Advances in office-based anesthesia

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Purpose of review

The practice of office-based anesthesia is quickly emerging as an important field for the anesthesia provider. The number of procedures being done in offices around the country has steadily increased, as has the invasiveness of these procedures. This creates new anesthetic considerations. To date most training programs have not addressed this area of practice. As practitioners enter the field, however, they should have information as to how to provide quality care in a location where very often they are completely alone. Many of the safety mechanisms we as anesthesia providers take for granted in a hospital setting are often not present in a surgical office, and it becomes our responsibility to help in establishing standards.

Recent findings

Some questions exist as to the 'safety' of many surgical offices in which anesthesia care is provided. Many medical professional societies have begun issuing recommendations as to the standards of care that should exist. Different anesthetic techniques are also emerging that are appropriate to the office setting.

Summary

As office-based anesthesia continues to mature as a specialty, we the anesthesia providers must be proactive in establishing guidelines and recommendations to make the practice safe. We should be informed of the rules and regulations that exist in our states, and we should provide a voice for the patients who put their faith in us.

Keywords

office-based anesthesia, safety, regulations, anesthetic techniques

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Abbreviations

ASA	American Society of Anesthesiology
OBA	office-based anesthesia
PONV	postoperative nausea and vomiting

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Introduction

The practice of office-based anesthesia (OBA) is an exciting and rapidly growing field. Until the early 1980s virtually all procedures were performed on hospital inpatients. By the year 2000, however, approximately 75% of all procedures were being performed on an outpatient basis; 17% were in freestanding ambulatory surgery centers, and approximately 8–10 million (14–25%) in physicians' offices [1,2]. By the year 2005, approximately 82% of all procedures will occur on an outpatient basis, and 24% of these will be office-based [1].

Over the past several years, there have been great strides made in improving the safety of OBA. Many medical societies have issued recommendations, and several states have passed rules and regulations regarding the practice. These recommendations/regulations have become increasingly more important as the procedures in the office become more invasive.

Types of procedures and anesthetics

The early procedures performed in offices were small, such as mole removals, or incision and drainage of superficial abscesses. The development of newer surgical and anesthetic techniques, however, has allowed quality care for more invasive procedures to be provided outside the hospital setting [3,4]. Currently, procedures appropriate for OBA include cosmetic surgery (breast augmentation/reduction, rhytidectomies, blepharoplasties, and rhinoplasties), laser surgery, liposuction, endoscopies, colonoscopies, urologic procedures, orthopedic procedures, pregnancy terminations, dental procedures, and microlaparoscopies [2,5••]. Presently, there is little scientific evidence relating the length of a procedure to the suitability for OBA [6••,7••]. However, a task force convened by the American Society of Plastic Surgeons to promote patient safety has recommended that procedures do not exceed 6 h, and that all procedures be completed by 3.00 pm [7••]. Currently many medical/surgical specialties perform procedures of varying degrees of invasiveness in the office [2,6••].

Initially, the sole anesthetic technique employed in the office was conscious sedation, often with an oral sedative. As anesthetic agents and techniques have evolved, however, there has been a progression towards deeper levels of sedation, as well as to regional and general anesthesia. The anesthetic technique chosen should be associated with a rapid recovery, a high safety profile, and be cost-effective [8]. Commonly utilized drugs include propofol, sevoflurane, desflurane, midazolam,

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ketorolac and other nonsteroidal antiinflammatories, ketamine, fentanyl, remifentanil, meperidine and local anesthetics [6••].

