Hyperthermia
Active Total Parenteral Nutrition (TPN) usage	Active cocaine or IV drug use
	Severe cognitive dysfunction / behavioral issues
	Down's Syndrome
	Difficult IV insertion, especially if Hx of central line insertion
	History of allergy to multiple opioids; opioid tolerance

**FIGURE LEGEND**

Figure 1: Adult Patient Selection Criteria for URMedicine Ambulatory Surgery

NYHA CHF: New York Heart Association Congestive Heart Failure; AICD: Automated

Implantable Cardioverter Defibrillator; MI/PTCA: Myocardial Infarction/ Percutaneous Transluminal Coronary Angioplasty; ESRD: End Stage Renal Disease; ESLD: End Stage Liver Disease; DM: Diabetes Mellitus; BMI: Body Mass Index; OSA: Obstructive Sleep Apnea; CAD: Coronary Artery Disease; METS: Metabolic equivalent; CKD: Chronic Kidney Disease

Supplemental Figure 1: Pediatric Patient Selection Criteria for URMedicine Ambulatory Surgery

ESRD: End Stage Renal Disease; ESLD: End Stage Liver Disease; DM: Diabetes Mellitus; BMI: Body Mass Index; ETCO2: End-tidal CO2; OSA: Obstructive Sleep Apnea; CHF:

Congestive Heart Failure; URI: Upper Respiratory Infection; RSV: Respiratory Syncytial Virus

**Figure 2** Pediatric Patient Selection Criteria for URMedicine Ambulatory Surgery.

ABSOLUTE Contraindication	CONSULTATIVE Consideration (Give chart to CPM NP)
<b>Cardiac</b>	
Cyanotic, complex, or palliated congenital heart disease	History of CHF
Patients with pending cardiac intervention	History of congenital heart disease of any kind
	Patients with history of cardiac intervention
	Pacemaker
<b>Neuro/Neuromuscular</b>	
Family or personal history of Malignant Hyperthermia (<8 years old)	Family or personal history of Malignant Hyperthermia (age >8 years)
Seizures refractory to standard medical therapy	Seizures
	Severe cognitive dysfunction / behavioral issues
	Severe Anxiety
<b>Pulmonary</b>	
Home Oxygen use	Recent URI
	Recent exacerbation of asthma or bronchopulmonary dysplasia
	Recent ED visit/Recent sick visit to MD
	RSV within the past 6 weeks
<b>Organ Failure</b>	
ESRD	Bleeding / Coagulation disorders / on anticoagulation
ESLD	
Severe uncontrolled DM	
<b>Prematurity and Age Considerations</b>	
Ex-premie (born at <37 weeks) and <60 weeks post-conceptual age at time of surgery	Prematurity
Full term infants (>37 weeks) <4 weeks of age at time of surgery	Dental patients <24 months of age
<b>Morbid Obesity / Airway Concerns</b>	
Age <3 for Tonsillectomy	Age infant - 2 y: Weight for length >95 <sup>th</sup> %tile
Age <2 for Adenoidectomy	Age 2-18: BMI >95 <sup>th</sup> %tile
BMI >99 <sup>th</sup> percentile for any procedure on airway in children ≤ 10 years	Down's Syndrome
BMI > 95 <sup>th</sup> percentile for tonsillectomy in children without a documented sleep study	Confirmed or suspected OSA
Oxygen Nadir <80% on sleep study and/ or ETCO2 >50mmHg on sleep study	History of difficult airway
OSA in a child <10 years with AHI >10	Craniofacial abnormalities
OSA in a child age 11-18 years with AHI >24	BMI >99 <sup>th</sup> percentile for dental procedures in children ≤ 10 years
C-Spine precautions (neck collar or halo)	
<b>Miscellaneous/ Teenager</b>	
Pregnancy	Active cocaine, heroin or IV drug use
	Difficult IV insertion
	History of allergy to multiple opioids; opioid tolerance

**Table 1** Chi-square test results: Association between gender of patients and their discharge outcome.

Characteristic	N=131 (100%)
<b>Absolute contraindication</b>	<b>51 (39%)</b>
<b>Cardiovascular</b>	<b>3 (6%)</b>
NYSHA CHF Class III or IV	1 (33%)
Severe or critical aortic stenosis	1 (33%)
Pending Cardiac intervention	1 (33%)
<b>Neurological</b>	<b>1 (2%)</b>
Refractory Seizures	1 (100%)
<b>Pulmonary</b>	<b>0 (0%)</b>
<b>Organ failure</b>	<b>9 (18%)</b>
Severe uncontrolled diabetes	8 (89%)
ESRD on hemo- or peritoneal- dialysis	1 (11%)
<b>Morbid Obesity/Airway concerns</b>	<b>37 (73%)</b>
BMI>99th percentile airway procedure/dental patients <= 10 years old	15 (41%)
BMI > 95th percentile for tonsillectomy in children without a sleep study	7 (19%)
OSA in a child < 10 years with AHI > 10	6 (16%)
BMI> 50	
BMI>45 with shoulder surgery	3 (8%)
<b>Miscellaneous Anesthesia Concern</b>	<b>3 (8%)</b>
Pregnancy	1 (3%)
<b>Automatic Anesthesia Consult (Consultative Consideration)</b>	<b>80 (61%)</b>
<b>Cardiovascular</b>	<b>1 (1%)</b>
Stable angina / Ischemia on stress test	1 (100%)
<b>Neurological</b>	<b>0 (0%)</b>
<b>Pulmonary</b>	<b>3 (4%)</b>
Recent exacerbation of asthma or COPD	3 (4%)
<b>Organ failure</b>	<b>12 (15%)</b>
Bleeding anticoagulation disorder/on anticoagulation meds	9 (75%)
CKD stage III or IV	3 (25%)
<b>Morbid Obesity/Airway concerns</b>	<b>16 (20%)</b>
OSA patients	12 (75%)
Craniofacial abnormalities	2 (13%)
History of difficult airway	2 (13%)
<b>Miscellaneous Anesthesia Concern</b>	<b>48 (60%)</b>
Acute illness	24 (50%)
Miscellaneous cardiac concerns (not specified in the criteria)	6 (13%)
Abnormal thyroid levels	5 (10%)
Inability to reach patient for consult/patient cancelled surgery	4 (8%)
Complex medical comorbidities	3 (6%)
<b>Other</b>	<b>6 (13%)</b>

