

Usage of Behavior Guidance Techniques Differs by Provider and Practice Characteristics

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Abstract: Purpose: The purpose of this study was to determine provider and practice characteristics influencing usage of behavior guidance techniques (BGTs). **Methods:** A 24-item survey was emailed to 4,117 active AAPD members to identify factors influencing pediatric dentists' use of BGTs. **Results:** A total of 1,081 surveys were returned, for a 26 percent response rate. The mean age of respondents was 44.7 years old, with recent graduates comprising the largest group (30.5 percent). Usage of voice control, nitrous oxide, sedation, and general anesthesia (GA) differed significantly, according to experience. Respondents with at least 30 years of experience reported changes in usage. Tell-show-do, nitrous oxide, oral sedation, and passive restraint were significantly more frequent among female respondents. Parental absence, oral sedation, and GA were significantly more frequent in respondents serving low income populations. Parental absence, pharmacologic techniques, and restraint were significantly different in frequencies among the different geographic regions. **Conclusions:** Usage of behavior guidance techniques has changed over the past three decades, with more recent graduates and experienced practitioners now emphasizing pharmacologic techniques. More assertive behavior guidance techniques are used more frequently by experienced providers and those in practices in the southwest or serving lower income populations. Pharmacologic techniques are used at a higher prevalence by recent graduates and providers who are female or serving lower income populations. (*Pediatr Dent* 2018;40(3):201-8) Received July 21, 2017 | Last Revision April 11, 2018 | Accepted April 20, 2018

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Behavior guidance is a continuum of skills employed by dentists to elicit cooperation from young and/or anxious children. The American Academy of Pediatric Dentistry (AAPD) summarizes the process of communicative guidance that is the foundation for basic behavior guidance techniques (BGTs), such as tell-show-do (TSD), voice control, non-verbal communication, positive reinforcement, and distraction; other basic BGTs include parental presence/absence, memory restructuring, and nitrous oxide/oxygen inhalation.¹ Advanced BGTs include protective stabilization, sedation, and general anesthesia (GA). BGTs may evolve over time with changes in society, parenting trends, and training.² In 2002, Casamassimo et al. described dentists' perceptions of changes in parenting styles toward a more permissive, less authoritative style,³ and two studies reported that more aggressive behavior management techniques, such as restraint and voice control, were less acceptable to parents than sedation and GA.^{4,5}

Several papers have reported the usage of various BGTs and have attempted to examine differences in dentists' utilization of BGTs according to dentist age, gender, and region of practice.⁶⁻⁹ Positive basic techniques, such as positive reinforcement, distraction, and TSD, are utilized by the vast majority of pediatric dentists.^{6-8,10,11} More aversive techniques, such as voice control and restraint, are reported less frequently^{6,7,10} and used on a smaller percentage of patients.⁹ When considering gender and age of provider, females are less likely to utilize voice control, more likely to use protective stabilization, and

more likely to allow parental presence.^{6,9} In these studies, female respondents were younger, and authors attributed the small differences in the usage of BGTs to inexperience rather than a true difference between genders.

The most recent study to examine the use of BGTs by geographic region was published over 20 years ago in 1993.⁸ The study found one- and two-fold differences in the use of pharmacologic techniques by region. No contemporary papers have examined the use of BGTs by region of practice.

Results from a pilot study conducted by one of the authors was presented as a poster during the 2010 California Society of Pediatric Dentistry Annual Meeting.¹² This questionnaire to the active members of the AAPD sought to describe whether participants believed that parenting practices had changed during the course of their careers and whether they believed that parents of differing parental typologies demonstrated different levels of acceptance for the various BGTs. Results were consistent with previously published reports.

Knowledge of BGT utilization rates in different practice settings could be useful to providers desiring an evidence base to support or change their methods of interacting with pediatric patients within current societal and parenting trends. The purpose of this paper was to survey pediatric dentists to determine: (1) if behavior guidance techniques have changed over time; and (2) whether gender of dentists, socioeconomic status of the patient, or region of the practice has an effect on BGTs.

Methods

The research instrument was designed and administered in 2010. The entire questionnaire consisted of 24 items: seven described provider demographics; four described practice characteristics; five described parenting styles observed in the practice over time; four described current usage and changes over time of BGTs by the provider; and four described perceptions of parental acceptance for different BGTs. Results of the original study were presented as a poster during the 2010

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California Society of Pediatric Dentistry Annual Meeting. The current publication is an exploratory secondary data analysis.

The research instrument was delivered as an electronic questionnaire using the survey platform SurveyMonkey (SurveyMonkey, San Mateo, Calif., USA). Potential subjects were sent an email describing the study and inviting their participation. Reminder notices were sent two and four weeks after initial contact.

