

# Current Sedation and Anesthesia Practices among Dentists: A Statewide Survey

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## Abstract

**Introduction:** The purpose of this survey was to describe the current sedation training and practices among dentists in the state of Virginia, and to determine what areas of sedation training may need to be improved or maintained.

**Methods:** A survey was developed by two faculty members at the Virginia Commonwealth University School of Medicine and School of Dentistry, focused on sedation practices of dentists within the state of Virginia. The survey contained several key domains: background, education and training, implementation in practice, and continuing education. The survey consisted of thirty questions.

**Results:** Four hundred and thirty nine dentists responded of the 1,982 (22% response rate) surveys were completed and used in analysis. Almost half of the dentists that responded use oral medication to administer sedation within their office and of those 67% re-dose the oral sedative medication to the patient. Over 75% of dentists indicated that they have had some type of sedation related emergency in their office; despite this number, 11% reported that they do not practice for sedation emergency scenarios. Over 70% of dentists reported that they solely monitor their patient during simultaneous sedation and dental treatment, while others reported having a dental assistant (20%) or other medical provider (10%) assisting with monitoring while they are providing dental care.

**Conclusion:** With 75% of dentists that responded to the survey practicing sedation, experiencing some type of medical emergency related to sedations, and 4% of these not using any type of patient monitoring system, all providers offering sedation should follow the monitoring guidelines set forth by the ADA and/or AAPD. With an increase in demand from patients for sedation services during dental procedures, additional training should be recommended to dentists to assure that they have the skills and knowledge necessary to rescue a patient should a medical emergency arise.

*Key Words:* Sedation, Dentists, Anesthesia, Survey

## Current Sedation and Anesthesia Practices among Dentists: A Statewide Survey

There are more than 23 million people with a dental fear that will require some form of sedation while in the dental office [1]. Unfortunately, fear, anxiety and pain have long been associated with the practice of dentistry despite advances in the administration of local anesthesia and dental treatment procedures. Surveys have consistently shown that although dentistry as a profession is highly respected by the public, the fear of going to the dentist ranked second only to the fear of public speaking [2]. In the United States, it is estimated that somewhere between 6% and 14% of the population (14 million to 34 million persons) voluntarily avoid seeking dental care because of their fear of dentistry [3].

Historically when treating dental patients, non-pharmacologic management techniques have been preferred over pharmacological ones. However, standards of care and patient and/or parental expectations are constantly evolving – what was once a viable treatment option may no longer be an accepted vehicle of care [4]. With advances in anesthesia safety, changing patient and parental views, and an increase in treatment needs, dental care utilizing sedation has become more accepted [5]. Sedation is becoming a popular practice and a useful adjunct for treatment of patients in dentistry. However, complications can arise when pharmacology sedation is administered. To ensure safe practices, additional training involving basic and advanced emergency skills may

be necessary when providing sedation services to the dental population.

With the use of sedation and anesthesia, the risks in providing dental treatment are dramatically increased. Reports of adverse reactions to sedation and general anesthesia provided for dental treatment, while mostly minimal, have been reported to be between 17.0-22.4% [6] with an even higher rate in children at 35% [7]. Current literature states that adverse events can occur during anesthesia procedures with mortality rates at approximately 1:250,000 [8] and potentially morbidity is significantly higher. Sedation related adverse events can include aspiration during sedation, oxygen desaturation below 90% (hypoxia), apnea, respiratory depression, hyperventilation syndrome, airway obstruction, stridor, laryngospasm, asthma related attack/ bronchospasm, excessive secretions, nausea, vomiting, aspiration or swallowing of foreign materials (ex. Crowns, cotton rolls, burs, etc.), over-sedation, anxiety attack, stroke, uncontrolled bleeding, seizures, angina, local anesthetic toxicity, local anesthetic reaction (vasoconstrictor), intraarterial injection, local venous complications, syncope, cardiac arrest, arrhythmias, increased blood pressure (hypertension), anaphylactic reactions and/or allergic reactions, and other adverse events including pulmonary edema that can result in unexpected admissions (increase in levels of care required). Sedation related adverse events can occur due to: improper drug administration, use of complex equipment, procedural or diagnostic errors, deviations from established protocols,

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communication errors, errors in creating an accurate anesthesia record [2], as well as a combination of errors with drug interactions, complex medical histories, overdose of medications, and errors in early identification of problems.

