Ambulatory Anesthesia for the Cardiac Catheterization and Electrophysiology Laboratories

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KEYWORDS

• Anesthesia • Cardiology • Electrophysiology • Intervention • Radiation safety
• TAVR

KEY POINTS

- The cardiac catheterization laboratory (CCL) and electrophysiology laboratory (EPL) environments present unique clinical challenges, including unfamiliar work areas and staff, limited space with physical barriers separating the patient from the care provider, remote locations, and procedures with rare but potentially catastrophic clinical complications.
- Ambulatory anesthesiologists must familiarize themselves with these new surroundings and practice vigilant preoperative planning and continual communication with the proceduralist and team.
- In the future, the need for anesthesiologists in the CCL and EPL will continue to grow as procedures increase in complexity and duration.

INTRODUCTION

The cardiac catheterization laboratory (CCL) and electrophysiology laboratory (EPL) present many clinical and logistical challenges to the ambulatory anesthesiologist. These challenges have been increased over the past decade with the introduction of new therapeutic procedures and a wider scope of pathology and acuity.

CONSULTATION: A MULTIDISCIPLINARY APPROACH

Effective use of clinical resources is critical to the success of a busy ambulatory surgery center. In the multidisciplinary team approach, the anesthesiologist is the one who can best manage significant patient pathology or procedures associated with significant hemodynamic instability, allowing the cardiologist to focus on the procedure.[1] Although some patients do not significantly benefit from being evaluated at least a day before the procedure, cardiology patients typically do. Patients may have a history of

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recent myocardial infarction, uncontrolled arrhythmias, heart failure, serious structural cardiac disorders, or other noncardiac morbidities not commonly encountered in the ambulatory setting, making a thorough and timely preanesthesia assessment essential. Additionally, in order to trigger appropriate anesthesia consultation, we should encourage our cardiology colleagues to perform a basic airway exam and consider the potential hazards of over sedation, aspiration and airway obstruction (**Box 1**).

GENERAL STRATEGIES FOR THE AMBULATORY ANESTHESIOLOGIST

CCLs and EPLs are generally not designed with the anesthesiologist in mind. Space for anesthesia equipment can be limited, whereas the fluoroscopy equipment and table can interfere with airway management. Extensions on intravenous tubing and breathing circuits are helpful because the fluoroscopy table is highly mobile and is usually controlled by the cardiologist. The anesthesia supply room may often be in a distant location, necessitating the use of a well-stocked anesthesia cart with emergency airway equipment and additional supplies.[1]

Avoiding common complications requires an understanding of the unique aspects of CCL and EPL procedures. Vascular access–related complications occur frequently (3%–4%)[2] and careful postoperative monitoring of access sites and appropriate vascular closure techniques are critical. It is also important to keep in mind that, as procedures increase in complexity and duration, deeper sedation is often required. Increasing the levels of sedation has implications for patient safety and regulatory compliance (institutional and state policies and non–anesthesia provider credentialing), further necessitating the anesthesiologist's increasing role in the CCL and EPL. It has been reported that oversedation, airway intervention, or conversion to general anesthesia occur in 40% of electrophysiology procedures scheduled for nongeneral anesthesia.[3]

HIGHER RISK PROCEDURES IN THE AMBULATORY SURGERY SETTING

Complex Catheter Ablation

Radiofrequency ablation is a therapeutic alternative to pharmacologic therapy for refractory atrial and ventricular arrhythmias.[4] Many of these procedures are performed under moderate sedation with standard monitors, but the increasing complexity of electrophysiology techniques has made these procedures significantly more time consuming. Partial airway obstruction, coughing, or an inability to remain supine and motionless can all interfere with both intracardiac mapping and ablation. With significant airway obstruction, swinging intra-atrial septum movement can make transseptal catheter placement by the cardiologist difficult.[5] General anesthesia may be best for some patients. Despite anecdotal practice and opinion, the literature remains sparse and unclear regarding the effects of anesthetic agents on cardiac conducting pathways relevant to electrophysiology procedures, but most anesthetic agents have some effect on cardiac conduction pathways.[6,7]

Box 1
Anesthesia comorbidities for the non–anesthesia provider

- Morbid obesity
- History of obstructive sleep apnea
- History of severe gastroesophageal reflux disease
- Inability to lie flat or still for extended periods of time
- Known or suspected difficult airway (Mallampati class III or IV)