Propofol has been a popular drug for ambulatory surgery since its introduction into the market. Its movement into the office-based practice has been a natural progression. Propofol has a rapid onset, with induction of anesthesia occurring in one arm to brain circulation time. It has a large volume of distribution and a high metabolic clearance. Recovery, primarily by redistribution, is also rapid. Propofol is not associated with nausea and vomiting, and, in addition to its role as an induction agent, it is often used as an infusion for maintenance of both monitored anesthesia care and general anesthesia. Remifentanil is a relatively new narcotic popular in office-based procedures. It too has a rapid onset (1–1.5 min), with a short clinical half-life (3–4 min). It is metabolized by nonspecific plasma esterases via esther hydrolysis. It can be used as either a bolus or an infusion. It has all the positive and negative effects of other narcotics. Since its half-life is so short, however, it does not provide postoperative analgesia. Remifentanil is ideal for highly stimulating procedures that are short-lived. An example is the injection of local anesthesia for a rhinoplasty. In this scenario, injecting the local anesthetic is quite painful, but once injected, systemic analgesia is no longer needed. Caution should be used whenever using remifentanil since, as with other narcotics, apnea is common, as is postoperative nausea and vomiting (PONV).

Ketamine (a phencyclidine derivative) has recently come into favor in office-based practices [5••]. A benefit of ketamine (25–50 mg boluses) is that it will function as a dissociative anesthetic, and will provide analgesia, while maintaining respiratory drive. It has an excellent safety profile, and is not associated with PONV. If used in conjunction with glycopyrolate, an antisialogogue, and midazolam or propofol to decrease the risk of dysphoria, ketamine is an excellent anesthetic choice [6••]. Some practitioners add clonidine (0.1–0.2 mg), an α-2 agonist, to a ketamine regimen. Its mechanism of action, which is the inhibition of sympathetic tone, can be helpful in limiting the increase in blood pressure associated with ketamine use. The decrease in blood pressure it causes will aid in limiting blood loss. Alone, clonidine also provides sedation, and its use has been associated with a decrease in monitored anesthesia care of up to 50% [6••]. Side effects include nausea and orthostatic hypotension.

Any office-based practice must address the issue of PONV, which can delay discharge or even precipitate an unplanned hospital admission. Many investigators recommend employing a multimodal approach to the treatment of PONV [6••,9–11]. This may include metoclopramide, dexamethasone, phenergan, droperidol, and 5-HT3 receptors, such as ondansetron and dolestron. A recent study by Tang *et al.* [12•] questioned the efficacy of the 5-HT3 receptor antagonists. American Society of Anesthesiology (ASA) 1–3 patients undergoing 20–40 min superficial procedures were randomly assigned to one of three treatment groups. All patients received 0.625 mg of droperidol and 4 mg of dexamethasone after induction. The groups were then administered ondansetron 4 mg, dolesetron 12.5 mg, or placebo prior to the end of the procedure. No significant difference was seen in recovery time, time to oral intake, time to ambulation or time to discharge between the groups. There was also no difference in the incidence of PONV, nausea scores or requirement for rescue antiemetics [12•].

Advantages/disadvantages of office-based anesthesia

The advantages to having a procedure done in a physician's office as opposed to a hospital are numerous. While facility fees in a hospital can be expensive and often unpredictable, the costs in an office are controllable and predictable [1,2,5••,13]. Thus, when patients undergo a procedure in an office, they can be made aware of all costs prior to consenting to have the procedure done. These costs typically include the surgeon's and the anesthesiologist's fee as well as the facility fee. Often, medically necessary procedures can be reimbursed by third-party payers [14•]. Other clear advantages of an office procedure are ease of scheduling, patient and surgeon convenience, maintenance of patient privacy, decrease in patient exposure to nosocomial infections, and improved continuity of care, since an office is often staffed by a small group of consistent personnel [2,14•,15••].

In 1997, Morello *et al.* [16] reported an excellent safety record for plastic surgical procedures performed in offices and concluded that the safety record of office surgical suites is comparable to that of a traditional hospital. However, data exist to the contrary. Presently, very few states have regulations in place regarding office-based practices. In office settings, quality of care plans for performance improvement, peer review and emergency preparedness are often missing [2]. Providers of anesthesia care in offices may have varying levels of skills. They may be physician anesthesiologists, nurse anesthetists, surgeons, dental anesthetists, or have no specific anesthetic training [4].

