



# Experience and Policy Implications of Children Presenting With Dental Emergencies to US Pediatric Dentistry Training Programs

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## Abstract

**Purpose:** The purpose of this study was to describe and substantiate the experience of children, their families, and their caregivers with children's dental pain and to explore implications of these experiences for public policy.

**Methods:** Data for 301 children presenting to 35 pediatric dentistry training programs during a 1-week period in 2000 for pain relief were collected with a questionnaire asking for: (1) sociodemographic characteristics; (2) oral health status; (3) dental care history; (4) presenting problem; (5) clinical findings; and (6) clinical disposition. Descriptive statistics are presented.

**Results:** Among children presenting to training programs with oral pain, 28% were under age 6, 57% were on Medicaid, and 38% were regarded by their dentists to have "likely or obvious" functional impairment—with 22% reporting the highest pain level. Parents reported that 59% had "poor or fair oral health" and 29% had a prior dental emergency in the previous year. Pain, experienced for several days by 73% of children, was associated with difficulty: (1) eating; (2) sleeping; (3) attending school; and (4) playing. Parent-reported barriers to seeking dental care included: (1) missed work (24%); (2) transportation costs (12%); and (3) arranging child care (10%).

**Conclusion:** In this study of children with dental pain, many suffered significant pain: (1) duration; (2) intensity; (3) recurrence; and (4) consequences. This study demonstrates the ongoing need for public policies that assure timely, comprehensive, and affordable dental care for vulnerable children. (*Pediatr Dent* 2006;28:431-437)

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Children's experience of dental pain and its consequences on their lives is frequently cited by policymakers as a motive to develop public policy on dental care for children.<sup>1</sup> Such pain has been cited as a problem worthy of societal attention by the US Surgeon General,<sup>2</sup> Institute of Medicine,<sup>3</sup> Government Accountability Office,<sup>4</sup> state legislators,<sup>5</sup> and maternal and child health officials.<sup>6</sup> Arguments favoring public policy attention to Medicaid, workforce development, safety net adequacy, and other programs addressing oral health care for high risk children have been advanced based on: (1) ethical considerations<sup>7</sup>; (2) functional implications<sup>8</sup>; and (3) growth

and developmental consequences.<sup>9,10</sup> A review of existing information from federal, state, dental professional, and hospital sources, however, reveals that only limited direct measures of children's dental pain experience are available.<sup>11</sup> These include case-series reports from 7 treatment sites<sup>12-18</sup> and prevalence reports from 2 Head Start studies.<sup>19,20</sup> These studies, however, provide little descriptive information about the pain experience as viewed by both the parents and the care providers.

The purpose of this study of children's clinical presentations to pediatric dentistry training programs for relief of dental pain was to better describe and substantiate the experience of children, their families, and their caregivers, and to explore implications for public policy in addressing the oral health needs of these children. Children presenting to US-accredited pediatric dentistry training programs during a 1-week period for pain relief were enrolled in a survey describing their: (1) sociodemographic characteristics; (2) oral health status; (3) dental care history; (4) presenting problem; (5) clinical findings; and (6) clinical disposition.

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## Methods

Data for this study were collected using a questionnaire administered by US pediatric dentistry residents who treated children and adolescents presenting with a chief complaint of dental pain or infection during 1 of 2 7-day periods in March 2000. Of the 56 university- and hospital-based programs functioning at that time, 50 agreed to participate in the study; 46 submitted applications to their Institutional Review Boards, and 35 obtained human subjects approval and participated in the study.

The study population comprised 301 children who presented in person to these programs with oral or dental emergencies and whose parents and dentists completed the questionnaire. An additional 112 children whose parents consulted pediatric dental residents over the telephone are not included in this analysis because of the uncertainty of their diagnoses and lack of clinical information.

