Can J Anesth/J Can Anesth (2010) 57:256–272
DOI 10.1007/s12630-009-9238-z

REVIEW ARTICLE/BRIEF REVIEW

Office-based anesthesia
L'anesthésie en cabinet

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Received: 11 September 2009 / Accepted: 18 November 2009 / Published online: 15 January 2010

Abstract

Purpose *Ambulatory office-based anesthesia (OBA) is a relatively new but rapidly growing field. OBA requires a different approach than that used in the hospital, because there are unique considerations that must be recognized when administering anesthesia in a free-standing office facility. This review provides a summary of the important issues and aspects of safe patient care.*

Methods *The Medline, Embase, Biological Abstract, Science Citation Index, and Healthstar databases were searched under the key words "office-based anesthesia" for relevant English language articles from 1966 to December 2008. Relevant publications were queried from governing institutions, such as the American Society of Anesthesiologists (ASA), as well as from colleges in various provinces across Canada.*

Principal findings *Office-based anesthesia remains poorly regulated in many parts of Canada (and the US). Despite continuing concerns regarding patient safety, the rates of death and reported major complications for OBA appear to be very low, especially in accredited facilities. Multiple considerations for facility design, administration, and patient care need to be taken into account.*

Conclusion *Appropriately so, an increasing number of provinces (Canada) and states (US) are beginning to regulate office-based facilities and require accreditation.*

Résumé

Objectif *L'anesthésie ambulatoire en cabinet (OBA) est un domaine relativement nouveau mais qui prend rapidement de l'essor. L'OBA requiert une approche différente de celle utilisée en hôpital étant donné qu'il faut tenir compte de certaines particularités uniques lorsqu'on administre une anesthésie dans un établissement tel qu'un cabinet autonome. Cet article présente un résumé des problèmes et aspects importants à prendre en considération pour prodiguer des soins sécuritaires aux patients.*

Méthode *Des recherches ont été menées dans les bases de données Medline, Embase, Biological Abstract, Science Citation Index et Healthstar avec les mots-clés « office-based anesthesia » afin d'extraire les articles pertinents publiés en anglais entre 1966 et décembre 2008. Les publications pertinentes ont été récupérées d'institutions en place telles que l'American Society of Anesthesiologists (ASA) ainsi que de collèges de diverses provinces canadiennes.*

Constatations principales *L'anesthésie en cabinet demeure peu réglementée dans de nombreux endroits au Canada (et aux États-Unis). En dépit de préoccupations constantes quant à la sécurité des patients, les taux de mortalité et de complications majeures rapportées lors d'OBA semblent très bas et ce, particulièrement dans des établissements certifiés. De nombreuses considérations concernant la conception de tels établissements, leur administration et la sécurité des patients doivent être prises en compte.*

Conclusion *Un nombre croissant de provinces (au Canada) et d'états (aux États-Unis) commencent, bien à*

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propos, à réglementer les installations en cabinet pour l'anesthésie et à demander qu'elles soient certifiées.

Introduction

Office-based anesthesia (OBA) refers to anesthesia provided in locations that are not approved under various legislations as public hospitals, private hospitals, or independent facilities (in Ontario, refer to the Public Hospitals Act).[1] In Canada, these locations include various medical, dental, oral, and plastic surgery/cosmetic offices (traditional OBA). For the purpose of this review article, we also include those out-of-hospital locations designated, licensed, and accredited by provincial authorities as "non-hospital surgical facilities" (NHSFs). In Ontario, all of these locations are collectively referred to as "out-of-hospital facilities" (OHFs). In the US, OBA usually refers to physicians' offices that perform surgery/procedures under anesthesia within the regular private office practice. This is distinct from the traditional free-standing ambulatory surgical centres (ASCs, otherwise known as "surgicentres") that are licensed facilities that provide surgical care almost exclusively and are often fully accredited.

Office-based anesthesia has experienced an exponential growth over the last decade, and it is estimated that up to 55% of all ambulatory procedures in the US are currently performed in free-standing facilities (40% in ASCs and 15% in offices).[2] As newer surgical and anesthetic techniques are being developed, more procedures, some of them with increasing degrees of invasiveness, are being performed outside of hospitals. This rapid growth is driven primarily by perceived economic advantages, i.e., reimbursement plus increased efficiency, as well as physician and patient conveniences. The advantages of surgery outside the hospital include personal attention, care, service, aftercare, ease of scheduling, greater privacy, lower cost, increased efficiency, decreased nosocomial infection, and consistency in nursing personnel.[3] In Canada, the limitations on reimbursement of facility fees to most facilities outside hospitals is a result of provincial health insurance regulation. Undoubtedly, this has limited the growth of OBAs compared with expansion in the US. While currently there are no statistics on the total number of procedures performed in out-of-hospital facilities in Canada, the two provinces with a well-established mechanism for oversight alone (Alberta and British Columbia) report approximately 140 operational out-of-hospital facilities.[A]

[A] Personal communication with Ms. Tracey Lubkey (March 2009), Accreditation Coordinator, Clinical Services, College of Physicians and Surgeons of Alberta (CPSA) and Mrs. Pat Fawkus (March 2009), Program Director, NHMSF, College of Physicians and Surgeons of British Columbia (CPSBC).

Out-of-hospital anesthesia requires a different approach than that used in the hospital. There are special considerations that must be recognized when administering anesthesia in offices. Regulations are often few or nonexistent and there is little oversight or control. The anesthesiologist must often practice completely independently without back-up, consultation, or clinical assistance and with a relative lack of ancillary support. Each practice should be examined with vigilance, and the steps needed to provide safe perioperative care should be discussed with the surgeon. The assessment should include inspection of the facility, evaluation of the anesthesia work area, as well as ensuring compliance with applicable laws, codes, and regulations. The anesthesiologist should take reasonable steps to ensure that established policies and procedures regarding fire, safety, drugs, emergencies, staffing, training, and unanticipated patient transfers are in place. It should be emphasized continuously that the standard of care should be no less than that of a hospital.[4]

For this review article, we have searched the Medline, Embase, Biological Abstract, Science Citation Index, and Healthstar databases under the key words "office-based anesthesia" for relevant English language articles from 1966 to December 2008. Relevant publications were queried from governing institutions, such as the American Society of Anesthesiologists, as well as Colleges in various provinces across Canada.

Administration and facility

Quality of care

Despite the continuing growth of office-based anesthesia, there remains a significant lack of oversight and regulations in this field. Currently, only 25 US states and two provinces in Canada (the College of Physicians and Surgeons of Alberta [CPSA][5] since 1998 and the College of Physicians and Surgeons of British Columbia [CPSBC][6] since 2007) have fully functional regulations in place regarding OBA.

A large number of documents from a variety of sources cover various aspects of office-based surgery and anesthesia, including regulations regarding local building codes, fire regulations, and occupational health and safety standards. It is beyond the scope of this review to cover all related rules and guidelines, though interested readers may consider studying one of the various available textbooks[7-9] as a starting point before familiarizing themselves with the other applicable regulations.

