Abstract

A national survey of members of the American Academy of Pediatric Dentistry was conducted to update information on the use of sedative agents by pediatric dentists. All 2532 members of the Academy were sent questionnaires regarding their use of sedation and 1497 responded. Practitioners were questioned regarding how frequently they used sedative agents and the nature of patients receiving sedation. In addition, they were questioned on reasons for change, if any, in their use of sedation during the past two years. A separate survey was conducted of directors of all 55 postdoctoral training programs in pediatric dentistry. Forty-six directors responded to questions concerning the type and frequency of sedation use in their programs. Both surveys demonstrated wide differences in sedation use between different training programs and between different practitioners. The heavier use of sedation by some practitioners or by some training programs, as compared with others, generally was not related to the percentage of handicapped patients who received sedation, nor to the type of training. Frequent users of sedation (more than once each day) were located more in the south/southeastern and western parts of the country and they tended to have been in specialty practice for more than 10 years. (Pediatr Dent 15:36–40, 1993)

Project USAP the use of sedative agents in pediatric dentistry: 1991 update

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Introduction

Most children with behavioral problems usually are managed with nonpharmacologic techniques. Occasionally, pharmacologic methods such as conscious sedation, deep sedation, or general anesthesia are necessary for patients who are very young or severely mentally handicapped who cannot communicate adequately and who have severe behavioral problems. Many factors other than the needs of the patient affect the use of sedation, and practice varies widely around the country.

In 1985, a survey was performed to examine the use of sedation by pediatric dentists in the United States and Canada.[1] A follow-up survey was conducted in 1991 to examine changes in sedation use, after the wide distribution of the guidelines for use of sedation developed by the American Academy of Pediatric Dentistry.[2] The 1991 project was performed in two parts: Part 1 examined the use of sedative agents by practicing dentists, and Part 2 studied the use of sedation by postgraduate students in postdoctoral teaching programs.

Part 1: Use of Sedative Agents by Practitioners

Methods

During the summer of 1991, a national survey was conducted of members of the American Academy of Pediatric Dentistry. All 2532 active members were sent questionnaires regarding the frequency of their use of sedation and the types of agents used. Fourteen hundred and ninety-seven practitioners responded representing all geographic areas of the United States, hospital- and university-based training programs, and various lengths of time in practice from recent graduate to long-time practitioner (Table 1). The practitioners were questioned concerning: their use of nitrous oxide and other sedative agents, the frequency of use of sedative agents, the percentage of their patients who were normal as compared to handicapped, the ages of their patients receiving sedation, reasons for changes in sedation use during the past two years, the methods for monitoring patients during treatment, the usual drugs used — together with the typical dosage and the typical effect of sedation, and any undesirable side effects observed by the practitioner. The format of the questionnaire was similar to that used in the 1985 survey.[1]

Results

The results of Part 1 of the study appear in Tables 1 to 3. Table 1 describes all 1,497 respondents. The total sample was divided into those who used sedative drugs other than nitrous oxide in their practices (1043 practitioners), those who used such drugs more than 60 times in a typical three-month period (> than once a day—173 practitioners), and those who used sedation more than 120 times in a similar time period (> than twice a day—57 practitioners). Respondents were fairly evenly distributed across the four geographic areas of the country with 19–30% in each area. Frequent users of sedation (more than once per day), however, were located more in the south/southeastern (41%) and western (28%) areas of the country compared with the northeastern (13%) or Midwestern (18%)

areas. (These differences were statistically significant at the 0.05 level, chi-square = 18.32, df = 3). Respondents from university-based programs who use sedative drugs other than nitrous oxide were similar in number (46%) to those who attended hospital-based programs (41%). More practitioners who were heavy users of sedation had been in specialty practice for more than 10 years (65%) compared with those with fewer years in practice (35%). One third of the respondents were Diplomates of the American Board of Pediatric Dentistry and half had participated in the original 1985 survey.

