Practice Patterns of Dentist Anesthesiologists in North America

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This study provides trends in the discipline of dental anesthesiology. A questionnaire-based survey was sent to 338 members of the American Society of Dentist Anesthesiologists to evaluate practice patterns. One focus of the study was modality of sedation/anesthesia used for dentistry in North America. Age, gender, years in practice, and geographic region of practice were also obtained. Data gathered from the returned questionnaires were entered into an Excel spreadsheet and then imported into JMP Statistical Discovery Software (v12.2 Pro) for descriptive analysis. A total of 112 surveys were completed electronically and 102 surveys were returned via post, for a total response rate of 63.3% ($N = 214$). Data from this survey suggested a wide variation of therapeutic practices among dentist anesthesiologists in North America. Of the surveyed dentist anesthesiologists, 58.7% ($SE = 4.2\%$) practice as mobile providers, 32.2% ($SE = 3.1\%$) provide care in an academic environment, and 27.7% ($SE = 2.8\%$) function as operator/anesthetists. The majority of anesthesia is provided for pediatric dentistry (47.0%, $SE = 4.2\%$), oral and maxillofacial surgery (18.5%, $SE = 3.9\%$), and special needs (16.7%, $SE = 3.6\%$). Open-airway (58.7%, $SE = 5.5\%$) sedation/anesthesia was the preferred modality of delivery, compared with the use of advanced airway (41.3%, $SE = 4.6\%$). The demographics show diverse practice patterns of dentist anesthesiologists in multiple regions of the continent. Despite concerns regarding specialty recognition, reimbursement difficulties, and competition from alternative anesthesia providers, the overall perceptions of dentist anesthesiologists and the future of the field seem largely favorable.

Key Words: Dental anesthesiology; Dentist anesthesiologists; American Society of Dentist Anesthesiologists.

The discipline of dental anesthesiology across the United States and Canada has been a growing facet of dentistry for several years. Previous literature has shown limited review of the practices of dentist anesthesiologists.¹ These specialized practitioners in the dental field provide unique treatment modalities and professional perspectives. A survey of the members of the American Society of Dentist Anesthesiologists (ASDA) presents information for current and potential future colleagues to gauge the dynamics and scope of dental anesthesiology in various regions of North America.^{2,3} There has been a constant need for anesthesia in the field of dentistry. The evolving outlook on anesthesia continues to grow with changes in health

care management and insurance coverage. Further, with states like Virginia writing legislation that would require insurance companies to cover general anesthesia in a dental setting for children up to age 13, the need for dental anesthesiologists could significantly increase.⁴

A questionnaire-based survey was designed to provide point-prevalence descriptive statistics of practice patterns of dentist anesthesiologist in North America. Age, gender, years in practice, regions of practice, and scope of practice were variables studied. In addition to objective data, subjective data explored the future of dental anesthesiology. Regions and perspectives of dentist anesthesiologists were considered from the dental professional and the general patient population.

This study examines the practices of dentist anesthesiologists in North America. A broad range of data was compiled that would allow comparison of multiple practice modalities. Information gathered may shape education and future practice. With constantly evolving techniques and pharmacologic advances, the future of the field continues to grow.

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MATERIALS AND METHODS

The University of Pittsburgh School of Dental Medicine's Department of Dental Anesthesiology prepared a 16-item questionnaire for members of the ASDA. Data collected from each practitioner provided demographic information, which included gender, age, number of years practicing, and geographic location of current practice. Seven regions were identified and used for classification.

The survey was drafted and vetted by members of the University of Pittsburgh School of Dental Medicine's department of dental anesthesiology. The survey and study design were sent to the institutional review board at the University of Pittsburgh for review and approval. Following approval, the survey was distributed to 338 active ASDA members. Members received the survey in 2 formats: an online and a paper copy, with instructions to complete only 1 version.

The online version was disseminated via electronic mail to all members on the ASDA listserve with a link to SurveyMonkey. The electronic mail described the project and its purpose. This version of the survey was sent out 2 weeks prior to the mailing and a reminder e-mail was sent approximately 3 weeks from the original posting. In order to ensure anonymity, no identification markers were used during the study. The Web site, however, was programmed to allow 1 submission per Internet protocol address to prevent multiple entries from the same electronic device.

The written survey was mailed to each ASDA member's listed address. Enclosed in each mailing was a written survey, a personalized signed letter asking for participation and describing the goals of the study, and a prepaid return envelope. In this version, participants were asked to disregard the letter if they had already completed the electronic survey.

Completed electronic questionnaires were compiled online, and completed mailed questionnaires were returned to a central site at the University of Pittsburgh School of Dental Medicine for processing and data entry. A total of 112 surveys were completed electronically and 102 surveys were returned via the United States Postal Service, for a total response rate (RR) of 63.3% ($N = 214$). In order to reduce response bias and duplication bias, the electronic and written surveys were evaluated as separate studies and then compared to one another. Subsequently, both data sets from the returned questionnaires were entered into an Excel spreadsheet and then imported into JMP Statistical Discovery Software (v12.2 Pro) for summary analysis.

