

# Anaesthesia for paediatric office-based surgery<sup>1</sup>

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Received 14 January 1998; accepted 30 January 1998

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## Abstract

General considerations for providing office-based anaesthesia to children are reviewed. These include monitoring and equipment, preoperative considerations, anaesthetic technique, emergence and recovery, and economic issues. Specific considerations for the haematology/oncology, gastroenterology, orthopaedic, dental and ophthalmologic clinics are also reviewed. © 1998 Elsevier Science B.V. All rights reserved.

*Keywords:* Office-based anaesthesia; Paediatric anaesthesia

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## 1. Introduction

Paediatric office-based surgery has expanded greatly within the hospital setting in recent years. It seems to have become a natural extension of the capability and willingness of anaesthesiologists to provide general anaesthesia in remote areas of the hospital, such as the radiology suite. It was then only a matter of time before children undergoing painful procedures in physicians' offices or clinics received general anaesthesia. Minor procedures that normally take place in the hospital's surgical suite or a free-standing surgi-center, are now occurring in physician's offices. Table 1 lists the clinics and offices within the hospital where we have given anaesthesia to children. In this article, a review of the general principles involved when anaesthetizing children in the office setting will be given, and will be followed with a brief description of the unique considerations for some locations.

## 2. General principles

### 2.1. Monitoring and equipment

It is essential that anaesthesiologists become familiar with our own [1] and the American Academy of Pediatrics' guidelines for monitoring patients during deep levels of sedation for painful procedures [2]. We cannot reasonably expect others to follow safety guidelines if we ourselves do not. For example, in healthy patients it is often tempting to use pulse oximetry alone during intravenous (IV) sedation for a brief procedure. However, the standard of care also requires use of electrocardiography and intermittent blood pressure measurements. Each remote location should be equipped with these capabilities as well as the provision of oxygen (via mask and positive pressure) and a suction device, unless the mobile anaesthesia team provides these themselves.

The necessity of an anaesthesia machine depends on several factors: comfort of the anaesthesiologist, induction technique, need for tracheal intubation, and often the most important, space limitations. Anaesthesiologists have different levels of comfort as far as their technique of induction of anaesthesia in children. Some are comfortable placing an IV catheter in an awake

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<sup>1</sup> This article is based upon a presentation given at the Postgraduate Assembly in New York City, December, 1997.

Table 1

Haematology/Oncology	Gastroenterology	Orthopaedics	Dentistry and oral surgery	Ophthalmology
Lumbar puncture	Endoscopy	Removal of hardware	Removal of wisdom teeth	Exam under anaesthesia
Bone marrow aspiration and biopsy	Colonoscopy	Cast change	Removal of gum lesions	Removal of sutures
		Joint aspiration	Miscellaneous minor oral surgery procedures	

child, and some prefer an inhalational induction prior to IV placement for which an anaesthesia machine is required. An alternative approach is to have an IV catheter placed by a paediatric practitioner prior to arrival. This will save time and allow for IV induction of general anaesthesia. If tracheal intubation is anticipated, capnometry is essential to confirm proper endotracheal tube placement. In this case, it is preferable to have an anaesthesia machine because of its capabilities for storing a capnometry device and the ability to provide positive pressure ventilation without having to rely on a bag-mask device.

## 2.2. Preoperative considerations

Fasting guidelines remain the same as for any anaesthetic, regardless of how light the sedative technique [1]. Premedication is encouraged for children > 1 year old and can be administered by the office staff prior to the arrival of the anaesthesiologist. It must have a considerable margin of safety so as not to require monitoring and have a short duration of action without prolonging the time to reach discharge criteria. Midazolam best fits these requirements and can be administered as either an oral, nasal or rectal preparation [3].

Preoperative use of a local anaesthetic cream (EMLA) is recommended for painful procedures (i.e. bone marrow aspiration). Parents should receive a prescription beforehand, and apply the EMLA at home at least 1 h prior to the procedure [4]. Although data is lacking, it has been my impression that local anaesthesia of the skin allows for less general anaesthesia to be used, resulting in a more rapid recovery.

## 2.3. Anaesthetic technique

The choice of anaesthetic technique depends on the answers to the following questions:

### 2.3.1. Is the procedure painful?

If so, then ordinarily an analgesic is indicated. However, in the office setting, where rapid emergence and early discharge are priorities, opioids are usually omitted in favor of larger doses of hypnotics that will result in a faster emergence. Few surgical procedures done in

remote settings produce significant postoperative pain that cannot be managed with oral analgesics alone.

### 2.3.2. Does the child need to be motionless?

Non-painful procedures such as echocardiography, or exams under anaesthesia require a motionless patient to obtain a high quality result. The goals are different than for painful procedures. The patient needs to tolerate only mild physical stimuli, and therefore, lighter levels of sedation are adequate.

### 2.3.3. What is the duration of the procedure?

The answer to this question is often the most important determinant when choosing the proper anaesthetic. Ideally, it should not last significantly longer than the procedure itself. Not only does the child with an altered mental status need to be detained in the office, but also directly supervised until their baseline mental and hemodynamic status is achieved. Experience and an honest estimate from the person performing the procedure will determine the choice of anaesthetic. The ideal agent would have a rapid onset and offset, and be easily titrated.

