

Contemporary Predoctoral Pediatric Behavior Guidance Education in the United States and Canada

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Short Title: Pre-doctoral Teaching of Behavior Guidance

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ABSTRACT

Purpose: To determine the contemporary educational experiences of predoctoral dental students in the United States and Canada regarding behavior guidance (BG) of the child patient and assess trends from a previous study in 2004.

Methods: Data were collected from 32 predoctoral pediatric dentistry program directors in the United States and Canada via a web-based survey.

Results: The didactic curriculum hours devoted to the teaching of BG techniques in 2019 are similar to 2004. A majority (60.7%) of programs do not have a formal assessment of competency with BG techniques. Lectures (n=28), clinical experience (n=28) and observation (n=26) were the most common techniques implemented to teach BG techniques, and tell-show-do (100%), non-verbal communication (82.1%), positive reinforcement (89.3%) and distraction (82.1%) were the techniques that more than 75% of dental students most commonly have hands-on experience with during their dental education. In 2019, students tended to have more hands-on experience with nitrous oxide/oxygen inhalation and less hands-on experience with aversive techniques and sedation.

Conclusions: The majority of dental schools do not have a formal competency in behavior guidance of the child patient. Compared with 2004, nitrous oxide/oxygen is used more by dental students and there is less predoctoral education in aversive behavior guidance techniques.

Keywords: pediatric dentistry, child behavior, dental education

INTRODUCTION

According to the U.S. Department of Health and Human Services, dental caries is the most common chronic condition in children and adolescents in the United States.¹ Even though pediatric dentistry is one of the larger dental specialty groups, general dentists make up a much greater proportion of dental practitioners than pediatric dentists.² Consequently, plans to meet the dental health care needs of children need to include general dentists.³ Therefore, the education

that general dentists receive during dental school regarding care for children is critically important.

The American Academy of Pediatric Dentistry (**AAPD**) states that the expectation for dentists is that they are able to diagnose and competently treat childhood dental diseases based on the experiences and techniques that they collected during their dental education.⁴ The practitioner must have the capability to influence the pediatric patient's reaction to treatment in order to deliver safe and effective care.⁴ Behavior guidance (**BG**) techniques, whether communicative or pharmacological, are the approaches used by dentists to facilitate treatment of childhood dental diseases. Dental schools provide students with the fundamentals of BG strategies. Didactic instruction of behavioral guidance techniques is necessary to relay the scientific principles behind the concepts but may be an insufficient method to train dental students on the clinical execution of these techniques. Observation is another method through which the complexity of BG techniques can be relayed to dental students although predoctoral dental students have reported insufficient opportunities to witness faculty members execute BG techniques.⁵ There have also been multiple reports of a decrease in the pediatric patient pools at dental schools.⁶⁻⁸ A decrease in the number of patients being treated at dental schools leads to fewer opportunities for dental students to gain valuable experience caring for children. In 2015 it was found that many dental school graduates were unable to perform several basic pediatric dental procedures and services.⁶

In 2004, Adair and colleagues surveyed predoctoral program directors in the United States and Canada on the teaching of communicative and pharmacologic BG techniques and showed that a majority (54%) of dental schools spent fewer than five classroom hours reviewing BG topics.⁹ Having an inadequate background in BG techniques may hinder a general dentist's ability to comfortably or confidently treat a child patient. If the training of predoctoral dental students is lacking in the area of caring for pediatric patients, it may ultimately undermine the dental care system and put children at risk.²

No study since 2004 has analyzed what BG techniques are being taught to predoctoral dental students in the United States and Canada. Future dental providers need to be well-versed in

strategies that enable safe and effective treatment of pediatric patients. Thus, research is needed to assess educational norms in this context. The objective of this study is to assess the contemporary educational experiences of predoctoral dental students regarding BG of the child patient and determine 15-year educational trends.

METHODS

Institutional Review Board (IRB) exemption was obtained from the IRB for the Behavioral and Health Sciences at the University of Michigan in Ann Arbor, Michigan (HUM00155556).

An eighteen question survey was designed to meet study objectives. The survey was structured in a similar fashion to the survey that was published in 2004 by Adair et al.⁹ A pilot survey was completed by multiple pediatric dentistry faculty members at different institutions to evaluate the format and content of the questions. Changes were made after feedback was received and reviewed. The questionnaire was divided into 7 questions on BG topics, with 3 questions containing multiple options for each BG technique that is listed in the AAPD 2019 Behavior Guidance for the Pediatric Dental Patient, Recommendations: Best Practices. Parental presence/absence was added to the guidelines in 1996, while memory restructuring ask-tell-ask, direct observation and positive pre-visit imagery were added to the guidelines in 2015.^{10,11}

An invitation email that included a link to an anonymous Qualtrics-hosted on-line survey was sent to all predoctoral pediatric dental program directors of dental schools accredited by the American Dental Association's (ADA) Commission on Dental Accreditation (CODA). There are 66 accredited dental schools in the United States and 10 accredited dental schools in Canada (total 76). Data were collected from 32 predoctoral pediatric dental program directors, a response rate of 42.1%.