Several relevant guidelines by the American Society of Anesthesiologists (ASA) are available on the Internet.[10-14] The ASA Committee on Ambulatory Surgical Care and the ASA-SAMBA Task Force on Office-Based Anesthesia

have assembled a comprehensive information manual[15] on OBA entitled *Office-based Anesthesia: Considerations for Anesthesiologists in Setting Up and Maintaining a Safe Office Anesthesia Environment*. The ASA manual is intended to provide "nuts and bolts" advice and resources, recognizing that the actual regulation and accreditation of most out-of-hospital anesthesia is increasingly conducted at a state (US) or provincial (Canada) level.

An increasing number of states in the US require accreditation that is conducted by one of the three major accrediting bodies, i.e., the Joint Commission,[B] the Accreditation Association for Ambulatory Health Care (AAAHC),[C] or the American Society for Accreditation of Ambulatory Surgical Facilities (AAAASF).[D] In Canada, both the CPSA (Alberta) and the CPSBC (British Columbia) have their own inspection and accreditation process. The College of Physicians and Surgeons of Saskatchewan (CPSS) is in the process of updating existing bylaws and setting the legal framework for the operation of out-of-hospital facilities and likely will rely on the process and standards already adopted in Alberta.[E] The College of Physicians and Surgeons of Ontario (CPSO) is currently developing standards for out-of-hospital facilities that are based on the CPSO's Independent Health Facility (IHF) assessment program and will take effect upon enactment of regulations supporting provincial legislation, possibly in early 2010.[F] The Collège des Médecins du Québec is also in the process of establishing the legal framework for the regulation of extra-hospital surgery, which is anticipated to take effect in 2010. There is also a third national (voluntary) accreditation organization, the Canadian Association for Accreditation of Ambulatory Surgical Facilities (CAAASF),[G] that focuses mainly on plastic surgery offices. The CAAASF is not related to the AAAASF.

Several important guidelines and recommendations for out-of-hospital anesthetic care are reviewed in the following section. Most of the following information is based on the Non-Hospital Surgical Facility Standards and Guidelines from the College of Physicians and Surgeons of Alberta. Their document represents one of the first attempts to regulate OBA in Canada (as of 1998), and it has also served as the template for the guidelines in British Columbia. The applicability to other provinces in Canada remains to be determined. In Table 1, several sections of the standards and guidelines from the CPSA are listed and compared with the guidelines from the ASA and the Massachusetts Medical Society (the latter were published in 2004 after guidelines from many other states were reviewed, and thus it serves as one example for state regulations in the US). Another resource in the US is the Federation of State Medical Boards (FSMB), which approved a model guideline in 2002 comprised of three proposed pathways stating that medical boards can adapt either separately or in combination for oversight of OBA in unregulated settings.[16] The Guidelines to the Practice of Anesthesia published by the Canadian Anesthesiologists' Society (CAS) currently contains limited specific recommendations for out-of-hospital locations ("The anesthetic and recovery facilities shall conform to hospital standards published by the CSA as defined in other sections.") and thus was not specifically tabled for comparison.[4]

Facilities are required to undergo a formal accreditation process. An annual fee is payable and accreditation has to be renewed through a process of re-accreditation. All health care professionals should possess and maintain adequate professional liability protection. The accountability and liability of regulated (and non-regulated) professions within collaborative care teams can pose challenges and require careful consideration. Documentation and records have to be maintained, including personnel records, medical records, incident reports, and a comprehensive policy and procedure manual, which should be updated on a regular basis. A formal administrative structure for the facility is required, including a Medical Director who should strive to provide safe and effective patient care and ensure compliance with all requirements. Health care providers, such as physicians intending to administer anesthesia, have to meet certain qualifications and apply for privileges to be granted by the regulatory authorities, i.e., the College. These privileges must be

[B] *The Joint Commission*. One Renaissance Blvd, Oakbrooke Terrace, IL 60181, Tel: (630) 792-5000, Email: First letter of person's first name plus entire last name@jointcommission.org Available from URL: www.jointcommission.org (accessed November 2009).

[C] *Accreditation Association for Ambulatory Health Care (AAAHC)*. 5250 Old Orchard Road, Suite 200, Skokie, IL 60077, Tel: (847) 853-6060, Email: info@aaahc.org (Source for Accreditation Handbook of Ambulatory Health Care). Available from URL: www.aaahc.org (accessed November 2009).

[D] *American Association for Accreditation of Ambulatory Surgical Facilities (AAAASF)*. Manual for Accreditation of Ambulatory Surgical Facilities. 1998. P.O. Box 9500, Gurnee, IL 60031, or 5101 Washington St, Suite 2F, Gurnee, IL 60031, Tel: (888) 542-5222, Email: infor@aaaasf.org; Available from URL: www.aaaasf.org (accessed November 2009).

[E] Personal Communication with Bryan Salte (May 2009), Associate Registrar, College of Physicians and Surgeons of Saskatchewan (CPSS).

[F] Personal Communication with Robin Reece (April 2009), Project Manager, Out-of-Hospital Facility Program, College of Physicians and Surgeons of Ontario, CPSO.

[G] *Canadian Association for the Accreditation of Ambulatory Surgical Facilities (CAAASF)*. 2334 Heska Road, Pickering, Ontario L1V 2P9, Tel: (905) 83-5804, Email: CSACPS@sympatico.ca; Available from URL: http://www.caaasf.org/.

Table 1 Comparison of the standards and guidelines from the CPSA, ASA and the Massachusetts Medical Society