Questionnaire items assessed children's sociodemographic characteristics, including:

1. sex;
2. age in years;
3. family structure;
4. categorized as 1-parent, 2-parent, group home, or other;
5. parental education, classified as:
  - a. below;
  - b. at; or
  - c. above high school; and
6. family income, categorized in intervals of \$16,500 to approximate levels of poverty.<sup>21</sup>

Insurance coverage was determined by the type of payment used for the appointment; it was classified as Medicaid, private insurance, out of pocket, and "other" which included Head Start, no arrangements, private foundations, or a relative. Oral health status was indicated by self-reported or adult-reported child's condition as poor, fair, good, or excellent. Perceived unmet needs for dental care were reported as yes/no. Dental care was characterized by usual source of care and history of previous care. The presenting dental problem was characterized by symptom duration, perceived impact on function, and prior management at home or at a treatment site. Extent of pain was classified using a simplified visual analog scale based on pictograms of 6 faces demonstrating increasing levels of discomfort.<sup>22</sup> Specific reason for the visit, clinical findings, and diagnoses were reported by the residents using open-ended questions that were later recoded in the categories shown in Tables 4 and 5. Providers also categorized their assessment of the child's level of functional impairment associated with the presenting problem using 4 categories: (1) unlikely; (2) possible; (3) likely; and (4) obvious.

## Statistics

Analyses were conducted in SAS version 8 for Windows (SAS Institute Inc, Cary, NC). Bivariate analyses of main outcome variables (pain intensity and impairment) by the sociodemographic variables (age, sex, family income, insur-

**Table 1. Sociodemographic Distribution of Children Presenting With Dental Emergencies to US Pediatric Dentistry Training Programs**

Characteristics	%
Sex (N=286)	
Boys	49
Age (N=301)	
Infants and toddlers (0-2)	9
Preschool (3-5)	30
Elementary (6-12)	52
Secondary (≥13)	9
Family structure (N=262)	
2 parents	54
1 parent	41
Group home	2
Other	3
Presenting parent's education (N=265)	
<High school	20
High school	54
College	26
Family income (N=247)	
<\$16,500	57
\$16,501-\$33,000	27
\$33,001-\$49,500	9
≥\$49,501	7
Payment (N=301)	
Medicaid	57
Private insurance	14
Out of pocket	11
Other	18

**Table 2. Oral Health Status of Children Presenting With Dental Emergencies to US Pediatric Dentistry Training Programs**

Indicators	%
Dental health status of child, as reported by parent (N=283)	
Poor	20
Fair	39
Good	28
Excellent	13
Has unmet dental needs, as reported by parent (N=281)	38
Underlying condition, as reported by clinician (N=79)	24
Infectious	7
Neoplastic	1
Developmental	14
Behavioral	58
Other	20

**Table 3. Dental Care Utilization and Access to Care of Children Presenting With Dental Emergencies to US Pediatric Dentistry Training Programs**

Indicators	%
Has usual source of care (n=281)	54
Usual source of care type	
Hospital	35
Private office	19
Community or public health center	39
Other	7
Had dental emergency visit in past year (n=279)	29
Had dental visit in past year (n=282)	51
Reason for last dental visit	
Emergency	36
Routine	60
Other	4
Paid transportation for this visit (n=268)	55
Transportation cost delayed this visit	12
Had to miss work (n=267)	36
Missing work delayed this visit	24
Had to arrange child care (n=239)	17
Child care delayed this visit	10

ance, or parents education), tested by chi-square analyses, indicated that there was no difference in the reports of pain or impairment by demographic groups. Therefore, the authors present descriptive statistics for all children. Participating children for whom incomplete information is available are included in the analyses, but excluded from calculations where data are missing.

## Results

Seventy-two percent of all hospital-based pediatric dentistry training programs (N=18) and 55% of dental school-based programs (N=17) participated in the study, with hospital programs reporting two thirds (66%) of emergency visits. The vast majority of these visits (91%) occurred during regular clinic hours. Numbers of reported cases per 7-day reporting period varied from 3 to 72 for hospital-based programs and 2 to 25 for dental-school based programs. The average number of enrolled children during a week was 19 in hospital-based programs and 10 in dental school-based programs. The median number of children seen was 15 for hospital based-programs and 10 for dental school-based programs.

High proportions of cases were toddlers and preschool-age children (39% under age 6), and elementary-school age children (52% between 6 and 13 years of age; Table 1). Over half of the children (54%) were from 2-parent families; most of their families (74%) had a parent with high school or less education; over half (57%) reported income levels compatible with poverty; and 57% had Medicaid coverage.