When perioperative adverse events occur, it is often difficult to establish a cause-and-effect mechanism. Difficult airway management is perceived by anesthesiologists as the greatest patient safety issue [9] and thus should be considered a very important aspect of dental sedation training [8].

Due to an increase in interest from the public in regards to sedation dentistry and safety, the Virginia Board of Dentistry recently released an "Emergency Regulation", effective 9/14/2012, revising the definitions and regulations for administration of sedation by dentists, requiring a sedation/anesthesia permit (Part I General Provisions with 18VAC60-20-10, 18VAC60-20-30) for dentists providing moderate sedation, deep sedation, and general anesthesia care. (Part IV Anesthesia, Sedation and Analgesia with 18VAC60-20-107. General provisions 18VAC60-20-110 and 18VAC60-20-120-requirements for permits). These new regulations will require that Virginia dentists practicing moderate sedation techniques, despite the route of administration, be properly trained and must have a permit from the state to practice these sedation techniques. To qualify for the moderate sedation permit utilizing "any route" including enteral, parenteral, intramuscular and intrabuccal, a dentist must provide documentation that they have had adequate training such as a transcript, certification and/or documentation of training content that confirms that they meet the education requirement (Guidelines for Teaching the Comprehensive Control of Anxiety and Pain in Dentistry, ADA) [9]. Practitioners applying for the "enteral method of administration only" permit, must provide a transcript or the certification and documentation of training content which confirms completion of a continuing education course offered by a provider approved in 18VAC60-20-50(C) of the Regulations Governing Dental Practice of not less than 18 hours of didactic instruction plus 20 clinically-oriented experiences in enteral and/or combination inhalation-enteral conscious sedation techniques. All practitioners applying for moderate sedation permits must hold current certification in advanced resuscitation techniques with hands-on simulated airway and mega-code training for health care providers, including basic electrocardiographic interpretation such as Advanced Cardiac Life Support (ACLS) for Health Professionals or Pediatric Advanced Life Support (PALS) for Health Professionals and current Drug Enforcement Administration registration

Though, the foundation of sedation skills could be provided during dental undergraduate curriculum [10], while feel that this takes time and practice and they feel that sedation training should be obtained during post-doctoral studies (ex. General Practice Residency, etc.). Despite when the dentist acquires the skills and training necessary to provide sedation, they must be able to manage the patient in the case of an emergency at any point before, during and after the sedation. According to the American Dental Association, "Guidelines for the Use of Sedation and General Anesthesia by dentists" [11] and the "Guidelines for Teaching Pain Control and Sedation to Dentists and Dental

Students" [9], the requirements for education for sedation practices vary, depending upon the level of sedation that you intend to achieve. Accordingly, because minimal, moderate, deep sedation and general anesthesia are a continuum, it is not always possible to predict how an individual patient will respond. Hence, practitioners intending to produce a given level of sedation should be able to diagnose and manage the physiologic consequences (rescue) for patients whose level of sedation becomes deeper than initially intended "Continuum of Depth of Sedation: Definition of General Anesthesia and Levels of Sedation/Analgesia, 2004, of the American Society of Anesthesiologists (ASA)" [12]. Malamed [2] defined the following: minimal sedation as a drug-induced state during which patients respond appropriately to verbal commands, Moderate sedation as a drug-induced depression of consciousness during which patients respond purposefully to verbal commands alone or accompanied by light tactile stimulation, deep sedation as a drug-induced depression of consciousness during which patients are difficult to arouse but should respond purposefully following repeated or painful stimulation, and general anesthesia as a drug-induced loss of consciousness during which the patients are not arousable, even by painful stimulation. Due to this sedation/anesthesia continuum and adverse events that can occur, it has been recommended by some that there may be a need for standardization of sedation education [10]. If possible it could benefit dental students and dental residents to receive practical experience in the administration of enteral, intravenous and inhalational sedation. Some specialty programs, including General Practice Residency, Pediatric Dentistry, Periodontics, Oral Maxillofacial surgery, Dental Anesthesiology, and Endodontics provide training in sedation during their graduate dental residency programs [11].

