

## Epidemiology of dental emergency visits to an urban children's hospital

Yang Zeng, DDS Barbara Sheller, DDS, MSD Peter Milgrom, DDS

### Abstract

All 1482 emergency room dental visits to Seattle's Children's Hospital and Medical Center from 1982 to 1991 were studied to evaluate trends in patients seeking care: 60% of visits were for trauma, the remainder for infection or other reasons. The number of visits was 2.1 times greater in 1991 than in 1982. Comparing the periods of 1982–1987 and 1988–1991, there was an increase in the proportion of infection-related visits from 30.5 to 43.5% of all visits. Spring/summer and weekends had the highest volume. More males (61.2%) than females received care. The largest number of visits (47.9%) occurred between 6:00 PM and midnight. Nearly two-thirds (62%) of children did not have a usual source of medical care; 30.2% of children had no medical insurance, and 21.5% received Medicaid benefits. Medicaid patients were twice as likely to be seen for infection as for trauma. Among the uninsured, there was no difference in the rates of trauma or infection. Non-Caucasian patients were twice as likely to be seen for infection as Caucasians. Infection visits were for pulpitis (32.1%), and periapical and gingival abscess (53.5%). Trauma patients were younger (66 months) than infection patients (89 months). Trauma was primarily to the maxillary anterior teeth (70.1%) and upper lip and gingiva (12.1%). Common agents for trauma were furniture, bicycles, and sports. (*Pediatr Dent* 16:419–23, 1994)

### Introduction

There are many recent studies regarding emergency room (ER) visits by children for dental causes. Despite differences in the overall health care system, an analysis of evening, weekend, and holiday emergency dental service at a children's hospital in Belfast, Northern Ireland, is the most comparable to the present study. Its goals were to quantify the number of patients seen, to determine the frequency of types of dental emergencies, and to record the causes and types of traumatic dental injuries.<sup>1</sup> Toothache accounted for 49% of visits while trauma (primarily due to falls and bicycles) accounted for 39%. More than one-half of the patients were children 5 years and younger and (61.9%) were boys. Weekends and evenings were the busiest. A 1983–84 study in Buffalo yielded similar results.<sup>2</sup> Other recent studies in the US have focused solely on trauma.<sup>3–4</sup> In the Perez study<sup>3</sup> of 1989–90 cases at the Children's National Medical Center in Washington, DC, males were twice as likely as females to be seen, 42.3% of the patients were younger than 5 years old, 37.4% were between 5 and 13 years old, most injuries were in late spring and summer, and soft tissue trauma and fractured anterior teeth predominated. The O'Neil study of Children's Mercy Hospital in Kansas City<sup>4</sup> studied child patients during 1986–87. Similar to the Washington, DC study, males were seen more frequently than females and most children were younger than 5 years old. The largest group of children was between 1 and 2 years old. Injuries were more common in summer and laceration of the lip was the most common type of injury, usually caused by falls in the home. Other studies

<sup>5–8</sup> yield similar findings, although none provides trends over any considerable length of time.

The purpose of this study was to ascertain the prevalence of ER dental cases at Seattle Children's Hospital and Medical Center over a 10-year period, and in doing so, try to find patterns and trends of ER visits that might assist health care planners.

### Methods and materials

#### Setting

The Seattle Children's Hospital and Medical Center is a 208-bed, tertiary-level pediatric teaching hospital with five attending dentists and three residents in the Department of Dentistry. The dental department of hospital emergency services is on call 24 hr a day. Patients presenting to the emergency room see a triage nurse who determines that the patient's complaint relates to a dental problem and calls the dental resident. Patients contacting the ER by telephone speak to the dental resident, who determines if the condition justifies a visit to the ER.

#### Sample

Patients register through the emergency room when the hospital dental clinic is closed (evenings, weekends, public holidays, and occasional weekdays when the staff attend educational meetings). All dental emergency cases registered through the emergency room for 10 years from January 1982 through December 1991 were studied (1482).

