

Anesthesiologists and the Education of Dentists (and Others) in Anesthesia



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Schartel, Scott A. DO

Since the beginning of the modern era of anesthesia practice in the mid-19th century, dentists have been involved in the practice of anesthesia. Both Horace Wells, who recognized the beneficial anesthetic effect of nitrous oxide, and William Thomas Green Morton, who in 1846 made the first public demonstration of ether anesthesia, were dentists. The following discussion will seek to review the current training of dentists in anesthesia practice as well as discuss the role of physician anesthesiologists in this training and practice. An overview of the training of other physicians and non-physician health care workers in aspects of sedation, analgesia, and airway management will also be included.

In 1977 Klein, Wollman, and Cohen ¹ published an article in *Anesthesiology* in which they reviewed the practice of anesthesia by dentists. They proposed that anesthesiology training programs should help to improve the quality of dental anesthesia practice by providing anesthesia training to dentists. They said: "It is the opinion of the authors that it would benefit the profession of dentistry and the quality of outpatient dental anesthesia in this country in a positive manner if there were formally set aside a small number of anesthesia residencies for dental applicants who have good academic qualifications and show a desire for teaching and research on a dental school faculty."

Anesthesia practice among dentists can include nitrous oxide sedation, oral sedation, combined oral and inhaled sedation, intravenous conscious sedation, deep sedation, and general anesthesia. The American Dental Association (ADA) has formulated a policy statement about the use of sedation and general anesthesia in dentistry. The policy states: "The use of conscious sedation, deep sedation, and general anesthesia in dentistry is safe and effective when properly administered by trained individuals. The American Dental Association strongly supports the right of appropriately trained dentists to use these modalities for

the management of dental patients and is committed to ensuring their safe and effective use.”² The policy goes on to describe educational requirements for practicing at various points on the continuum from sedation through general anesthesia.

A document entitled *Guidelines for Teaching the Comprehensive Control of Anxiety and Pain in Dentistry*³ was adopted by the ADA House of Delegates in October 2000. These guidelines (referred to hereafter as the ADA teaching guidelines) establish educational requirements necessary for dentists to practice various levels of sedation and analgesia, in accordance with the ADA policy statement referenced above.

Both the ADA policy statement ² and the teaching guidelines ³ provide specific requirements for various practices. The practices specified include conscious sedation, combination inhalation–enteral conscious sedation, deep sedation, and general anesthesia. The teaching guidelines are divided into three parts.

Part I of the guidelines pertains to the education of dental students in the control of anxiety and pain, including the use of conscious sedation. The curriculum requires preliminary education in anatomy, physiology, pharmacology, immunology, and behavioral sciences. A didactic curriculum in anxiety and pain control is specified that includes, among other topics, patient evaluation, physiology and pharmacology of agents used for anxiety and pain control, physiologic monitoring, airway anatomy and physiology, deep sedation, and general anesthesia.

The teaching guidelines state: “Following didactic instruction in conscious sedation, the student must receive sufficient clinical experience to demonstrate competency in those techniques in which the student is to be certified. It is understood that all institutions may not be able to provide instruction to the level of clinical competence in anxiety and pain control modality to all students.” The guidelines do not provide more specific guidance about how the achievement of competence will be judged. Neither the specific duration of the training experience nor the number of supervised cases to be performed is specified.

Part II of the teaching guidelines discusses the education required for dentists to practice deep sedation or general anesthesia. These guidelines require a minimum of 24 months of comprehensive clinical and didactic training in anxiety and pain control: “At a minimum, a total of twelve months over the two-year period should be devoted exclusively to clinical training in general anesthesia and related subjects such as establishing and maintaining an emergency airway and use and interpretation of appropriate monitoring.”³ This experience is commonly supervised by anesthesiologist physicians. It is expected that this training will involve participation of the dental resident in the usual activities of a medical

anesthesiology resident. Additionally, experience in the administration of general anesthesia for ambulatory dental patients is required. This portion of the training is usually 12 months in duration. It is expected that this portion of the training will be under the supervision of a qualified dentist anesthesia provider.