Inclusion criteria specified that subjects be AAPD members with email addresses who indicated that they were pediatric dentists. Email addresses were obtained through an agreement with the AAPD. Individuals were excluded from participation if demographic information indicated that they were general dentists or graduate students. The questionnaire was administered in accordance with the AAPD's Guidelines for Survey Submission and was certified exempt from Institutional Review Board review (IRB no. 10-031) by the Office of the Human Research Protection Program, UCLA, Los Angeles, Calif., USA.

Initial data were downloaded from the SurveyMonkey platform and managed with Microsoft Excel 2016 for Mac (Microsoft Corp., Redmond, Wash., USA). Statistical analysis was conducted using the SPSS Statistics software, version 23 (IBM, Armonk, N.Y., USA).

The outcome of interest for this study was the frequency of usage of each of the most commonly described BGT methods, as influenced by various provider and practice characteristics. Thus, outcomes were measured as continuous variables between zero and 10 to indicate with how many patients out of 10 each technique was estimated to be used. This variable can directly be translated to percentages. For example, if providers selected five for voice control, they were indicating use of voice control with approximately 50 percent of their patients.

Frequencies were used to describe provider demographics and practice characteristics. Descriptive statistics (mean ± standard deviation [SD] and frequency distribution) were generated to estimate frequencies of BGT usage. One-way analysis of variance (ANOVA) was used to compare the mean frequency of BGT usage among groups, according to number of years since provider completed training, socioeconomic status of practice, and U.S. region in which the practice was located. An independent sample *t* test was used to compare the mean frequency of BGT usage between genders. A one-sample Wilcoxon test was used to determine if providers who had been in practice for over 30 years felt their frequency of usage of each BGT had been different in the past by 10-year increments.

Results

A total of 4,117 individuals fulfilled the inclusion criteria. Surveys were initiated via SurveyMonkey system from 1,305 potential subjects, with 922 subjects completing the survey in its entirety. There were variable levels of response per question, requiring the exclusion of the data points from statistical analysis for each question under consideration. Overall, 1,081 subjects (26 percent response rate) were included in statistical analysis for this study based on positive response to a question indicating the number of years since completing specialty training.

Demographic information about respondents and their practices is reported in Table 1. Overall, the mean age of 1,016 subjects responding to this item was 44.7 years old (±11.7 SD). Subjects were asked to indicate one of five categories of time periods elapsed since completing specialty training (one to five, six to 10, 11 to 20, 21 to 30, and over 30 years). The

largest group was recent graduates, completing residency one to five years prior (30.5 percent). The other groups were reasonably well distributed. To indicate socioeconomic status of the practice, subjects were asked to indicate the predominant status of their patient population (high, medium, or low). Practices of predominantly medium status were the most highly represented (60.8 percent). To define geographic region of practice, subjects were asked to indicate one of 13 regions used to define the AAPD districts prior to 2004. Responses were then adapted to approximate the five United States regions published by the National Geographic Society.¹³ The largest groups of respondents represented the Southeast (27.4 percent) and the West

Table 1. DEMOGRAPHIC AND PRACTICE INFORMATION OF SURVEY RESPONDENTS

	Percentage of respondents
<i>Years since completing residency (N=1,080)</i>	
1-5	30.5
6-10	17.2
11-20	19.1
21-30	18.0
>30 years	15.3
<i>Gender (N=1,077)</i>	
Male	52.6
Female	47.2
<i>Socioeconomic status of practice (N=918)</i>	
High	18.6
Medium	60.8
Low	20.6
<i>Geographic region of practice (N=1,020)</i>	
Northeast	18.1
Southeast	27.4
Midwest	17.0
Southwest	11.1
West	26.5

Table 2. BEHAVIOR GUIDANCE USAGE BY SURVEY RESPONDENTS*

Behavior guidance technique (N=1,081)	Percentage of patients with whom technique is currently used ± SD
Tell show do	92.3±15.3
Voice control	34.2±31.2
Parental absence	33.7±34.7
Nitrous oxide	53.5±32.5
Oral sedation	14.7±19.0
General anesthesia (IV/OR)	12.7±13.6
Active restraint	12.3±14.9
Passive restraint	9.2±14.5
Hand over mouth	0.5±3.8

* Subjects were asked: "Please estimate the overall percentage of patients on whom you use the following behavior management techniques. For example: 100 percent—with every patient; 50 percent—with approximately half my patients." A scale from one to 10 was used, which was multiplied by 10 to yield percent of patients.

(26.5 percent). The Southwest was represented by the smallest group of respondents (11.1 percent).