Item	CPSA (Canada)	ASA (USA)	Massachusetts Medical Society (USA)
Facility Classification	Uniform for all non-hospital diagnostic and treatment facilities (*iv* sedation, major regional block or GA)	Refers to Level I-III (complexity of surgery) and Level A-C (level of anesthesia): Level A: topical/local Level B: oral/*iv* sedation Level C: GA/regional Note: AAAASF restricts the use of propofol to class C facilities	Level I: Minor procedures, topical/local anesthesia (minimal preoperative oral antianxiety medications) Level II: minimal or moderate intravenous or intramuscular sedation/analgesia, intraoperative and postoperative monitoring necessary Level III: deep sedation/general anesthesia, or major conduction blockade
Dental	If facility owned and operated by dentist, accreditation relates to practice of medicine/anesthesia only (dentist is responsible for surgical standards and administration). Safe care of patients in facility shall be satisfied	Delivery of safe office-based anesthesia requires special attention to the office facilities.	Not specifically addressed
Accreditation	Through CPSA, limited to four years, may be renewed through same steps as initial accreditation Note: Annual fee applies	Referred to state regulation; imperative that all practitioners maintain high standard	Must obtain accreditation appropriate for level from approved agency (level II and III)
Anesthesiologist (GA)	Either: recognized specialist -and- active staff privileges or ACLS or: approved to give anesthesia as non-specialist -and- active staff privileges (incl. anesthesia privileges) and ACLS	Anesthesiologist participation optimally desirable (see separate guideline from ASA[24]); if other supervising practitioner or physician, anesthesiologist participation is desirable. Provider should be trained in sedation, anesthesia, and rescue techniques. Recommended current ACLS and hands-on airway training	Supervisor of administration of anesthesia by a CRNA must have sufficient knowledge of the anesthetic technique specified by him or her for the procedure to provide appropriate medical direction of the anesthetic. If the surgeon does not possess the requisite knowledge of anesthesia, the anesthesia should be administered by an anesthesiologist or by a Certified Registered Nurse Anesthetist supervised by an anesthesiologist. At least one health care professional who is immediately available shall have completed ACLS within the previous two years.
Anesthesiologist (*iv* sedation)	Either: Qualified to administer GA or completed training for *iv* sedation and provide acceptable evaluation -and- hold current ACLS -or- have immediate access to code team (at least one MD and one RN, each ACLS)	Anesthesiologist participation is desirable. Provider should be trained in sedation, anesthesia, and rescue techniques. Recommended current ACLS and hands-on airway training	Anesthesia administered or supervised only by individuals competent to deliver conscious sedation and to assist in any support or resuscitation measures as required. At least one health care professional who is immediately available shall have completed ACLS within the previous two years.

Table 1 continued

Item	CPSA (Canada)	ASA (USA)	Massachusetts Medical Society (USA)
Facility General	Shall comply with all applicable building codes	See specific sections	Referred to accreditation process
Facility Fire	Shall comply with all applicable fire regulations and meet or exceed standards in Alberta Fire Code	If no state regulation exists, general health fire and safety provisions apply. Facilities may not meet National Fire Protection Association (NFPA) 99 Health Care Facilities standards: -evacuation plans, including non-ambulatory patients, elevator use -air handling of potentially toxic fumes Anesthesiologist should develop procedures, policies, and protocols. Fire drills should be rehearsed and maintained.	Referred to accreditation process
Facility Medical Gases	Shall be designed, installed, and tested according to building codes and verified by Safety Officer	NFPA description of level 1, 2, and 3 gas supplies in health care facilities are not required in office setting unless indicated by accrediting organization. Reference to Compressed Gas Association (CGA) and Department of Transportation (DOT) and other local and state regulations regarding transport of gases (such as in a motor vehicle). Waste gases should not re-enter living space. Disposal of waste gases should be assessed	Referred to accreditation process
Facility Equipment	Anesthetic equipment: refers to CSA standards	Five areas should be reviewed: -anesthesia equipment should be fully factory supported -anesthesia machines should not be obsolete according to ASA standards -back-up power for life-support equipment should be in place -back-up power systems should be tested regularly -in the absence of line-isolation monitors, ground fault circuit interrupters can be used	Via accreditation process
Facility Drugs	For GA and Major Regional Blocks: Required Drugs listed, including: -Dantrolene enough for first dose Recommended incl.: -Amiodarone For *iv* sedation: -oral ASA and NTG -inhaled salbutamol -*iv* atropine, Benzodiazepine, Diphenhydramine, Epinephrine, and Naloxone (if parenteral narcotics are used)	Listed, includes; -dantrolene 36 vials wherever MH trigger agents are in use -amiodarone	Drug requirements are identical for Level II and III facilities, include: -Minimum of 20 ampoules of dantrolene if known triggering agents are administered (includes Sux and inhaled agents), rapid procurement of 600 more milligrams -amiodarone

Table 1 continued

Item	CPSA (Canada)	ASA (USA)	Massachusetts Medical Society (USA)
Facility Electrical	Shall meet or exceed CSA standards for Canadian Electrical Code, Electrical Safety in Patient Areas, and Essential Electrical Systems for Hospitals Should have back-up power for anesthetic equipment	In the event of (power) failure another source of vacuum must be available. Suggest to review: -NFPA documents to determine need for back-up power systems and type. Should provide 90 minutes of back-up power to life-saving and resuscitative equipment. -emergency power should be periodically maintained and tested, incl. generator if applicable -in the absence of line isolation monitors, ground fault circuit interrupters should be used to limit shock hazard.	Via accreditation.
Facility Infection Control	Occupational Health and Safety Act applies, incl.: -staff immunizations -universal precautions -ethical obligation to know serologic status (hepatitis B/C and HIV) if performing exposure-prone procedures -airflow and quality maintenance -sterilization and disinfection -housekeeping and waste management	CDC recommendations regarding multi-dose vials should be followed as well as CDC's universal precautions. Suggestions include: -dedicated area for sterilization with quality control -procedures for training personnel -protective clothing to be worn during surgery -special procedure for patients with transmittable disease -procedures for occupational health and blood born pathogen standard, including employee protection against injuries Occupational Safety suggestions refer to other standards and guidelines, including OHSA	Should comply with state and federal regulations and should meet current OSHA requirements.
Preoperative	ASA III and IV only if patient's disease entity could not reasonably be expected to be affected adversely by anesthetic or procedure. Discussion and documentation required. History and physical required within 90 days prior to planned procedure	For ASA III and IV patients, a direct consultation with anesthesiologist is warranted History and physical required within 30 days prior to planned procedure or as per state legislation It is not advisable to anesthetize MH-susceptible patients if no immediate access to blood gas, electrolyte measurement, and medical back-up.	ASA III only if qualified physician assessed impact on anesthesia and surgical risk History and physical required within 30 days prior to planned procedure.
Intraoperative	Standard procedure and monitoring, including (if applicable): -pulse oximeter with audible signal -Endtidal CO_2 (if ETT or LMA) -BP -ECG -Agent specific monitor	Refers to other relevant standards and guidelines by ASA	Refers to other ASA standards and guidelines. Otherwise standard procedure and monitoring, including (if applicable): -BP -Pulse oximeter -ECG -CO_2 for all GAs, strongly recommended for all moderately and deeply sedated patients -Temperature