#### Instrument

The records were reviewed by a single dentist (YZ) trained in record abstraction during a pretest. The instru-

ment included variables in the following categories:

1. Sociodemographics (age, gender, race, zip code)
2. Medical care access (usual source of medical care, medical insurance)
3. Logistic (time of day, day of week, month of emergency visit)
4. Nature of dental emergency (injury area, sources of injury, type of treatment, management difficulties, type of dentition, and the need for follow-up care).

Trauma visits were defined as those for injury to the teeth, lips and jaws. In the case of trauma to multiple areas, the area of most severe injury was recorded. Infection visits were defined as those for dental caries or its sequelae. Other reasons for visits included lost fillings, orthodontic problems, herpetic stomatitis, acute necrotizing ulcerative gingivitis (ANUG), exfoliating primary teeth, and foreign objects in the mouth.

### Reliability

In order to assess the reliability of the single record abstractor, 92 dental emergency records were selected randomly for rereview. Test-retest reliability was assessed using the Kappa statistic or Pearson product moment correlation where appropriate. On the key variable of diagnosis of infection versus trauma, Kappa = 0.93,  $P < 0.05$ . For other variables such as the usual source of medical care and nitrous oxide use, the Kappa statistic ranged from 0.74 to 0.82. Pearson correlations for variables such as type of treatment, source of injury, the presence of baby bottle tooth decay, and other diagnostic information ranged from 0.79 to 0.98. Thus, there was a high level of abstractor reliability.

## Results

### Prevalence

Of the 1482 dental emergencies, 884 (60%) were for trauma, 514 (35%) were for infection, and 84 (5%) were for other reasons. The 1398 trauma and infection cases are analyzed in the subsequent results and tables. The mean number of ER cases overall was

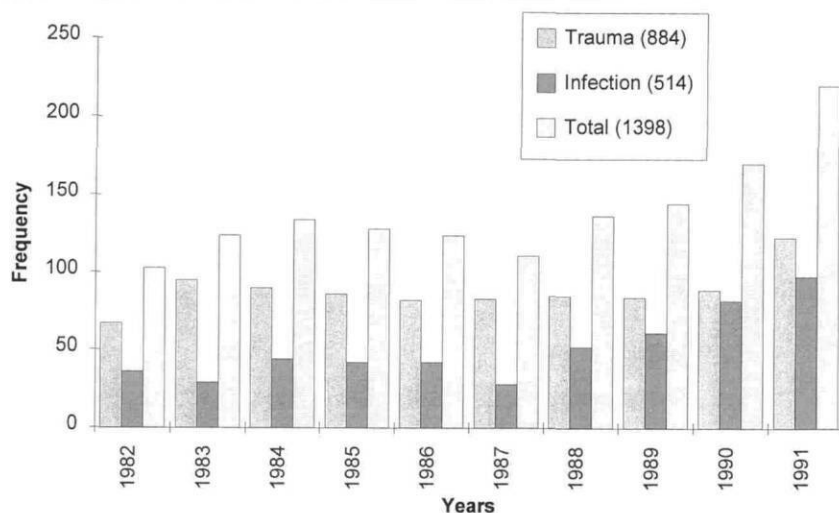


Fig 1. Prevalence of trauma and infection by year.