Table 2 summarizes usage of different BGTs by subjects. Subjects used TSD in approximately 92 percent of their patients. Nitrous oxide was the second most frequently used

BGT, with subjects indicating use in approximately 54 percent of their patients. Voice control and parental absence were indicated in approximately 34 percent of patients. Oral sedation, GA, and active restraint were indicated in approximately 12 to 15 percent of patients. Passive restraint was indicated for approximately nine percent of patients. Hand-over-mouth was indicated for use in less than one percent of patients.

Subjects were grouped according to years since completing training. Table 3 summarizes these data. Voice control was used in a higher percentage of patients by more experienced providers. Respondents in practice for more than 30 years indicated use in 51 percent of patients, in contrast to graduates with less than 10 years' experience, who indicated using voice control in less than 30 percent of their patients. One-way ANOVA comparing between groups was significant at $P < 0.01$, with increasing usage of the technique for individuals in practice greater than 20 years. Nitrous oxide, oral sedation, and GA were used at a higher percentage for more recent graduates, with one-way ANOVA between groups indicating significance at $P < 0.01$. Respondents with less than 20 years indicated greater than 50 percent usage of nitrous oxide analgesia. Oral sedation usage for providers one to five years out of residency was double that of providers with more than 30 years of experience (nine to 18 percent), with ranges for the other groups around 14 to 15 percent. Treatment under GA, whether via intravenous administration or in the operating room setting (IV/OR), demonstrated two groupings, with individuals with less than 21 years of experience utilizing the technique for 13.3 to 14.6 percent of their patients and respondents with more experience at around 10 percent.

A subgroup of 124 respondents indicated that they had been in practice greater than 30 years. Table 4 summarizes the comparison of current BGT use over time. Differences were demonstrated using a one-sample Wilcoxon signed rank test. Respondents indicated no major changes in their use of TSD and active restraint. Voice control and parental absence were used more frequently in the past than at the time of the study, with statistically significant changes in parental absence evident 30 years ago and statistically significant changes in voice control evident 20 years ago. Respondents indicated that they also used nitrous oxide, oral conscious sedation, and GA (IV/OR), passive restraint, and hand over mouth less frequently in the past than at the time of the study.

Subjects were grouped according to gender. Table 5 summarizes these results. An independent sample *t* test was used to indicate differences between groups. Female respondents used TSD, nitrous oxide, oral sedation, and passive restraint in a greater percentage of patients than male respondents. Usage of other techniques was relatively similar between the genders.

Subjects were pooled according to predominant socioeconomic status of their patient population. Table 6 summarizes these results. One-way ANOVA was used to determine differences between the three groups. Parental absence, oral sedation, GA (IV/OR), and passive restraint were used with increasing frequency as socioeconomic status decreased. Nitrous oxide and

Table 3. DIFFERENCES IN BEHAVIOR GUIDANCE TECHNIQUE USAGE BETWEEN AGE GROUPS BY NUMBER OF YEARS SINCE RESIDENCY

Behavior guidance technique	Percentage of patients with whom technique is currently used ± SD (95% CI for mean)				
	No. of years since residency				
	1-5 (N=329)	6-10 (N=186)	11-20 (N=206)	21-30 (N=194)	>30 (N=165)
Tell show do	93.8±13.0 (92.4-95.2)	92.2±14.4 (90.1-94.3)	92.7±15.6 (90.6-94.9)	90.3±17.1 (87.8-92.7)	91.2±17.9 (88.4-93.9)
Voice control*	28.6±27.0 (25.6-31.5)	27.3±26.7 (23.4-31.1)	30.7±30.2 (26.5-34.9)	40.5±33.5 (35.7-45.2)	51.1±35.2 (45.5-56.6)
Parental absence	34.1±34.0 (30.5-37.8)	34.8±34.5 (29.8-39.8)	29.0±32.5 (24.5-33.5)	33.0±35.5 (27.9-38)	38.5±37.4 (32.7-44.3)
Nitrous oxide*	62.9±29.0 (59.8-66.1)	57.7±30.0 (53.4-62.1)	51.6±31.7 (47.2-56)	44.8±33.7 (40.0-49.6)	42.8±35.0 (37.4-48.2)
Oral sedation*	17.9±20.7 (15.7-20.2)	14.8±17.7 (12.2-17.3)	14±19.4 (11.4-16.7)	14.9±19.1 (12.2-17.6)	9.1±15.1 (6.8-11.5)
General anesthesia (intravenous/operating room)*	14.6±14.7 (13-16.2)	13.8±12.1 (12.1-15.6)	13.3±13.0 (11.5-15.1)	9.8±11.6 (8.2-11.5)	10.5±15.4 (8.1-12.9)
Active restraint	11.3±13.5 (9.8-12.7)	11.6±12.1 (9.8-13.3)	13.2±16.3 (10.9-15.4)	14±17.3 (11.5-16.5)	12.1±15.6 (9.7-14.6)
Passive restraint	10±14.4 (8.5-11.6)	10.5±14.8 (8.3-12.6)	9.8±16.1 (7.6-12)	8.6±13.4 (6.7-10.5)	6.4±13.5 (4.3-8.5)
Hand over mouth	0.2±1.3 (0-0.3)	0.8±4.3 (0.2-1.4)	1±7.2 (0-2)	0.4±2.0 (0.1-0.7)	0.4±1.9 (0.1-0.7)

