Utilization of Emergency Services for Non-Traumatic Dental Disease

Da Silva K* / Kunzel C** / Yoon RK***

Purpose: *To identify and characterize children who utilize emergency dental services for non-traumatic dental disease.* ***Study design:*** *Caregivers of children under 12 years old who seek out emergency services for the treatment of non-traumatic dental disease will be surveyed regarding their child's current oral health status. Patient's clinical data will be obtained and they will be further followed for a period of 2 months to determine if they follow-up with recommendations for comprehensive dental care.* ***Results:*** *One hundred and ninety-eight people participated in the study (97% response rate). Eighty-three percent of the children were diagnosed with dental caries. Seventy-four percent of patients of record presented with an emergency at least once before and 73% had a history of one or more broken appointments. Patients with a history of previous emergency visits (OR=3.45, CI=2.05, 5.81) or a history of missed appointments (OR=2.21, CI=1.42, 3.58) were significantly more likely to fail to return for comprehensive care (P<.01).* ***Conclusion:*** *This study shows that those who utilize emergency services more than once, or have a history of missed appointments are more likely to continue to utilize emergency dental services as their primary means for dental care.*
Keywords: *childhood, dental, caries, emergency*

INTRODUCTION

Dental care has been identified as one of the most prevalent unmet health needs in US children; many do not have access to preventive care consistent with recommended standards.[1] Approximately 21% of all US children, or roughly 7.6 million children ages 2-11 have untreated dental caries.[2,3] Children living in poverty suffer twice as much from dental caries as their affluent peers and their disease is more likely to be untreated.[4-7] This translates into increased pain, suffering and loss of school time for children from low socioeconomic status (SES) backgrounds. Although there has been recent focus on improving children's oral health, children from low-income families continue to have difficulty accessing dental care. It is estimated that 1 in 5 children covered by Medicaid has a preventive dental visit in a year.[8] Dental schools are often viewed as safety-net providers, however one survey indicated that even children with dental pain wait on average 1 month and in some cases up to 3 months to receive care at these sites.[9] Without routine preventive dental visits, children are more likely to develop dental emergencies.[3,10-12]

* Keith Da Silva, DDS, Private Practice in Etobicoke, Toronto, Canada.
** Carol Kunzel, PhD, Associate Professor of clinical dental community health, College of Dental Medicine, and an associate professor of clinical sociomedical sciences, Mailman School of Public Health, Columbia University, New York City.
*** Richard K. Yoon, DDS, Associate Professor of clinical dentistry and residency program director, Division of Pediatric Dentistry, College of Dental Medicine, Columbia University, New York City.

Send all Correspondence to: Richard K. Yoon, 722 W 168th Street, Rm 8, New York, NY 10032

(212) 305-1043
Fax: (212) 342-5619

E-mail:rky1@columbia.edu

There are many studies that describe emergency dental problems in children; however the emphasis has been on the etiology of the chief complaint.[11,13-17] Pain caused by toothaches and/or abscess and dental trauma were the most frequently cited complaints at hospital-based pediatric dental clinics.[11,13-16] Traumatic dental disease is defined as avulsions, subluxations, intrusions, contusions and tooth fractures. Non-traumatic dental disease includes pain associated with caries, abscess, inflammation, and cellulites. Non-traumatic dental disease, primarily dental caries and abscesses, is estimated to represent anywhere from 38-73% of all dental emergencies reported in hospital clinics.[11,13,18-19] Despite the notable variance between these reports, there appears to be a trend of increasing hospital emergency visits related to non-traumatic dental disease which could normally be treated in a regular dental setting.[6] The high frequency of caries-related emergencies may be representative of the prevalence of untreated caries in the sample populations.

