Social Determinants and Behavior Characteristics of Families Seeking Emergency Dental Care for Child Dental Pain

THESIS

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By

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Abstract

Purpose: To characterize a child population seeking emergency dental care at the largest urban children's hospital's dental clinic and determine social determinants of health associated with emergency care seeking behaviors.

Methods: 418 parents of children seeking emergency dental care at the Nationwide Children's Hospital Dental Clinic (NCHDC) completed a two-part survey. Part 1 asked 22 questions regarding patient and parent demographics, social risk factors, prior utilization of the dental and medical health care system, parent-identified chief complaint, thorough pain history, and past dental history. In part 2, dentists noted diagnosis, whether patient had sought care elsewhere for chief complaint, and information regarding necessary treatment and follow-up care. Additional patient demographics, in depth medical history and information related to previous care seeking behaviors were drawn from the electronic health record.

Results: Of 418 patients completing the survey, most respondents were Caucasian 227(54%) or African American 161(39%), with the majority residing in Franklin County 288(71%). At assessment, 243(59%) of patients presented with caries pain, and 74(18%) presented with dental trauma. 237(57%) patients required treatment, with extraction being the most common. 234(56%) of patients were in pain, and nearly half (49%) had

been in pain for 7 days or more. Almost half of patients (44%) had a dental visit within the last 6 months, and nearly one third of patients (30%) were seen elsewhere before presenting to NCHDC for this emergency visit. 226(54%) patients have only ever sought care at NCHDC on an emergency basis, with 47(11%) having their first dental visit at the time of emergency visit. 301(77%) families were considered low income, earning less than $40,000 annually which is approximately 200% of the federal poverty level. 227(67%) children lived in single parent homes, and only 90(22%) parents reported having a bachelor's degree. Only 259(63%) of respondents were employed, and the majority of patients (79%) had Medicaid insurance.

Conclusions: Parents of children with dental pain often delay seeking care which results in patients presenting with progressive dental disease that frequently necessitates irreversible treatment, such as dental extractions. Low income, low education, minority status, public insurance and single parent home are risk factors associated with emergency dental care seeking behaviors and poor oral health outcomes requiring emergent dental treatment.

Dedication

This document is dedicated to my family and research mentors,

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Publications

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Fields of Study

Major Field: Dentistry

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Introduction

Dental caries represents the most common chronic disease of both children and adults in the United States (US)[1], with 40% of children being affected before they begin kindergarten[2], and the burden disproportionately affecting poor and minority children.[3] Although most children have experienced a decline in dental caries due to significant improvements in oral health over the past four decades[4], children from vulnerable backgrounds have failed to show the same reduction in disease burden over time, highlighting the existence of an oral health disparity in children[3]. Data from a recent report by the Center of Disease Control and Prevention has shown a reverse in this trend, with caries prevalence increasing for toddlers and preschool children 2-5 years of age from 24% to 28%.[5] It is estimated that for children 2-5 years of age, 28% have had a caries experience[5] and 21% currently have untreated decay[4], with the true prevalence of early childhood caries (ECC) being much higher as most studies in the United States do not include noncavitated lesions or white spot lesions.

Access to dental care is the most prevalent unmet need in children living in the US[6], and vulnerable children from low-income and minority families are at the highest risk for poor oral health outcomes[3]. It has been well established in the literature that the ECC burden is disproportionately carried by the same disadvantaged population, with 70% of dental caries found in only 8% of children 2-5 years of age.[7] The third National

Health and Nutrition Examination Survey showed that in the US the percentage of all children aged 2-5 with decay is inversely related to family income, with 30% of children below the federal poverty line (FPL) having untreated decay compared to only 6% of children at 300% and higher of the FPL[4]. Additionally, Mexican American and African American children are more likely to have a higher caries prevalence and more unmet treatment needs compared to their higher-income and white counterparts[4].

Social determinants of health have been shown to threaten children's overall health in a cumulative manner across physical health, mental health and oral health domains[8]. Although associations between multiple social risks and physical health outcomes have been less well studied compared to their associations with mental health outcomes[9-11], poverty, low income and single parent homes were found to be associate d with poorer child health status and a greater likelihood of children having a chronic condition[12]. Social determinants of health have been looked at with respect to certain common childhood diseases, such as asthma and obesity, with studies showing that children who are non-white and low income have a significantly higher risk of asthma and disease morbidity compared to white children, and children growing up in poor neighborhoods and whose parents are poorly educated and without stable income have a significantly increased rate of obesity[13, 14]. Larson et al examined the association of 8 social risk factors (poverty, minority status, unemployment, lack of education and literacy, single-parent families, family conflict, maternal mental health and depression, lack of health insurance and community violence) on parent-reported child health status. They found that multiple social risk factors have a cumulative effect on child health, with

the percentage of children in poorer health increasing with the number of social risk factors across all health outcomes[8]. Some of these same social risk factors, including low income, minority background, and low parental education, are associated with early childhood caries and higher caries prevalence[6, 15-17], with this group of disadvantaged children having an increased likelihood of presenting with a more progressive, severe form of disease as measured by the number of affected teeth per child[4].