* $P < 0.01$ using one-way analysis of variance to indicate differences between groups.

Table 4. CHANGES IN BEHAVIOR GUIDANCE TECHNIQUE USAGE OVER TIME*

Behavior guidance technique (N=124)0	Percentage of patients with whom technique is currently used ± SD	10 years ago	20 years ago	30 years ago
Tell show do	89.8±19.7	3.02±0.56	3.02±0.59	2.99±0.55
Voice control	51.4±34.8	2.93±0.89	3.23±0.85†	3.33±0.93†
Parental absence	37.6±37.2	2.93±1.14	3.16±1.24	3.55±1.43†
Nitrous oxide	42.8±34.1	2.66±1.15†	2.59±1.19†	2.62±1.31†
Oral sedation	8.2±13.7	2.21±1.56†	2.43±1.61†	2.68±1.73
General anesthesia (intravenous/operating room)	9.4±12.1	2.64±1.31†	2.50±1.36†	2.58±1.44†
Active restraint	10.3±12.6	2.82±1.20	3.04±1.26	3.18±1.40
Passive restraint	5.8±11.9	2.46±1.56†	2.51±1.62†	2.74±1.75
Hand over mouth	0.4±1.9	1.81±1.76†	2.11±1.95†	2.96±2.04

* Respondents were asked to respond to the question: "Compare your usage of the following behavior guidance techniques in the stated time period compared to today (1=substantially less than today; 3=same as today; 5=substantially more than today)."

† $P < 0.05$ using one-sample Wilcoxon signed rank test to indicate differences from a median of 3.

Table 5. DIFFERENCES IN BEHAVIOR GUIDANCE TECHNIQUE USAGE BETWEEN GENDERS

Behavior guidance technique	Percentage of patients with whom technique is currently used ± SD	
	Gender	
	Male (N=566)	Female (N=511)
Tell show do*	91.3±16.5	93.3±13.9
Voice control	35.8±32.0	32.5±30.2
Parental absence	33.1±35.5	34.2±33.7
Nitrous oxide*	51.5±34.1	55.8±30.4
Oral sedation*	13.6±17.9	16.0±20.2
General anesthesia (intravenous/ operating room)	12.1±13.3	13.5±14.0
Active restraint	11.6±14.8	13.1±15.0
Passive restraint†	8.1±14.1	10.5±14.8
Hand over mouth	0.4±2.3	0.6±5.0

* *P*<0.05 using independent samples *t* test to indicate differences between groups.
 † *P*<0.01 using independent samples *t* test to indicate differences between groups.

Table 6. DIFFERENCES IN BEHAVIOR GUIDANCE TECHNIQUE USAGE BETWEEN SOCIOECONOMIC STATUS OF PATIENTS*

Behavior guidance technique	Percentage of patients with whom technique is currently used ± SD (95% CI for mean)		
	Predominant socioeconomic status of patient population		
	High (N=171)	Middle (N=558)	Low (N=189)
Tell show do	94.2±13.3 (92.2-96.2)	92.6±15.0 (91.4-93.9)	91.6±15.5 (89.4-93.8)
Voice control	32.2±31.7 (27.4-37.1)	35.2±32.0 (32.5-37.9)	34.4±31.1 (29.9-38.9)
Parental absence†	26.6±32.1 (21.8-31.5)	33.5±34.7 (30.6-36.4)	37.6±35.2 (32.5-42.7)
Nitrous oxide‡	47.6±33.2 (42.6-52.6)	55.9±31.9 (53.2-58.5)	54.3±32.4 (49.7-59)
Oral sedation†	8.2±14.9 (6.0-10.5)	14.6±18.0 (13.1-16.1)	21±23.4 (17.6-24.4)
General anesthesia (intravenous/ operating room)†	8.4±10.4 (6.8-9.9)	11.8±12.0 (10.8-12.8)	18.4±18.0 (15.8-21)
Active restraint†	8.7±10.6 (7.1-10.3)	13.1±15.3 (11.9-14.4)	13.1±16.3 (10.8-15.5)
Passive restraint†	5.1±8.7 (3.7-6.4)	8.8±13.9 (7.7-10)	15.2±19.9 (12.3-18)
Hand over mouth	0.4±3.3 (-0.1-0.9)	0.6±3.7 (0.3-0.9)	0.5±5.2 (-0.3-1.2)