Several poor outcomes have sparked a flurry of media attention towards the potential risks of having an office-based procedure [2,14•,17]. The concerns have been substantiated by the medical literature. A study by Morello *et al.* [18] was conducted via a survey sent to

418 accredited plastic surgical offices, to which they had a 57% response rate. The survey dealt with safety issues such as complications, admissions and deaths. Over a 5-year period, 40 000 office procedures were conducted and, of these, 63.2% were cosmetic and 36.8% were reconstructive. Complications included hemorrhage (0.24%), hypertension (0.1%), wound infection (0.09%), hypotension (0.04%), unplanned hospital admission (0.03%), and re-operation (0.13%), with an overall complication rate of 0.24%. Over this 5-year period, seven deaths occurred, secondary to cerebral hypoxia during an abdominoplasty, a tension pneumothorax during a breast augmentation, a cardiac arrest during a carpal tunnel procedure, a stroke 3 days following a rhytidectomy and brow lift, and one unexplained death [18]. This represents a death rate of approximately 1 in 5000. During the 1980s surgical mortality was approximately 1 in 10 000 anesthetics. Currently, mortality is approximately 1 in 250 000 anesthetics administered in a hospital, and 1 in 400 000 anesthetics administered in a free-standing ambulatory surgery center. Further adding to the significance of these data is that most office-based procedures are performed on younger, healthier patients [17].

Often, many of the safeguards inherent in the hospital system are not present in a surgical office [2,17]. In 2000, the Anesthesia Patient Safety Foundation stated that the level of care in an office should be equal to that in a hospital [19]. This idea was also put forth by the ASA in their recommendations for setting up an office-based practice [20]. Since regulations do not exist in most states, however, any physician who holds a valid license can perform any procedure in his or her office [2]. There have been cases of operating surgeons with no formal training in anesthesia and airway management providing the anesthesia. A surgeon may, in fact, have limited experience in performing the surgical procedure, and not be subjected to peer review [2]. Law suits have been filed for cases in which there was no preoperative history and physical, no necessary blood work, no consent, no intraoperative or postoperative monitoring, or no operative report. Procedures have been performed in areas that do not employ sterile techniques, and in one case a surgeon's pet was present in the operating room [2]. Often the surgeon performing the procedure owns the office, and may put undue pressure on the person performing the anesthetic to proceed with a patient who may not have been optimized for surgery [14•]. Furthermore, there have been cases of serious injuries resulting from old malfunctioning anesthesia machines with ventilators that have not been serviced or alarms that do not work [2].

Candidates for an office-based procedure often include children over the age of 6 months. This patient population is frequently being anesthetized for dental procedures, as dental caries is the number one diagnosis of children who may need surgery in the United States [5••]. Commonly used drugs in dental offices include nitrous oxide and chloral hydrate. This practice is not quite as benign as it may appear to be. It was found that in children 1–9 years of age, 70 mg/kg of chloral hydrate, in conjunction with 30% nitrous oxide, had a 94% incidence of hypoventilation, and when the chloral hydrate was used in conjunction with 50% nitrous oxide, 97% of the patients hypoventilated [5••].

Cote *et al.* [21,22], in conjunction with the FDA, reviewed 95 adverse sedation-related events in pediatric patients. Neurologic injury and death occurred more often during sedations performed in offices rather than in a hospital, even though this group of pediatric patients tended to be older and healthier. Ninety-three percent of the adverse events resulted in permanent neurologic injury or death. Eighty percent of the events presented as respiratory in nature. The reason for failure to rescue varied (Table 1). In cases of neurologic injury or death, the person providing the anesthesia was either an oral surgeon, a periodontist or a certified registered nurse anesthetist supervised by a dentist.

