



## Ambulatory pediatric surgery



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### ABSTRACT

Ambulatory pediatric surgery has become increasingly common in recent years, with greater numbers of procedures being performed on an outpatient basis. This practice has clear benefits for hospitals and healthcare providers, but patients and families also often prefer outpatient surgery for a variety of reasons. However, maximizing the potential opportunities requires critical attention to patient and procedure selection, as well as anesthetic choice. A subset of outpatient procedures can be performed as single visit procedures, further simplifying the process for families and providers.

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### Introduction

The performance of ambulatory surgery offers significant benefits for patients and their families, as well as healthcare providers and the systems in which they practice. The growing trend of increasing numbers of pediatric surgical operations to the outpatient arena is hardly a new practice, and was first established at the Royal Glasgow Hospital for Children in 1909 due to a lack of inpatient resources.<sup>1,2</sup> The concept slowly gained traction over the following decades, finally picking up steam in the 1960s with the development of the first outpatient surgical center in 1968.<sup>2</sup> In recent years, concerns over rising healthcare costs have stimulated even further interest in broadening ambulatory surgical practices.

In exploring the topic of ambulatory pediatric surgery, this review will describe its potential benefits, define the scope of appropriate surgical procedures and patient selection, and highlight crucial anesthetic considerations. Special attention will be devoted to the practice of single visit surgery, a practice which attempts to capitalize on and magnify the advantages of the ambulatory surgery experience. Finally, practical considerations and advice from the literature regarding the creation of new ambulatory practices will be reviewed.

### Benefits of outpatient surgery

#### To the patient and family

While the shift of surgical procedures to the outpatient realm has advantages for both the provider and the system in which he/

she practices, the primary goal is to improve patient care. By definition, outpatient surgery precludes the need for the patient to remain in the hospital, thereby minimizing potential exposure to nosocomial pathogens and iatrogenic injuries.<sup>1</sup> Furthermore, patients and families often prefer more focused and personalized care that minimizes time and distance away from the home.<sup>3</sup> In the ambulatory setting, wait times are typically decreased both before and after surgery, with decreased stress and disruption for the patient and their family.<sup>1</sup> Even among patients with appendicitis, same day discharge following laparoscopic appendectomy correlates with greater postoperative patient satisfaction.<sup>4</sup> Finally, minimizing time spent in a hospital away from home decreases any potential economic impacts on the family such as lost wages, or payments for child care and transportation.<sup>5</sup> In general, pediatric patients and their parents and family members prefer to recuperate at home when possible. Equally importantly, several studies have demonstrated the safety of same-day discharge after routine operations such as laparoscopic appendectomy and cholecystectomy, with no increase in surgery-specific complications or unanticipated readmissions.<sup>6–8</sup>

#### To the provider

Based on the nature of the procedures typically performed in the outpatient setting, providers are often able to accommodate up to 50–100% more cases within a set time period.<sup>9</sup> This increased efficiency can be attributed to a focus on streamlined throughput that permeates the very concept of ambulatory surgery. Furthermore, moving these procedures out of an inpatient operating room has the potential to relieve scheduling burdens, reserving larger, more complex cases for inpatient operating room block time.<sup>9</sup>

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### To the healthcare system

Multiple studies have demonstrated that outpatient surgery reduces the costs of providing surgical care as compared against inpatient surgery.<sup>2,3,9–11</sup> This reduction in cost can be attributed primarily to a decrease in inpatient length of stay, but may also be related to a lower risk of infection and decreased operating costs.<sup>9,11</sup>

### Patient and procedure selection

Appropriate patient and procedure selection are paramount for patients and providers to reap the full benefits of ambulatory surgery while minimizing the potential risk of any complications. This begins with careful examination and evaluation of patients in the preoperative clinic to ensure that appropriate cases are done in the outpatient setting. Each hospital should develop its own criteria for outpatient cases, especially to exclude patients that are not eligible. In addition, some patients are only considered for outpatient surgery after preoperative clearance; these patients can be subdivided into those who can be cared for at the free-standing surgery center and those whose operations should be performed at a surgery center that is physically attached to the hospital.