* Subjects were asked to respond to the question: “What is the predominant socioeconomic status of your patient population?”
 † *P*<0.01 using one-way analysis of variance to indicate differences between groups.
 ‡ *P*<0.05 using one-way analysis of variance to indicate differences between groups.

active restraint were used least frequently in patients from practices that were predominantly of high socioeconomic status. There was no difference in usage of TSD, voice control, and hand over mouth between respondents with different socioeconomic statuses dominating their practices.

Subjects were asked to indicate region of practice. Table 7 summarizes these results. Usage of parental absence was higher in the Southeast (41 percent), Midwest (38 percent), and Southwest (42 percent). Nitrous oxide usage was dramatically higher in the Southwest (70 percent) than in the Northeast (39 percent), with usage in the other three regions ranging between 54 and 57 percent. Oral sedation and GA (IV/OR) demonstrated similar regional patterns, ranging from 34 percent to 17 percent usage in the Southwest, respectively, from five percent to 10 percent usage in the Northeast, and from 10 to 16 percent (oral sedation) and 11 to 14 percent (GA) for the other regions. Active restraint had a different regional pattern of usage, with the lowest usage in the Southwest and West (nine to 12 percent) in comparison with the other regions (13 to 15 percent). The geographic usage pattern for passive restraint was similar to those of nitrous oxide, oral sedation, and GA (IV/OR), with 14 percent in the Southwest and seven to 10 percent for all other regions.

Discussion

Pediatric dentists are witnessing evolving societal changes, particularly regarding parenting and the consideration of health care as a consumable commodity. Modern parents tend to be actively involved in their children’s lives, particularly in medical treatment. Concurrently, pediatric dentists tend to report a growing unwillingness for parents to allow another adult to discipline or guide their children’s behavior and a growing distrust of traditional medical care.² Additionally, parents have immediate and relatively unlimited access to information (or misinformation) regarding treatment recommendations and alternatives through the internet, and can shop for preferred treatment options. This study aimed to elucidate how pediatric dentists have begun to accommodate and adapt to these changes and identify trends that may continue in the future.

TSD was utilized by the vast majority of pediatric dentists, which is similar to results from previous studies.^{6-8,10} For nitrous oxide, respondents reported usage with over 53 percent of patients. The standard deviation was large, meaning that the data were spread out (some individuals are most likely high users and others may even be non-users). Another study conducted in 2010 examined changes in pharmacologic techniques employed by pediatric dentists and reported an increase in the percentage of patients sedated with nitrous oxide.¹⁴ In 2010, greater than 50 percent of respondents indicated that 26 percent or more of their patients needed nitrous oxide, an increase from 2000 data, in which 37 percent of practitioners reported using nitrous oxide for greater than 26 percent of their patients. Several explanations could exist for the high use of nitrous oxide, including: changes in parenting style have adversely influenced child behavior and, as a result, more children need nitrous oxide³; high parental acceptance of nitrous oxide^{4,15}; and/or parental demands for less aversive techniques⁵ and high parental expectations for a positive dental experience for the child. Furthermore, it is possible that the increased use of nitrous oxide is also a reflection of contemporary education of pediatric dentistry residents. A 2011 survey of residents reported that 93 percent felt their training with nitrous oxide was excellent.¹⁶

Studies which have tracked the use of oral sedation over time have demonstrated that the most consistent trend since 1991 was for practitioners to report an increase in the use of sedation. The two most common reasons cited for the increase are: (1) more patients require sedation; and (2) dentists feel more prepared to use sedation.¹⁴ In 1985 and 1991, only 11 percent of practitioners reported using sedation in more than 10 percent of their patients. In 2000 and 2010, that number grew to 17 percent and 23 percent, respectively.¹⁴ This study's results also support the trend for use of oral sedation in more children (approximately 15 percent of practitioner patient population).

An interesting finding was the report of the use of parental absence in a third of patients. Several studies have reported that contemporary parents have a clear preference to be present in the operatory for all types of dental procedures; this trend has been reported in various countries and cultures.¹⁷⁻²⁰ Previous studies over the past two decades have reported that more dentists are allowing parental presence in the operatory.^{6,9} However, parental absence can be an effective guidance technique and have high parental acceptance if discussed with parent prior to treatment.^{15,21} Therefore, practitioners may find parental absence as a useful alternative to pharmacologic management.