The oral health status (Table 2) of the majority of children (59%) was reported by parents as fair or poor, and 38% were reported to have a pre-existing unmet dental need. A quarter of the children (24%) were reported by dental providers to have a condition that complicated treatment. Of these children, 58% were reported to have a behavioral condition and 14% a developmental condition. Regarding prior dental care (Table 3), 54% reported having a usual source of care, mostly in a hospital dental clinic or private office. Half (51%) reported having a dental visit in the last year with 29% of those visits also being for a dental emergency. Thirty-six percent reported that their immediate-prior dental visit was for treatment of an acute dental problem. Missing work to attend to their child's acute dental needs was reported by 36% of parents, 24% of whom indicated that doing so caused them to delay care. Most parents (55%) paid for transportation to attend the emergency visit, and 12% of them reported that doing so caused them to delay their child's care. Fewer parents (17%) reported the need to arrange for other children's daycare, while 10% of them reported that doing so delayed the child's visit.

The majority of children (73%) reportedly experienced their acute dental problem for several days, as 37% had symptoms lasting between 2 and 7 days and 36% had symptoms lasting for more than a week (Table 4). Nearly a quarter (24%) had experienced the same problem before. At the time of presentation, 27% of children reported no pain or pain levels in the lowest level of the analog scale, 34% in the middle third of the scale, and 39% at the highest third of the scale (Table 4).

Family reports of consequences stemming from the dental problem included interference with: (1) eating (86%); (2) sleeping (50%); (3) school activities (32%); and (4) play (19%) (Table 4). In contrast, providers reported that functional impairment was "obvious" in only 14% of cases and "likely or possible" in 45% of cases, with 41% of cases presenting with problems that were considered "unlikely" or "not obvious(ly)" contributing to impairment (Table 4).

Pre-visit home management (Table 4) was most commonly via swallowed medication (44%) or other medicinal approaches (13% applied medication topically and 6% used home remedies), but over a third either "waited it out" (18%) or avoided some foods (19%). For those children who received prior professional management of the presenting problem, prior treatment had been by prescription (14% antibiotics, 10% analgesics), pulp treatment (15%), restoration (16%), or extraction (32%).

Families and clinicians characterized presenting symptoms differently. While 47% of parents reported pain and 9% reported infection as the reason for the visit, providers reported 59% "toothache," 23% "infection," and 22% "swelling" as clinical findings, and "dental abscess" as the primary diagnosis in 47% of cases (Table 5). Trauma was reported by parents in 18% of cases, while "fractured teeth" was the clinical finding in 14% of cases and trauma was the primary diagnosis in 15% of cases. Caries was identified by 7% of parents as the chief complaint and diagnosed as the primary condition in 16% of cases.

## Discussion

A national dental pain “snapshot” survey was conducted to characterize the existence and nature of pediatric dental pain and its acute management during an arbitrarily selected week of the year. This study of children who experience den-

tal pain, primarily associated with caries, substantiates that such pain can be consequential to children’s function and quality of life and can place burdens on families seeking to address that pain. This study was not designed to determine the overall national prevalence of childhood dental pain. Such pain, however, is clinically associated with untreated caries—a condition which affects 21% of all US children 2 to 11 years old<sup>23</sup> or roughly 7.6 million children. While not all children with untreated caries will experience pain, the national level of untreated disease—coupled with its consequences when pain does occur—may be sufficient to substantiate pediatric dental caries as a public health problem worthy of governmental attention.

Public policies establish focus and opportunity for governmental action to redress the problem of children suffering from dental pain.<sup>24</sup> In contrast, clinical policies establish norms and expectations about patient care and are usually developed by associations of health professionals. Examples of clinical policy relevant to children’s oral health include the guidelines and policies established by the: (1) American Academy of Pediatric Dentistry (AAPD)<sup>25</sup>; (2) American Academy of Pediatrics<sup>26</sup>; (3) Bright Futures: Oral Health<sup>27</sup>; and (4) the US Prevention Task Force.<sup>28</sup> There are currently no clinical policies that specifically address management of dental pain in children. The AAPD offers