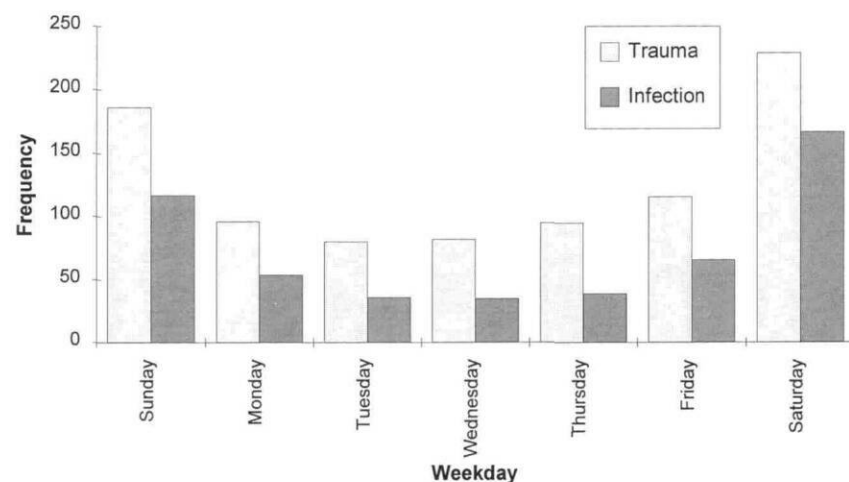


Fig 2. Distribution of ER visits by day of the week, 1982-91.

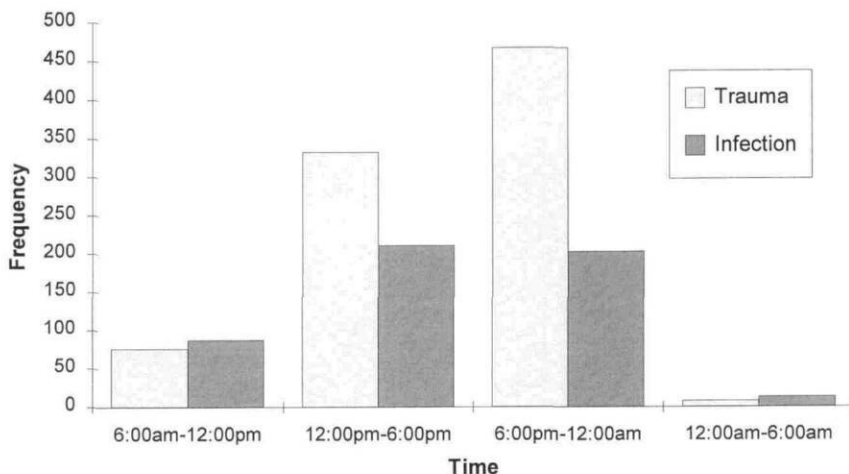


Fig 3. Distribution of visits by time of day ( $\chi^2 = 38.0$ ,  $P = 0.000$ ).

2.1 times larger in 1991 than in 1982 and was 1.4 times larger in 1988–91 than in 1982–87. Fig 1 gives the frequency data. The number of cases increased by 1.6 times between 1988 and 1991. The relative frequency of emergency visits for trauma and infection varied by year. Comparing the periods 1982–87 and 1988–91, there was a reduction in the proportion of cases presenting for trauma from 69.5% (503/724) to 56.5% (381/674;  $\chi^2 = 34.8$ ,  $P < 0.0001$ ).

### Seasonal variation

The volume of visits varied by month. The lowest volume was in January (5.1% of visits, 72/1398) while the largest volume was in May (11.7% of visits, 163/1398). Late spring and summer had a higher proportion of total cases than other months. The proportion of cases from trauma versus infection varied from a low of 45.5% trauma (40/88) in November to a high of 71.9% trauma (87/121) in August.

### Day of the week

One-half of the visits (699/1398) were on Saturday or Sunday (Fig 2). A larger proportion of the visits during the weekend were for infection (40.6%, 284/699) than visits during the week (32.9%, 230/699;  $\chi^2 = 9.0$ ,  $P = 0.003$ ).

### Time of day

The largest number of visits (47.9%, 670/1398) was between 6:00 PM and midnight (Fig 3). The next most frequent period was between noon and 6:00 PM (38.9%, 544/1398). During these afternoon and night-time periods, 30.3 to 38.8% of the cases were for infection. Between midnight and noon, 53.4 to 61.9% of the cases were for infection.

## Patient demographics

### Gender

The relative frequency of ER visits varied by gender: 61.2% males (856/1398) and 38.8% females (542/1398). However, there was no gender difference in the reason for the visit.

