

Dental Sedation by Dentists: A View From Anesthesiologists Working in Central Western Brazil

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BACKGROUND: Anesthesia care has been provided by diverse health professionals worldwide, but little is known about anesthesiologists' views about this. Using a survey, we sought the opinions of a group of Brazilian anesthesiologists regarding nitrous oxide/oxygen and oral minimal/moderate sedation performed by dentists.

METHODS: A 3-part postal questionnaire was sent to 206 physician anesthesiologists working in the state of Goias, in Central Western Brazil. Part 1 consisted of 4 questions describing respondents' characteristics: gender, time elapsed since completion of the residency program, and experience in providing sedation and general anesthesia for dental treatment. In Part 2, respondents were asked to give their opinions on 11 statements about sedation performed by dentists. Possible responses ranged from total disagreement to total agreement (minimum score = 11 and maximum score = 55). Part 3 was a section for general comments. Data were analyzed by k-means clusters, χ^2 , and Student's *t*-test.

RESULTS: The response rate was 53.8% (111 questionnaires). Most anesthesiologists (85.6%) had rarely or never provided sedation or general anesthesia for dental treatment, and 92.8% disagreed with the statement that dentists can administer moderate sedation in the dental office. Two clusters representing more favorable ($n = 21$) or less favorable ($n = 90$) opinions were established. Anesthesiologists in the "less favorable" group had more experience with dental sedation ($P = 0.006$) and dental general anesthesia ($P = 0.008$) than those in the "more favorable" group. Gender and time elapsed since residency completion did not significantly affect anesthesiologists' opinions.

CONCLUSIONS: Many anesthesiologists in Central Western Brazil do not sedate dental patients and are not confident that dentists are able to do it. Dental sedation is an issue that still needs to be clarified in this region; the respective roles of physicians and dentists need to be determined to benefit the population.

(Anesth Analg 2010;110:110-4)

Minimal and moderate sedation in dental offices can be performed by practitioners who are not specialists in anesthesiology as long as guidelines for minimizing risks to patients are followed.¹ However, departments of anesthesiology are responsible for providing procedural sedation,² including procedural sedation in dentistry.³ The role of the anesthesiologist in the dental office sedation process includes personally administering anesthesia, training and supervising nonanesthesiologist providers, looking after the care environment, and promoting the quality and safety of care.²

Procedural sedation delivery varies around the world. There are regions where anesthesiologists are the sole providers of such care in surgery units (e.g., most of Europe), others where a few trained nonanesthesiologists provide sedation in specified circumstances and locations (e.g., the United Kingdom [UK]), and other countries where multiple nonphysician professionals provide sedation in diverse settings (e.g., United States and Canada).⁴ In Brazil, anesthesiology is a specialty restricted to physicians. After a 6-yr medical undergraduate course, physicians can apply for a 3-yr anesthesiology residency program. Brazilian law also allows qualified dentists to perform analgesia/sedation and hypnosis.

Practitioner skills and practice standards are the general areas of controversy in procedural sedation.^{4,5} According to the Joint Commission on Accreditation of Healthcare Organizations, a qualified hospital sedation provider is one who has "at a minimum had competency-based education, training, and experience" in evaluating patients, performing moderate sedation, and rescuing patients who slip into a deeper-than-desired level of sedation.⁶ It has been claimed that a shortage of anesthesiologists is one factor that has limited the expansion of sedation services.^{2,5,7}

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Accepted for publication August 13, 2009.

Supported by the National Council of Technological and Scientific Development (CNPq), Brazil (for the undergraduate student Wilson J. Valadao, Jr.).

Reprints will not be available from the author.

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DOI: 10.1213/ANE.0b013e3181bdc63d

There is a wide range of dental training experiences to prepare the dentist to provide dental sedation.⁸ With an increasing demand for sedation in dentistry,³ it is necessary to clarify professional roles in providing this kind of sedation.

Information about anesthesiologists' perceptions on the provision of dental sedation is lacking, although we found one report on this topic.³ This survey sought the opinions of a group of Brazilian anesthesiologists regarding nitrous oxide/oxygen and oral minimal/moderate sedation performed by dentists. This information may help researchers and clinicians in the development of strategies to improve patient dental care.

METHODS

Sample

This study was approved by the IRB of the Federal University of Goiás. The sample consisted of 206 physicians registered as anesthesiologists in the state of Goiás, Central Western Brazil, in the second half of 2006. Although there were 342 registered anesthesiologists in Goiás, no contact information for 136 of them was available to the research team. Written informed consent was obtained from all subjects, and their anonymity was protected.

