

Case Report

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Emerging Demand in Pediatric Dentistry for Office-Based General Anesthesia by Dentist Anesthesiologists in the United States



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Abstract

Pediatric dentists have traditionally relied upon self-administered sedation techniques to provide office-based sedation. The use of dentist anesthesiologists to provide office-based anesthesia is an emerging trend. Recent research have examined and compared these two models of office-based anesthesia services a survey evaluating office-based sedation of diplomates of the American Board of Pediatric Dentistry (ABPD) found that over 70% of board-certified US pediatric dentists use some form of sedation or anesthesia in their offices. Furthermore, less than 20% administer IV sedation and 20 to 40% use a dentist anesthesiologist. Therefore, the first purpose of this review is to explore the use of office-based sedation and anesthesia by pediatric dentists practicing in the United States. The second purpose of this review is to identify what graduate training programs in pediatric dentistry and dental anesthesiology are addressing to meet the future demands for deep sedation/general anesthesia services required for pediatric dentistry.

Introduction

Office-based sedation and anesthesia is a critical component of the modern pediatric dental practice. This is especially true for the management of special populations that include patients with cognitive impairments, developmental delay, pre-cooperative age and other conditions that limit the effectiveness of the traditional behavior management techniques used by pediatric dentists. Some pediatric dentists provide minimal or moderate sedation while simultaneously performing dentistry on these patients. Although this practice of operator-administered sedation has been a cornerstone of pediatric dental practice for generations, there are profound limitations to depth and effectiveness of sedation that can be provided using this technique [1-3].

Treatment of preschool children with early childhood caries is another major indication for office-based sedation and anesthesia. Early childhood caries is a major public health issue in the United States. Dental caries, the most common chronic childhood disease in the United States, affects approximately 1 in every 4 children under the age of 12 [4]. Pain and infection related to dental caries results in the loss of 51 million school hours each year [5]. Operator-administered moderate sedation for children with early childhood caries is often only minimally

effective. The limited depth and short working time of self-administered sedation techniques limit the pediatric dentist's ability to treat this population.

When general anesthesia is required for the treating special populations, or children with early childhood caries, pediatric dentists have three options: treat the child in hospital, an ambulatory surgery center, or have office-based anesthesia performed in their office by a dentist anesthesiologist. All three options can be performed safely and effectively, however there are significant differences between the three options regarding cost and efficiency. The most expensive option is hospital-based general anesthesia, where combined facility, operating room and personnel charges for a single case of pediatric dental rehabilitation can cost several thousands of dollars [6]. Hospital-based general anesthesia is also the least efficient option. Traveling outside of the office requires the dentist to suspend patient visits in his private practice while he travels to and from the hospital. Scheduling is more constrained, and wait times of up to several weeks can elapse between the request for operating room time and actual treatment [7]. Scheduling restraints on the operating room time, which must provide priority to more urgent surgeries often make hospital treatment

less productive for the dentist than rendering that treatment in her private office [8].

Ambulatory surgery centers usually charge lower facility costs than hospitals, and may have more accommodating schedules, but travel out of the office is still required [9]. In addition, very few ambulatory surgery centers possess the specialized armamentarium required for dentistry, making it more difficult for the center to accommodate dental cases as compared to more common, minor outpatient surgeries [10]. Personnel in ambulatory surgery centers must respond to a variety of surgeries and surgeons, and may not possess the training and experience required for optimal delivery of dental care.

Office-based anesthesia is both the least expensive option for the patient and most productive for the pediatric dentist, since no travel outside of the office is required, treatment is accomplished with armamentaria that is optimally-suited for dentistry, with personnel that are very familiar with dental procedures. The addition of a dentist anesthesiologist to the care team would seem to add to the efficiency of office-based dentistry for pediatric dental rehabilitation, however little specific information about dentist anesthesiologists working with pediatric dentists has been published.

Dentist Anesthesiologists are a group of dentists that have undergone a two to three years of hospital-based anesthesia training in an accredited residency program. The residency includes training to proficiency in all major forms of anesthesia delivery, and specific training in office-based anesthesia. Dentist anesthesiologists work extensively with pediatric dentists, providing, among other services, office-based general anesthesia for preschool children with Early Childhood Caries (ECC.) A 2010 survey of the American Society of Dentist Anesthesiologists showed that work provided for pediatric dentists accounted for more than 60% of the average dentist anesthesiologist practice [11]. Dentist anesthesiologists provide broad range of anesthesia services, ranging from moderate sedation to general anesthesia. Despite these advantages, however, the number of dentist anesthesiologists practicing in the United States is relatively small and certain areas of the country have limited access to their services [12].