Part III of the teaching guidelines establishes the requirements for teaching the control of anxiety and pain in a continuing medical education program. Three types of courses are defined: (1) intensive courses designed to allow dentists to become proficient in various methods of pain and anxiety control, (2) supplemental courses designed to allow dentists with prior training and experience to supplement their knowledge and skills, and (3) survey courses whose purpose is informational and that are not expected to lead to clinical competency. Within this structure three separate areas of study are defined: inhalational sedation, enteral and/or combination inhalation–enteral conscious sedation, and parenteral sedation.

Inhalational sedation (the use of nitrous oxide and oxygen) courses require 14 hours of instruction, including a clinical component during which “competency in inhalational sedation is demonstrated.” The course director is required to certify the competence of the participants at the conclusion of the course. No more specific guidelines for certification of competence are delineated.

A course in combined inhalational–enteral sedation requires a minimum of 18 hours of instruction and 20 clinically oriented experiences, which may include group observations of patients undergoing this technique. The guidelines state: “[c]linical experience in managing a compromised airway is critical to the prevention of life-threatening emergencies. Participants should be provided supervised opportunities for clinical experience to demonstrate competence in management of the airway.” No additional specificity about what this should involve is provided.

A parenteral sedation course requires a minimum of 60 hours of instruction, plus each course participant must manage 20 patients. “Participants should be provided supervised opportunities for clinical experience to demonstrate competence in management of the airway.” No further guidance about how this should be accomplished is given. The guidelines recommend that course faculty schedule additional clinical time, as necessary, until the participant demonstrates competence.

The ADA has also adopted guidelines [4](#) for the use of sedation and general anesthesia by dentists. These guidelines set expectations for patient evaluation, preoperative preparation, personnel, equipment, monitoring, documentation, recovery, and discharge. The requirements for who can practice which forms of

sedation and anesthesia are consistent with the ADA policy and teaching guidelines previously discussed.

Common to the clinical guidelines for all levels of sedation and anesthesia is preanesthetic evaluation of the patient and risk assessment; monitoring of ventilation, blood pressure, heart rate, and oxygen saturation; creation of a time-based anesthetic record; and supervision of recovery and discharge. If a certified registered nurse anesthetist (CRNA) is involved in providing sedation or anesthesia, the guidelines specify that the CRNA cannot practice beyond the scope of the supervising dentist's level of qualification. A detailed discussion of these guidelines is beyond the scope of this paper, but the reader is referred to the complete guidelines. [4](#)

Various postgraduate advanced training programs in dentistry require training in sedation, anesthesia, and pain control. These include programs in general dentistry, general practice residency, oral and maxillofacial surgery, orthodontics and dentofacial orthopedics, pediatric dentistry, and periodontics. A summary of these educational requirements is presented in [Table 1](#). A more detailed discussion of the requirements in oral and maxillofacial surgery is given below.

Specialty	Requirement
General dentistry ¹⁷	Competence in management of pain and anxiety in outpatient care using behavioral and pharmacological modalities beyond local anesthesia. Training should include use of nitrous oxide/oxygen or oral or parenteral conscious sedation.
General practice residency ¹⁸	Same as above plus 70 hours of anesthesia training, including general anesthesia, airway management, tracheal intubation, treatment of emergencies
Oral and maxillofacial surgery ¹⁹	Anesthesia rotation, 4 months, functioning as an anesthesia resident; longitudinal and progressive experience in all aspects of pain and anxiety control; each final-year resident must administer general anesthesia or deep sedation for 100 ambulatory oral and maxillofacial surgery patients, substantial number must be general anesthesia
Orthodontics and dentofacial orthopedics ²⁰	Familiarity with pain and anxiety control and pharmacology
Pediatric dentistry ²¹	Anesthesia rotation in hospital anesthesiology department lasting 4 consecutive weeks with experience in management of children and adolescents undergoing general anesthesia
Periodontics ²²	In-depth knowledge in all areas of conscious sedation and proficiency in more than one method of conscious sedation, including nitrous oxide/oxygen inhalation, oral or intravenous sedation

Table 1. *Sedation and Anesthesia Training Requirements in Advanced Dental Education Programs*