All survey responses were summarized using frequencies and percentages. Relationships of dentist anesthesiologist gender, age, number of years in practice, years

of training, number of days practicing per week, number of cases per week, and region of practice were examined. Standard error and standard deviation were calculated with JMP and included with published results.

Additionally, perceptions of dentist anesthesiologists were compiled and considered. The surveys asked responders to provide their opinions on a variety of different topics, with possible answers ranging from strongly unfavorable to strongly favorable on a 5-point Likert-like scale. These topics included the responder's opinion of the perception of dental anesthesiologists from each provider, from the general public in the area of practice, and from the dental professionals in the area. Each one of these questions was designed to determine whether or not there is a discrepancy in the view of the profession from various standpoints. Also, each provider was asked to report his or her current demand and extrapolate the demand for dentist anesthesiologists in the next 5 years. This perceived demand could suggest a barometer of anticipated health of the profession in the near future.

RESULTS

A total of 112 surveys were completed electronically and 102 surveys were returned via post, for a total RR of 63.3% ($N = 214$). Results of the comparison indicated no significant deviations between the survey formats. The Table shows the number of ASDA members who responded to the survey based on gender, age, years in practice, years of training, number of days practicing per week, number of cases per week, and region where they practice.

Demographics

Of respondents, 75.2% ($n = 161$) were male, 22.0% ($n = 47$) were female, and 2.8% ($n = 6$) did not indicate gender. Age distribution of respondents ranged from less than 35 years ($n = 49$, 22.9%) to 65 years or older ($n = 21$, 9.8%). Years in practice for respondents ranged from 0–5 ($n = 66$, 30.8%) to more than 20 ($n = 56$, 26.2%). Years of training of respondents ranged from 1 year ($n = 15$, 7%) to two years or more ($n = 194$, 90.7%). Number of days practicing per week ranged from 1 day ($n = 6$, 2.8%) to greater than 5 days per week ($n = 97$, 45.3%) (Table 1). The number of cases per week showed a bimodal distribution, with peaks at 10 ($n = 28$, 13.1%) or 20 cases per week ($n = 29$, 13.6%) (Figure 1).

Of the surveyed dentist anesthesiologists, 58.7% (SE = 4.2%) practice as mobile providers, 32.2% (SE = 3.1%) provide care in an academic environment, and 27.7% (SE

Characteristics of Respondents

<i>Characteristic</i>	<i>No. (%) of Respondents (N = 214)</i>
Gender	
Male	161 (75.2)
Female	47 (22.0)
Years in practice	
0–5	66 (30.8)
6–10	24 (11.2)
11–15	28 (13.1)
16–20	18 (8.4)
20+	56 (26.2)
Current resident	13 (6.1)
Age	
≤34	49 (22.9)
35–44	62 (29.0)
45–54	42 (19.6)
55–64	36 (16.8)
65+	21 (9.8)
Days in practice per week	
1	6 (2.8)
2	19 (8.9)
3	35 (16.4)
4	52 (24.9)
5+	97 (45.3)
Years in training	
1	15 (7.0)
2–2.25	154 (72.0)
3+	40 (18.7)

= 2.8%) function as operator/anesthetists. The majority of anesthesia is provided for pediatric dentistry (47.0%, SE = 4.2%), oral and maxillofacial surgery (18.5%, SE = 3.9%) and special needs (16.7%, SE = 3.6%). Addition-

ally, the most frequently used airway management technique was open airway (58.7%, SE = 5.5%) compared to advanced airway (41.3%, SE = 4.6%).

Region Comparison

For analysis of practice regions, respondents were categorized into 8 categories: Canada ($n = 23$, RR = 74.2%), Middle West ($n = 17$, RR = 62.9%), Northeast ($n = 48$, RR = 56.4%), Southeast ($n = 20$, RR = 95.2%), Southwest ($n = 33$, RR = 94.3%), West ($n = 68$, RR = 75.5%) and unspecified ($n = 11$) (Figure 2). Respondents who failed to indicate their region of practice were categorized as unspecified. These results were included because they represent a significant percentage of the data (5.1%) and also provide a random sample for comparison. Additionally of note, there were respondents who identified themselves as providing anesthesia service for multiple regions. These individuals are included in the analysis of each practice region in Figure 2.

Regions of practice were compared to level of sedation/general anesthesia. Figure 3 shows that the predominate level of anesthesia is deep sedation or general anesthesia by nearly a 4:1 ratio in most regions compared with mild or moderate sedation. Additionally, the largest percentage of mild or moderate sedations appears to be in the Southeast region.