This review examines the practice characteristics of office-based sedation and anesthesia performed in United States pediatric dental offices. Specific attention is given to the utilization of dentist anesthesiologists. A broad range of data was collected that compared the use of self-administered sedation services by pediatric dentists, the use of dentist anesthesiologists for office-based anesthesia, and the economic aspects of these practices.

Use of Dentist Anesthesiologists by Pediatric Dentists in the United States

In a recent study by Olabi et al. [13], Diplomates of the American Board of Pediatric Dentistry (ABPD) were surveyed

anonymously regarding their experience with dentist anesthesiologists with respect to the practitioner gender, age, years in practice, US. region of practitioner practice, number of years as a Diplomate of the ABPD, use of in office sedation, use of IV sedation, use of dentist anesthesiologist, and their comments on the use of a dentist anesthesiologist [13]. Fifty percent of respondents (N=246) had been Diplomates for 5 or less years. However the largest age group among respondents was 51+ years (N=173, 35%) followed by the 31-35 year olds (N=108, 22%) and the 36-40 year olds (N=97, 20%). With regard to years in practice, 35% (n=172) had been in practice 21 or more years, followed by the 0-5 years in practice group (N=99, 20%) and the 6-10 years in practice group (N=104, 21%). This suggests a bimodal distribution of age and years in practice among the Diplomates who completed this survey, with early career and late career pediatric dentists making up the largest groups.

Diplomates of the American Board of Pediatric Dentistry were queried for practices related to administering any form of sedation in office, administering IV sedation in office, using a dentist anesthesiologist, and those who would utilize a dentist anesthesiologist if one were available. Respondents were later classified by gender, age, years in practice, practice type, region where they practice, and years as a Diplomate of the ABPD, the following results were reported:

a. Gender

More female respondents (N=77, 39%), as compared to male respondents (N=59, 23%), reported they used a dentist anesthesiologist ($p < .01$). There was no significant difference between the male and female respondents with regards to administering sedation in office, administering IV sedation in office and using a dentist anesthesiologist if one were available.

b. Age

The 51+ year old respondents were less likely, compared to all other age groups respondents, to administer IV sedation ($p < .01$), use a dentist anesthesiologist ($p < .01$) and would use a dentist anesthesiologist if one were available ($p < .01$). There was no statistical significant difference among age of respondents in administering some form of in office sedation.

c. Years in Practice

Respondents that have been in practice for 21+ years were least likely to use IV sedation in their office (12%, $p < .01$) and among the least likely to use a dentist anesthesiologist (25%, $p < .01$). There was no statistical significant difference between years in practice and administering some form of sedation in office and using a dentist anesthesiologist if one were available.

d. Practice type

The group type of practice was the least likely (63%, $p < .01$) to administer some form of in office sedation. There was no statistical significant difference in practice type when administering IV sedation, using a dentist anesthesiologist, and using a dentist anesthesiologist if their services were available.

e. U.S. Region of practitioner practice

From a regional perspective, the South West region were the most (88%, $p < .01$) to report that they administered some form of in office sedation. District 6 (West) respondents were the most to report that they administered in office IV sedation (39%, $p < .01$), employed the services of a dentist anesthesiologist (59%, $p < .01$) and would use a dentist anesthesiologist (78%, $p < .01$) if one were available. It is interesting to note that the desire to utilize a dentist anesthesiologist, if available, is consistently higher than the number of pediatric dentists providing their own anesthesia in every region of the country.

Years as a Diplomate of the ABPD

Respondents that have been board certified for 16-20 and 21+ years were the least to administer in office IV sedation (8%, $p < .01$) respectively, and would utilize the services of a dentist anesthesiologist if one were available (47%, $p < .01$ and 53%, $p < .01$ respectively). There was no statistical significant difference among ABPD respondents in administering some form of in office sedation and employing a dentist anesthesiologist.