Treatment of caries in an emergency setting is not an ideal model for dental care, as treatment is time consuming, more costly and less definitive than care provided in a regular dental clinic setting.[11,18-20] The emergency visit is often the first dental experience for many children. In a survey of parents, common reasons for seeking emergency treatment for non-traumatic dental disease include referral from a pediatrician, never seen a dentist before and was unaware of any problems, and financial limitations.[20] Financial and socioeconomic factors may influence the utilization of hospital clinics for emergency care. Patients covered by Medicaid or those without any form of dental insurance (self-pay) use disproportionately more emergency services than those with private insurance.[11,19] A study of children utilizing emergency services for dental pain found 6 times as many uninsured, 2.5 times as many African-Americans, and 4.5 times as many children from single parent families compared to surrounding county demographics.[20] Interviews of patients seen for non-traumatic problems revealed that barriers to seeking out definitive dental care included not only the cost of treatment, but also

limited clinic hours and difficulty in scheduling appointments to a small aggregate of practitioners willing to accept Medicaid-enrolled patients.[20]

The current body of knowledge regarding emergency dental care for non-traumatic dental disease has been primarily determined by studies which are retrospective in nature consisting of chart reviews over a given period of time.[9,11-12,20] These studies have been successful and consistent in documenting the prevalence and characteristics, including etiology, demographics and social factors, related to non-traumatic dental emergency visits. However, a common limitation with these retrospective studies is the inability to determine and classify the reason why primary caregivers seek emergency care. There is also limited information regarding previous dental history and frequency of emergency visits for these children. Data taken from retrospective studies are limited to the chief complaint at presentation, usually pertaining to a single tooth or problem, and the overall oral health status of the children is unknown. Further, there is little knowledge as to whether caregivers who utilize emergency dental services follow-up with routine dental care in a traditional dental setting.

The purpose of this prospective study was four-fold: (1) to identify and characterize children 12 years of age and younger who present to the Pediatric Dental School Clinic with non-traumatic dental disease. Once identified, parents were invited to participate in a survey in order (2) to determine the reason of the child's emergency visit. The study also aimed (3) to examine the relative importance of various factors (for example, diet, personal dental hygiene habits, previous dental history, and overall oral health status) associated with dental emergencies and the likelihood of returning for follow-up care. Furthermore, the children were followed over time (4) to determine if they were receiving the necessary completion of treatment to avoid a continuation or future re-occurrence of their dental condition.

MATERIALS AND METHOD

This study was reviewed and approved by the Columbia University Medical Center Institutional Review Board (#AAAD4777). Caregivers of children 12 years of age and under, who sought emergency dental services for the treatment of non-traumatic dental disease at the Pediatric Dental School Clinic between September-December were invited to participate in the study. Patients with emergency conditions, such as spontaneous pain and swelling, are seen at the clinic without appointment between the hours of 8:30am and 4:30pm, Monday through Friday. For the purpose of this study, non-traumatic dental disease included the presentation of dental caries, dental abscess, oral soft tissue inflammation, and cellulites. Patients presenting with traumatic dental disease, such as avulsions, subluxations, intrusions, contusions and tooth fractures were excluded.

Prior to being seen by a dentist, caregivers were asked to complete a two-page questionnaire which was available in both Spanish and English pertaining to their child's current oral health status, home oral hygiene, frequency of routine dental visits, and history of previous need for emergency dental care. Children were then seen by one dental resident for diagnosis and treatment of their chief dental complaint. Following the emergency visit, patients' charts were pulled and data pertaining to the current emergency, pertinent clinical findings, radiographic findings, treatment performed, and follow-up recommendations were recorded. For patients who had a history of treatment at the clinic, data pertaining to previous dental visits (number of emergency visits, number of routine dental visits, number of broken/missed appointments, and general clinical findings) were also recorded. Patients were further followed for a period of 2 months [through February] to determine if the patient complied with recommendations for comprehensive dental care by returning to the clinic.

We used statistical software (SPSS 12 for Windows, SPSS, Chicago) to complete data analysis. We calculated frequencies for demographic characteristics, diagnosis, treatment, as well as caregiver responses to the questionnaire. Logistic regression models were used to identify the likelihood of returning for follow-up comprehensive care. We considered P values of .05 or less to be significant.