A limitation of this study regarding this finding was that the questionnaire did not explore the circumstances under which parental absence was utilized. In hindsight, it would

have been more informative to determine whether parental absence was utilized when a child displayed uncooperative behavior, for specific types of visits, or due to practitioner preference. For example, Wells et al. found that practitioners were more likely to exclude parents for a sedation visit and routine operative care versus an emergency or recall visit.⁹

Most respondents in this study were new graduates who were more likely to use advanced BGTs. Pharmacological techniques were reported in increasing frequency the more recently the respondent had graduated. Other studies that have examined age of the practitioner and not necessarily time elapsed since training have postulated that the use of advanced BGTs decreases as practitioners gain more experience.^{6,9} This study's results support this hypothesis. Practitioners with more experience were significantly less likely to use sedation and GA, which may be a function of the dentists' increased skill in guiding children's behavior but may also be due to differences in training. Contemporary training programs have shown dramatic increases in the use of sedation and GA for pediatric surgery and imaging²² as well as changes in the delivery of these modalities of care, such as in same day surgery versus main operating room settings. The increased use of procedural sedation for medical procedures in pediatric patients and society's increased acceptance of sedation and GA may influence recent graduates to offer sedation more frequently as a modality of care. Accreditation standards require programs to provide residents with a minimum number of sedation experiences. Training in a hospital or combined program may afford recent graduates with greater opportunity for training in emergency management of adverse events and, thus, increase their confidence level in managing the risks of sedation. Hence, the difference could also be due to the possibility that recent graduates feel more confident in their sedation training. A final explanation for the finding that recent graduates sedate a higher percentage of patients than more experienced practitioners is that younger practitioners may have reduced opportunities to obtain hospital privileges. These providers may be sedating more children because of reduced access to the operating room.

This study also shows a clear trend indicating a decline in the use of voice control among more recent graduates while more experienced pediatric dentists, who trained at a time when voice control was considered less objectionable, were more likely to use it. This is consistent with a continual decline in the acceptance of voice control as an appropriate BGT among parents.^{4,23} A reasonable hypothesis for this difference in technique usage is that recent graduates are responding to contemporary parents' view of voice control as aversive.

Interestingly, parental presence/absence did not show a significant trend based on level of experience. Other studies have suggested that more experienced practitioners are more likely to exclude all parents in general compared to less experienced practitioners.⁶ However, this study indicated that almost all age groups utilized parental absence with approximately 34 percent of patients. As discussed earlier, practitioners may find this technique as a useful alternative to more aversive options. Additionally, similar usage across all experience levels may indicate that practitioners of all age groups and experience levels have responded to the parental demand for presence in the operatory.

Table 7. DIFFERENCES IN BEHAVIOR GUIDANCE TECHNIQUE USAGE BETWEEN U.S. REGIONS

Behavior guidance technique	Percentage of patients with whom technique is currently used ± standard deviation (95% CI for mean)				
	U.S. geographic region				
	Northeast (N=185)	Southeast (N=279)	Midwest (N=173)	Southwest (N=113)	West (N=270)
Tell show do	93.4±14.32 (91.4-95.5)	91.9±15.65 (90.1-93.7)	93.3±14.75 (91.1-95.5)	90.1±16.82 (87.0-93.2)	91.4±16.4 (89.4-93.4)
Voice control	34.5±32.1 (29.8-39.2)	33.1±29.8 (29.6-36.6)	37.8±31.4 (33-42.5)	34.5±31.1 (28.7-40.3)	31.4±30.3 (27.7-35.1)
Parental absence†	24.6±30.5 (20.1-29)	40.7±36.1 (36.4-44.9)	38±36.0 (32.6-43.4)	42.4±39.2 (35.1-49.7)	27.9±30.8 (24.1-31.6)
Nitrous oxide†	39±32.6 (34.3-43.8)	55.8±32.5 (52-59.6)	54.7±32.6 (49.7-59.6)	70.4±27.5 (65.3-75.6)	56.6±29.1 (53.1-60.1)
Oral sedation†	5.2±10.7 (3.7-6.8)	14.8±17.5 (12.7-16.9)	10.9±17.8 (8.2-13.6)	33.9±25.6 (29.1-38.7)	15.8±17.1 (13.8-17.9)
General anesthesia (intravenous/operating room)†	9.6±11.8 (7.9-11.3)	11.4±12.4 (9.9-12.9)	12.1±12.8 (10.2-14)	17.0±17.3 (13.7-20.2)	13.4±12.8 (11.9-15)
Active restraint†	13.7±17.1 (11.2-16.2)	13.1±15.0 (11.3-14.9)	14.4±16.2 (11.9-16.8)	11.3±12.6 (9.0-13.7)	9.7±12.5 (8.2-11.2)
Passive restraint†	7.1±12.2 (5.3-8.9)	10.1±13.3 (8.6-11.7)	9.1±14.0 (7.0-11.2)	14.2±19.9 (10.5-17.9)	8.5±14.8 (6.8-10.3)
Hand over mouth	0.8±6.0 (-0.1-1.6)	0.4±2.2 (0.2-0.7)	0.2±1.9 (0-0.5)	1.1±6.9 (-0.2-2.4)	0.3±1.6 (0.1-0.5)