**Table 2** Percentage Day of Surgery Cancellation and Transfer to Hospital (2015-2017).

Year	Day of Surgery Cancellation %	Day of Surgery Transfer to Hospital %
2015 (8 mo)	0.51%	0.18%
2016	1.01%	0.12%
2017	1.02%	0.22%

(ASC) transfer rate is 0.42% while the average state ASC transfer rate for New York is 0.34% (15). The transfer rate from Sawgrass to an inpatient facility averaged from 2015-2017 was 0.17%. Thus, the Sawgrass transfer rate is approximately 52% lower than nationally and 65% lower than the state transfer rates. Hospital readmission rates within four days after Sawgrass discharge may indicate that discharge after ambulatory surgery was premature. A convenience sample review revealed a 0.8% (n= 71) rate of hospital readmission. This readmission rate to the hospital within four days after discharge from our ambulatory surgery center suggests patients did not have acute care issues requiring hospital care after their transition to home.

This review uncovered a significant amount of inappropriate booking (39%) of patients at Sawgrass, ie patients who had comorbidities that fell in the Absolute Contraindication section of the criteria and ideally would have preferentially been booked to the hospital and not Sawgrass. These patients were triaged to the hospital setting by CPM after review; the majority of these patients (73%) were morbidly or super obese, had potential difficult airways, or showed signs of severe end-organ failure. This analysis prompted an interdisciplinary quality improvement process that involved education of surgical office staff, including surgeons and surgical Nurse Practitioners, regarding appropriate use of the criteria so that patients who have comorbidities that fall under Absolute Contraindication for surgery at the ambulatory center would be automatically scheduled for surgery in a hospital setting.

We also identified that two-thirds of the patients triaged away from the ambulatory center to the hospital for surgery had comorbidities categorized in the Consultative Consideration section of the criteria. Of these cases, there was no preponderance of conditions; though, 25% of the cases were triaged to the hospital for concerns about organ failure (CKD, hematologic diseases) and 20% of the cases were triaged to the hospital due to concerns about morbid obesity/airway concerns.

Surgical teams appreciate consistency in the decision-making related to their patient's candidacy for ambulatory surgery at Sawgrass. In this system structured by standardized Patient Selection Criteria, decisions are made prior to the day of surgery with a high degree of certainty that the patient will not be cancelled by an anesthesiologist on the day of surgery. This reflects a level of trust in the criteria to enable patient care decisions and allows for efficient and streamlined workflows. As the volume of outpatient surgery continues to grow and there is increased complexity of surgical procedures and patient comorbidities scheduled for ambulatory surgery, ready-to-use criteria that have been applicable to a high volume of patients at a busy surgical center such as ours may serve as a useful tool.

Proper patient selection and advances in anesthetic and perioperative care over the past three decades have promoted the success and safety of ambulatory surgical procedures (2-4). In 2013, Mathis et al described the lack of prospectively collected data regarding optimal patient selection for ASC procedures and identified a list of specific patient comorbidities that increase morbidity and mortality after ambulatory surgery (2). More recently, Teja et al published

an instrument for prediction of unplanned 30-day admission after ambulatory surgical care which may be useful in identifying high risk patients scheduled for ambulatory surgery (16). To date there is no published patient selection criteria that provides ready-to-use guidance to a clinician making decisions about patient candidacy for ambulatory surgery.

There are limitations to the widespread adoption of these criteria to other ambulatory surgery centers. These criteria may not be applicable for ambulatory patients at other centers as they are not necessarily generalizable to other populations. Orthopedic surgery constitutes more than 60% of the surgical population at Sawgrass, allowing the avoidance of deeper anesthetics by implementing regional anesthesia techniques for anesthesia care for a subset of patients considered high-risk, which may not be an option for other facilities. Future studies evaluating metrics before and after implementation of developed patient selection criteria would be ideal. By disseminating these criteria, we also hope that similar practices to ours consider implementation and report on their utility and their outcomes. In this way, ambulatory anesthesia care might move towards adopting a more standard practice.

The Patient Selection Criteria have been instrumental in allowing the Sawgrass perioperative team to care for a large volume of a wide variety of patients in a safe, appropriate and efficient manner. As the volume of outpatient surgery continues to grow with an increasingly complex patient population, implementing the Patient Selection Criteria for ambulatory surgery has helped our single center provide clinical guidance and appropriate patient triaging while still allowing us to safely meet the clinical demand of this growing outpatient surgical volume.

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