After graduating from dental school, dentists are expected to provide safe and pain free dental care [13,14]. Boynes [1] suggested that there is a need for sedation services to be provided to care for the segment of the patient population who are unable to receive dental care in a routine manner. Thus, sedation has become an important adjunct of dental practice. Boynes [1] argues that sufficient training and experience in sedation education is necessary to be an entry-level component in General Dentistry. Graduates of dental schools should be knowledgeable in the management of pain and anxiety by both pharmacological and behavioral management methods [14]. Additional advanced training in sedation; however continues to be necessary, due to the complexity of the level of expertise necessary, the in depth understanding of the sedation and anesthesia continuum, difficulty in being able to teach to the level of required educational requirements, and the changes in the patients expectations for sedation and dental treatment. The ADA Guidelines for teaching pain control and sedation to dentists and dental students recommend that for all levels of sedation the practitioner must have the training: (a) skills, (b) drugs, (c) equipment to identify and manage such an occurrence until the emergency medical service arrives or until the patient returns to the intended level of sedation.

The purpose of this survey study is to describe the current sedation and anesthesia practices and training among dentists in the state of Virginia. This information can then be used to

determine what areas of sedation training and practices may need to be improved or maintained to assure patient needs and safety practices are being met.

### Methods

This survey design study was administered in Fall 2012, prior to the Virginia Board of Dentistry Emergency Regulations were announced. The participants in this study were identified through the Virginia Dental Association email list. Surveys were distributed by email to all known listings on the database (N =2,432). This study received approval from the Internal Review Board (IRB) at Virginia Commonwealth University.

#### Survey instrument

The survey was developed by the two authors to learn about sedation practices among dentists in the state of Virginia. The survey contained several key domains: background, education, implementation in practice, and continuing education. The survey consisted of thirty items.

Background and demographic questions included zip code, years of practice, formal advanced training in dentistry. Questions about education focused on how the dentist obtained their sedation training, whether they were required to have advanced cardiac life support training, number of sedation procedures required to observe during training, the number of clinically oriented sedation procedures required to complete training, training related to airway management during respiratory distress, and training related to rescuing patients if they were sedated deeper than intended level of sedation. Implementation and practice questions focused on the percentage of patients that request sedation, how patients pay for sedation (i.e., Fee for service), referrals to other providers for sedation, years administering sedation, medication used for sedation, monitoring and evaluation of patient that is sedated, and practice of emergency scenarios in the office. The continuing education portion of the survey focused on maintenance of sedation skills, hours of continuing education for sedation and/or anesthesia over the past five years, and interest in attending a sedation course using a simulation manikin.

#### Data Collection

Study data were collected and managed using REDCap electronic data capture tools hosted at Virginia Commonwealth University. REDCap (Research Electronic Data Capture) is a secure web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources. Descriptive statistics were calculated for the respondents to the survey.

Frequency (percentage) data related to each survey domain were calculated. All data were analyzed in SPSS 20.0.

### Results

There were 2,432 surveys distributed by email. 450 emails

were marked as “delivery failures” resulting in 1,982 successful deliveries. Four hundred and thirty nine dentists responded out of the 1,982 (22% response rate) successful deliveries; therefore 439 surveys were used in the analysis. Background and education domains for survey participants are reported in *Table 1*.