* Subjects were asked to respond to the question: "Please indicate the location of your current practice based on the AAPD regions" These regions included: Northeast—CT, MA, ME, NH, NJ, NY, RI, VT; Southeast—AL, DC, DE, FL, GA, KY, MD, MS, NC, PA, SC, TN, VA, WV; Midwest—IA, IL, IN, KS, MI, MN, MO, NE, OH, WI; Southwest—AR, LA, NM, OK, TX. West: AK, AZ, CA, CO, HI, MT, ND, NV, OR, SD, UT, WA, WY.

† P<0.01 using one-way analysis of variance to indicate differences between groups.

Practitioners with more than 30 years of experience reported changes in their use of various BGTs over time. To the authors' knowledge, this is the first study to examine the usage of BGTs in this subset of practitioners as an individual group. These data give current pediatric dentists insight into the changes that have occurred during the career span of our most experienced practitioners. Thirty years ago, the paternalistic approach was more evident in the techniques used more frequently than those reported for the present day, including parental absence, voice control, restraint, and hand over mouth. The latter is no longer recognized as an acceptable BGT by the AAPD, and the other techniques have decreased in parental acceptance.^{4,5,24} Contemporary parents are interested in and involved in their children's care and have increased immediate access to health care information through the internet and handheld smart-phones.²⁵ Parents have become more aware of procedures, techniques, dental materials, and alternative options than parents of the past might have been. Direct-to-consumer pharmaceutical advertising, internet access, and the continued popularity of medical television shows may have increased parents' awareness of sedation and GA.⁵ Indeed, practitioners appear to have responded to the loss of the more aversive non-pharmacologic techniques with increases in pharmacologic management, as practitioners report using nitrous oxide, sedation, and GA 10, 20, and 30 years ago "less than [they do] today." While parental preference has most likely played a large role in these differences, changes in care modalities have also played a role. Office-based procedural sedation has undergone changes in monitoring guidelines,²⁶ medication availability, and preference (i.e., midazolam over chloral hydrate)¹⁶ as well as parental acceptance.²⁷ Additionally, GA has become more efficient and accessible in some ways, such as through same day surgery centers or ambulatory anesthesiologists who offer in-office anesthesia services. A 2011 survey of dental anesthesia program directors reported an increase in the requests for dental anesthesia services by pediatric dentists compared to two, five, and 10 years ago,²⁸ and a survey of pediatric dentists reported that 28 percent use a dentist anesthesiologist and 61 percent would use one if one were available.²⁹

With females now comprising more than half of new pediatric dentistry graduates, it is important to examine gender differences in the delivery of care. While female respondents reported using more TSD than male respondents, this is most likely not clinically significant, as both genders reported using it in over 91 percent of their patients, which is consistent with other studies.^{6,11} This study indicated that females were more likely than males to use nitrous oxide, sedation, and passive restraint. However, this study also found that new graduates were also more likely to use advanced BGTs. The greater use of advanced techniques may be due to inexperience rather than a true gender difference, a finding supported by others.^{6,9} Additionally, a recent study of conscious sedation usage showed no significant difference in use by gender.³⁰ No other differences in the utilization of techniques by gender were reported, and Wells et al. also found that practitioners of both genders utilize BGTs at approximately equal rates.⁹

To the authors' knowledge, this is the first study to examine BGT usage by socioeconomic characteristics of the practice population. Dentists whose practices primarily served children of low socioeconomic status used sedation, GA, parental absence, and passive restraint for a significantly greater percentage of patients. The high use of advanced BGTs is not surprising, given that caries is disproportionately high in low-

income children.³¹ Restoring multiple carious teeth can be difficult for both the child and the dentist without the use of advanced techniques, and parents are more accepting of GA if multiple appointments are required to complete the treatment.⁵ What is perhaps troubling is the much higher use of parental absence and protective stabilization in this population. Protective stabilization was reported in almost twice as many low-income patients as middle-income patients and three times as many as high-income patients. This finding could be due to the higher percentage of patients receiving sedation with concomitant protective stabilization. As mentioned previously, the questionnaire did not explore the types of appointments for which parents were excluded from the operator.