Table 1. Demographic characteristics of study population

Characteristic	% (N)
Gender (N=198)	
Male	47 (92)
Female	53 (106)
Age (N=198)	
0-2	1 (2)
3-5	35 (69)
6-12	64 (127)
Race/Ethnicity (N=198)	
Hispanic	73 (144)
African-American	11 (22)
Caucasian	8 (16)
Other	8 (16)
Insurance (N=198)	
Medicaid	83 (164)
None/Self-Pay	17 (34)
Patient Category (N=198)	
Patient of Record	65 (129)
New Patient	35 (69)
Caregivers highest level of education (N=198)	
Less than high school	38 (76)
High school or above	62 (122)
Child born in the US (N=198)	
Yes	52 (104)
No	48 (94)
Average stay in the US (for patients born outside of the US, N=94)	
< 1 year	6 (6)
1-5 years	33 (31)
6-10 years	37 (35)
>10 years	24 (22)

RESULTS

A total of 205 people were invited to participate in the study with a final sample size of 198 for an overall response rate of 97%. There were 7 individuals who withdrew after being consented due to the

Table 2. Summary of clinical characteristics of presenting dental emergency

Characteristic	%(N)
Presenting Symptoms (could choose more than one)	
Pain	78 (155)
Sensitivity	22 (43)
Fever	7 (14)
Swelling	17 (34)
Diagnosis (N=198)	
Caries Alone	48 (95)
Caries + Fistula	21 (42)
Caries + Abscess	14 (27)
Soft Tissue Swelling	15 (29)
Viral Lesion	2 (5)
Treatment rendered (N=198)	
Extraction	49 (97)
Pulpotomy	39 (77)
Pulpectomy	6 (12)
Temporary Restoration	6 (12)
Behavior management technique (N=198)	
No intervention	30 (60)
Nitrous oxide	32 (63)
Protective stabilization support	38 (75)
Patients returning for follow-up care (N=96)	
Total Sample	48 (96)
New Patient	63 (48)
Patient of Record	33 (43)

potential length of wait time prior to being seen by the emergency dentist**.** Table 1 presents subjects demographic characteristics. There was a rather even distribution of males and females in the study. Subjects' ages ranged from 22 months to 10 years, with a median age of 6 years. A total of 129 patients (65%) were patients of record and had been seen in the clinic previously. When looking at characteristics of the caregivers, 76 (38%) had less than a high-school education and 94 (48%) were born outside of the US. Of the 94 immigrants, 37 (39%) have lived in the US for five years or less.

As shown in Table 2, 43 (22%) of the children presented with symptoms of sensitivity whereas 155 (78%) children presented with pain. Of those experiencing pain, 34 (17%) also presented with an associated facial swelling and 14 (7%) had symptoms of a fever. After a full clinical and radiographic examination, 164 (83%) of the children were diagnosed with caries. Of these children, 42 (21%) had an associated draining fistula and 27 (14%) children with carious lesions had a localized abscess. Emergency treatment consisted of extraction of the offending tooth in 97 (49%) of the subjects. A pulpotomy with a definitive restoration was completed in 77 (39%) children whereas a pulpectomy was required in 12 (6%) children. No behavior management intervention was required for 60 (30%) children, whereas 63 (32%) were given nitrous oxide/oxygen, and 75 (38%) required protective stabilization support. Follow-up instructions to the caregivers included returning to the clinic for comprehensive treatment planning and treatment of remaining dental disease. The appointments were made at the end of the patient's emergency visit. After a 2 month observation period, 96 (48%) of the total sample returned for their follow-up appointments. Subdividing the sample revealed that only 43 (33%) of patients of record returned for follow-up compared to 48 (63%) of new patients.