The relative frequency of use of sedative agents by the respondents is described in Table 2. In regard to the use of nitrous oxide alone, 51% of the total sample used nitrous oxide less than 10% of the time and two thirds indicated that they used nitrous oxide less than 25% of the time. In regard to other types of sedative agents, most practitioners used little, if any, sedation. Eighty-six per cent of the practitioners used sedation for 10% or less of their patients, whereas only 14% used sedation for more than 10% of their patients. In comparison, only 38% of heavy users (more than two times per day) sedated less than 10% of their patients, and 62% used sedation more than 10% of the time. (These differences were statistically significant at the 0.05 level, chi-square = 52.26, df = 1).

In regard to changes in the use of sedation, 57% indicated that they had not changed their frequency of use during the past two years. Twelve per cent had increased use and 31% had decreased use of sedation during that period (significant at 005 level, chi-square = 30.65, df = 2). Typical reasons cited for decreased use were that practitioners felt more able to manage patients without sedation, had fewer patients requiring sedation, had less difficulty providing treatment with general anesthesia, had difficulty complying with the Academy sedation guidelines, and they were concerned about increased malpractice insurance cost and state legislation which made sedation more difficult. Reasons for increased use were that some practitioners had more patients requiring sedation, they felt more prepared to use sedation, and had more difficulty providing treatment with general anesthesia.

In a typical three-month period, a total of 33,208 drug administrations were reported by the 1497 respondents. One third (11,731) of the sedations were administered by only 57 practitioners who used sedative agents other than nitrous oxide twice a day each day during the three-month period. Almost two thirds of the sedations (20,524 or 62% of the total) were administered by only 12% of the practitioners (173), who used sedation on the average of more than once each day. The average number of patients sedated in the three-month period by each practitioner in the total sample was 22, as compared with an average of 119 for those practitioners using sedation more than once a day and 206 for those using sedation greater than twice each day.

The heavier use of sedation by some practitioners was not related to the percentage of their sedated patients who were handicapped, and there was a rather low percentage for both the total sample (12% of patients) and heavy users of sedation (7%) (Differences not significant, chi-square = 1.31, df = 1). Forty-two per cent of patients sedated by heavy users were more than 3 years of age, compared with 28% of sedated patients for the total sample. Sedation was

Table 1. Participants in Project USAP: the use of sedative agents by pediatric dentsts, 1991 update (figures shown in per cent of sample)

	Total Sample N = 1497	*Sample Using Sedation* N = 1043	*Sedation Use > 1/day* N = 173	*Sedation Use > 2/day* N = 57
Type of Training				
Grandfathered	3	2	1	0
University based	47	46	46	46
Hospital based	40	41	41	45
Combined	10	11	12	9
Area of Practice				
Northeast	27	24	13	10
South/southeast	30	32	41	38
Midwest	24	22	18	20
West	19	22	28	32
Years of Practice				
1–5	19	22	16	21
6–10	19	22	19	19
11–15	24	24	29	32
16–20	19	17	27	21
20+	19	13	9	7
Diplomate Status				
Diplomate	34	33	31	30
Nondiplomate	66	67	69	70
Participation in 1985 Project USAP				
Participant	50	48	56	49
Nonparticipant	50	52	44	51

usually administered in the office 61% of the time and in the patient's home for the remainder.

Practitioners who used sedation indicated that they monitored their patients by a variety of methods. Most evaluated color of their patients, but only 54% used a precordial stethoscope and only one third took blood pressure ratings. Pulse rate was monitored by approximately 83% of the practitioners and respiration by 80%. Sixty-nine per cent now use pulse oximeters.

Side effects consisting of nausea, vomiting, hyperactivity, excessive sleep, and insufficient sedation or respiratory depression were reported to have been experienced at least one time by approximately 40% of the respondents. Four per cent reported some experience with respiratory depression following sedation.