A review of the closed claims database, which incorporates information from 35 liability insurers representing about 50% of the practicing anesthesiologists in the United States, reveals that safety deficiencies exist in some offices [17]. Presently there are 5480 claims; dental incidents are excluded from the database. Of these, 753 are for ambulatory procedures and 14 are office-based. The low number of cases may reflect the 3–5-year lag in reporting [17]. The majority of the claims were filed by ASA 1–2 females who underwent elective surgery with general anesthesia. This parallels the profiles of claims made at large. A disturbing trend is seen when comparing injuries that occurred in an ambulatory surgery center with those that occurred in an office. In ambulatory surgery centers, 62% of the injuries resulted in temporary nondisabling injuries and 21% in death. In an office, however, 21% of injuries were temporary and nondisabling, but 64% resulted in death [17]. Table 2 lists the damaging events that have occurred in the

Table 1. Reasons for failure to rescue

1.	Inadequate resuscitation equipment
2.	Inadequate monitoring, especially pulse oximetry
3.	Human error
4.	Slow recognition of event
5.	Slow intervention
6.	Lack of experience
7.	Drug overdose
8.	Inadequate preoperative evaluation
9.	Inadequate postoperative evaluation

Data from [21,22].

office. When a damaging event did occur, it most frequently occurred intraoperatively. Fourteen percent of the adverse events occurred in the postanesthesia care unit, and 21% occurred after discharge [17]. A disturbing statistic is that 46% of injuries occurring in an office were considered preventable, as opposed to only 13% in an ambulatory surgery center. All of the preventable respiratory events occurred in the postanesthesia care unit, and might have been avoided if pulse oximetry had been employed. Care was considered to be substandard in an office 50% of the time, and in an ambulatory surgery center 34% of the time. Finally, in claims that originated out of an office, financial compensation was awarded in 92% of cases, with a median claim of US$200 000 (range of US$10 000–2 000 000), while for those claims that originated out of an ambulatory surgery center, only 59% of the claims received financial compensation, with a median payout of US$85 000 (range of US$34–14 700 000) [17].

The case of liposuction

A common procedure performed in the office, and one that has received much attention in the media, is tumescent liposuction. This is a procedure that involves 'wetting' of the fat cells, by injecting a hypotonic solution to lyse the adipose cell walls and emulsify the fat [23]. Adding epinephrine (1:1 000 000) to the solution provides hemostasis, thus allowing the emulsion of several liters of fat. Further, adding lidocaine 0.05–0.1% provides postoperative analgesia. The peak serum levels of lidocaine occur 12–14 h after injection, and decline over the next 6–14 h. Although the use of lidocaine is traditionally limited to 7 mg/kg, since the tumescent technique causes a single compartment theory of lidocaine clearance, similar to a sustained release medication, 35–55 mg/kg of lidocaine has been used safely [24,25].

Presently, liposuction is performed primarily by plastic surgeons and dermatologists. A study done by Grazer and deJong [26] in 2000 looked at morbidity and mortality following liposuction. The study was conducted via a survey sent to 1200 aesthetic plastic surgeons, of which 917 responded. The data revealed that between 1994 and 1998 there were 95 deaths out of 496 245 liposuction procedures (Table 3). Complications during liposuction may be secondary to multi-liter infiltration, major third spacing with fluid shifts, pulmonary edema, organ perforation, hypothermia, multiple concurrent procedures, anesthetic effect, lidocaine or epinephrine toxicity, permissive postoperative discharge criteria, or a tight abdominal binder [24–26]. Forty-six percent of the deaths following liposuction were found to occur after an office-based procedure, while 26% occurred after a hospital-based procedure.

Houseman *et al.* [27•] reported that liposuction is safer then the media reports. Their conclusion resulted from a survey sent to 505 of the 517 worldwide members of the American Society for Dermatologic Surgery who perform liposuction. This survey addressed issues such as location of procedure and specific complications over the 7-year period from 1994 to 2000. Two hundred and sixty-one respondents gave information regarding 66 570 liposuction procedures. The mean number of procedures for each practitioner was 255 (0–3014). In this series, no deaths were reported. Serious adverse events included hospitalization, massive infection, abdominal/thoracic wall or viscous perforation, hypotension without shock, hemorrhage, pulmonary embolism, lidocaine toxicity, skin ulceration and anesthesia reaction. Serious adverse events were noted in 36 cases, with the incidence of serious adverse events being higher in patients cared for in hospitals and freestanding surgery centers than those treated in private offices. Of the procedures, 71% were performed in nonaccredited offices. These authors also found a higher incidence of adverse events occurring in patients receiving sedation as opposed to local anesthesia only. They found that the incidence of adverse events correlated with the area of the body being operated on [27•] (Table 4).