Airway management techniques were compared and are depicted in Figure 4. The majority of cases are

Figure 1. Distribution of cases per week.

MW: Middle West; NE: Northeast; SE: Southeast; SW: Southwest; W: West

Figure 2. Map of the United States with region breakdown.

provided with open or unprotected airways in all regions except for the Southeast, where advanced airway techniques predominate. Furthermore, Canada appears to have the largest discrepancy in airway management technique, with more than twice as many open-airway cases than advanced airway cases.

The type of cases anesthesia is provided for appears to follow similar patterns in all regions. Figure 5 shows pediatric dentistry accounting for the largest percentage

of cases, with oral maxillofacial surgery and special needs cases accounting for the second and third largest case types, respectively, for most regions.

The types of practice in which dentist anesthesiologists operate are shown in Figure 6. Although the largest population of providers practice as mobile anesthesiologists, in Canada and the Southeast operator/anesthetist models are the greater majority. As expected, regions of practice with the highest percentages of providers

Figure 3. Comparison of dental anesthesiology levels of sedation/general anesthesia versus regions of practice.

Figure 4. Comparison of dental anesthesiology airway management techniques versus regions of practice.

involved in academic institutions appear to coincide with residency program locations.

Additional Results

Of the dentist anesthesiologists who responded, 70.2% provides service 4+ days per week. The highest demands for service are in pediatric dentistry, oral maxillofacial surgery, and special needs dentistry, respectively. Additionally, older dentist anesthesiologists are primarily male; however, the trend for new providers appears to be more inclusive of females.

In regard to perspectives of dentist anesthesiologists, there is a perceived competition for service demands and future growth from alternative anesthesia providers such as medical doctors and certified registered nurse

anesthetists. Despite these concerns, the majority of dentist anesthesiologists have a favorable outlook on the profession (89.5%) and feel positive regarding future demand (70.9%) (Figure 7). Additionally, as presented by Hicks et al,² the demand for future need of deep sedation/general anesthesia in pediatric dentistry, according to pediatric dentistry residency directors, will continue to increase in the future (64%).

DISCUSSION

Significant differences in clinical practice occur in dentist anesthesiologists based on regions of service. Although providers mostly administer general anesthesia and deep sedation, the types of cases and settings of practice may vary substantially. This difference may be

Figure 5. Comparison of dental anesthesiology case types versus regions of practice.

Figure 6. Comparison of dental anesthesiology practice types versus regions of practice.

attributed to distinct laws regulating sedation and general anesthesia within each state. Additionally, changes in practice modalities may be related to proximity of current residency programs (ie, more academics in California, Pennsylvania, and New York). Ultimately, these results have the potential of shaping residency programs, tracking changes within regional practice models, and indicating how regulatory changes may affect future practice.

As with any study, limitations must be considered. Although results presented are largely descriptive statistics, an inherent element of recall bias exists. Respondents were asked to report case numbers and percentages primarily from memory and not from a universally accessible health record system. Additionally, potential duplication bias is possible, as multiple responses could originate from the same provider despite online submission limitations and explicit directions for single responses.

Figure 7. A. Personal perceptions from survey respondents' regarding dental anesthesiology. B. Respondents' perceptions of the general public view of dental anesthesiology. C. Respondents' perceptions of dental professionals' views of dental anesthesiology. D. Respondents' perceptions of demands for service in their region over the next 5 years. E. Respondents' perceptions of current demand for service in their region.

Nevertheless, this study shows trends in dental anesthesiology across regions of North America. As the survey is inherently comprised of descriptive statistics, it posits only the groundwork for further examination noting changes in practice patterns over the course of time. Changing laws and insurance coverage occur regularly, meaning a comparative study evaluating the estimated future demand and perception of the profession could be beneficial. Additionally, a follow-up study could be instrumental in determining the perspectives of potential residents, dentists, and specialists seeking dental anesthesiology services.

CONCLUSIONS

This study was conducted to gauge anesthesia patterns across the United States and Canada. The information will help current dentist anesthesiologist residency programs to tailor their curriculum for current private practice modalities. Open-airway cases far outnumber intubated cases, and deep sedation/general anesthesia outnumbers moderate/light sedation across all of the regions. Advanced airway techniques outnumber open-airway techniques only in the Southeast region of the United States, as operator anesthetist is the most popular model. Residents wishing to practice in this region should pay attention to these cases, and residents wishing to practice in other regions must become proficient at managing an open airway. Depending where a resident intends to practice in the future, he or

she can choose a residency program that focuses on the anesthesia techniques that will benefit him or her most effectively. Oral surgery and pediatric dentistry cases are the vast majority of private cases performed by dentist anesthesiologists. This gives evidence as to why continual communication with pediatric dental societies and oral maxillofacial surgery societies is vital for the profession. Educating each of these professional groups regarding the safety and the benefits a dentist anesthesiologist can provide to them will help the field grow.

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