Table 2. Frequency of use of sedative agents (figures shown in per cent of sample)

		Sample Using Sedative Drugs Other Than N_2O		
	Total Sample N = 1497	*> 1/3 months* N = 1043	*> 1/day* N = 173	*> 2/day* N = 57
Per cent of patients sedated only with nitrous oxide				
0	18	10	10	12
1–5	26	26	15	14
6–10	13	15	13	14
11–25	14	17	18	12
26–50	12	14	19	23
> 50	17	18	25	25
Per cent of patients sedated with other sedative agents				
0	26	0	0	0
1–5	50	69	30	15
6–10	13	17	27	23
11–25	7	9	23	32
26–50	3	4	14	23
> 50	1	1	5	7
Per cent of sedated patients (other than N_2O) who were handicapped	—	12	7	7
Per cent of patients sedated (other than N_2O) who were ages:				
0–2 years	—	34	21	20
3	—	38	39	38
4–5	—	19	29	29
6–10	—	6	9	10
> 10 years	—	3	2	3

Table 3. Numbers of patients sedated with agents other than nitrous oxide in a three-month period

		Total Number By All Practitioners	*Average Number By Each Practitioner*
Total Sample	N = 1497	33,208	22
Sample Using Sedation			
> 1/3 months*	N = 1043	33,208	32
> 1/3 months and < 1 week	N = 524	2,798	5
> 1/week and < 1 day	N = 344	9,886	29
< 1/day	N = 868	13,050	15
> 1/day	N = 173	20,524	119
>1/day and < 2/day	N = 116	8,793	76
> 2/day	N = 57	11,731	206

* > 1/3 months = greater than once in three months.

Part 2: The Use of Sedative Agents in Postgraduate Training Programs

Methods

A survey was conducted of all training programs in the United States as a separate part of the 1991 update of Project USAP. The survey was performed to study the use of sedative agents in training programs and to examine any relationship that might exist in sedation use for private practitioners. Of the 46 programs responding, 20 were hospital-based, 20 were university-based, and six were a combination. In addition, there were approximately 142 first-year and 133 second-year students, averaging three students in each year of each program. The program directors were asked what percentage of total patients received sedation with nitrous oxide, what percentage received sedation with other agents, what percentage of sedated patients were handicapped, the relative ages of patients who received sedation, and the experiences students had with the following sedative agents: hydroxyzine, chloral hydrate, meperidine, diazepam, and other drugs.

Results

Program directors indicated that approximately 16% of the patients of first-year students and 18% of patients of second-year students were treated using sedation with nitrous oxide alone (range = 2 to 75%, median = 10%.) Sedation with other agents was used by first year students with 6% of their patients and by second year students with 8% of their patients (range = 0 to 30%, median = 6%). Of those patients sedated with agents other than nitrous oxide, 70% were considered not handicapped (median = 80%). Of those patients receiving sedation other than nitrous oxide, 28% were between 0–2 years, 35% were age 3, 22% were 4–5 years, 8% were 6–10 years, and 7% were age 10 or more years.

The frequency of use of various drugs and drug combinations appears in Table 4. For each drug or drug combination, the mean number of sedations performed by each first-year and by each second-year student is reported. Because many programs do not use particular drugs, the means were calculated for all 46 programs and also for only those programs using the particular drug combination. For example, the mean number of sedations performed by first-year students with hydroxyzine alone ranged from 0 to 40. The mean equaled two for all 46 programs, but it was eight when only those 15 programs using the drug were considered.

There was a very large range of mean numbers of sedations performed by each student (0–105 for first-year students and 0–335 for second-year students). Because of the large number of sedations performed at a few institutions, the means are somewhat larger than the median values (35 compared with 27 for first year students, and 56 compared with 36 for second year students). Consequently, the median values are more representative of sedation use at all 46 programs. Furthermore, programs in which sedation was used heavily did not correlate with the percentage of handicapped patients treated.

The most commonly used drug combination was chloral hydrate and hydroxyzine supplemented with nitrous oxide (15 for first-year students and 19 for second-year students); however, more individual programs (28) used oral diazepam supplemented with nitrous oxide.