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Of the advanced training programs currently accredited by the Commission on Dental Accreditation of the ADA, oral and maxillofacial surgery (OMFS) requires the most extensive education in anesthesia. The OMFS residency is a minimum of 48 months in duration. The residency program must provide a comprehensive didactic program on anesthesia and pain control. A 4-month clinical rotation in anesthesiology is required for each OMFS resident. The training and clinical responsibilities required during this 4-month period are the same as those of an anesthesiology resident physician. In most OMFS programs this training is provided by anesthesiologist physicians. In addition to this continuous period of anesthesiology training, OMFS residents are expected to receive experiences in

pain management, sedation, and general anesthesia in ambulatory dental and OMFS patients that progress throughout the continuum of education. The training must include both adult and pediatric patients and must include airway management.

During the final year of training each OMFS resident must administer deep sedation or general anesthesia to a minimum of 100 ambulatory OMFS patients, more than 10 of whom must receive general anesthesia. The residents must also receive "extensive" training in all aspects of parenteral and inhalational sedation. Advanced Cardiac Life Support certification is required.

While oral and maxillofacial surgeons have, in general, been the dentists who have had the most extensive training in sedation and anesthesia and provided the most dental anesthesia care, there is a smaller group of dentists who have concentrated their training and practice on anesthesia care. Currently there are several postdoctoral dental anesthesiology training programs in the United States. A list of programs can be found at the web site of the American Society of Dentist Anesthesiologists (ASDA, <http://www.asdahq.org>) or the American Dental Society of Anesthesiology (ADSA, <http://www.adsahome.org>). At least one of the ten programs listed on those sites (UMDNJ, Robert Wood Johnson Medical School) is no longer active (personal communication, S. Klein, DDS, MD, Dec. 19, 2001).

The Commission on Dental Accreditation of the ADA does not currently recognize or accredit dental anesthesiology training programs. The American Dental Board of Anesthesiology (ADBA) does accredit dental anesthesiology programs [5](#) but is an independent organization not affiliated with the ADA. This organization has petitioned the Commission on Dental Accreditation for recognition of dental anesthesiology as a specialty area within dentistry (personal communication, Joel M. Weaver, DDS, PhD, Dec. 23, 2001, Jan. 31, 2002).

Two specialty organizations currently provide an examination process in dental anesthesiology: the ADBA and the ADSA.

The ADBA, founded in 1994, requires dentists who wish to enter the ADBA certification process [6](#) to complete a minimum of 24 months of anesthesiology training that conforms to the ADA teaching guidelines, part II. After completion of an approved dental anesthesia residency program, candidates can petition the ADBA for entry into its examination process. If accepted, the candidate must take and pass a written examination on anesthesiology. Following the successful completion of the written examination and the completion of a minimum of 18 months of post-training clinical experience, the candidate can sit for an oral certifying examination. Those candidates who pass the oral examination become

diplomats of the ADBA. An alternative educational pathway (“grandfather clause”) is available for dentists whose training occurred before July 1993. [7](#)

The ADSA, founded in 1954, offers a fellowship examination in anesthesiology and also offers an examination in conscious sedation. The ADSA has recently formed the National Board of Dental Anesthesiology; the current fellowship examination will be replaced by the National Board of Dental Anesthesiology examination (written and oral) in 2005 (personal communication, Robert Campbell, DDS, Jan. 28, 2002). The criteria for entry into the examination process include active membership in the ADSA, graduation from an accredited college of dentistry (or one approved by the Board of Directors of the ADSA), completion of an accredited OMFS surgery residency, or completion of a dental anesthesiology residency program that is in compliance with the ADA teaching guidelines, part II. [8](#)

The practice of sedation and anesthesia by dentists is regulated by statutory and regulatory rules in each state. State boards of dentistry issue permits for dentists who wish to practice sedation and anesthesia. For the specific requirements for a state, the reader is referred to the specific state board of dentistry. As an example, the requirements and rules in Pennsylvania will be reviewed.