Formal guidelines regarding liposuction have been issued by the American Society for Dermatologic Surgery, the American Academy of Dermatology, the American Society for Plastic Surgery and the American Academy of Cosmetic Surgery. Generally, it is recommended that liposuction in an office be limited to 5000 ml of total aspirant to include supernatant fat and

Table 2. Damaging events in the office

1.	Respiratory 50% Includes airway obstruction, bronchospasm, inadequate oxygenation/ventilation, and esophageal intubation
2.	Cardiovascular 8%
3.	Equipment related 8%
4.	Drug related 25% Includes incorrect drug/dose, allergy or malignant hyperthermia
5.	Blunt needle trauma

Data from [17] (previously published).

Table 3. Causes of death during liposuction

1.	Pulmonary embolism 23.1%
2.	Abdominal viscous perforation 14.6%
3.	Anesthesia related 10%
4.	Fat embolism 8.5%
5.	Cardiorespiratory failure 5.4%
6.	Massive infection 5.4%
7.	Hemorrhage 4.6%
8.	Unknown or confidential 28.5%
9.	Overall death rate 19.1 per 100 000 cases, 1 in 5000

Data from [26] (previously published).

Table 4. Complications during liposuction by treated area

1.	Abdomen 72%
2.	Buttocks and lower extremities 39%
3.	Upper extremities 3%
4.	Upper back 14%
5.	Lower back 8%
6.	Head and neck 6%

Data from [27•] (previously published).

fluid. A Foley catheter should be inserted if more than 4000 ml of liposuction is proposed, and concurrent procedures should be avoided if volume of aspirant is large [7••,25].

Rules, regulations and accreditations

In most states, accreditation of a surgical office is voluntary; however most third-party payers will not reimburse a facility fee if the office is not accredited [14•]. Presently, there are three nationally recognized agencies that can accredit a surgical office: the American Association for Accreditation of Ambulatory Surgical Facilities, the Accreditation Association for Ambulatory Health Care and the Joint Commission for Accreditation of Healthcare Organizations. These organizations address issues such as the physical design of the office, emergency power, staffing, policies and procedures, preoperative assessment, patient consent, monitoring (preoperatively, intraoperatively, and postoperatively), documentation, patient recovery and peer review. The agencies all have slightly different criteria as well as accreditation cycles [28••]. Many professional societies are encouraging their members to perform surgical procedures only in accredited facilities. The Society for Aesthetic Plastic Surgeons set a deadline of July 2002 for all its members to operate solely in offices accredited by one of the three accrediting organizations or an equivalently recognized accrediting organization, in an office certified to participate in the Medicare program under Title XVIII, or in an office licensed by the state.

Currently, regulations exist for office-based standards in California, Florida, New Jersey, Ohio, Pennsylvania, Illinois and Texas, and are under consideration in New York, Rhode Island, Connecticut, Georgia, North Carolina, and Wisconisin [5••]. It is often difficult to place regulations on offices that may have been providing care for many years without incident. Regulations are sometimes viewed as political in motive and may be delayed in court. In a recent article, restrictions made in an office were interpreted as 'under the guise of patient safety, in some states the regulatory efforts have been driven by politically motivated physician anesthesiologists seeking to needlessly restrict their competition in an attempt to monopolize an ever expanding marketplace for anesthesia services' [3, pp. 113].

California was one of the first states to place safety regulations on offices providing surgical care [2]. Section 1248-1248.85 of the California Health and Safety Code requires that offices be accredited by a recognized agency. An office that fails to comply may be subjected to sanctions ranging from a reprimand to criminal or monetary charges. The office must have adequate patient monitoring, and a system for maintaining patient records. California regulations require that practicing physicians have either admitting privileges in a local hospital or that a written transfer agreement is in place with a physician who does. There must be an emergency transfer policy in place with a local hospital, which is consistent with the hospital's peer review and a performance improvement plan. California law only applies to patients undergoing a general anesthetic (loss of airway protection, and/or consciousness), and not to patients undergoing straight local, conscious sedation or nerve blocks.