Table 1 continued

Item	CPSA (Canada)	ASA (USA)	Massachusetts Medical Society (USA)
Postoperative	Care by anesthesiologist or RN trained in recovery room (incl. ACLS/PALS if $\leq$ 8 years old) Patient to meet documented pre-determined recovery criteria using a validated grading system (reference to Aldrete score) and anesthesiologist (or other physician qualified to administer *iv* sedation of anesthesia) to remain on premises	Staff need to be appropriately trained. Relevant ASA standards apply. Discharge: refers to Modified Aldrete Score and Fast-Tracking Criteria as well as ambulatory discharge criteria.	Care may be transferred to qualified health care personnel. Discharge criteria to be met.
Policy and Procedure Manual	Comprehensive Manual required	Reference to maintenance of a Policy and Procedure Manual	Comprehensive Manual required
Records	To be kept minimum 10 years following last service and after patient reaches majority (dependant adults indefinitely)	Records must be kept by both facility and provider according to state regulations	Not specifically addressed
Quality Improvement	Incident reports required and annually reviewed by facility director Reportable incidents to College within one working day: -deaths within 10 days -facility transfer -unexpected admission within 10 days -clusters of infections -procedural errors (wrong patient, site, or side)	Anesthesiologist should participate in quality improvement and risk management activities: -should consider peer review, benchmarking and complications -review of morbidity and adverse/sentinel events -patient satisfaction -annual review with written notes and conclusions	Performance improvement should be implemented. Board of Registration in Medicine rules regarding reporting of adverse incidents should be followed.
Patient Safety	Mock Drills required and documented every 6 months: -Fire -Power loss -Equipment failure -Arrest -Anaphylaxis -MH -Intruder -Emergency transfer	Site visit should be conducted prior to anesthesia to evaluate compliance with relevant ASA guidelines. Quality improvement should include at least annual equipment check Emergency protocols require at least annual drills Specific Disaster Designee assumes responsibility for: evacuation	
Obstructive Sleep Apnea	Not specifically addressed	Not specifically addressed	Not specifically addressed

Table 1 continued

Item	CPSA (Canada)	ASA (USA)	Massachusetts Medical Society (USA)
Pediatric Patients	Not specifically addressed Note: CPSA by-law states that surgery/anesthesia may not be performed in children ≤ 18 months of age in NHSFs	In an office where anesthesia services are provided to infants and children, the required equipment, medication, and resuscitative capabilities should be appropriately sized for a pediatric population. The child should be in good health and should be at least 4–6 months old. The ex-premature infant is not a good candidate. Children with moderate-to-severe reactive airway disease are best excluded.	Not specifically addressed
Liposuction	Liposuction to a maximum of 5 litres total aspirate	Fluid replacement for Superwet/Tumescent Liposuction should be maintenance only for volumes up to 5000 mL. Above 5000 mL consider inpatient *vs* outpatient venue.	Not specifically addressed
Obesity	Not specifically addressed	Not specifically addressed	Not specifically addressed

Comparison of the standards and guidelines from the College of Physicians and Surgeons of Alberta (CPSA), American Society of Anesthesiologists (ASA), and the Massachusetts Medical Society. GA = general anesthesia; ACLS = Advanced Cardiac Life Support; PALS = Pediatric Advanced Life Support; CSA = Canadian Standards Association; NTG = nitroglycerin; MH = malignant hyperthermia; CRNA = Certified Registered Nurse Anesthetist; ETT = endotracheal tube; LMA = laryngeal mask airway; BP = blood pressure; ECG = electrocardiogram; CDC = Centers for Disease Control and Prevention; OHSA = Occupational Safety and Health Administration; NHSF = non-hospital surgical facility; NFPA = National Fluid Power Association

reviewed for renewal on an annual basis and include a review of immunization status. Note: several jurisdictions in Canada have adopted policies with respect to health care workers' ethical obligations to know their own serological status for hepatitis and HIV. This would apply to out-of-hospital facilities as well.

Numerous cases of hepatitis B and C patient-to-patient transmission have been documented in non-hospital facilities. The re-use of syringes and needles during sedation and anesthesia was implicated, and the trend was thought to parallel the migration of care from acute-care hospitals to non-hospital care settings.[17] Adherence to occupational health standards is expected, and infection prevention measures are enforced along with strict aseptic techniques. Air flow and quality need to be monitored and maintained. Pre-processing, sterilization, and disinfection will be scrutinized as well as housekeeping and waste management, including adequate handling of sharps.

Out-of-hospital surgical facilities are expected to have a formal quality improvement program. While an annual review (at least) of incident reports (with documentation of corrective actions taken) will be an internal process, the medical director should be familiar with the reporting requirements for certain adverse events that may require a formal report to the appropriate regulatory authorities for their review. Currently, the facilities in Alberta are required to report the following situations to the Quality of Care Department of the College: any death, transfer, or admission to a hospital occurring within ten days of a procedure, as well as clusters of infections or procedures performed on the wrong patient, site, or side. The ASA has suggested quality improvement activities, including a comprehensive list of adverse events to be reviewed, which are listed in Table 2. The anesthesia provider should participate in the ongoing quality improvement activities in each facility.

Facility considerations

Anesthesiologists should personally inspect facilities (this extends beyond the responsibility of the medical director) before providing care, and they should be prepared to assume additional responsibilities to ensure patient safety with respect to facility standards, e.g., air and gas exchanges, environmental safety, etc. Various standards have been published in Canada that address good engineering practice for health care facilities. Some of the relevant standards are listed in Table 3. Standards for operating and recovery rooms are defined; back-up equipment must be available, and a minimum inventory of miscellaneous supplies and medications must be on-site and maintained. All equipment must meet Canadian Standards Association (CSA) level of quality.

Table 2 Examples of adverse events to be reviewed in office-based anesthesia

- Death, cardiac or respiratory arrest
- Re-intubation (unplanned)
- Central or peripheral nervous system deficit
- Myocardial infarction
- Pulmonary edema or aspiration pneumonia
- Anaphylaxis or adverse drug reaction, including drug errors
- Postdural puncture headache
- Dental injury
- Eye injury
- Surgical infection or excessive blood loss
- Unplanned admission
- Wrong procedure, patient, surgical or regional block site

Adapted from reference 15

Health care facilities' requirements for electrical safety are defined by the Canadian Electrical Code (CEC) and by the Canadian Standards Association (CSA).[H] They include requirements for specifications for electrical equipment and devices and building electrical systems, including receptacles, grounding, and ground fault interrupters and requirements for essential electrical systems, including emergency lighting and power supply. Procedures involving deep sedation/general anesthesia performed in physicians' offices ("critical care area" CSAZ32-04 section 4.2.6.1.(c)) require the same standard as operating rooms.[I] Each practitioner should take appropriate steps to ensure **c**ontinuity of electrical power as well as protection against electrical shock hazards.

Building design and construction are regulated by National Building and Fire Codes that are adopted by the provinces with their own modifications and are enforced at the municipal level. Building codes contain specific requirements applicable to the type and use of buildings, including hospitals, offices, industrial buildings, etc. However, when an office building has facilities to treat out-patients, i.e., no sleeping accommodation for more than 24 hrs, additional safety features for the treatment areas may not have been applied to the building design and construction. In the case of hospitals, some of the requirements that generally apply include sprinkler protection throughout, fire separation of floor areas into two zones for horizontal evacuation of patients, wider corridors and stairs, fire separation of sleeping rooms and corridors, and additional requirements for operating rooms, recovery rooms and intensive care units, including fire separations and dedicated/protected air supply and elevators to accommodate stretchers in a horizontal position.