The Pennsylvania statute [9](#) authorizes three types of anesthesia permits: (1) unrestricted permits authorizing the practitioner to administer nitrous oxide/oxygen analgesia, conscious sedation, and general anesthesia; (2) a restricted permit that allows the holder to administer conscious sedation or nitrous oxide/oxygen analgesia; and (3) a restricted permit authorizing the hold to administer nitrous oxide/oxygen analgesia only.

To obtain an unrestricted permit the dentist must complete at least 1 year of training conforming to the ADA teaching guidelines, part II, or be certified by (or eligible for certification by) the American Board of Oral Surgery; and be a Fellow of the American Association of Oral and Maxillofacial Surgeons or a Fellow of the ASDA. Part II of the teaching guidelines requires 2 years of anesthesia training. The limited permit for conscious sedation or nitrous oxide/oxygen sedation requires 80 hours of education. The limited permit for nitrous oxide/oxygen sedation requires 40 hours of education. The education for both limited permits must conform to the ADA teaching guidelines part I or III. Specific “grandfather” exemptions are allowed for dentists who have practiced sedation or anesthesia for at least five years prior to 1986.

Anesthesiologists in teaching programs have frequently had experience teaching OMFS residents the principles of anesthesia and are familiar with the level of skill developed by these dentists during their 4 months of anesthesiology training. Many anesthesiologists have a more limited or no understanding of the nature of

oral surgeons' practice of anesthesia in office settings. The practice of sedation and anesthesia by other (non-OMFS) dentists in an office or hospital setting is even less recognized.

I sent a survey to the program directors of the ten dental anesthesiology residencies identified at the ADBA and ASDA web sites. One of the questions asked if the program director was aware of dentists practicing anesthesia for non-dental patients. Four of the five programs that answered the survey currently have active residency programs. Each respondent with an active program identified that he was aware of dentists who practiced anesthesia in non-dental patients. The respondents indicated that the practice was limited to a few practitioners, that it was uncommon, and that it was diminishing as the remaining practitioners aged. The practice of anesthesia by dentists for non-dental patients would be regulated by state law and hospital (or ambulatory surgery center) bylaws.

Anesthesiologists may also become involved in the training of non-anesthesiology physicians and other non-physician health care providers in aspects of anesthesia practice. In reviewing the Accreditation Council for Graduate Medical Education (ACGME) requirements for residency training, no programs (other than anesthesiology) were identified that explicitly require rotations in anesthesiology. However, several programs expect trainees to develop some level of airway management skills and/or receive education about the use of sedation and analgesia.

Residents in emergency medicine are expected to develop skills in emergency airway management, including tracheal intubation facilitated by the use of sedative-hypnotic drugs and muscle relaxants. Emergency medicine programs commonly include a rotation in anesthesiology as part of this education.

Critical care medicine residents and combined pulmonary and critical care residents must develop competence in establishing and maintaining an "open airway in nonintubated, unconscious, paralyzed patients."[10,11](#) The requirements do not provide more specific details about this. Education in tracheal intubation is not required, but many trainees seek this experience.

Interventional and vascular radiology residents must be taught about the use of analgesics and be "thoroughly familiar with all aspects of administering and monitoring sedation of the conscious patient."[12](#) The requirements for programs in endovascular surgical neuroradiology include the expectation that residents will develop skills and knowledge in the use of analgesics, neuroanesthetic agents, and provocative testing with anesthetics and sedatives. [13](#)

Gastroenterology residents must receive formal instruction in sedation and sedative pharmacology. [14](#) There are specific requirements for the resident to learn a variety of gastrointestinal endoscopic procedures (most or all of which will be performed with sedation and analgesia); however, there is no formal requirement for the trainee to learn airway management.

Respiratory therapists and paramedics commonly receive training in airway management, including tracheal intubation. This training usually occurs in an operating room setting and involves anesthesiologists. Anesthesiologists also participate in the education of CRNAs and anesthesia assistants.

Oral surgeons and dental anesthesia residents receive the most formal and supervised training in the principles and practice of anesthesia (excluding anesthesiology resident physicians, CRNAs, and anesthesia assistants). Much of this training is under the supervision of physician anesthesiologists. Many of the other professionals discussed above (physicians and dentists) who practice sedation and analgesia techniques have formal training that may be inadequate to prepare them for emergency management of an overly sedated or apneic patient.