Graduate Pediatric Dentistry Programs

Graduate programs in pediatric dentistry provide a critical influence on the sedation practices of new pediatric dentists. In an effort to identify ways in which to address the demands for sedation and anesthesia in tomorrow's pediatric dental practice, Hicks, et al. [14], conducted an anonymous electronic survey of current United States graduate programs in pediatric dentistry and dental anesthesiology [14]. Surveys were directed to pediatric dentistry graduate program directors and to identify and quantify the types of deep sedation and general anesthesia experiences pediatric dentistry residents were receiving. The study also queried dental anesthesiology program directors to identify and quantify the clinical experiences of Dental Anesthesiology (DA) residents and determine which dental specialties have the highest demand for office-based deep sedation/general anesthesia by a dentist anesthesiologist.

Pediatric Dentistry Program Directors: Ninety-eight percent of pediatric dentistry programs treat patients by deep sedation/general anesthesia, with 69% of these occurring in an operating room (OR) environment only, and 29% of pediatric dentistry programs performing deep sedation/general anesthesia in both a clinical and OR setting. Forty three percent of pediatric dentistry programs use the services of a Dentist Anesthesiologist (DA) of the 43% that use DAs, 26% provide clinic based mild/moderate sedation, 68% provide clinic based deep sedation/general anesthesia, 37% provide operating room based deep sedation/general anesthesia. Fifty-two percent of programs do not use the services of dentist anesthesiologist. When pediatric dentistry residency directors were asked, compared to 2, 5, and 10 years ago, have you seen an increase, decrease, or no change in the request for DA services by pediatric dentists, 44% have seen an increase in the past 2 years, 60%

have seen an increase in the past 5 years and 71% have seen an increase in the past 10 years. Sixty-four percent of pediatric dentistry residency directors anticipate an increased need for deep sedation/general anesthesia services provided by a dentist anesthesiologist. Pediatric dentistry residency directors reported that the greatest barriers to incorporating the services of a dentist anesthesiologist into the treatment of pediatric dental patient were state/dental anesthesia regulations followed by costs associated with the service.

Dental Anesthesiology Graduate Program Directors: When Dentist Anesthesiologist directors were asked which of the following dental specialties request your services for deep sedation/general anesthesia most, residency directors responded Oral and Maxillofacial Surgery-44%, Pediatric dentist- 44%, and General dentist-11%. When weighed for frequency, pediatric dentistry requested their services most. When asked, compared to requests from 2, 5, and 10 years ago, 56 % perceived an increase in the past 2 years, 63 % saw an increase in the last 5 years and 88% had saw an increase in the last 10 years. When dentist anesthesia directors were asked what percentage of your resident's dental deep sedation/general anesthesia cases are performed on children with special health care needs, results were, 1-25% reported by 56% or directors and 26-50% reported by 44% of directors.

When directors were asked what percentage of your resident's dental deep sedation/general anesthesia cases are performed on children under 6 years of age, the results were 1-25% of cases were on children under 6 years old reported by 33% of directors. Forty-four percent of directors said 26-50% their resident's deep sedation/general anesthesia cases were performed on children less than 6 years of age. Additionally 22% of dental anesthesiology residency directors indicated that 75-100% of their resident's deep sedation/general anesthesia cases were on children under 6 years of age.

Barriers to dentist anesthesiologist for pediatric dentistry: When anesthesia directors were asked what you perceive as the greatest barrier to incorporating the services of a dental anesthesiologist into the treatment of pediatric dental patients, awareness of the services provided by dentist anesthesiologists and access to their services were the top two factors limiting the use of dentist anesthesiologists by pediatric dentists.

Dental rehabilitation under hospital-based general anesthesia vs. office-based general anesthesia

Clinical outcome studies of anesthesia providers provide additional quantitative information for pediatric dentists when choosing to treat their patients under hospital-based anesthesia or office-based anesthesia. Saxen [15] compared outcome data for both using the National Clinical Outcomes Registry (NACOR) database and the Society for Ambulatory Anesthesia Clinical Outcomes Registry (SCOR). Seven thousand one hundred and thirty-three (7,133) office-based general anesthetics by dentist

anesthesiologists were compared to 106,420 hospital-based anesthetics.

Children below the age of six received the greatest proportion of general anesthetic services rendered by both dental anesthesiologists and hospital-based anesthesia providers. These general anesthesia services were primarily provided for complete dental rehabilitation of early childhood caries. Anesthesia for complete dental rehabilitation in the office-based setting by dentist anesthesiologists was significantly shorter than comparable care provided in the hospital operating room and surgery centers [15].