Discussion

These surveys demonstrate wide differences in the use of sedative drugs by pediatric dentists and wide differences in the experiences postgraduate students have with sedative drugs. Since the types of patients treated by most practitioners are fairly similar, and the types of patients

Table 4. Mean number of sedations performed by each student each year in postgraduate training programs using particular sedative agents

	Number for Each 1st Year Student			*Number for Each 2nd Year Student*		
	Range	*All Programs*	*Programs Using Agent*	*Range*	*All Programs*	*Programs Using Agent*
a. Hydroxyzine (Atarax or Vistaril) alone	0–40	2	8 (15)*	0–80	4	11 (15)
b. Hydroxyzine and N_2O	0–60	4	9 (19)	0–99	5	11 (21)
c. Chloral hydrate (Noctec) alone	0–20	1	7 (9)	0–25	2	11 (8)
d. Chloral hydrate and N_2O	0–20	2	6 (15)	0–35	3	10 (16)
e. Chloral hydrate and promethazine (Phenergan) alone	0–10	0	6 (2)	0–10	0	6 (2)
f. Chloral hydrate, promethazine, and N_2O	0–48	1	15 (4)	0–30	2	13 (6)
g. Chloral hydrate and hydroxyzine (alone)	0–40	3	11 (11)	0–40	3	10 (13)
h. Chloral hydrate, hydroxyzine, and N_2O	0–45	7	15 (23)	0–45	10	19 (24)
i. Meperidine (Demerol) alone	0–15	1	5 (5)	0–20	1	6 (6)
j. Meperidine with N_2O	0–10	0	5 (4)	0–30	1	7 (7)
k. Meperidine and promethazine	0–20	1	6 (8)	0–99	4	19 (9)
l. Meperidine, promethazine, and N_2O	0–35	4	11 (16)	0–60	6	46 (18)
m. Diazepam (oral valium) alone	0–20	2	5 (23)	0–20	4	7 (24)
n. Diazepam (oral) and N_2O	0–50	4	7 (28)	0–99	7	10 (31)
o. Other	0–35	3	8 (18)	0–25	4	6 (19)
Total (Average number for each student each year)	0–105	Mean = 35 Median = 27		0–335	Mean = 56 Median = 36	

* *Bracketed number equals number of programs in which agent was used.*

treated in most training programs are fairly similar, and since with few exceptions the numbers of patients sedated did not correlate well with the percentage of handicapped patients treated, the wide differences in sedation use probably reflect differences in the biases of individual teachers and practitioners. It is quite likely that when a healthy child is sedated for dental treatment, the type of drug depends more on the experiences of the practitioner than the requirements of the patient. These findings suggest a need for research to enable better identification of those factors that dictate when and with which drug regimen a child should be sedated for dental treatment.

Comparison with data from the 1985 survey indicates many similarities and some differences in the findings. In regard to the overall use of sedation, the total of 33,208 drug administrations in a typical three-month period reported by the 1497 respondents, was almost identical to the 33,465 administrations reported in 1985 for 1105 respondents. Although there were 30% more practitioners in 1991, the total number of sedations performed in a three-month period did not change, but rather the average number of sedations performed by each practitioner was reduced from 30 in 1985 to 22 in 1991. In 1985, 6% of the practitioners used sedative agents, other than nitrous oxide, twice each day during a three-month period; however, by 1991, this number was reduced to only 3% of the respondents. These heavy users of sedation in 1991 sedated — on the average — 206 patients during a three-month period in comparison to an average of 231 patients sedated by heavy users of sedation in 1985. A similar finding is evident in comparisons of the data reflecting sedations performed in postgraduate training programs. For the 1991 survey, the overall *median* value of 63 for the average total number of sedations performed by each student in the two years of training is similar to the *median* value of 62 reported in 1985. However, the *mean* value of 91 is substantially lower than the *mean* of 151 reported in 1985. This indicates that although most programs have continued using sedation, other than nitrous oxide, with similar frequency over the past six years, programs that were heavy users of sedation have substantially reduced their frequency of drug use.

While it is beyond the scope of this paper to identify the specific reasons for changes in the use of sedation, some influencing factors would be the Academy's guidelines, increased malpractice insurance costs, and new state regulations.

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2. American Academy of Pediatric Dentistry: Guidelines for the elective use of conscious sedation, deep sedation, and general anesthesia in pediatric patients, Pediatr Dent 7:334–37, 1985.