In pediatric patients, one of the most important criteria is age: a combination of gestational and post-natal age is utilized to determine the relative risk for apnea, and therefore the need for continued monitoring, following general anesthesia. Specific age criteria vary by institution, but otherwise healthy patients ranging from 50 to 60 weeks post conception are generally eligible for ambulatory procedures.<sup>12</sup> Before this age, infants have higher risks of apnea and other respiratory complications after undergoing general anesthesia. Full term infants are typically candidates for outpatient surgery after 54 weeks post-conception age.<sup>12</sup>

In addition to age, other specific aspects of the patient's personal or family medical history may preclude the safe performance of an outpatient surgical procedure. Patients with a known difficult airway should not be treated in an ambulatory setting, in which the requisite resources or expertise to manage such patients may be limited. Examples of airway concerns include a history of prolonged intubation or ventilation, and patients with known tracheal stenosis or airway malacia. Other respiratory diagnoses which may preclude the safe performance of outpatient surgery include severe obstructive sleep apnea, dependence on positive airway pressure or poorly controlled asthma.<sup>13</sup>

Patients with certain chronic medical conditions such as poorly controlled diabetes mellitus should not be cared for in an outpatient surgery center. Patients with a Body Mass Index greater than the 95th percentile are considered obese and are not candidates for outpatient surgery. Uncontrolled or new onset seizure patients are also excluded. Patients with congenital heart disease (hypoplastic heart, septal defects, Eisenmenger syndrome, cyanosis, etc.) must be repaired and stable prior to consideration for care in the outpatient surgery center. However, the location of the ambulatory surgical center must be considered in these decisions, in that those attached to adjacent inpatient facilities may be able to adequately manage medically complex patients.

Certain patients may only be considered candidates for outpatient surgery after evaluation and examination by anesthesiology (see Tobias paper on this topic in this issue of *Seminars in Pediatric Surgery*). Included are patients with implantable devices, repaired congenital heart defects and complicated medical histories, including a personal or family history of malignant hyperthermia. Patients with malignant hyperthermia may safely undergo outpatient surgery, even in stand-alone ambulatory centers, but anesthesiologists should prepare accordingly by

flushing the ventilator circuit of any volatile anesthetics.<sup>14</sup> Outpatient surgery centers should also be prepared for the possibility of patients developing malignant hyperthermia for the first time. This requires having an adequate and available supply of dantrolene, appropriate support staff, and rapidly transferring the patient to an intensive care setting.<sup>14</sup> Patients with an acute illness such as upper respiratory or gastrointestinal infections should have a period of wellness prior to surgery; recent hospitalizations or emergency room visits must be reviewed for cardiopulmonary issues which may preclude an anesthetic. Patients with bleeding disorders should be reviewed to ensure that their particular disorder will not pose a risk for outpatient surgery. Candidates with a BMI > 95% but below 99% may be eligible for outpatient surgery after review. Some adenoidectomy patients under that age of two years may be eligible for outpatient surgery after review. Craniofacial syndromes (Pierre-Robin, Trisomy 21, others) can at times pose airway difficulties and must be reviewed. Finally, patients with recent vaccinations within one week of surgery should be excluded. A case-by-case review by anesthesiology may help determine whether patients who are not eligible for outpatient surgery at the free-standing surgery center may be considered at centers attached to the main hospital.

The ideal procedure is one which can be rapidly performed, limiting the anesthetic time, and with minimal risk of major complications. Examples of procedures commonly performed on an outpatient basis include inguinal and umbilical hernia repairs, appendectomies, cholecystectomies, tonsillectomies/adenoidectomies, circumcisions, and orchidopexies.<sup>7,13,15,16</sup> Complications following these procedures are generally uncommon and can be readily detected by parents or other caregivers, precluding the need for prolonged inpatient observation.

In an effort to continue to enhance efficiency and decrease hospital length of stay, several institutions have evaluated the safety of extending the types of procedures that may be treated with ambulatory surgery. Two of the most commonly evaluated procedures in pediatric surgery literature are laparoscopic appendectomy for simple appendicitis and laparoscopic cholecystectomy. Several institutions have demonstrated that both laparoscopic appendectomy for simple appendicitis and laparoscopic cholecystectomy can safely be performed as outpatient procedures without overnight hospital observation.<sup>4,17,18</sup> Additional follow-up studies have demonstrated no difference in 30-day hospital readmission rates or wound complications when compared to 1 or 2-day hospital stays.<sup>6,7</sup> The majority of studies demonstrating successful implementation of a same-day discharge protocol discuss the need for a multidisciplinary effort including nursing staff and providers across multiple hospital areas (emergency center, surgical services, anesthesiology, and the post-anesthesia care unit). Additionally, a clear designation of inclusion criteria (i.e., time of day, patient selection, diagnoses, and intra-operative findings) should be disseminated and revisited through the implementation process. With appropriate patient selection and process implementation these efforts also result in excellent patient and provider satisfaction.

Given the many relative contraindications, it is clear that the outpatient surgery patients represent a select group of the healthiest patients. The strict outpatient anesthetic criteria help ensure that there will not be any need for conversion of a patient from the outpatient setting to admission to the hospital.

### Anesthetic considerations

Since a variety of different procedures can be safely performed in the outpatient setting, the anesthetic approach can also vary widely. Monitored anesthesia care can be utilized as the sole

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