Table 3. Caregivers' responses regarding child's dental history

	%(N)
Main cause of emergency (N=198)	
Too much candy	49 (98)
Sleeps with a bottle	16 (31)
Born with bad teeth	20 (39)
Does not brush teeth	15 (31)
Child experiencing pain (N=198)	
Yes	82 (162)
No	18 (36)
Child has difficulty eating (N=198)	
Yes	42 (83)
No	58 (115)
Child has missed days of school (N=198)	
Yes	68 (135)
No	21 (42)
N/A	11 (21)
Child has a place for routine dental treatment (N=198)	
Yes	69 (136)
No	31 (63)
Child has had a previous dental emergency (N=198)	
Yes	65 (129)
No	35 (69)
Frequency of previous dental visits (N=198)	
First dental visit	16 (31)
Emergency visits only	23 (45)
Less than once a year	20 (40)
At least once a year	26 (51)
At least twice a year	15 (31)
Last visit to a dental office (N=198)	
Less than one month ago	17 (33)
Between 1-6 months ago	28 (55)
Between 7-12 months ago	26 (52)
Between 1-2 years ago	11 (21)
Greater than two years ago	3 (6)
N/A	15 (31)

Caregiver responses to questions regarding the child's previous dental history are shown in Table 3. "Too much candy" was reported by 98 (49%) caregivers as the main cause of their child's dental problem, whereas 39 (20%) caregivers believed that the child was just "born with bad teeth." Dental problems were responsible for 135 (68%) of the children to miss at least one day of school. Difficulty eating was also reported by 83 (42%) subjects. When looking at previous dental appointments, 136 (69%) caregivers reported that they did have access to a clinic for routine dental treatment, and 129 (65%) caregivers reported that they have had to utilize emergency services at least once before. Furthermore, 31 (16%) caregivers

Table 4. Caregivers' responses regarding child's diet and oral hygiene habits

	%(N)
How often does the child brush his/her teeth (N=198)	
At least twice a day	66 (131)
At least once a day	24 (48)
At least once a week	10 (19)
How long does the child spend brushing his/her teeth (N=198)	
Less than 15 seconds	7 (15)
Between 15-30 seconds	35 (69)
Between 30-60 seconds	29 (57)
Between 1-2 minutes	29 (57)
Frequency of intake for foods with high sugar content (N=198)	
3+ times per day	22 (45)
1-2 times per day	29 (57)
Less than once a day	34 (67)
Never	15 (29)
Has the child ever slept with a bottle (N=198)	
Yes	58 (114)
No	42 (84)
Most common contents of bottle (N=114)	
Water	16 (18)
Milk	39 (45)
Juice	39 (45)
Soda	6 (6)
How often does the child drink water in an average day (N=198)	
Never	0
Once a day	27 (53)
Twice a day	46 (91)
3 times a day	21 (42)
>3 times a day	6 (12)
What of water does the child primarily drink (N=198)	
Tap water	42 (83)
Bottled water	23 (45)
Filtered water	35 (70)

reported that this was their child's first dental visit, and 45 (23%) caregivers reported that they only seek out dental treatment in emergency situations.

Caregiver responses regarding their child's diet and oral hygiene habits are shown in Table 4. Of the total sample, 131 (66%) report that their children are tooth brushing at least twice a day compared to 19 (10%) who are not tooth brushing daily. The average time reported for duration spent brushing teeth falls between 15 and 60 seconds (64%), whereas 15 (8%) of caregivers reported that their child spends less than 15 seconds brushing their teeth. Regarding diet, 45 (22%) reported the frequency of intake for foods with a high sugar content to be at least 3 times per day, 67 (34%) were less than once a day, and 29 (15%) reported that their child does not eat foods with a high sugar content. Concerning bottle use, 114 (58%) reported their child has previously slept with a bottle with milk (39%) and juice (39%) being the most common contents.

Table 5. Summary of dental history for patients of record

	%(N)
Previous emergency visits (N=129)	
0	26 (33)
1	34 (44)
2+	40 (52)
Previous missed appointments (N=129)	
0	27 (36)
1	17 (21)
2+	56 (72)

Of the 129 patients of record, 44 (34%) had been seen in the clinic for previous emergency care at least once, where 52 (40%) had been seen more than twice. Looking at their history of appointments, 21 (17%) had missed at least one previous scheduled appointment, compared to 72 (56%) who had missed more than 2 appointments (Table 5). When looking at patient's clinic history as a predictor for missed follow-up appointments (Table 6), it was found that patients with a history of previous emergency visits or a history of missed appointments were significantly more likely to fail to return for comprehensive care ($P<.01$). No significant associations were found with the likelihood of returning for comprehensive care when looking at parental education level, emergency symptoms, children's oral hygiene practices and children's diet.