### Race

Race was specified for only 38% of the patients (531/1398). Of the 531 cases where race was available, non-Caucasians were twice as likely to visit for infection than were Caucasians ( $\chi^2 = 14.0$ ,  $P = 0.007$ ).

### Age

The relative frequency of visits for trauma and infection varied by age. The mean age for trauma cases was 66 months (SD = 48.3 months) and the mean age for infection cases was 89 months (SD = 55.2 months;  $t = -8.2$ ,  $P < 0.0001$ ).

**Table 1. Source of trauma**

Source	N	%
Beds	50	5.7
Other furniture	185	21.2
Bicycles	183	21.0
Other falls	145	16.6
Sports	117	13.4
Playground equipment	87	10.0
Toys	70	8.0
Automobiles	20	2.3
Swimming pools	10	1.1
Other causes	6	0.6
Totals	873	100.0

**Table 2. Primary treatments provided for children with traumatic injuries to maxillary anterior teeth by age group**

Treatment	< 72 Months		72 Months	
	N	%	N	%
Extractions	133	30.6	30	11.6
Examination only	120	27.6	37	14.3
No treatment	59	13.6	8	3.1
Composite bandage	32	7.4	90	34.9
Antibiotics	28	6.4	6	2.3
Splint	19	4.4	63	24.4
Replant tooth	10	2.3	6	2.3
Endodontics	5	1.1	8	3.1
Other	29	6.6	10	4.0
Totals	435	100.0	258	100.0

May include more than one treatment per child.

## Usual source of medical care

Thirty-eight percent of children had no physician recorded on their ER visit record. For the majority of patients, dental providers, if any, were not listed in the records. More than half of trauma cases (57.5%, 307/879) but only 44.3% (227/512) of infection cases reported a usual source of medical care ( $\chi^2 = 12.1$ ,  $P = 0.001$ ).

## Medical insurance

In the patients presenting with trauma, 29% (252/879) had no insurance, 15% (134/879) had Medicaid, and 56% (493/879) had commercial insurance. In the infection group, 33% (169/513) had no insurance, 32% (165/513) had Medicaid, and 35% (179/513) had commercial coverage. There were no significant differences in the type of visit between those who had commercial coverage or no medical insurance at all. The percentage of patients with Medicaid seeking care for infection

was nearly double the percentage with trauma ( $\chi^2 = 75.3, P < 0.0001$ ). Dental insurance status was not available in most records, although Medicaid coverage, which was recorded, includes limited dental care.

### Residence

Most ER visits were from children who reside in Seattle (61.6%, 905/1468). Other patients were from: King County outside Seattle (22.8%, 335/1468); Snohomish County (11.7%, 172/1468); Pierce County (1.7%, 25/1468) and elsewhere.

### Clinical problem — trauma

#### Injury area for trauma cases

Most injuries were to maxillary anterior teeth (70.1%, 733/1045). Other common trauma was to the upper lip and gingiva (12.1%, 126/1045), lower lip and gingiva (6.5%, 68/1045), and mandibular anterior teeth (4.3%, 45/1045). Injuries to other areas were much less frequent. In cases of multiple injuries, only the primary area of trauma was considered.

#### Sources of trauma

Almost all of the trauma fit into Andreassen's category of falls.<sup>5</sup> Most common were injuries related to furniture, bicycles, sports, and other falls (Table 1). Most injuries involved the primary dentition.

#### Treatment of trauma

Children could receive more than one treatment. Overall, the more frequent treatments for the trauma cases were exam only (19.9%, 211/1058) and tooth extraction (19.0%, 201/1058). Composite bandage (15.6%, 165/1058), suturing (15.3%, 162/1058), and splinting teeth (10.8%, 114/1058) also were common procedures. During the 10-year period four children were admitted to the hospital as a result of trauma.