Questionnaire

The questionnaire used in this study was developed in 2 phases. The first phase consisted of a qualitative study: one researcher (WJV) conducted in-depth interviews with a convenience sample of 10 anesthesiologists using a 4-question guide focusing on their perceptions about sedation or general anesthesia for dental treatment, sedation administered by dentists, and their experience with dental sedation. The interviews were audiotaped, and the responses were transcribed; an interpretative analysis led us to the respondents' most commonly held ideas: sedation in the dental office is valid for adults but not indicated for children; dental sedation should preferably be performed in a hospital; chloral hydrate is no longer used by anesthesiologists to sedate children; midazolam is the premedication of choice; dentists could administer dental sedation if they were able to rescue a patient from emergency situations; and general anesthesia in the hospital setting is highly indicated for some cases, for example, special needs patients or those who will undergo painful dental procedures. These ideas were the basis of the questionnaire that was tested in the pilot study.

For the phase 2 (pilot) study, 10 residents in anesthesiology were invited to complete the questionnaire. After data analysis and minor changes, the final version was administered to all the anesthesiologists who did not take part in the preliminary phases of this study.

The final version of the questionnaire consisted of 3 parts. Part 1 included 4 questions to elicit demographic data: gender, length of time (years) since completing the residency program, and frequency of dental sedation and dental general anesthesia by the anesthesiologists (never, less than once a month, or more than once a month). Part 2 (first column, Table 1) sought their opinions about dentist-performed sedation through 11 statements, each with 5 possible Likert scale responses: strongly disagree (Score 1), disagree (Score 2), unsure (Score 3), agree (Score 4), and strongly agree (Score 5). Statements 2, 3, and 10 had reversed scores for inferential analysis. The minimum and maximum possible scores were 11 and 55, respectively; the higher the score, the more positive were the opinions about sedation performed by dentists. There was also a section for voluntary general comments (Part 3).

Data Collection

This study was designed as a cross-sectional postal questionnaire-based survey. An envelope containing a cover letter, the informed consent form, the questionnaire, and a stamped return envelope was mailed to 206 registered anesthesiologists working in the state of Goiás. One month after the first attempt, another envelope was sent to those individuals who did not answer the first time. Those who did not return the questionnaire after 2 attempts were excluded from the study.

Statistical Analysis

Cronbach's α was used to investigate the internal consistency of the questionnaire, and its initial value for the 11 questions was 0.64. Then, we sequentially removed 1 question at a time until we obtained the best possible solution (Cronbach's α 0.80) with 4 remaining items: question numbers 1, 4, 6, and 9.

Because there was no dependent variable, a k-means cluster analysis was performed to divide the answers to Part 2 of the questionnaire into 2 clusters where scores from 1 cluster were more similar to each other than scores from the other cluster. The k-means algorithm is a partition method that uses an iterative refinement technique. It assigns each point to the cluster whose center (centroid) is nearest using Euclidean distance. The center is the average of all the points in the cluster, that is, its coordinates are the arithmetic mean for each dimension separately over all the points in the cluster. The iteration continues until the number of objects changing clusters is below a user-specified threshold. The algorithm seeks to minimize within-cluster variance and maximize variability between clusters in an analysis of variance-like fashion.⁹

The clusters were named "more favorable" and "less favorable" opinions toward dental sedation practiced by dentists, and they were compared by Student's *t*-test. χ^2 tests and Student's *t*-test were used to compare the 2 clusters in regard to the independent

Table 1. Score Frequency from the Anesthesiologists' Answers

Statements	Scores, <i>n</i> (%)				
	Strongly disagree (1)	Disagree (2)	Unsure (3)	Agree (4)	Strongly agree (5)
1. Dentists are able to provide moderate sedation in the dental office	91 (82.0%)	12 (10.8%)	8 (7.2%)	0	0
2. In the dental office, moderate sedation should be provided by medical anesthesiologists (<i>r</i> ^a)	0	18 (16.2%)	5 (4.5%)	40 (36.0%)	48 (43.2%)
3. Moderate sedation should be provided in a hospital setting (<i>r</i> ^a)	0	8 (7.2%)	12 (10.8%)	61 (54.9%)	30 (27.0%)
4. Dentists are able to provide oral sedation	53 (47.7%)	37 (33.3%)	10 (9.0%)	11 (9.9%)	0
5. Dentists are able to provide basic life support in an emergency situation	52 (46.8%)	27 (24.3%)	12 (10.8%)	20 (18.0%)	0
6. Oral sedation is a safe procedure for other practices such as radiological clinics	35 (31.5%)	35 (31.5%)	22 (19.8%)	19 (17.1%)	0
7. A 96-h program ^b is sufficient to enable a dentist to provide inhalational sedation with nitrous oxide and oxygen at his or her office	74 (66.7%)	30 (27.0%)	7 (6.3%)	0	0
8. A dentist can provide oral chloral hydrate sedation for ASA PS 1 children	59 (53.2%)	29 (26.1%)	14 (12.6%)	9 (8.1%)	0
9. A dentist can provide oral midazolam sedation for ASA PS 1 children	78 (70.3%)	26 (23.4%)	6 (5.4%)	1 (0.9%)	0
10. General anesthesia is the first choice for dental treatment of patients that do not cooperate with nonpharmacological behavior management methods (<i>r</i> ^a)	12 (10.8%)	45 (40.5%)	12 (10.8%)	31 (27.9%)	11 (9.9%)
11. If dentists were trained to provide moderate sedation in the dental office there would be less referral for dental treatment under general anesthesia	27 (24.3%)	39 (35.1%)	20 (18.0%)	10 (9.0%)	15 (13.5%)