Predocutorial program directors were contacted through an email sent from the AAPD Educational Affairs Manager to a list of predoctoral program directors. This list did not contain all 76 accredited dental schools; for the programs that were not included in this list attempts were made to contact them by email separately.. The email with the invitation to participate was sent on two occasions two weeks apart.

Data were collected via Qualtrics Survey Software Version XM, manually entered into Microsoft Excel for Mac 2019 version 16.25, and directly imported to SPSS 25. A forest plot was created to compare data from the 2004 survey to the results from the 2019 survey using Stata SE 15. Because multiple questions had more than two answer choices, some responses were combined. Wilson's score interval was used to calculate the upper and lower bounds of the confidence interval.

RESULTS

The amount of curriculum hours spent covering BG techniques over the last 15 years has remained consistent—in 2004, a majority (94%) of predoctoral pediatric program directors stated that they spent no more than 10 didactic curriculum hours covering BG techniques, while in 2019 84.4% of program directors stated they spend 10 hours or less covering these topics. There was a higher percentage of schools that spent 11-15 hours (6.25%) and more than 15 curriculum hours (9.38%) in 2019 than there were in 2004. (Table 1)

Only 39.3% of programs have a formal assessment of each student's competency with BG techniques. These results are similar to those obtained in 2004 when 37% of the programs had a formal assessment of competency with BG techniques. (Table 2)

Predoctoral pediatric dental program directors were questioned on the extent to which each technique is taught in a clinical setting by estimating the percentage of dental students who receive at least one hands-on experience with each technique. They were asked to choose from the following choices: <25%, 25-75%, >75% or not taught. Tell-show-do is the technique that is practiced most often by dental students—in 2019 100% of respondents stated that more than 75% of their students were able to have one hands-on experience with tell-show-do. A high percentage of respondents in 2004 (96%) also stated that more than 75% of their students had the opportunity to implement this technique. Voice control appears to be less commonly taught as 7.1% of respondents stated that it is not taught to their students and 35.7% responded that less than 25% of their students have a hands-on experience with voice control; in comparison, in 2004, voice control was reportedly taught to all students clinically.⁹ Positive reinforcement, non-

verbal communication and distraction remain commonly taught to and practiced by dental students; 89.3% of respondents believed that more than 75% of their students had a hands-on experience with positive reinforcement and 82.1% of program directors reported that more than 75% of their students had a hands-on experience with distraction. The decline of hand-over-mouth from the dental curriculum has continued, as 96.4% stated that it was not taught to their students compared with 88% of predoctoral pediatric program directors in 2004. (Table 3)

Five techniques were added to the survey that were not included in 2004. Positive pre-visit imagery, direct observation, ask-tell-ask, memory restructuring and parental presence/absence are all now included in the AAPD Behavior Guidance Guidelines.⁴ Therefore, these topics were included in the questionnaire but cannot be compared to the 2004 survey results. Parental presence/absence is the most utilized of the five additional techniques. All programs stated that they taught this to their students and 66.7% stated that more than three quarters of their students were able to have a hands-on experience with the technique. Memory restructuring and ask-tell-ask are not commonly taught in the United States and Canada, as 55.6% and 51.9% of programs respectively stating that these techniques are not taught at all. Direct observation and positive pre-visit imagery are taught more often to dental students (46.4%), but not commonly clinically used (21.4%). (Table 3)

In 2004, a majority (70%) of dental schools did not have predoctoral dental students use nitrous oxide.⁹ In comparison, 2019 had a large increase in the number of students that were able to have a hands-on experience with nitrous oxide/oxygen inhalation. 35.7% of respondents said that >75% of their students have a hands-on experience with nitrous oxide/oxygen inhalation; in 2004 only 2% of respondents responded the same way. Few dental students obtained hands-on experience with active or passive immobilization of sedated or non-sedated children. These results were similar to 2004 responses. (Table 3)

Moderate sedation was rarely implemented by dental students with a majority (59.3%) of respondents stating less than 25% of their students had at least one hands-on experience with this technique. Similar results were obtained for general anesthesia (57.1%). However, 40.7% of respondents stated that moderate sedation is not taught to their students clinically, which is

higher than the 8% reported in 2004.⁹ In 2004, 67% reported that general anesthesia was not taught clinically to their students, but in 2019 only 39.3% of respondents reported it was not taught.⁹ (Table 3)