Time and Cost Analysis

Regardless of the venue, general anesthesia for pediatric dental rehabilitation is often costly and third party reimbursement poor. Given the high prevalence of early childhood caries and the need to treat it early and aggressively, cost will remain as a significant factor for many in determining where dental rehabilitation of early childhood caries should be performed. In 2012, Rashewsky et al. [16] performed a cross-sectional, retrospective study of 96 cases pediatric dental rehabilitation performed in either a hospital operating room or office-based environment. Highly significant differences in cost, total anesthesia time and recovery room time were found. After controlling for anesthesia time and procedures, general anesthesia performed in Stony Brook University Hospital operating room was 13.2 times more expensive than general anesthesia performed in the School of Dental Medicine office-based environment [16].

Discussion

This review of the emerging need in pediatric dentistry for office-based general anesthesia indicates that female pediatric dentists, that were Diplomates of the American Board of Pediatric Dentistry (ABPD), were more likely to employ a dentist anesthesiologist than males. In general, practitioner age did not show any difference in administering some form of in office sedation. Additionally, most pediatric dentists administered some form of in office sedation, a finding that correlates with a study by Boynes et al. [17] that evaluated the practice characteristics among dental anesthesia providers in the United States [17]. They concluded that the enteral sedation technique of moderate sedation was the most frequently used sedation/anesthesia technique used by pediatric dentists (63%). Boynes et al. [17] also noted that dentist anesthesiologists differ from all other dental anesthesia and sedation providers in that the large majority only provide anesthesia and avoid performing dental procedures while simultaneously delivering anesthesia. For this reason, dentist anesthesiologists provide a unique point of reference when comparing their outcomes to medical anesthesia providers in hospitals that deliver anesthesia in the same way.

This review also found that the longer ABPD practitioners have been in practice and practiced in a group setting the less likely there are to use IV sedation, use a dentist anesthesiologist

and utilize dentist anesthesiologists if their services were available. There are many factors that could lead to these findings. The newest ABPD members could have more training in IV sedation and are therefore more comfortable in using IV sedation. From a regional practice perspective there was a difference in the clinical practice and administration of IV sedation by ABPD respondents. One of the reasons could be the different sedation/anesthesia laws associated with each state.

With respect to graduate program directors in pediatric dentistry and educational aspects of the current and future interaction of pediatric dentists and dentist anesthesiologists, thirty-seven percent of pediatric dentistry programs use clinic-based deep sedation/general anesthesia for dental treatment in addition to hospital-based deep sedation/general anesthesia. Eighty-eight percent of those programs use dentist anesthesiologists for administration of office based general anesthesia in a clinic-based setting.

Pediatric dentistry residency directors perceive a future change in the need for office based general anesthesia services provided by dentist anesthesiologists to pediatric dentists. Sixty-four percent anticipate an increase in need for dentist anesthesiologist services. Additionally, pediatric dentistry residency directors reported that the greatest barriers to incorporating the services of a dentist anesthesiologist into the treatment of pediatric dental patient were state/dental anesthesia regulations followed by costs associated with the service.

Dentist anesthesiologist program directors, when asked compared to 2, 5, and 10 years ago, have you seen an increase, decrease, or no change in the request for DA services by pediatric dentists, 56 % reported an increase in the past 2 years, 63 % reported an increase in the last 5 years and 88% reported an increase in the last 10 years. When dentist anesthesiologist directors were asked what you perceive as the greatest barrier to incorporating the services of a dental anesthesiologist into the treatment of pediatric dental patients, dental profession awareness and access to the services of a dental anesthesiologist were the top two responses.

Predicting the future need of dentist anesthesiologists is an uncertain task, but these results show pediatric dentistry directors and dental anesthesiology directors are considering the need, and they recognize a trend of increased need for dentist anesthesiologist services over the past decade.

Conclusion

The literature reviewed evaluated here indicates the potential for a team approach to dental rehabilitation for this special population of the pediatric dental patients. A unique relationship, the authors believe, exists between the patient populations that pediatric dental residents and dentist anesthesiology residents treat. The survey by Boynes et al on the Practice Characteristics among Dentist Anesthesia Providers, indicates that when data results were categorized according to main practice activity, it

was revealed the dentist anesthesiologists and pediatric dentists had the highest mean number of patients with SHCN in a sedation / anesthesia practice per month [17]. Boyne's study did not limit the sedation to deep sedation/general anesthesia but does show support for this unique sedation-surgery interaction as dentist anesthesiologist and pediatric dentist coordinate their efforts in the dental rehabilitation of patients with SHCN.

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