^a Scores were reversed (*r*) for 5 to 1.

^b Bylaw of the Brazilian Dental Association.

variables (Part 1); the frequency of anesthesiologists' experience in providing dental sedation or dental general anesthesia was dichotomized as "yes" (regularly provided) or "no" (never or rarely provided). Statistical analyses were performed using SPSS for Windows, version 10.0 (SPSS, Chicago, IL).

RESULTS

One hundred eleven anesthesiologists answered Parts 1 and 2 of the questionnaire completely (response rate 53.8%). They were mostly men (85.6%) and had been practicing in this specialty for 1–34 yr (mean 12 yr). The majority of anesthesiologists had never (54.1%) or rarely (31.5%) (i.e., less than once a month) provided dental sedation in a dental office. General anesthesia for dental treatment was routinely (more than once a month) practiced by only 5.4% of anesthesiologists in this sample.

Low scores were observed in the second part of the questionnaire (11–32 of a maximum of 55, mean 21.4, and *SD* 4.9), pointing to the anesthesiologists' resistance to having dentists provide sedation (Table 1). Most of them disagreed with the statements that dentists can provide moderate sedation (92.8%), are able to manage an emergency situation (71.1%), or are adequately prepared by a 96-h program to provide nitrous oxide/oxygen sedation (93.7%). Instead, most

anesthesiologists (79.2%) thought that moderate sedation should only be administered by anesthesiologists in a hospital setting (81.9%).

Only questions 1, 4, 6, and 9 were considered for bivariate analysis because together they provided the best internal consistency for the scale. A cluster analysis was performed to divide the differences of opinion into 2 clusters. The first cluster included the anesthesiologists whose opinions about moderate sedation provided by dentists were more favorable ($n = 21$), with total scores ranging from 20 to 32. The second cluster included anesthesiologists who had less favorable opinions ($n = 90$, total scores ranging from 11 to 27). There were significant differences in anesthesiologists' opinions between the clusters regarding the 4 questions (Table 2). Differences between clusters were statistically significant in regard to 2 independent variables: there were more anesthesiologists who had provided dental sedation and/or general anesthesia in the cluster of less favorable opinions (Table 3).

Part 3 of the questionnaire, which focused on the inability of the dentist to handle adverse events related to sedation ($n = 7$), anesthesiology as a role of the specialized physician ($n = 7$), or both ($n = 1$), was completed by 13.5% of respondents. Some typical comments were:

Table 2. The Most Relevant Questions About the Opinions of Anesthesiologists About Dental Sedation Provided by Dentists

Statements	Mean scores (SD)		P*
	More favorable opinions (n = 21)	Less favorable opinions (n = 90)	
Dentists are able to provide moderate sedation in the dental office	2.29 (0.64)	1.01 (0.10)	<0.001
Dentists are able to provide oral sedation	2.71 (1.01)	1.60 (0.83)	<0.001
Oral sedation is a safe procedure for other practices such as radiological clinics	3.86 (0.36)	1.84 (0.79)	<0.001
A dentist can provide oral midazolam sedation for ASA PS 1 children	2.24 (0.77)	1.17 (0.36)	<0.001
Total scores	28.10 (3.40)	19.83 (3.67)	<0.001

* Student's *t*-test.**Table 3.** Associations Between Anesthesiologists' Opinions About Dental Sedation Provided by Dentists and Independent Variables

Independent variables	More favorable opinions (n = 21)	Less favorable opinions (n = 90)	P*
Gender, n (%)			
Female	2 (12.5%)	14 (87.5%)	0.732
Male	19 (20.0%)	76 (80.0%)	
Time elapsed (yr) after residency completion, mean (SD)	14.33 (8.94)	11.50 (6.89)	0.113
Have provided dental sedation, n (%)	4 (7.8%)	47 (92.2%)	0.006
Have provided dental general anesthesia, n (%)	2 (5.3%)	36 (94.7%)	0.008

* Fisher's exact test, Pearson χ^2 , and Student's *t*-test.