At least 18% of dentists have been administering sedation

**Table 1.** Percentage of Dentists in Virginia for Background and Education Questions.

Survey Item	Percentage
<b>Background</b>	
<b>How many years have you been practicing dentistry?</b>	
0-5	4.33%
6-10	9.13%
11-15	13.46%
16-20	7.21%
21-25	11.54%
26-30	15.87%
31-35	20.19%
36-40	11.54%
41-45	4.81%
46-50	0.96%
51-55	0.48%
56-60	0.48%
<b>Have you received formal advanced dental training?</b>	
Advanced education in general dentistry	10.10%
Dental Anesthesiology	1.44%
Endodontics	2.40%
General Practice Residency	16.35%
None beyond dental school	31.25%
Oral Maxillofacial Radiology	0.00%
Oral Maxillofacial Surgery	13.94%
Orthodontics	2.40%
Other	5.29%
Pediatric Dentistry	10.10%
Periodontics	4.81%
Prosthodontics	1.92%
<b>Where did you receive your sedation training?</b>	
Dental School	18.75%
Graduate residency program	48.56%
CE course for sedation	26.44%
Other	6.25%
<b>Were you required to complete an Advance Cardiac Life Support course during you sedation training?</b>	
Yes	49.52%
No	50.48%
<b>Were you required to complete a Pediatric Advanced Life Support course during your sedation training?</b>	
Yes	81.73%
No	18.27%
Survey Item	Percentage
<b>During your course training, were you taught to manage and rescue a patient experiencing respiratory distress?</b>	
Yes	12.02%
No	87.98%
<b>During your course training, did you practice rescuing a patient that is deeper than the intended level of sedation?</b>	
Yes	41.83%
No	58.17%

Note: N = 439

for 0–5 years. Half (49%) of the Virginia dentists that responded to the survey have been trained in Advanced Cardiac Life Support and 82% have been trained in Pediatric Advanced life support. Only 19% of the respondents received sedation training during dental school and 49% received training during graduate residency training programs. Approximately 26% of Virginia Dentists that responded reported that they received training from continuing education programs focused on sedation, while 6% listed another source for sedation training. During sedation training, 70% of dentists were not required to complete a clinically oriented sedation procedure and 67% did not observe a sedation procedure. 31% have not received formal advanced training; however the remaining 69% have participated in advanced dental training.

The mean scores, standard deviations, and frequency data for the survey participant respondents for Implementation in Practice domain by item are in *Table 2*. 44% of Virginia

**Table 2.** Percentage of Dentists in Virginia for Implementation in Practice Questions.

Survey Item	Percentage
<b>Implementation in Practice</b>	
<b>What percentage of patients in your office request sedation for dental treatment?</b>	
0%	29.81%
20%	51.92%
30%	6.25%
40%	3.37%
≥50%	8.65%
<b>In your clinical judgment, what percentage of patients would benefit from sedation in dental treatment?</b>	
0%	9.13%
20%	55.29%
30%	17.31%
40%	7.69%
≥50%	10.58%
<b>Do you refer patients to another provider for sedation?</b>	
Yes	47.60%
No	52.88%
<b>If so, who is the provider?</b>	
Another dentist/ dental specialist	87.27%
Nurse Anesthetist	0.00%
Dental anesthesiologist	12.73%
<b>If you are referring to other providers for sedation, what is your reason for referral?</b>	
I am not referring patients for sedation	38.16%
Complex medical history	17.39%
Age (too young of too old)	8.21%
Complicated/ long procedure	13.53%
Other	22.71%
<b>How often do you refer patients for sedation to other providers?</b>	
Never	37.20%
1-2 times a year	28.50%
3-5 times a year	14.98%
5 ≤ times a year	19.32%
<b>Are you currently providing sedation for your patients?</b>	
Yes	36.06%
No	63.94%
<b>What level of sedation are you providing for your patients?</b>	
Minimal	44.23%