In order to further explicate the treatment of trauma, children with injuries involving the maxillary anterior teeth were subdivided into those younger than 72 months and those 72 months and older. Primary treatments received by these age groups are given in Table 2. Age 72 months was chosen in order to try to separate the children with primary incisors from those likely to have permanent incisors. The data show that the most frequent treatments in the younger age group were extractions (30.6%), examination only (27.6%), and no treatment (13.6%). In contrast, the older children were more likely to receive composite bandages (34.9%) or splinting (24.4%). Fewer received an examination only (14.3%) or extractions (11.6%).

### Clinical problem — infection

#### Infection

Patients with dental caries were classified into three categories: 31.1% (172/553) had a chief complaint of severe toothache (pulpitis); 53.5% (296/553) had den-

tal caries that had progressed to cause either a local gingival swelling, fistula, or diffuse cellulitis; and 8.5% (47/553) had dental caries as an incidental finding when seen for treatment of trauma or had a history of intermittent provoked toothache without current symptoms.

#### Treating infection

Overall, the largest proportion of ER visits for infection were treated by tooth extraction (37.1%, 202/545); the next most common treatments were endodontics (24.8%, 135/545), antibiotics (17.4%, 95/545), and examination only (8.4%, 46/545). Other treatments were much less frequent. Note, patients may have received more than one treatment. Three patients during the 10-year period were admitted to the hospital as a result of odontogenic infections.

For primary tooth infections, the most common treatments were tooth extraction (46.3%, 183/395), endodontic procedures (19.7%, 78/395), antibiotics (15.7%, 62/395), and examination only (8.1%, 32/395). Other procedures constituted less than 5% of total treatments to primary teeth. For infections involving permanent teeth, the most common treatments were endodontics (44.4%, 52/117), antibiotics (17.9%, 21/117), tooth extraction (16.2%, 19/117), and examination only (12.0%, 14/117). Other procedures constituted less than 5% of total treatments to permanent teeth.

### Discussion

Visits to the emergency room reflect both a lack of access to regular primary dental care and the underlying extent of both dental infection and trauma. Similar to the recent studies in Belfast and Buffalo, trauma was a more common reason than infection for ER visits in Seattle.<sup>1</sup> As with previous studies, ER visits for dental treatment occur primarily at times when dentists in the community are less available. Cases in the afternoon and evening were more likely to be for trauma while a larger proportion in the morning were for infection.

Interestingly, virtually all of the traumatic injuries seen in the ER are caused by falls. Falls involving beds, other furniture, and bicycles accounted for almost half the traumatic injuries. It may be that more severe impact and collision-type accidents cause broader injuries that are more often seen in other settings such as the regional trauma center. Most trauma was to the anterior teeth and lips and the children were somewhat older than in other studies.<sup>4,9</sup> The young patients received primarily extractions and examination only while the older children were treated by composite bandages, splinting, and very few extractions. In contrast to other studies,<sup>9</sup> very few children were admitted to the hospital.

By definition, all infections considered in this study were caused by dental caries. Comparing the periods of 1982–87 and 1988–91, there was an increase in the

proportion of infection-related visits from 30.5 to 43.5% of all visits. This is comparable to the report of Fleming that for 1987, caries and its sequelae accounted for 49% of emergency dental presentations at Royal Belfast Hospital for Sick Children. It is disturbing to note that, at a time when the overall incidence of dental caries in children is declining, carious teeth are responsible for an increasing proportion of emergency dental presentations.

The sociodemographic profile of the patients in this sample correlates poorly with that of King County. Where race was discernible from the emergency record, 27% of the patients were minorities, yet the non-Caucasian population of King county is only 15.2%. Non-Caucasians were twice as likely to be seen for infection: many of these children had no usual source of medical care and were more likely to be on Medicaid. Both Caucasians and non-Caucasians on Medicaid had similar rates of infection emergencies. Current reimbursement levels for dental care under the state's Medicaid program are so low that fewer than one in five dentists participate to a meaningful extent. The increasing number of patients presenting with dental caries and infection reflects limited financial access to private dental practitioners as well as unavailability of dentists during off hours.