"It is extremely risky to have other professionals such as dentists provide any kind of sedation because they do not have the formal education to do this. Every human body is different. We never know a particular body's response to a particular sedative. That is why an anesthesiologist attends a residency program for so many years: to be prepared for an unwanted response from the patient. We cannot agree to sedation being left in incompetent hands." (A97)

"Only anesthesiologists are able to manage all topics related to procedural sedation. Dentists must not meddle in professional business for which they are not competent." (A22)

DISCUSSION

This group of Brazilian anesthesiologists held unfavorable views about dentists providing sedation, especially those physicians who had already conducted dental sedation and/or dental general anesthesia. Although this was not a national survey, it highlighted some findings that deserve further consideration.

The anesthesiologists did not approve of dentists administering moderate sedation, and one of the reasons for this was that they were not confident that dentists are competent to provide sedation. However, many anesthesiologists in other studies realize that it is unrealistic to expect anesthesiologists to provide all sedation for dental treatment, and that dentists should be trained to use sedation techniques.³ In our study, a few anesthesiologists agreed that 96 h of training (as legally required by the Brazilian Dental Association) was satisfactory to educate dentists to provide inhaled sedation with nitrous oxide and oxygen. However, the American Dental Association has determined that this type of course should last a minimum of 14 h, including a clinical component during which competency in inhaled sedation technique is achieved, and that it can be completed as a part of a predoctoral dental education program or as a postdoctoral continuing education competency course.¹⁰ Furthermore, Scottish anesthesiologists approved the use of this kind of inhaled sedation by dentists in hospitals (81%) and dental offices (72%).³

Many dentists think that they should receive formal education in sedation.^{8,11,12} General dental practitioners have low overall satisfaction with the quality of sedation education in US dental schools,¹² whereas 49% (*n* = 227), 47% (*n* = 216), and 58% (*n* = 265) of UK dentists find their training in oral sedation, inhaled sedation, and IV sedation, respectively, less than adequate.⁸ From another perspective, undergraduate students attending dental school in the UK and Ireland were reported to be receiving more didactic teaching about, and hands-on training in, inhaled and IV sedation.¹³

There are two other important factors supporting the need to teach dentists to provide dental sedation. The first is an increase in awareness by the population and the wish to have sedation to alleviate their anxiety during dental procedures.^{12,14,15} There is often heavy demand for pediatric sedation in many different settings including dentistry in a hospital setting and outside the operating room.¹⁶ The second factor is the desire of dentists to deliver this kind of service.^{12,17} Of 237 dentists in Canada, for example, 80% believe that nitrous oxide and oxygen sedation should be included among the treatments that a licensed practitioner can provide, and 50% believe that IV sedation should be included.¹⁸

Approximately 22% of the 111 anesthesiologists in the present survey agreed that the provision of moderate sedation by the dentist would reduce referrals

for general anesthesia, and this expectation was investigated and confirmed in a study about midazolam sedation for dental treatment of children.¹⁹ Many anesthesiologists were opposed to the dentist having a role in sedation. To avoid a continuing battle, health professionals and institutions could develop or endorse minimum training requirement guidelines for dentists wishing to practice sedation.³ Anesthesiologists could help professionals and patients by sharing their knowledge with and providing their guidance and oversight to others who might provide hands-on care.² Also, it should be emphasized that adverse events occur in pediatric sedation regardless of physician type (including dentists), but complications are related to the skill set of the practitioner.²⁰

Although anesthesiologists were not as favorable to dentists providing sedation, we attempted to create 2 groups that would represent more or less favorable opinions, and cluster analysis proved that this split was valid. Perhaps if we had had more groups, the results of the statistical associations would have been different. In fact, a shortcoming of this study is that its sample size was restricted to one Brazilian state, but our response rate might be acceptable for this type of survey. In fact, factors influencing response rates in this study might include unwillingness to participate or lack of interest in the subject. However, we expect to stimulate other research groups to study this topic in different regions.

Furthermore, because most of the anesthesiologists did not regularly provide dental sedation or general anesthesia, we could hypothesize that their responses might be affected by factors not measured by the instrument, such as severity in assessment of this subject or even halo error.²¹ Such sources of rater biases must be considered when interpreting or generalizing our results.