New Jersey has regulations in place that apply to offices providing all levels of anesthesia. Their regulations require that a provider of general anesthesia be credentialed by a hospital, and that only a credentialed physician supervise certified registered nurse anesthetists. New Jersey law permits only ASA 1 or 2 patients to undergo general anesthesia. ASA 3 patients may only undergo conscious sedation [2]. New Jersey law makes specific requirements as to what monitoring and emergency equipment/drugs must be present in an office. The law also has specific requirements regarding policies and procedures, physician credentialing, documentation and peer review. Violations are dealt with as professional misconduct and could subject the physician to reprimand, license revocation or fines. Severe violations may result in criminal prosecution.

Safety recommendations

In August 2000, the state of Florida, in response to several well publicized deaths and injuries involving patients undergoing office-based procedures, imposed a 90-day moratorium on offices performing anesthetics more invasive than conscious sedation [7••,14•]. During this time a safety panel consisting of surgeons, anesthesiologists, and other health care professionals was formed and charged with the responsibility of developing recommendations to improve the safety of office surgery. The panel made recommendations regarding selection of patients, with an emphasis on history and physical (including stratification of the risk of thromboembolism), as well as preoperative laboratory testing [15••]. Recommendations were also made regarding surgeon qualifications and facility standards [15••]. Finally, recommendations dealing with procedures to be done, and complications to anticipate, including hypothermia, blood loss and concurrent procedures, were given [7••].

In addition, many professional societies have independently developed recommendations. Societies that have been particularly active include the ASA, the American Society of Plastic Surgery, and the American Association of Nurse Anesthetists. Each has developed voluntary rules for their members [4,7••,15••,20,29].

Generally, all safety recommendations involve the patient, the procedure and the facility. The anesthesiologist should play a vital role in keeping office practices safe [4]. Prior to an anesthetic being delivered, the anesthesiologist should ensure that the patient has had an adequate preoperative evaluation including all pertinent labs and consultations. The patient should be given an informed consent for surgery and anesthesia. The office should be equipped with age and size appropriate resuscitation equipment and drugs [21,22]. There should be a means available to deliver positive pressure ventilation, and all equipment should be regularly maintained. If a ventilator is being used, it should be regularly serviced and maintained, and air quality testing should be done routinely. All components of the ASA algorithm for the difficult airway should be available. Intraoperative and postoperative monitoring and documentation must adhere to the ASA guidelines [20]. The office must have an oxygen supply with back up as well as suction. All drugs must be routinely checked for expiration dates. A defibrillator should be present with a routine battery check. Likewise all monitors should be routinely serviced and calibrated.

In designing an office suitable for surgery, at a minimum, it should have a policy and procedure manual that outlines issues such as emergency planning, infection control, staffing, documentation, peer review and quality assurance. There should be a 1 h firewall present as well as a back-up emergency generator. There should always be predetermined criteria for discharge based upon peer reviewed literature [30,31]. Most societies agree that the office should be accredited [4].

The surgeon must also be qualified to do a procedure in an office. The surgeon must be licensed and should be credentialed to do the procedure in a hospital, or have training and documented proficiency comparable to that of a surgeon who does. The surgeon should be either board eligible or board certified by a recognized member of the American Board of Medical Specialties [7••], and have adequate malpractice insurance.

Not all patients or procedures are suitable for an office setting. Inappropriate patients would include ASA 4s, patients with brittle or poorly controlled diabetes, substance abusers, patients with a seizure disorder or who are malignant hyperthermia susceptible, patients who are morbidly obese, those who have a history of obstructive sleep apnea, and those with no escorts home [4,15••,32••,33••]. There is no good scientific evidence to exclude specific procedures from the office. One must consider, however, such possibilities as hypothermia, intraoperative blood loss, significant fluid shifts, and duration of the procedure [7••].

Conclusion

OBA is a rapidly developing field of medicine. It can provide great convenience to both the patient and the physician, and save costs. As this system matures it is our responsibility to ensure that patient safety is never compromised.

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