To some extent these numbers reflect the convenience of using an emergency room as a care source. Patients with nonemergency problems who called before presenting for care were discouraged from coming in and were given information regarding appropriate clinics for primary dental care. However, virtually all patients physically presenting to the ER with a dental complaint were seen by the dentist on call. The dentist examined each patient and those with nonemergent problems did not receive treatment. In this study only 9% (46/513) of infection patients were nonemergent.

This study suffers from limitations in the records available. In particular race is under-ascertained and no information on the availability of dental insurance or a regular source of dental care was available. It is impossible to determine if Seattle dentists are using the hospital ER as their emergency service.

This study is limited by focusing on only the dental records for patients registered in the emergency room. As such, it may have failed to ascertain cases that were seen in the ER by nondental personnel and other emergency cases seen in the hospital dental clinic during regular clinic hours. These primarily would be patients of record of the dental service. In order to understand the extent of this problem, the day sheets for 3 months in the clinic were examined. There were an average of 13 emergency visits per month that did not appear in the ER records. These cases had almost the same distribution of trauma versus infection, and similar treat-

ment profiles as did the cases we studied from the ER. Thus, the failure to ascertain the cases bypassing the emergency room is not a major influence on the validity of the findings reported here.

It would be valuable to re-examine the records to add more detail. In the trauma patients only the area of most severe trauma was recorded, yet many patients present with multiple injuries. The specific teeth involved with the various agents of trauma and the ages of patients involved with each agent would be useful to those working in the area of accident prevention. It would be enlightening to determine which primary teeth and which permanent teeth were most often involved with infection leading to ER visits. Detailed information on treatment for both infection and trauma would be helpful for dental educators.

## Conclusion

1. This study is one of the first to focus on trends over time and to offer evidence of the ability to do reliable abstraction of a large number of dental emergency records.
2. There was an increase in the proportion of ER visits related to dental caries between 1982 and 1991.
3. There was a greater than 100% increase in the number of visits to the ER for dental emergencies between 1982 and 1991.

Dr. Zeng is visiting scholar, department of dental public health sciences, University of Washington; Dr. Sheller is chief, resident training and education, department of dental medicine, Children's Hospital and Medical Center, Seattle, and affiliate assistant professor, departments of orthodontics and pediatric dentistry, University of Washington; Dr. Milgrom is professor, department of dental public health sciences, University of Washington.

1. Fleming P, Gregg TA, Saunders ID: Analysis of an emergency dental service provided at a children's hospital. *Int J Paediatric Dent* 1:25-30, 1991.
2. Majewski RF, Snyder CW, Bernat JE: Dental emergencies presenting to a children's hospital. *ASDC J Dent Child* 55:339-42, 1988.
3. Perez R, Berkowitz R, McIlveen L, Forrester D: Dental trauma in children: a survey. *Endod Dent Traumatol* 7:212-13, 1991.
4. O'Neil DW, Clark MV, Lowe JW, Harrington MS: Oral trauma in children: a hospital survey. *Oral Surg Oral Med Oral Pathol* 68:691-96, 1989.
5. Andreasen JO: *Traumatic Injuries of the Teeth*, 2nd ed. Munksgaard: Copenhagen, 1981.
6. Judd PL: Paediatric dental trauma: a hospital survey. *Ontario Dentist* 62:19-20, 23 1985.
7. Meadow D, Lindner G, Needleman H: Oral trauma in children. *Pediatr Dent* 6:248-45, 1984.
8. Blinkhorn AS, Attwood D, Kippen AM: A report on the feasibility of establishing a paediatric emergency dental service at Glasgow Dental Hospital. *Comm Dent Health* 8:257-62, 1991.
9. Harrington MS, Eberhart AB, Knapp JF: Dentofacial trauma in children. *ASDC J Dent Child* 55:334-38, 1988.