**Table 4. Children’s Presenting Problem: Characteristics, Effect on Quality of Life, and Management**

Event	%
Parent report of symptom duration (N=301)	
No pain	15
≥1 h, but <24 hs	13
≥1 d, but <7 ds	37
≥1 wk	36
Had this problem before (N=271)	24
Clinician’s report of apparent impairment (N=264)	
Obvious	14
Likely	24
Possible	21
Unlikely	12
Not obvious	29
Child’s report of pain intensity	
0 (none)	15
1	12
2	13
3	21
4	17
5 (highest)	22
Parent report of consequences (N=283)	
Problem affects mood	47
Problem interferes with	
Play	19
School	32
Sleeping	50
Eating	86
Parent’s report of symptom management at home (N=301)	
Held in the mouth	13
Swallowed medicine	44
Avoided foods	19
Home remedies	6
Waited it out	18
Parent’s report of problem management by prior dentist (N=297)	
Antibiotics	14
Extraction	32
Pain prescription	10
Pulp treatment	15
Restoration	16
Other	13

**Table 5. Reason for Visit and Clinical Findings of Children Presenting With Dental Emergencies to US Pediatric Dentistry Training Programs (N=301)**

Reason for visit	%
Pain	47
Trauma	18
Caries	7
Abscess, swelling, fistula	9
Exfoliation/eruption	4
Restoration failed	4
Soft tissue problem	5
Orthodontics	1
Other	5
Clinical findings*	
Infection	23
Bleeding	4
Fractured teeth	14
Toothache	59
Swelling	22
Caries	39
Diagnosis	
Abscess	47
Exfoliation/eruption	10
Trauma	15
Caries	16
Other (soft tissue, ortho)	12

\*More than 1 finding was reported for some children.

guidelines on treatment of the tooth that could be the source of pain in its chapter on pulp therapy. These guidelines center on the affected tooth, however, and do not present guidelines on broader systemic issues related to addressing this common problem.<sup>25</sup>

While this study is descriptive of a significant pediatric health problem, it is also limited in its findings, as only 35 of 56 programs participated. Program directors typically credited unfamiliarity with or difficulties negotiating the institutional review board process for not participating. Additionally, program directors suggested that residents' compliance may have varied within and across programs, which may partially explain the wide range in numbers of children seen at the training sites. The authors had anticipated that program directors' and residents' interest in the study would promote residents' active engagement, but perhaps greater provider compliance in future studies could be accomplished through financial incentives for the residents. Lastly, the numbers of parents willing to participate may have been limited by the circumstances of the visit and distraction of having to deal with their children's acute dental problem. Thus, this study can be considered representative of the experiences of children and families when confronting dental pain, but cannot be considered representative of all such similarly situated children.

The various strategies that parents utilize to deal with their children's pain while awaiting the opportunity to obtain definitive care are telling of the family's experience when a child suffers dental pain. One third either "waited it out" or modified their child's diet, while others used topical medications or home remedies in place of, or in addition to, systemic analgesics. Notably, definitive care was not typically offered after regular business hours by training programs even if the parent was interested and willing to seek off-hours care. Rather, for the 112 children whose parents reached pediatric dental trainees by telephone after hours, available care was palliative rather than definitive. Even among children who had received some prior care for the same clinical problem, more than a fourth had similarly been offered palliation rather than definitive treatment. These findings suggest that many children suffer pain for prolonged durations, while their parents, whose resources are typically limited, arrange for multiple visits before obtaining a final resolution of the etiology.

Consistent with earlier studies of pediatric dental pain,<sup>16,18,19,29</sup> children enrolled in this study tended to come from the poorest segments of society. While nationally, 16% of children live in poverty (at or under 100% of the federal poverty line [FPL]),<sup>30</sup> over half of children presenting for pain relief (57%) in this study were poor. An additional 37% of all US children are from low-income families (at or under 200% FPL),<sup>30</sup> while nearly a third of cases (27%) in this study were from low-income families. As Medicaid insures poor children, this study's finding that nearly 57% of children in pain were covered by Medicaid is consistent with this income level.

More surprising is the preponderance of young children in this study, as nearly 40% were younger than age 6. This finding suggests that:

1. acute dental problems may be prevalent among children who are often considered too young for routine dental care by many general dentists<sup>31</sup>; and
2. training programs may function substantially as safety net facilities for young children with acute dental presentations.