Moderate	36.54%
Deep	12.98%
General Anesthesia	14.42%
<b>How do you administer the majority of your sedations?</b>	
Oral	45.86%
Intramuscular	0.00%
Intravenous	24.81%
Inhalational	9.02%
Combination of any of the above	20.30%
<b>What type of medications do you use for sedation?</b>	
Midazolam	29.33%
Diazepam	36.54%
Chloral hydrate	5.29%
Demerol	9.13%
Ketamine	10.10%
Triazolam	27.40%
Hydroxyzine	13.94%
Nitrous oxide	44.71%
Larazepam	14.42%
Combination of two drugs	22.60%
Combination of three drugs	21.15%
Other	12.02%
<b>Do you ever re-dose your oral sedative medications?</b>	
Yes	66.17%
No	33.83%
<b>Who monitors the patient during your sedations?</b>	
Myself	70.68%
Dental assistant	19.55%
Anesthesia provider (CRNA, Dentist Anesthesiologist, MD anesthesiologist)	3.01%
Other	6.77%
<b>What types of monitors do you use to evaluate your patient under sedation?</b>	
Precordial stethoscope	19.71%
EKG	20.19%
BP	51.92%
HR	46.63%
SPo2 (pulse oximetry)	52.88%
EtCO2 (nasal canula or nasal hood sampling line)	7.21%
All of the above	7.21%
None	4.33%
Other	0.96%
<b>Do you administer supplemental oxygen to your patients?</b>	
Yes	21.05%
No	78.95%
<b>Have you ever experienced a medical emergency in your office related to your sedation patients?</b>	
Yes	75.94%
No	24.06%
<b>What type of reimbursement do you receive for sedation procedures?</b>	
Fee for service	68.42%
Insurance fees	26.32%
Insurance co-pays	3.01%
Medicaid or Medicare	2.26%

Note: N = 439

dentists report providing minimal sedation for their patients, while 36% report moderate sedation and 13% report Deep and 14% report providing General Anesthesia for their patients.

Almost half of the dentists use oral medication to administer sedation within their office and of those 67% reported that they re-dose the oral sedative medication to the patient during the dental procedure. 20% report using combined methods of administering medications, including oral, intravenous, and inhalational sedatives. Twenty nine percent of Virginia dentists report using midazolam and 37% report using Diazepam, while 23% report using a combination of 2 drugs, and 21% reports using combination of 3 drugs.

Over 75% of the survey participants indicated that they have had a medical emergency in their office related to a sedated patient; and 11% reported that they never practice for sedation emergency scenarios within their practice. Despite the amount of medical emergencies reported, 65% of dentists reported that they would not be interested in simulation training for sedations and emergencies. Over 70% of dentists reported that while providing dental treatment, they are the sole monitors for their patient during sedation; 20% report having a dental assistant who's sole responsibility is to monitor the patient, and 10% have another medical provider assist with monitoring the patients during treatment.

Respondents report using the ASA monitors including precordial stethoscope (20%), EKG (20%), BP (50%), HR (47%), Pulse Oximetry (53%), EtCo2 (Nasalcannula) (7%), All of the monitors listed (7%), and alarmingly 4% said they use no monitors during sedations.

The mean scores for the survey participant respondents for Continuing Education domain by item are in *Table 3*. The majority of dentists attend a continuing education course to maintain sedation skills annually (35%) or every other year (47%). The majority of dentists would not be interested in using simulation training as a tool for continuing education credits for maintenance related to sedation skills and emergency training skills (65%).

55% of dentists reported that they feel that 20% of their patients would benefit from sedation management during dental treatment. 68% of respondents report that they receive fee for service for sedation and anesthesia procedures, while only 26% insurance pays for, and 3% have insurance co-pays, and Medicaid /Medicare at 2%.

### Discussion

When looking over the data collected, it was surprising to note that over 75% of the participants indicated that they have had a medical emergency in their office related to a sedated patient. Despite the amount of medical emergencies reported, 65% of dentists reported that they would not be interested in simulation training for sedations and emergencies. Simulation training could address the team approach to training for medical emergencies.

#### Sedation levels and the sedation continuum

Training including simulation of medical emergencies with sedation and anesthesia may be the safest and best method for providing training for dental students, graduate students/residents, and dental providers already practicing sedation and anesthesia for their patients. Previous research has been