Likewise, the survey instrument did not explore the types of appointments for which protective stabilization was used. However, the respondents of this study who treated a mostly low-income population reported a higher rate of parental absence than use of sedation. Thus, parents are most likely excluded from additional procedures as well. The AAPD recently adopted a guideline regarding the use of protective stabilization, and Wells et al. reported that the overwhelming majority of pediatric dentists indicated that passive restraint was rarely acceptable for routine care.⁹ Additional research in this area is warranted to explore the circumstances under which protective stabilization and parental absence are utilized in low-income populations, especially given that alternative caries management strategies such as silver diamine fluoride, the non-restorative caries technique, and the Hall technique have a growing body of evidence to support their use in managing the carious process.³²

Sparse data exist that examine differences in use of behavior techniques by region of practice. The McKnight-Hanes study explored the percentage of practitioners utilizing each type of behavior guidance versus the percentage of patients with whom the technique was utilized.⁸ This 1993 study reported that practitioners from the Southwest and Northwest reported the most frequent use of pharmacologic management, while the lowest use was reported in the Northeast. The current study reports pharmacologic management to be highest in the Southwest and West regions. The Northeast remained the region with the lowest use of pharmacologic techniques. These findings may be due to a difference in the burden of disease in the population, as the South has a higher percentage of individuals living in poverty and the Northeast has higher median family incomes.³³ Another explanation could be that the Southwest and West have a relatively higher immigrant population in which English may be a second language. It is possible that advanced techniques are used when dentists perceive a communication barrier may limit the communicative guidance techniques. Regional differences may also exist due to differences in state laws, access to GA, and regional training programs with more intensive sedation experience.

Previous research has reported on parental acceptance of BGTs; however, the parental surveys were of parents in the region of the study. Additional research could explore parental acceptance of various techniques in various regions of the country as practice patterns are most likely a function of both training experiencing as well as parental expectation and demand.

There are a number of limitations to this study. Because it was conducted as a secondary data analysis of a previous study, survey questions were not phrased to yield the specific outcome measures sought in this study. Also, the survey requested

estimates for frequency of BGT usage but did not specify circumstances in which techniques were used—whether for exams, preventive appointments, or restorative treatment. Behavioral status of patients wasn't considered either. For the items comparing usage of BGTs in the past to the time of survey administration, respondents were asked to compare their recollection of the past to current use, introducing recall bias and a very non-specific method of measuring differences in the past. Furthermore, the survey data is from 2010. Previous studies in pediatric dentistry reporting on behavior guidance trends are typically reported in 10-year intervals. However, the BGT usage among socioeconomic status is novel data; additionally, the use of BGTs by region is updated information, as the next most recent study is from 1993.⁸ Also, this study's results could be useful in the design of future BGT usage surveys. Finally, as with many contemporary survey studies, there was a low response rate and an oversampling of recent graduates. The respondents only represented approximately a quarter of pediatric dentists, although there were over 100 respondents for each demographic group. Understanding the reasons for non-response would be valuable. However, no information on the non-respondents is available, as potential subjects were promised anonymity to protect confidentiality and privacy.

Despite these limitations, the purpose of this paper has been fulfilled in that some provider and practice characteristics that may influence the usage of BGTs have been described. With these results, providers have evidence to support or change their BGTs according to their practice characteristics as they continue to gain experience throughout their careers. Future studies of BGT usage could investigate in detail the reasons pharmacologic management is used for more patients, the types of appointments for which parental absence is used, under what circumstances it is actually used as a guidance technique, and perhaps with what effectiveness and what parental acceptance rate. Further research is indicated for low-income populations to explore the circumstances in which passive restraint and parental absence are used. Finally, future exploration of BGT trends will be interesting as the profession begins adopting alternative caries management strategies that may either delay advanced BGTs or decrease their use.

Conclusions

Based on this study's results, the following conclusions can be made:

1. Usage of nitrous oxide, sedation, and general anesthesia differed significantly according to experience, as recent graduates used pharmacology for a higher percentage of patients and used voice control for fewer patients than experienced individuals.
2. Use of tell-show-do, nitrous oxide, oral sedation, and passive restraint was significantly more frequent among female respondents.
3. Parental absence, oral sedation, passive restraint, and GA were used with a significantly higher percentage of patients by respondents serving low-income populations.
4. Parental absence, pharmacologic techniques, and restraint were used on a significantly different percentage of patients among the different geographic regions.
5. Practitioners who have been in practice for more than 30 years have decreased use of parental absence and voice control and increased use of pharmacologic techniques.
6. Collectively, use of behavior guidance techniques has changed in the past three decades, with pharmacologic techniques being used at a higher prevalence by recent graduates, female providers, and those serving low-income populations.

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