Fire safety in medical offices outside the hospital is not solely a theoretical concern – from 2005 to 2007, the Ontario Fire Marshal's Office reported an average of 13 fires (with loss) per year in Ontario regarding dental/medical offices alone (with an average of one injury per year).[J] The health care facility should have a detailed coordinated fire safety plan in place, which health care providers should carefully review in order to provide for patients' safety in the event of a fire and/or emergency evacuation.

Clinical care

Patient and procedure selection

Anesthetic care is expected to meet all current hospital standards. Selection may be questioned for all but ASA I and II patients. Patients whose pre-existing medical conditions may pose perioperative complications or interventions beyond the office resources should have their procedures performed in a hospital-based facility. The offices should have guidelines that include criteria for patient selection that account for the condition of the patient, specific medical conditions (including the management of patients with obstructive sleep apnea), and the intrinsic risk or invasiveness of the procedure. Several factors should be considered when deciding whether office-based anesthesia should be provided[15] (Table 4). A complete preoperative work-up as well as a pre-anesthetic assessment are required. It may be of interest that a recent publication has questioned the use of routine preoperative laboratory testing for healthy patients undergoing ambulatory surgery in a hospital outpatient department.[18] The patient must be given an adequate explanation about the nature of the proposed investigation or treatment and its anticipated outcome as well as the significant risks involved and alternatives available. The information must be such as will allow the patient to reach an informed consent decision, and this dialogue should be documented in the patient's chart along with the signed consent form.

[H] *Canadian Standards Association (CSA).* Electrical safety and essential electrical systems in heath care facilities. Document Z32-04 published Canadian Standards Association (CSA), 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4 W 5N6; Tel: 1-800-463-6272; 2004.

[I] Personal Communication with Prof. Alfred Dolan (April 2009), Chair, Technical Committee on Application of Electricity in Health Care, Institute of Biomedical Engineering, University of Toronto, Ontario.

[J] Personal Communication (April 2009) Angela John, Office of the Fire Marshal, Ontario.

Table 3 Selected Standards from Canadian Standards Association (CSA): Canadian Electrical Code, Application of Electricity in Health Care and Health Care Facility Engineering

Category	Standard	Title	Selected Topics
Electrical	C22.1-09	Canadian Electrical Code (CEC) Part I	Section 24: Patient Care Areas: Grounding, Branch Circuits, Receptacles, Essential Electrical Systems, Emergency Supply
Application of Electricity in Health Care:	Z32-04	Electrical Safety and Essential Electrical Systems in Health Care Facilities	Patient Area Classification, Electrical Safety Program, Medical Electrical Equipment, Receptacles, Isolated Power (not required), Essential Electrical Systems
Health Care Facility Engineering	Z317.1-09	Special Requirements for Plumbing Installations in Health Care Facilities	Infection Control, Water Supply and Testing, Hot Water Systems, Drainage, Sanitary Systems, Hazardous Waste, Fixtures and Fittings
Health Care Facility Engineering	Z317.2	Special Requirements for Heating, Ventilation, and Air Conditioning	Ventilation, Air Exchange and Relative Pressurization, Air Quality, Infection Control, Fire Safety, Exhaust Systems, Smoke Management
Health Care Facility Engineering	Z317.5	Illumination Systems in Health Care Facilities	Light Sources, Luminaries, Switching, Task Lighting, Glare, Light Loss, Specific Areas (incl. Corridors, Surgical Areas, Recovery Rooms, Indoor Ramps and Corridors, Parking Areas), Emergency Lighting

Selected Standards from Canadian Standards Association (CSA): Canadian Electrical Code, Application of Electricity in Health Care, and Health Care Facility Engineering

Table 4 Factors to consider in selecting patients for office-based anesthesia

- Abnormalities of major organ systems, and stability and optimization of any medical illness.
- Difficult airway, morbid obesity, and/or obstructive sleep apnea
- Previous adverse experience with anesthesia and surgery, including malignant hyperthermia.
- Current medications and drug allergies, including latex allergy.
- Time and nature of the last oral intake.
- History of alcohol or substance use or abuse.
- Presence of a vested adult who assumes responsibility specifically for accompanying the patient from the office.

Adapted from reference 15

While most ambulatory surgery could be performed in offices and free-standing facilities, the Canadian federal insurance legislation does not allow the recovery of a facility fee for insured procedures performed outside of hospitals. This legislation has prevented the growth of this sector of health care, even though it has been suggested that some procedures may be performed more economically outside the hospital.[19] Unless the providers and facility operators are willing to operate without recovery of these fees, which is usually not economically feasible except in some cases of minimally invasive, diagnostic endoscopic, or arthroscopic procedures, special arrangements with provincial health insurance plans would have to be made. As a consequence, the customary procedures performed in out-of-hospital facilities in Canada are plastic and cosmetic surgery, certain ophthalmic cases (mostly of vision correction), oral-maxillofacial and dental procedures, as well as some bariatric operations.

Interested readers can find detailed discussions of procedures, anesthetic management, and complications elsewhere.[7,9] However, due to special anesthetic considerations, three procedures will be explored later in this article, i.e., liposuction, facial cosmetic, and dental and bariatric surgery.

Monitoring, equipment and intraoperative care

Intraoperative monitoring and management are expected to be of hospital standard. Postoperatively, formal recovery room orders and a dedicated recovery room record must be used. Adequately-trained providers, i.e., a registered nurse trained in recovery room procedures, must provide continuous care for the patient in a properly equipped recovery location until pre-determined discharge criteria and "street-fitness" have been documented. The anesthesiologist (or other physician qualified to administer intravenous sedation or anesthesia) shall remain on the premises until the patient meets documented pre-determined recovery criteria. Physicians should be aware of and comply with the regulatory framework of policies regarding supervision and delegation. In view of the frequent need to efficiently "fast-track" patients in non-hospital locations, the discharge process needs to include particularly detailed verbal and

written instructions as well as routine and emergency follow-up plans.

Postoperative care and discharge

Out-of-hospital facilities, particularly offices, represent a unique environment that depends on a rapid and complete transition from the initial stages of postanesthetic recovery to "street fitness" in a very short time-span while avoiding complications that can occur after ambulatory surgery.[20] As documented in the ASA closed claim analysis[20], the most common mechanism of injury in office-based anesthesia claims was due to adverse respiratory events in the recovery or postoperative period, which were judged to be preventable by use of pulse oximetry. The ASA[11] and CAS standard is monitoring for all patients, regardless of the type of anesthesia.[4]

Several discharge/postanesthesia recovery scores are available[22-24] for use in documenting appropriate recovery. It is important to recognize the difference between discharge from the traditional postanesthesia care unit (PACU) and discharge to "street fitness", as these represent two different stages in the recovery continuum. In most offices, two separate areas may not be available for these two phases, and patients may be discharged directly from the recovery area to the street, employing the concept of "fast-tracking" even more than in hospital-based ambulatory surgery. It is not unusual for the patient in an office setting to recover in the surgical location and be escorted by the anesthesiologist to the waiting area to be directly discharged home. For this discharge procedure, the patient must have stable vital signs, be fully oriented, and ambulate without dizziness and with minimal pain, nausea, vomiting, or bleeding. The patient should receive specific written instructions, including management of pain, postoperative complications, and routine and emergency follow up. Also, the patient should be advised about the additive effects of alcohol and other sedative drugs, about driving or operating other hazardous machinery in the postoperative period, and about the necessity for attention by a competent adult during the postoperative period.[25] The preceding advice indicates the expectation that, except for procedures performed under local anesthesia only and without sedation, the patient must be discharged into the care of a responsible adult. Physicians have an obligation to appropriately inform patients about clinical signs and symptoms that may arise in the post discharge period, and they are required to indicate the need for further medical assessment, including the urgency of seeking that care.