**Table 3.** Percentage of Dentists in Virginia for Continuing Education Questions.

Survey Item	Percentage
<b>Continuing Education</b>	
<b>How often do you complete Continuing Education to maintain your sedation skills?</b>	
Once a year	35.34%
Once every 2 years	46.62%
Every 2-4 years	7.52%
Every 4 years	0.00%
Every 5 years or more	4.51%
None	6.02%
<b>How many total hours of Continuing Education credit related to sedation and/or anesthesia have you completed within the last 5 years?</b>	
0-5	18.80%
6-10	5.26%
11-15	6.02%
16-20	17.29%
21-25	6.02%
26-30	10.53%
31-35	3.01%
36-40	9.77%
41-45	0.00%
46-50	6.77%
51-55	0.75%
56-60	5.26%
61-65	0.00%
66-70	0.75%
71-75	2.26%
76-80	0.75%
81+	6.77%
<b>Would you be interested in attending a CE course on sedation using manikin simulation?</b>	
Yes	34.59%
No	65.41%

Note: N = 439

conducted that highlights the success of using simulation as an educational intervention to teach moderate sedation skills to non-anesthesia providers [15,16]; as well as using simulation to teach resuscitation, advanced cardiac life support, and airway management skills [15-18].

### Limitations

Although the response rate was 22% and could introduce the possibility of non-response bias, this is consistent without similar surveys reported in the dental and medical literature. Surveys of physicians tend to have significantly lower response rates than non-physicians and it is unclear whether response rate alone is a fair predictor of non-response bias. In addition, our study was limited to Dentists in Virginia. External validity is weak since we focused on participants within our state. Our survey did not allow dentists to be exempted from the survey if not providing sedation, thus may have skewed the data. It should also be noted that Dentist Anesthesiologists (DA) and Oral Maxillofacial Surgeons (OMFS) receive more advanced training in sedation and anesthesia than a general dentist. This lack of distinction between the DA/OMFS and the general dentist, limits the conclusions that can be drawn from the data. Thus by the survey not allowing for this distinction,

there could be bias introduced into the data and could have inappropriately skewed the data.

Additional research and time is needed to determine if the Virginia Board of Dentistry new laws and Regulations set forth in the Emergency Regulations from 9/2012 have affected the training, number of dentists doing sedations, and patients requesting more highly trained providers for sedation and anesthesia services. Despite the lack of interest of Virginia Dentists, one of the safest and most proven routes of providing training and competency is simulation training. Using simulation as a way to teach emergency preparedness in the dental office, appropriate emergency management drills have been demonstrated with successful use of simulation training to teach the management skills for the most common adverse events including basic emergency airway management during respiratory emergencies [16]. Thus simulation has the potential to teach skills that can be translated to other settings. Simulation-based training can lead to demonstrable benefits for sedation training [15,16], basic airway management [17] emergency preparation/prevention [18], and emergency management skills acquired for students learning in simulation with the translation of those skills into practice [17,18].

Another issue noted in the survey was that the participants were not asked what type of adverse events they experienced. Additional research should focus on the type of adverse event, since it was not appropriately defined in the survey. If 75% of the respondents reported that they experienced a sedation-related emergency, what constituted a dental emergency for that particular provider? How was it managed? Due to the fact that this definition wasn't defined clearly, it is unsure whether the emergencies were serious or required intervention and then the patient recovered well.

It would also be interesting to note; what are the major barriers for taking advantage of the technology and training utilizing current simulation for sedation emergency management. Our assumption is that this is related to the average cost of the courses starting around \$1000, and the

lack of courses in the area where the dentists live. Having to travel to take these types of courses can add additional costs to the already expensive courses.

## Conclusion

This survey revealed that only a small minority of the dentists that responded perform emergency drills despite the widespread practice of minimal and moderate sedation. Equally alarming is the revelation that most dentists that responded denied specific training in the management of respiratory distress and rescue from a deeper level of sedation. With an increase in interest in sedation and anesthesia coming from patients, for sedation to be provided during dental procedures, additional training should be a recommendation for dentists to assure that they are providing safe sedation and anesthesia protocol, and that they also have the skills and knowledge necessary to rescue a patient should a medical emergency arise. In the future, it would be interesting to see what the impact of the Emergency Regulations requiring a permit for dental anesthesia and sedation provided by dentists, has on the number of providers, type of procedures, type of sedation being administered, monitoring, training and skills, and whether the advent of simulation training would be beneficial to these providers.

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## Conflicts

The authors report no conflicts of interest.

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