DISCUSSION

The Columbia University Pediatric Dental School Clinic serves an area of Northern Manhattan where the majority of the population is of Hispanic origin. The majority of patients is covered by Medicaid and represents a high-risk population with a lower SES status. Our study reveals that numerous caregivers within the community are utilizing emergency dental services for the management of untreated dental caries with associated pain. Over half of the study population falls under the age of 7 with the offending tooth being in the primary dentition. Further, many of the caregivers are reporting missed days of school and difficulty eating as sequelae of their children's untreated dental disease.

Although organized dentistry and medicine recommend an early first dental visit with the emphasis on prevention and the hope that the child will have a positive introduction to dentistry, for 16% of the children, the emergency visit was their first dental appointment. Also, 23% had only ever been seen under emergency circumstances. Furthermore, a lack of a dental home, or place for routine dental treatment was reported in 31% of patients. When dental caries progresses to unmanageable pain, timely intervention is vital. The treatment received on an emergency basis at our clinic was consistent with previous studies with the majority of children having the offending tooth extracted or requiring pulp therapy.[13] Further, 38% of children required treatment with the use of protective stabilization support, a less than ideal introduction to dentistry but necessary for patient safety and support at the time of treatment.

By examining our study population, it appears that children are seeking out emergency dental care due to a lack of timely and consistent dental treatment for caries which have now progressed to levels

Table 6. Two Logistic Regression Models of Likelihood Patients of Record Fail to Return for Comprehensive Care (N=129)

Independent Variable	Odds Ratio	95% CI	P Value
Model 1 - Previous Emergency Visits			
0	1.00		
1	1.83	1.16 - 2.88	0.01
2+	3.45	2.05 - 5.81	0.003
Model 2 - Previous Missed Appointments			
0	1.00		
1	1.51	1.19 - 2.54	0.005
2+	2.21	1.42 - 3.58	0.01

beyond the scope of conservative management. The overall oral health status of these children is also poor, as many present with multiple carious teeth and more than one emergency condition over a relatively short span of time. More effort needs to be placed on examining the potential barriers preventing this population from accessing routine dental care. Increasing access to preventive treatment and management of the dental caries process in its initial stages will ultimately reduce the number of emergency conditions that arise.

No significant findings were noted between oral health behaviors and dental emergencies or returning for follow-up care. This is not surprising as dental caries is a complex disease modified by multiple behavioral decisions. However some interesting findings are worth noting. Although the majority of patients presenting with emergencies were engaging in appropriate oral hygiene protocols, it was still surprising that 10% of the children are not brushing their teeth on a daily basis and 7% of children are spending less than 15 seconds brushing their teeth. Almost two-thirds of the children had at some point consistently slept with the bottle usually containing milk or juice. Another interesting finding was that over half of the children were reporting their primary water source as coming from bottled or filtered water prompting questions regarding the primary source of fluoride exposure for these children. These findings reflect limited dental knowledge for a portion of the study population which could warrant further studies evaluating their knowledge, attitudes and behaviors as well as development of more culturally sensitive educational tools to help promote optimal dental health.

In the two month follow-up period, patients had the opportunity to schedule anywhere between 2-3 follow-up appointments for treatment planning and restorative treatment. Given this opportunity, only 48% of the sample population returned for at least one of their follow-up appointments. Of note, new patients to the clinic were more likely to return for their comprehensive care appointments when compared to patients of record with a history in our clinic. It appears that caregivers who utilized emergency services for the first time were more sensitive to the message of the importance of comprehensive treatment planning and definitive care and thus more motivated to return for further care. This is in contrast to caregivers who frequently utilize emergency care and seem to be locked in the pattern of treating caries only as symptoms arise. Perhaps those who return for repeat emergency visits have self-selected themselves as the group who will not be receptive to instruction to return for follow-up care.