In order to facilitate a rapid recovery and avoid delayed emergence from anesthesia, certain strategies may be useful, including the use of inhalational agents with low blood gas solubility and other intravenous agents with shorter duration of action. Adequate pain control using multiple modalities, such as local anesthesia, non-steroidal anti-inflammatory drugs, and, if necessary, opioids, as well as prevention and treatment of nausea and vomiting will also assist in shortening the length of stay. Particularly in orthopedic interventions, the use of regional anesthesia may be considered.[26] As more extensive procedures might result in (more excessive pain, postoperative nausea, vomiting, or observation for bleeding) warranting overnight stay, it is still being debated whether the length of the surgical procedure should be limited for out-of-hospital facilities.[27]

Emergencies and transfers

Unlike hospitals, most out-of-hospital facilities do not have a comprehensive logistical support structure in place. Facilities must therefore have detailed plans for various emergencies, including personal safety, fire, loss of power, equipment failures, cardiac arrest, anaphylaxis, malignant hyperthermia, as well as emergency transfers. Mock drills to prepare adequately for these emergencies must be conducted regularly (every six months), and the degree of familiarity with the procedures should be documented.

Common office-based procedures

Liposuction

Liposuction, the surgical removal of subcutaneous fat, is one of the most common cosmetic procedures performed. The surgical techniques have evolved over the decades and now include tumescent and superwet liposuction during which the surgical area is infiltrated with a solution of crystalloid and lidocaine with epinephrine. Typically, 1 mL of solution is injected for each 1 mL of planned adipose removal. In some cases the proportion of solution is two to three times the volume of anticipated adipose resection.[28] Liposuction, even if performed with sedation only, is a procedure that can be associated with significant complications. The intervention may take several hours, and, as approximately 70% of the infiltrate is absorbed, hypervolemia can occur. Fluid management should be based on blood loss balanced with approximately 70% of infiltrate being absorbed. Temperature monitoring must be considered, as the large volumes of infiltrate are usually not warmed. Hypothermia is a risk in prolonged cosmetic procedures, and active warming devices should be available. Local anesthetic toxicity from the injectate may result in cardiac dysrythmia and death. Drug concentrations vary; typically, lidocaine doses of 35 $mg \cdot kg^{-1}$ during tumescent

liposuction are accepted, while epinephrine should not exceed 0.07 $mg \cdot kg^{-1}$. While some doses used in plastic surgery exceed the recommended maximum, there is some suggestion that the resulting plasma levels may be below the levels considered toxic.[29] Patients are at increased risk of deep venous thrombosis (DVT), and prophylaxis should be carefully discussed with the surgeon. Suggestions for thromboprophylactic measures have been published.[30] The presumed benefit of combining procedures, particularly liposuction, must be weighed against the possibility of adverse events. It is not recommended to perform out-of-hospital large volume liposuction (>5000 mL of total aspirate or >2000 mL for liposuction as an adjunct procedure) or to combine liposuction with certain other procedures, such as abdominoplasty. The potential physiological stresses caused by hypothermia, intraoperative blood loss, liposuction in combination with multiple procedures, and the duration of the procedure(s) should be considered when selecting the appropriate facility setting.[30,31]

Blepharoplasty, rhinoplasty and facelift

Blepharoplasty, rhinoplasty, and rhytidectomy (facelift) are common cosmetic procedures frequently performed under local anesthesia with supplemental sedation. Apart from potential local anesthetic toxicity, the anesthesiologist should be aware of the increased risk of operating room fires during these procedures that frequently involve flammable skin preps, supplemental oxygen, and electrocautery.[22] Such an occurrence could result in serious injury or death and warrants special attention to detail, for example, all potentially flammable prep solutions should be allowed to dry completely before drapes are applied; the latter should be arranged by avoiding any tenting to prevent the creation of oxygen-rich reservoirs, and oxygen should be used only when needed (guided by oximetry) and turned off completely when in close proximity to an ignition source.

Dental surgery

The provision of anesthetic services in dental offices provides some special challenges, as the facilities are usually owned by dental care providers (dentists, oral surgeons) and, as such, fall under the jurisdiction of the local dental college. The dental college's guidelines and accreditation process may not necessarily fulfill or adhere to the same facility standards as required by medical regulatory authorities and may not be accepted for reciprocal accreditation. A medical anesthesiologist who is asked to provide anesthesia services in such a facility would be well advised to seek input from the appropriate regulatory authority with respect to the fulfillment of any requirements.

The operating rooms of many dental offices are much smaller than in-hospital facilities, and the anesthesiologist often must bring his/her own equipment for temporary set-up. Dental treatment chairs usually provide limited positioning, and additional means for positioning and airway management should be available. Some facility engineering elements, such as back-up power, suction, etc., may not be available, and appropriate steps must be taken to ensure that safety is not compromised.

Even though the majority of adult dental patients seeking anesthesia services have significant anxiety, general anesthesia may not always be necessary. The combination of intravenous sedation and local anesthesia administered by the dentist usually provides adequate operating conditions for dental providers who are often used to working on "awake" and moving patients. The dental patients are usually satisfied as long as some anxiolysis and degree of amnesia is assured. Due to the nature of the procedure, this practice involves a "shared airway" and changes in ventilation. The ability to clear secretions or blood, water from drills or interference from foreign objects (gauzes or instruments) must be taken into account.

It is particularly important to brief patients adequately regarding preoperative care and the intraoperative period as well as to provide postoperative instructions. Many dental patients have a minimal understanding of anesthesia outside the hospital and may not take preparation (including NPO status) or postoperative instructions seriously.

Bariatric surgery

Anesthesia for bariatric surgery can be associated with multiple complications, several of which are related to obesity, and there have been previous reviews regarding this topic.[33] The circumstances that would make these patients appropriate candidates for free-standing facilities continue to be a matter of debate. The College of Physicians and Surgeons of British Columbia has published guidelines based on body mass index (BMI, weight in kg/height in metres squared)[34] that include a recommendation that patients with a BMI > 35 requiring a general anesthetic should not be considered suitable candidates for non-hospital surgical facilities except under extraordinary circumstances. Further evidence is needed to make specific recommendations regarding the perioperative care of obese patients, with and without obstructive sleep apnea, in the setting of free-standing ambulatory offices and clinics.