A forest plot was created using two groups for the number of students who had a hands-on experience with each BG technique: more than 75% of students or less than 75%. The techniques that predoctoral dental students have the most hands-on experience with are plotted further to the right. The techniques that dental students have the most hands-on experience with are tell-show-do, positive reinforcement, non-verbal communication and distraction. The confidence intervals for nitrous oxide/oxygen inhalation for the years 2004 and 2019 do not overlap, suggesting that there is a significant difference in the proportion of students who had hands-on experience with nitrous oxide/oxygen inhalation between the two surveys. In 2019, significantly more students had hands-on experience with nitrous oxide/oxygen inhalation. (Figure 1)

DISCUSSION

When comparing the results of the 2004 and 2019 surveys the didactic curriculum time spent on BG techniques has remained similar. A majority (84.4%) of programs from 2019 spend 0-10 hours covering these topics, which is similar to the results from 2004 (94%). According to the ADA 2010 Survey on Dental Education, the typical dental school provides an average of 177 hours of didactic and clinical instruction focused on treating pediatric patients, which makes up approximately 4.7% of their total curriculum time.¹² Carving out sufficient time to cover BG techniques when only this small amount of time is available can be challenging for predoctoral pediatric program directors.

A majority of dental schools do not have a formal assessment of competency with BG techniques. These results were similar between 2004 and 2019 survey results. Formal assessments are performed to measure if students have achieved independent competency. A formal assessment also allows the student to receive feedback which can allow them to focus on improving areas of weakness.¹³ A previous study showed the difficulty in evaluating students while handling challenging patients—students who were evaluated as competent in their patient management skills were those that behaved most similar to the instructors that were grading

them, and whether the student's interventions with the patient were effective or not seemed to have no bearing on the instructor's evaluation of their competence.¹⁴ A formal assessment may be difficult to implement with BG techniques due to the spectrum of behaviors that are encountered with each patient and the subjectivity in evaluating complex interpersonal communication.

In a study by Henzi and colleagues, dental students reported that increased clinical time would be most beneficial to the enhancement of their education and that more patient interactions would help reinforce classroom learning.¹⁵ Without practicing skills hands-on it is difficult to understand a technique and its application. The results of what percentage of dental students have at least one hands-on experience with each BG technique were similar between the 2004 and 2019 surveys for a majority of the techniques. One major difference was that in 2019 program directors reported more students have hands-on experience with nitrous oxide/oxygen inhalation. There has been a gradual rise in the use of nitrous oxide/oxygen inhalation in practice;¹⁶ a 2015 survey showed that pediatric dentists believe they use nitrous oxide/oxygen inhalation for a greater percentage of their patient pools than they did in 1996.¹⁷ Levering and Welie warn against the overuse of nitrous oxide/oxygen inhalation in predoctoral dental education, despite its usefulness in extending the length of time that a child can cooperate, because students may become too reliant on this BG technique and as a result not implement the other nonpharmacological techniques available to them.¹⁶ **The trend of increase in use of nitrous oxide/oxygen inhalation is consistent with experience in the UK; between 1997 and 2001, predoctoral dental students in the UK's clinical experiences with nitrous oxide inhalation sedation more than doubled.¹⁸ This suggests that the shift to increased use of nitrous oxide/oxygen may have already started in Europe prior to the 2004 Adair study, and the current study's findings agree with this continued trend.**

A recent study in the United Kingdom by Grindrod et al. also investigated what behavior guidance techniques are taught to predoctoral dental students.¹⁹ Their findings are similar to the findings of the current study in that the less aversive techniques such as tell-show-do and positive reinforcement are taught universally and almost always taught for knowledge and use. Inhalation sedation was also universally taught in the UK, however only 58% of

universities reported teaching it for knowledge and clinical use, while the rest reported only teaching for the purpose of knowledge. This number is in agreement with the findings in the current study which suggest that at least 64% of dental programs in the US and Canada are teaching hands on nitrous oxide/oxygen in the predoctoral clinic. One large difference between the education for predoctoral students between the US and the UK is in the use of general anesthesia. In the current study general anesthesia is taught in 61.7% of programs, but only 3.6% of programs reported students having experience with this modality; Grindrod and colleagues found that general anesthesia is taught in every program and taught for knowledge and use in 53.8% of programs.