Low levels of adolescents presenting with dental emergencies may represent:

1. their generally lower use of dental services<sup>32</sup>;
2. greater opportunity to obtain care in the private sector or by general dentists;
3. policies of pediatric dentistry residency programs; or
4. the fact that their relatively new dentitions offer fewer opportunities for them to yet have disease extensive enough to elicit symptoms.

The finding that almost two thirds of parents considered their children's oral health status to be only poor or fair and that nearly 40% believed their children to have unmet needs for dental care reflects prior findings that low-income children are more likely to:

1. experience caries;
2. have more extensive disease; and
3. experience lower treatment rates than children from more affluent families.<sup>33-35</sup>

This reflects generally on the limited availability of dental services in community health centers as well as the poor performance of Medicaid in assuring dental services for child beneficiaries, particularly those who are young. High disease rates for young low-income Medicaid-eligible children have been well substantiated in nationally representative data,<sup>32</sup> and low treatment rates for these children are extensively reported by Head Start and the federal Office of Medicaid and State Operations.

As reported in this study, this combination of high dental disease rates and low treatment rates among poor and low-income children anticipates that many of these children will experience sequelae of untreated disease, including: (1) pain; (2) infection; and (3) dysfunction. Even when care is available, parents report significant barriers, including:

1. missed work;
2. transportation costs and logistics; and
3. the need to arrange childcare for additional children in the family.

Because dental caries is a progressive disease that continuously extends both within affected teeth and throughout the developing dentitions, it is not surprising that nearly a third of cases had experienced prior dental emergencies within the past year, even though half had had a prior dental visit in that year.

## Conclusions

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

1. Findings of this snapshot survey translate the population-level statistic that dental caries is the most prevalent chronic childhood disease<sup>2</sup> into a personal picture of frequently avoidable pain and its sequelae.
2. Because many children who experience odontogenic pain are also covered by public programs, study findings support development of policies and programs that address the problem of pediatric pain associated with common dental disease.

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## Abstract of the Scientific Literature



### Midazolam, Nitrous Oxide, Oxygen, and Sevoflurane Sedation: A Novel Approach?

Failure of dental treatment due to anxiety is a common problem in children. The aim of this study was to establish whether the use of a combination of intravenous midazolam with inhalation agents (nitrous oxide alone or in combination with sevoflurane) was any more likely to result in successful completion of treatment than midazolam alone. A further aim was to evaluate the clinical viability of these techniques as an alternative to general anesthesia. In total, 697 children—who were too anxious for management with relative analgesia and requiring invasive dental procedure for which a general anesthetic would usually be required—were recruited and randomly assigned to 1 of 3 groups given the following interventions: (1) group 1: a combination of inhaled medical air and titrated intravenous midazolam; (2) group 2: a combination of inhaled 40% nitrous oxide in oxygen and titrated intravenous midazolam; and (3) group 3: a combination of an inhaled mixture of sevoflurane 0.3% and nitrous oxide 40% in oxygen with titrated intravenous midazolam. The primary outcome measure was successful completion of the intended dental treatment with a co-operative child responsive to verbal commands. Fifty-four percent successfully completed treatment in group 1 (94/174 children), 80% in group 2 (204/256 children), and 93% in group 3 (249/267 children). This difference was significant at the 1% level. Intravenous midazolam, especially in combination with inhaled nitrous oxide or sevoflurane and nitrous oxide, are effective techniques—with the combination of midazolam and sevoflurane the one most likely to result in successful treatment.

**Comments:** This is an interesting study describing a sedation technique that is, unfortunately, unlikely to find its way into North American private pediatric dental practice. Because of the addition of a volatile inhaled anesthetic agent, this technique would likely be restricted to hospital clinics, although the authors specifically state that this is NOT necessary. One might rightly ask that, since an anesthesiologist would have to present to administer sevoflurane, why not just administer general anesthesia and secure the airway? It's a good question that, sadly, the authors do not address. **ARM**

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**Averley PA, Girdler NM, Bond S, Steen N, Steele J. A randomized, controlled trial of pediatric conscious sedation for dental treatment using intravenous midazolam combined with inhaled nitrous oxide or nitrous oxide/sevoflurane. *Anaesthesia* 2004;59:844-852.**

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