Safety of office-based anesthesia

The growth of OBA has triggered considerable concern about patient safety. Often this concern is escalated by

media coverage of tragic mishaps that allegedly occurred due to a lack of resources that are usually available in a hospital. There is no simple answer to the question of the safety of anesthesia outside the hospital. It appears to be less a question of "where" and more a question of "how" the procedures are performed (on appropriately selected patients).

Statistics on morbidity and mortality in out-of-hospital facilities are difficult to analyze and compare. Most of the available literature comprises only retrospective chart reviews and questionnaires, is based on limited sample sizes of selected patients, and lacks a standardized definition for adverse events. Frequently the rates for reported events are inaccurately determined because cases are based on self-reporting and may not capture all patients, or the estimates are only for the total number of procedures making the denominator for the calculation unreliable. Often the criteria for morbidity and mortality are different, for example, some studies use 24-hr mortality *vs* seven-day or 30-day mortality. Some studies may exclude cases that are thought to be unrelated to treatment or the characteristics of the patient population and facilities are different. Some of these findings are compared in Table 5.

In 2001, Domino[21] published the results of a review of the ASA's Closed Claims Database to compare adverse events after office-based anesthesia (n = 14) with anesthesia in ambulatory settings (n = 753). While the number of claims after office-based anesthesia were small (due to the three- to five-year delay to resolve the claim and appear in the database), some interesting trends were found. The severity of injury for office-based claims was greater than for other ambulatory anesthesia claims, and 64% of the office-based claims were regarding death *vs* 21% of other ambulatory anesthesia claims ($P < 0.05$). Compared with 13% of ambulatory anesthesia claims, more than 46% of office-based injuries were a result of adverse respiratory events in the recovery period and were judged to be preventable by better monitoring, such as the use of pulse oximetry. Since the overall number of procedures performed in each setting was unknown, a statistical comparison of safety was not possible; furthermore, the details of the ambulatory setting (hospital or accredited facility) were not described.

Another study raising concerns about the safety of OBA was published by Vila in 2003.[35] In comparing adverse incidents reported to the Florida Board of Medicine from 2000 to 2002, Vila reported an adverse event rate of 66 per 100,000 procedures in offices *vs* 5.3 per 100,000 procedures in highly regulated ambulatory surgical centres (ASCs). The death rate per 100,000 procedures was 9.2 in offices and 0.78 in ASCs. Vila estimated that the relative risk for injuries and deaths was 12.4 per 100,000 procedures for office-based procedures *vs* 11.8 for ASCs.

In response to Vila's study, in 2004 Coldiron[36] examined patient injuries in medical offices in Florida from 2000 to 2003 and concluded that there was no increased risk of death from office-based procedures compared with procedures performed in ASCs. It was pointed out that Vila's calculation (based on all reported deaths in registered as well as unregistered offices as the numerator and only an estimated number of procedures from registered offices as the denominator) overestimated the relative risk of deaths for office-based procedures. Furthermore, due to a difference in relevant reporting requirements for offices and surgical centres, several office surgery deaths should not have been used for the comparison, and, once removed, the risk differences were no longer statistically significant.

While the above reports by Domino and Vila questioned the safety of office-based anesthesia, there are several publications from 1999 to 2008 suggesting that procedures in offices and other out-of-hospital facilities are as safe as those in hospital facilities.

In 1997, Morello[37] reported adverse events and death rates from a five-year period covering 400,675 procedures in 241 plastic surgery offices. The data were obtained through an anonymous questionnaire that the American Association of Accreditation of Ambulatory Surgical Facilities (AAASF) sent to its accredited facilities with a response rate of 57%. The rate of adverse events was 0.47% and the mortality rate was 0.0017% (the time frame for mortality was not specified). The authors concluded that the risk in an accredited office surgical facility showed an excellent safety record and was comparable with hospital ambulatory surgical facilities.

In 2001, Hoefflin[38] published the results of a review of 23,000 consecutive cases of general anesthesia over an 18-yr period in an accredited plastic surgical facility. The report shows no deaths and no significant complications.

In 2003, Byrd[3] published a review of 5,316 consecutive cases in an accredited outpatient plastic surgery facility in Dallas, Texas from 1995 to 2000. They reported no deaths and 35 complications (0.7%), mostly secondary to hematoma formation.

In 2003, Perrot[39] reported a prospective study of 34,391 patients who underwent oral maxillofacial surgery in an ambulatory office in 2001. While only 24% reported accreditation by the Accreditation Association for Ambulatory Health Care (AAAHC) or the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), 47 of the 58 sites (81%) reported that their state Dental Practice Act or Society of Oral and Maxillofacial Surgeons (OMS) required an onsite evaluation for office-based anesthesia. More than 95% of the time, the operating surgeon was also the anesthetist and performed the operation with a support team. Although the majority of cases met specialty recommendations, there was not 100% compliance in the use of capnography for patients who elected tracheal intubation.

Table 5 Summary of relevant publications about the morbidity and mortality in out-of-hospital facilities between 1997 and 2008

	Year of Publication	Study Population	Major Findings
Domino[21]	2001	ASA closed claims	Greater severity of injury in OBA as well as larger percentage of claims judged to be potentially preventable by better monitoring
Vila[35]	2003	Adverse incident reports to Florida State Board 2000–2002	Mortality in offices 0.009% *vs* 0.00078% in ASCs, relative risk for injuries and deaths for office-based procedures *vs* ambulatory surgical centres 12.4 and 11.8, respectively (however, see response by Coldiron[36])
Morello[37]	1997	400,675 procedures in 241 accredited plastic surgery offices over five years	Overall risk comparable to hospital ambulatory facility (mortality 0.0017%)
Hoefflin[38]	2001	23,000 consecutive cases of GA in accredited plastic surgery facility over 18 years	No deaths, no significant complications
Byrd[3]	2003	5,316 consecutive cases in accredited plastic surgery facility over 6 years	No deaths, rate for complications 0.7% (mostly secondary to hematoma formation)
Perrot[39]	2003	Prospective evaluation of 34,391 oral and maxillofacial surgery patients in office 2001 (71% deep sedation/GA)	No deaths, complication rate 1.3% (minor and self-limited), concluded to be safe
D'Eramo[40]	2003	Retrospective practitioner survey of 157 oral and maxillofacial surgeons in Massachusetts	Two treatment-related deaths (mortality 0.00011%); note: additional 5 deaths after discharge were thought to be unrelated to treatment and excluded from calculation
Bitar[42]	2003	4,778 consecutive plastic surgery procedures under sedation/MAC in offices	No deaths, 12 complications (mostly PONV)
Keyes[43]	2008	1,141,418 outpatient procedures from AAAASF quality assurance program	23 deaths in 1,141,418 procedures (0.0021%) with only one death as a result of an intraoperative event (0.00008%)
Fleisher[44]	2004	564,267 outpatient procedures in Medicare patients over 65 years old from 1994 to 1999	Mortality (within 24 hours): Offices: zero ASC: 0.004% Hospital: 0.009% Mortality (within 7 day) Offices: 0.035% ASC: 0.025% Hospital: 0.05%
Nkansah[45]	1999	2,830,000 cases of dental anesthesia in Ontario, Canada from 1973 to 1995	Mortality 0.00014%
CPSA[K]	2009 (unpublished)	474,166 cases in accredited OHFs in Alberta, Canada from 2002 to 2007	Mortality 0.0017% (total of 8 deaths, all unrelated to anesthesia)