Various factors have been identified by the medical profession as contributory to broken appointments. Dervin, Stone and Beck identified twenty factors as potential predictors of no-show behavior of patients.[21] No-show patients were defined as the patients who neither keep nor cancel their appointments. Their findings indicate that although none of these factors individually is related to no-show behavior, the combined effect of the twenty contributing variables did reach a statistically significant level. These factors were broken into the following major categories: (1) personal illness, forgetfulness, confusion and lack of transports, (2) socioeconomic – age, social class, race, completion of high school, marital status, and urban childhood environment or (3) clinical or managerial – appointment interval, source of appointment, urgency of appointment, and type of insurance. Hertz and Stamps focused on the organizational factors that might be responsible for reinforcing poor appointment-keeping behavior.[22] These factors included: (1) physician continuity, that is, seeing the same physician each time positively correlated to appointment keeping, (2) increased communication efforts – including reminders of missed scheduled appointments and (3) type of appointment system utilized by the health care facility, that is, the responsibility of the clinic to adjust its operation to meet the needs of patients. DiStasio reported one of the first studies in dentistry describing the no-show patient behavior of Medicaid patients versus private patients.[23] Dentists in general practice experienced 97% more broken appointments among their Medicaid patients than their private patients. Iben, Kanellis and Warren investigated appointment-keeping behavior of pediatric dental patients.[24] Their findings were similar to previous studies mentioned, with Medicaid patients breaking more appointments compared to non-Medicaid patients. However, they also noted that the failed appointment rate for Medicaid patients was much higher in a private practice setting when compared to a public health or a dental school facility.

O'Brien and Lazebnik found that telephone reminders are a very effective method of increasing attendance in hospital based adolescent medical clinics.[25] The reminder is a consistently effective intervention, whether the message is delivered to the parent, other family members, an answering machine or to the patient themselves. They reported a 26% reduction in broken appointments when telephone calls were used. Christensen *et al* also found that telephone reminders reduced the percentage of broken appointments in a pediatric dental clinic by 62%.[26] Despite reminder telephone calls the day before every dental appointment at our site, there is a large number of patients failing to return for their appointments. The data from this study suggest that there may be some value in identifying patients who are more likely to miss their appointments based on previous clinic history and placing them on a more aggressive reminder protocol.

This study has several limitations. First, that this study targets only those children actively seeking out dental care is an inherent selection bias. As a result, this study cannot be used to estimate the prevalence of non-traumatic dental disease in the general population. It was also undetermined whether or not patients sought after-hours care in the hospital emergency room prior to presenting at the dental clinic. Data regarding oral health behaviors, diet, and previous dental history for new patients were obtained from caregiver's responses to the questionnaire and thus were subject to recall bias, as well the likelihood that the caregivers may have responded in a socially desirable manner. It is also difficult to get reliable data

on frequency of intake of high sugar foods as caregivers are typically unable to identify all the high sugar foods encountered by their child during the day. Furthermore, patients were monitored for only 2 months past their original emergency appointment. Two months allowed the patients to make up to 2 appointments for follow-up care; however, a longer period of follow-up may have yielded more accurate data. In addition, there are caregivers that may have sought dental care elsewhere. No data were obtained to determine why caregivers were not able to return for care.

CONCLUSIONS

Untreated dental caries remain notably present in children who utilize emergency services in Northern Manhattan. This study shows that those who utilize emergency services more than once, or have a history of missed appointments are more likely to continue to utilize emergency dental services as their primary means of dental care. Identifying and understanding this population is of paramount importance in order to reduce the amount of non-traumatic dental emergency situations that occur. More attention regarding broken appointments and scheduling may be warranted and ultimately, further studies will be required to determine the actual barriers preventing this subpopulation from returning for comprehensive dental care and to develop appropriate interventions to overcome these obstacles.

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