Interestingly, anesthesiologists who had provided dental sedation and/or general anesthesia were less permissive of dentists performing this procedure. However, we were not able to explain whether this group was more concerned about sedation-related risks, more aware of the dentists' limitations, or more concerned with the financial implications of having appropriately trained dentists performing sedation/IV analgesia in the dental office. Moreover, because dental general anesthesia has been conducted in a hospital setting in Brazil, these anesthesiologists may have considered dental general anesthesia an efficient solution for healthy patients who need dental anxiety control, despite waiting lists for operating rooms, nosocomial infection, and financial costs.²²

Most of the anesthesiologists surveyed disagreed with sedation provided by dentists in the dental

setting. Instead, they were favorable to hospital-based dental moderate sedation or general anesthesia that they themselves performed. However, very few of these anesthesiologists provide such care.

REFERENCES

1. American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. *Anesthesiology* 2002;96:1004-17
2. Wetzel RC. Don't confuse the anesthetic with the anesthesiologist! *Anesth Analg* 2006;103:859-62
3. Shearer J, Wilson KE, Girdler NM. A survey of the opinion of consultant anaesthetists in Scotland of sedation carried out by dentist. *Br Dent J* 2004;196:93-8
4. Krauss B, Green SM. Procedural sedation and analgesia in children. *Lancet* 2006;367:766-80
5. Gozal D, Gozal Y. Pediatric sedation/anesthesia outside the operating room. *Curr Opin Anaesthesiol* 2008;21:494-8
6. Joint Commission on Accreditation of Healthcare Organizations. Comprehensive accreditation manual for hospitals. Oakbrook Terrace, IL: JCAHO, 2005
7. Lalwani K, Michel M. Pediatric sedation in North America children's hospitals: a survey of anesthesia providers. *Paediatr Anaesth* 2005;15:209-13
8. Wilson PH, Boyle CA, Smith BJ. Conscious sedation training received by specialist registrars in restorative dentistry in the UK: a survey. *Br Dent J* 2006;201:373-7
9. Andreopoulos B, An A, Wang X, Schroeder M. A roadmap of clustering algorithms: finding a match for a biomedical application. *Brief Bioinform* 2009;10:297-314
10. American Dental Association. Guidelines for teaching pain control and sedation to dentists and dental students. Chicago, IL: ADA, 2007
11. Hill KB, Hainsworth JM, Burke FJ, Fairbrother KJ. Evaluation of dentists' perceived needs regarding treatment of the anxious patient. *Br Dent J* 2008;204:E13
12. Costa LRRS, Dias AD, Pinheiro LS, Chaves MEPS, Ferreira RAR, Almeida RB, Lima ARA. Perceptions of dentists, dentistry undergraduate students, and the lay public about dental sedation. *J Appl Oral Sci* 2004;12:182-8
13. Leitch J, Jauhar S. A follow-up survey of the teaching of conscious sedation in dental schools of the United Kingdom and Ireland. *Anesth Prog* 2006;53:43-8
14. Chanpong B, Haas DA, Locker D. Need and demand for sedation or general anesthesia in dentistry: a national survey of the Canadian population. *Anesth Prog* 2005;52:3-11
15. Allen EM, Girdler NM. Attitudes to conscious sedation in patients attending an emergency dental clinic. *Prim Dent Care* 2005;12:27-32
16. Cravero JP, Blike GT. Review of pediatric sedation. *Anesth Analg* 2004;99:1355-64
17. Boynes SG, Lemak AL, Close JM. General dentists' evaluation of anesthesia sedation education in U.S. dental schools. *J Dent Educ* 2006;70:1289-93
18. Ryding HA, Murphy HJ. Use of nitrous oxide and oxygen for conscious sedation to manage pain and anxiety. *J Can Dent Assoc* 2007;73:711
19. Uldum B, Hallonsten AL, Poulsen S. Midazolam conscious sedation in a large Danish municipal dental service for children and adolescents. *Int J Paediatr Dent* 2008;18:256-61
20. Cote CJ, Notterman DA, Karl HW, Weinberg JA, McCloskey C. Adverse sedation events in pediatrics: a critical incident analysis of contributing factors. *Pediatrics* 2000;105:805-14
21. Hoyt WT. Rater bias in psychological research: when is it a problem and what we can do about it? *Psychol Methods* 2000;3:64-86
22. Milnes AR. Intravenous procedural sedation: an alternative to general anesthesia in the treatment of early childhood caries. *J Can Dent Assoc* 2003;69:298-302