In recent years, IV propofol has replaced IV ketamine as the most commonly used anaesthetic outside the operating room environment. Its advantages include easy titratability, rapid onset, short duration of action, and a low incidence of postoperative nausea and vomiting [5]. The most common side effect is pain on injection that is prevented by the liberal addition of lignocaine [6]. Respiratory depression will result when high doses are administered, however clinical experience has shown that lower doses, that preserve spontaneous ventilation [7], are quite effective for most procedures [8].

## 2.4. Emergence and recovery

Each office or clinic where general anaesthesia is administered should have fully equipped recovery facilities with the monitoring equipment and trained personnel that parallel those in the Post-Anaesthesia Care Unit (PACU). In the office setting, it is desirable to have a rapid recovery. This enables the child to be discharged home with minimal post-anaesthesia nursing

care, and allows the anaesthesiologist to move on to the next case in an efficient and cost-effective manner.

### 2.5. Economics

The cost efficiency of office-based anaesthesia presents an additional challenge. The most common obstacle is delay, either because the office staff are not properly prepared to begin on time, or because of an unexpected delay during the previous case. The solutions to these problems are to develop a fluid working relationship with the staff in each location, enabling them to understand the economic pressures, and to administer anaesthesia in a cost-efficient manner with rapid induction and emergence times.

Finally, a word of caution to those considering venturing into the office setting: Flexibility is essential on the part of the anaesthesiologist but one should not expect office staff to be flexible as well. In fact, the most important ingredient for success from their standpoint is consistency. At first, these statements may seem paradoxical. However, with experience, the anaesthesiologist will become familiar with the office or clinic's surroundings and staff and will develop a consistent technique for taking care of the patients. This is especially true in the haematology/oncology department, where the patients typically require many procedures over time. Ideally, in any given institution, a small cadre of anaesthesiologists will make up the 'office-based anaesthesia team' so that differences in preferences and techniques will be minimized and a trusting relationship can develop between members of the team and non-anaesthesiology staff in those areas.

In the following section, some of the unique anaesthetic considerations for the offices and clinics where we have participated in the administration of anaesthesia will be discussed.

### 3. Haematology/oncology

Anaesthesia and sedation for haematology/oncology patients are one of the more challenging aspects of office-based practice. The most common procedures are bone marrow biopsy and lumbar puncture for administration of intrathecal chemotherapy. These procedures are performed with the child lying prone or in the lateral position. Children often have an indwelling central venous catheter that facilitates IV induction of anaesthesia. Up until the advent of propofol, these children were typically sedated with a combination of a benzodiazepine and an opioid. Propofol, however, has greatly improved patient and staff comfort [8,9]. Parents and children appreciate the rapid onset, brief recovery time, and complete amnesia of the procedure. An alternate method that results in a

more rapid recovery time is to combine IV midazolam (0.05 mg/kg) with a continuous infusion of remifentanyl to produce a state of conscious sedation. A nasal cannula or the 'blow-by' technique provides supplemental oxygen. Remifentanyl is given as a bolus of 1 mcg/kg over 1 min followed by a continuous infusion of 0.2 mcg/kg per min and titrated every 5 min (the time to reach steady-state concentration) by either doubling or halving the concentration to achieve an 'analgesic state'. This method should be used with caution because the dose required to achieve analgesia frequently exceeds the dose that causes apnea! Children need to be old enough to respond to encouragements to take a deep breath. Most children and parents, however, prefer the unconscious state and the paediatric staff prefer the more rapid onset of propofol, although recovery may be prolonged. Besides, these procedures are typically of shorter duration than the time it takes to achieve an analgesic state with remifentanyl.

### 4. Gastroenterology

The two most common procedures in the gastroenterology clinic are endoscopy of the esophagus and stomach, and lower intestinal colonoscopy. The most important consideration for anaesthesia during upper endoscopy is airway protection. Unless the child is older and a sedative technique chosen, we prefer tracheal intubation for all children undergoing this procedure. The anaesthetic technique reflects the fact that these procedures often end abruptly without advance warning. Therefore, short-acting muscle relaxants (i.e. mivacurium, succinylcholine infusion) and light levels of anaesthesia are preferred. Opioids are rarely used because pain is not a prominent concern during and following upper endoscopy, and their administration may delay awakening.

Colonoscopy, on the other hand, is more painful than it appears and opioids are often used as part of the sedative technique. These children rarely require tracheal intubation unless they are susceptible to pulmonary aspiration of gastric contents due to some pre-existing condition. We find that a combination of an opioid and a benzodiazepine is most useful for this particular procedure, but a propofol infusion technique is also effective.

### 5. Dentistry and oral surgery

The anaesthetic considerations during dental procedures are similar to those during upper endoscopy in that the upper airway is shared. For small children,

tracheal intubation is preferred. A light sedative technique may suffice for older, more cooperative children.

## 6. Orthopaedics

Various different minor surgical procedures can be performed in the orthopaedic clinic if a suitable space is available. The most common procedures are removal of hardware, joint aspiration, and cast changes in young infants. Opioids are avoided because postoperative pain is rarely a consideration. For brief procedures, an inhalational technique may be used without IV catheter placement, if space allows the presence of an anaesthesia machine.

## 7. Ophthalmology

We are frequently called upon by our ophthalmologic colleagues to provide a motionless child during either suture removal following eye surgery, or to enable a complete ophthalmologic exam. Titration of a short-acting hypnotic or inhalational anaesthesia will suffice. Since the procedures often involve the use of sharp instruments inside small, delicate eyes, immobilization is a priority.

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