Summary of relevant publications regarding the morbidity and mortality in out-of-hospital facilities from 1997 to 2008. ASA = American Society of Anesthesiologists; GA = general anesthesia; MAC = minimum alveolar concentration; AAAASF = American Society for Accreditation of Ambulatory Surgical Facilities; OBA = office-based anesthesia; ASCs = ambulatory surgical centres; OHF = out-of-hospital facilities; PONV = postoperative nausea and vomiting; CPSA = College of Physicians and Surgeons of Alberta

The overall complication rate was 1.3%, all described as minor and without long-term consequences (0.4% for local anesthesia, 0.9% for conscious sedation, and 1.5% for general anesthesia, which was statistically significant). No deaths were reported. Perrot concluded that the administration of anesthesia was safe in the study population.

In 2003, D'Eramo[40] published the results of a retrospective survey evaluating adverse events associated with outpatient oral and maxillofacial surgery in Massachusetts. This study involved 157 oral and maxillofacial surgeons who treated patients from 1995 to 1999. The mortality rate of one per 835,000 was the result of only two treatment-related deaths recorded during that time. An additional five deaths that occurred after the patients had been discharged home were thought to be unrelated to the treatment and were excluded from the calculation. The most frequent untoward event was syncope occurring with local anesthesia (one in 160 patients). The author later published findings of a follow-up study in 2008[41] documenting results that were consistent with the previous findings.

Bitar[42] specifically evaluated the adverse events rates of sedation in the office by means of a chart review of 4,778 plastic surgery procedures over a one-year period (1999–2000). There were no deaths, ventilator requirements, or DVTs/pulmonary emboli. There were 12 anesthetic complications, including protracted nausea and vomiting (most common), dyspnea, one emergent intubation, and two unplanned hospital admissions. No prolonged adverse effects were noted.

Statistical data on the mortality from the American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF) were reported by Keyes[43] in 2008. Using accumulated data from the AAAASF's quality assurance and peer review reporting system from 2001 through 2006, Keyes found 23 deaths in 1,141,418 outpatient procedures (1:49,626 or 0.002%). Pulmonary embolism caused 13 of these 23 deaths, and the procedure most commonly associated with this was abdominoplasty. Only one death occurred as a result of an intraoperative adverse event, when the operating surgeon administered intravenous propofol, fentanyl, and midazolam without the assistance of a nurse, anesthetist, or anesthesiologist. The patient subsequently developed hypotension and bradycardia, was transferred to hospital and died.

Fleisher *et al.* compared hospital admissions and death after outpatient surgery in 564,267 elderly Medicare patients from 1994 to 1999.[44] The 24-hr mortality (death rates on day of surgery, expressed per 100,000 procedures) was zero for office-based surgery, 2.3 for ASC, and 2.5 for hospital outpatient. The seven-day mortality (expressed per 100,000 procedures) was 35 for office-based surgery, 25 for ASC, and 50 for hospital outpatient. The admission rate within seven days of outpatient surgery (expressed per 1,000 procedures) was 9 for office-based surgery, 8.4 for ASC, and 21 for hospital outpatient. In multivariate models, the following types of patients were identified as being at increased risk for hospital admission or death within seven days after surgery: more advanced age, hospital admission within the previous six months, surgery performed at a physician's office or outpatient hospital, and invasiveness of the surgery. The authors pointed out appropriately that the study included only those individuals over 65 yr having procedures covered by Medicare; only 5% of all procedures were performed in office (28,199 of 564,267), and the data collection design could not account for type of anesthesia or selection bias with respect to which patients were selected for which setting (office *vs* ASC *vs* outpatient hospital). They suggest that patient outcomes and risks are multivariate phenomena, and that further studies could assist in appropriate analysis to move patients to lower-intensity settings.

Apart from Nkansah's publication of a mortality incidence of 1.4 per 1,000,000 cases in dental anesthesia offices in Ontario[45] (published in 1997), there is little information on morbidity or mortality rates in Canadian out-of-hospital facilities. Data collected by the College of Physicians and Surgeons of Alberta (CPSA) of adverse incidents and deaths in registered out-of-hospital facilities in Alberta indicates a rate of 0.05% for reportable adverse events (243 events for 474,166 procedures) and a death rate of 0.0017% (eight deaths for 474,166 procedures, all unrelated to the anesthetic) from 2002 to 2007.[K]

In summary, despite the limitations of the currently available publications, death and major complications in out-of-hospital facilities (including ambulatory surgical centres and offices) occur infrequently, especially in accredited facilities (see Table 1). There is no doubt, however, that anesthesiologists should strive to ensure patient safety by carefully considering the facility standards and by promoting the regulation and accreditation of these practices where they are not (yet) in place.

Future directions and conclusions

Unfortunately, there has been very little change in anesthesia residency programs to facilitate education and hands-on experience with office-based anesthesia.[46] It would be desirable for more academic anesthesiologists to become involved, not only in the practical conduct but also in the regulation and facility accreditation of out-of-hospital anesthesia. Appropriate integration of electives into the residency curriculum for anesthesia residents as well as continuing medical education (CME) events with a focus on out-of-hospital anesthesia (ideally including simulation training) would be an important step in the direction of safe care for our patients in this unique environment.

Office-based anesthesia is a relatively new phenomenon that continues to enjoy popularity among patients and health care providers alike. Increasing regulation will assure that patient safety remains the primary focus.

Acknowledgements We acknowledge assistance for the preparation of this article from the following individuals: Prof. Frances Chung (Toronto Western Hospital, University Hospital Network, University of Toronto); Jonathan Rubes (Leber Rubes Inc., Consulting Engineering Firm, Toronto); Prof. Alfred Dolan (Institute of Biomaterials and Biomedical Engineering, University of Toronto); Tracey Lubkey and Dr. Bryan Ward (College of Physicians and Surgeons of Alberta); Pat Fawkus (College of Physicians and Surgeons of British Columbia); Bryan Salte (College of Physicians and Surgeons of Saskatchewan); Robin Reece (College of Physicians and Surgeons of Ontario); Carolyne Pehora and Cheri Nickel (The Hospital for Sick Children, Toronto).

[K] Personal Communication with Tracey Lubkey (March and April 2009), Accreditation Coordinator, Clinical Services, College of Physicians and Surgeons of Alberta (CPSA).

Conflicts of interest None declared.

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