An evaluation of whether the results of this survey indicate that dental schools are sufficiently preparing dental students in implementing BG techniques would be important. The Commission on Dental Accreditation (CODA) states that there must be methods of evaluating a student's competency in place.²⁰ **Competency in pediatric behavior guidance may be assessed in behavior guidance through observation and rubric-based assessment, objectively structured clinical examination (OSCE), and potentially through interactive computer-based modules.**²¹⁻²³ These survey results indicate a majority of programs do not have a formal assessment of competency with BG techniques. Whether this is due to difficulty in assessing communicative strategies formally or due to the limit in pediatric patient interactions that can be assessed, this may be a shortcoming of the current curricula. CODA also has a standard that states it is the responsibility of the dental school to provide enough patient experiences to allow the student to become competent in all designated areas.²⁰ There have been multiple articles that have shown the decrease in pediatric patient experiences for dental students in the United States.⁶⁻⁸ Some dental schools rely on community-based programs for students to gain more experience with pediatric patients.²⁴ It is important for students to have ample opportunities to care for child patients because general dentists are unlikely to practice skills and techniques that they have not been taught or in areas in which they have not developed competency during their dental education.²⁵

CODA also expects that graduates from dental schools are able to provide skilled treatment to patients in all phases of life, as long as treatment by a specialist is not required.²⁰ It was

previously reported that many dental school graduates were unable to perform many basic pediatric dental procedures and services.⁶ It has been established by other studies that dental school graduates commonly do not feel well prepared to treat children due to a lack of clinical experiences during their training, but approximately 74% of the dental care rendered to children in the United States is done by general dentists.^{3,26} If guiding the child patient's behavior is within the scope of general dentistry, it may be important to measure the predoctoral student's competency in this skill set.

When dental students have the opportunity to treat children, many of their patients are cooperative and the patient visit is for diagnostic and/or preventive care.^{7,27} This can contribute to the lack of experience with BG techniques, as students may not be compelled to implement strategies because the treatment is quick, painless, non-invasive and the patients may not be not anxious or fearful. A previous survey showed that the greatest influence on BG technique selection was the dentist's personal comfort with the technique.²⁸ The lack of experience treating children with complex restorative needs and challenging temperaments limits predoctoral dental students' understanding and implementation of BG techniques.²⁷

There are several limitations of the present study. Surveys can be an effective and expedient means of gathering information but they are inherently limited by self-reporting. Potential sources of bias include the respondents' recall ability of the educational experiences of their students and knowing what techniques are taught by all the attending dentists. There may be ambiguity in some of the questions—for example, the question about hands-on experience for dental students may have been interpreted differently by different respondents. Some may interpret observation or simulation as hands-on experience while others may think only of opportunities as the operator or clinician while treating a pediatric patient. This could skew results since no definition or expectation of hands-on experience was given.

This study looked at many aspects of the teaching of BG techniques to predoctoral dental students, however it could not address all the questions of interest on this topic. This research analyzed the teaching of BG techniques based solely on the perspective of the faculty member completing the survey; it did not investigate the perspectives of the dental students. Future

research could focus on which specific techniques recent dental school graduates felt most comfortable with, which they had the most experience with during dental school, what techniques need to be allotted more time, and what techniques they feel would be most beneficial to teach these techniques.

An additional limitation is the small sample size (n=32). Although the total number of completed surveys was similar to the Adair et al. 2004 survey, the increase in the number of dental schools since this time led to a decrease in response percentage. A 42.1% response rate for a web-based survey is acceptable when compared to the results of other studies that analyzed response rates.²⁹ Although the total number of respondents is similar, a comparable response rate to the survey from 2004 would have been more ideal to make comparisons.

CONCLUSIONS

1. The amount of didactic curriculum time spent regarding BG techniques has not changed significantly in 15 years.
2. A majority of programs do not have a formal assessment of competency with BG techniques.
3. Tell-show-do, non-verbal communication, positive reinforcement and distraction were the techniques that most dental students have hands-on experience with during their education.
4. Students have significantly more hands-on experience with nitrous oxide/oxygen inhalation and less experience with sedation than 15 years ago.
5. There has been a decrease in the teaching of voice control over the last 15 years.

CONFLICT OF INTEREST DISCLOSURE STATEMENT

All authors confirm that they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Manuscript

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Table 1. Number of curricular hours devoted to pediatric behavior guidance.

Number of hours of didactic curriculum time devoted to behavior guidance topics	Responses (2019)	Reponses (2004-Adair)
<5 hours	12 (37.5%)	26 (54%)
5-10 hours	15 (46.9%)	19 (40%)
11-15 hours	2 (6.3%)	2 (4%)
>15 hours	3 (9.4%)	1 (2%)
Total responses	32 (100%)	48 (100%)

Table 2. Behavior guidance competency assessment trends, 2004-2019.