The question of how much training is necessary to become proficient in airway management is not easily answered because there is little empiric evidence. Advanced Cardiac Life Support training teaches the principles of emergency airway management and is frequently required for individuals who will be administering or supervising intravenous sedation, but few would argue that a 1- or 2-day course in which only a small portion of the total time is devoted to teaching airway management is sufficient for the participant to become proficient.

Konrad and colleagues [15](#) studied the rate at which novice anesthesiology residents became proficient at a variety of procedures. They found that the learning curve for tracheal intubation reached a 90% success rate after a mean of 57 attempts. However, even after 80 intubations, 18% of the residents still needed assistance. In this study a successful attempt was one that required no assistance by the attending anesthesiologist. The steepest portion of the learning curve was between 0 and 20 attempts. These authors also found that the interindividual confidence intervals decreased as the experience of the residents increased. A limitation of this study was the small number of residents studied (n = 11). No similar study looking at mask ventilation was found.

Those who practice sedation and analgesia techniques or respond to airway emergencies must be able to deal with an apneic patient. The consequences of failed airway management or failure to recognize apnea or hypoventilation and hypoxemia can be devastating for the patient. Therefore, all those whose

practice includes the administration of sedation and analgesia must receive adequate training in the principles of sedation, analgesia, and airway management, along with sufficient direct patient experience, supervised by an appropriate teacher, to become proficient. The teacher frequently will be an anesthesiologist.

As anesthesiologists teach people other than physician anesthesiology residents about airway management, sedation, and analgesia, it is important to identify those skills the individual will most likely need in practice. It is essential that trainees become proficient at bag-mask ventilation of the apneic patient, but it is equally important that they develop the skills necessary to observe and monitor the sedated patient and be able to recognize when airway support is necessary. Practitioners who will be providing sedation and analgesia for procedures must learn how to evaluate patients prior to sedation and analgesia. The ability to recognize patients at increased risk for difficult management or complications is essential for safe practice.

The boundaries among many areas of practice are less clear today than they were in the past. Radiologists, vascular surgeons, and interventional cardiologists may all perform radiologically guided interventional vascular procedures. Epidural steroid injections may be performed by anesthesiologists, radiologists, or psychiatrists. In a similar fashion, tracheal intubation in an emergency department may be performed by an emergency medicine physician, an anesthesiologist, a nurse anesthetist, or a respiratory therapist. Many practitioners perform procedures that require sedation and analgesia and also supervise the administration of the sedation and analgesia. It is important for anesthesiologists to be aware of how sedation, analgesia, and airway management are being practiced by non-anesthesiologists. Anesthesiologists must advocate for safe practice by all individuals, should serve as consultants and teachers where necessary, and should oppose practices that are judged to be unsafe.

The ACGME, in the program requirements for residency education in anesthesiology, discusses the presence of trainees other than physician residents as well as the role of non-physicians in the training of anesthesiology residents. The requirements state: "The integration of nonphysician personnel into a department with an accredited program in anesthesiology will not influence the accreditation of such a program unless it becomes evident that such personnel interfere with the training of resident physicians. Interference may result from dilution of faculty effort, dilution of the available teaching experience, or downgrading of didactic material. Clinical instruction of residents by nonphysician personnel is inappropriate, as is excessive supervision of such personnel by resident staff."[16](#)

It is clear from this statement that the training of dentists, emergency medicine residents, respiratory therapists, CRNAs, and others within a (medical) anesthesiology residency must be structured in such a manner that it will not adversely affect the training of anesthesiology residents. This would suggest that residency programs must consider the number of cases available for educating all trainees when deciding on the size of the anesthesiology residency, as well as deciding on the number of other trainees that can be accommodated. Dentist anesthesia providers and CRNAs cannot be used to educate medical anesthesiology residents.

In conclusion, this paper has attempted to provide the reader with an overview of the training of dentists, non-anesthesiologist physicians, and other health care personnel in sedation, analgesia, and airway management. It has been my aim to provide this information without specific conclusions about who should be allowed to do what.

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