Do the students have a formal assessment of competency with behavior guidance techniques?		
Yes	2019 responses (%)	11 (39.3%)
	2004 responses (%)	17 (37%)
No	2019 responses (%)	17 (60.7%)
	2004 responses (%)	29 (63%)

Table 3. Predoctoral student clinical experience using BG techniques, 2004-2019.

Percentage of dental students who receive at least 1 hands-on experience with the following behavior guidance techniques		2019 Responses (%)	2004 Responses (%)
Tell-show-do	<25%	0 (0%)	0 (0%)
	25-75%	0 (0%)	2 (4%)
	>75%	29 (100%)	45 (96%)
	Not Taught	0 (0%)	0 (0%)
Non-verbal communication	<25%	1 (3.6%)	1 (2%)
	25-75%	4 (14.3%)	7 (15%)
	>75%	23 (82.1%)	39 (83%)
	Not Taught	0 (0%)	0 (0%)
Voice control	<25%	10 (35.7%)	15 (31%)
	25-75%	8 (28.6%)	17 (35%)
	>75%	8 (28.6%)	16 (33%)
	Not Taught	2 (7.1%)	0 (0%)
Positive reinforcement	<25%	1 (3.6%)	0 (0%)

	25-75%	2 (7.1%)	1 (2%)
	>75%	25 (89.3%)	47 (98%)
	Not Taught	0 (0%)	0 (0%)
Distraction	<25%	1 (3.6%)	2 (4%)
	25-75%	4 (14.3%)	10 (21%)
	>75%	23 (82.1%)	36 (75%)
	Not Taught	0 (0%)	0 (0%)
Hand over mouth	<25%	1 (3.6%)	6 (12%)
	25-75%	0 (0%)	0 (0%)
	>75%	0 (0%)	0 (0%)
	Not Taught	27 (96.4%)	42 (88%)
Positive pre-visit imagery	<25%	8 (28.6%)	
	25-75%	5 (17.9%)	
	>75%	6 (21.4%)	
	Not Taught	9 (32.1%)	
Direct observation	<25%	5 (17.9%)	
	25-75%	6 (21.4%)	
	>75%	13 (46.4%)	
	Not Taught	4 (14.3%)	
Ask-tell-ask	<25%	4 (14.8%)	
	25-75%	4 (14.8%)	
	>75%	5 (18.5%)	
	Not Taught	14 (51.9%)	
Memory restructuring	<25%	5 (18.5%)	
	25-75%	4 (14.8%)	
	>75%	3 (11.1%)	
	Not Taught	15 (55.6%)	
Parental presence/ absence	<25%	5 (18.5%)	
	25-75%	4 (14.8%)	
	>75%	18 (66.7%)	
	Not Taught	0 (0%)	
Nitrous oxide/oxygen inhalation	<25%	8 (28.6%)	12 (26%)
	25-75%	8 (28.6%)	1 (2%)
	>75%	10 (35.7%)	1 (2%)

	Not Taught	2 (7.1%)	32 (70%)
Active immobilization for non-sedated child	<25%	17 (60.7%)	25 (52%)
	25-75%	3 (10.7%)	13 (27%)
	>75%	2 (7.1%)	1 (2%)
	Not Taught	6 (21.4%)	9 (19%)
Passive immobilization for non-sedated child	<25%	15 (53.6%)	20 (42%)
	25-75%	4 (14.3%)	12 (25%)
	>75%	3 (10.7%)	3 (6%)
	Not Taught	6 (21.4%)	13 (27%)
Active immobilization for sedated child	<25%	16 (59.3%)	20 (42%)
	25-75%	0 (0%)	0 (0%)
	>75%	0 (0%)	1 (2%)
	Not Taught	11 (40.7%)	27 (56%)
Passive immobilization for sedated child	<25%	15 (55.6%)	16 (33%)
	25-75%	0 (0%)	2 (4%)
	>75%	0 (0%)	1 (2%)
	Not Taught	12 (44.4%)	29 (60%)
Moderate sedation	<25%	16 (59.3%)	21 (45%)
	25-75%	0 (0%)	14 (30%)
	>75%	0 (0%)	8 (17%)
	Not Taught	11 (40.7%)	4 (8%)
General anesthesia	<25%	16 (57.1%)	13 (28%)
	25-75%	0 (0%)	1 (2%)
	>75%	1 (3.6%)	1 (2%)

Figure 1. Forest plot analysis of percentage of students with hands-on experience with each behavior guidance technique. >75% of students was compared to all other options (not taught, <25%, 25-75%)