Establishing a dental home and engaging in a child's first dental visit by the age of one has had significant effects on preventing dental disease and reducing treatment needs and costs[18-20]. However, due to a general lack of oral health literacy, limited access to dental care, and failure to perceive a need for dental treatment[17], a significant number of children will first see a dentist in pain from dental caries or trauma. Previous reports have found that emergency appointments act as the first contact with a dentist in approximately 25% of pediatric patients [21], and as high as 52% in children aged 3.5 years and younger[22]. With limited access to care, visits to an emergency department (ED) for dental issues have been on the rise[23-25], which negatively impacts healthcare expenditures since treating oral health issues in the emergency room is much more expensive than in a primary care setting[26]. According to the Ohio Department of Health, in 2010-2011, dental treatment in EDs costs approximately $188.5 million, with lack of regular access to nearby affordable dental care being cited as the major reason for people turning to EDs to provide care[27].

Both medical and dental literature suggests that limited access to care leads to inappropriate utilization of EDs by children with non-urgent health care needs[28].

Several studies of pediatric dental emergencies in a hospital ED setting address the etiology of the chief complaint [26, 29-32] and the high cost of emergency room care [27, 33-35]. However, only a few studies look at how social determinants of health affect care-seeking behaviors, with low income, minority background and uninsured or publically insured patients being previously associated with episodic, problem-focused care seeking behaviors [22, 29, 36]. One report in particular by Von Kaenel et al identified patients of African American descent, single parent household, and covered by public assistance programs being correlated with an increased risk for non-urgent ED utilization[37].

The purpose of this study was to characterize the population of children presenting for emergency dental care, to determine whether the social determinants of health identified in the Von Kaenel et al study[37] correlated with non-urgent ED utilization (minority status, single parent household and public insurance program) are also associated with emergency dental care-seeking behaviors, determine whether other social determinants of health referenced in the Larson et al[8] study are also associated with emergency care seeking, and evaluate previous medical and dental care utilization patterns. We would like to investigate the assumption that patients presenting for emergency dental care have not been evaluated elsewhere for their chief complaint, and determine if there is a cohort of patients who are episodic care seekers, who present to the dental clinic, urgent care and emergency room for non-urgent or preventable diagnoses despite good access to affordable preventive services.

Methods

Nationwide Children's Hospital Dental Clinic (NCHDC) in Columbus, Ohio serves as a dental safety net for patients in Central Ohio and surrounding areas. Patients with emergency dental needs can present to the NCHDC without an appointment between the hours of 8:30am and 4:00pm Monday through Thursday, and 7:30am and 3:00pm on Friday and obtain quality dental care regardless of ability to pay. On average, the NCHDC sees up to 500 patients a month for emergencies, many of who are not patients of record. This study was a mixed methods design utilizing a survey and retrospective chart review. It was reviewed and approved by the NCH Institutional Review Board.

Subjects

Parents and legal guardians of children seeking emergency dental services at the NCHDC between October 1, 2015 and January 31, 2016 were invited to participate. Inclusion criteria included any patient seeking emergency dental care at NCHDC who spoke English, Spanish, or Somali.

Procedure

Before being evaluated by a dentist, the caregivers were asked to complete part 1 of a survey available in English, Spanish or Somali pertaining to their child's demographic background, previous dental and medical care-seeking behaviors and social, economic, psychosocial and community factors. Part 2 of the survey was completed by a trained dental resident who obtained a thorough pain history, performed a clinical

examination, determined a diagnosis and rendered emergency dental treatment when necessary. Following the emergency visit, the patients' medical records were analyzed by two trained reviewers using the NCH Enterprise Data Warehouse (EDW), which pulled data pertaining to additional patient demographics (age, gender, language of preference, city of residence, and zip code), and previous medical and dental encounters within the NCH healthcare system to assess family care seeking behaviors.

Social Determinants of Health

Ten social determinants of health variables were assessed in this study, representing a broad range of child, family and community influences on health. The sociodemographic variables obtained were patient race and ethnicity, parent marital status, number of children in the patient's household, level of parental education, parent employment status, estimated total annual household income, perceived neighborhood safety, family conflict, maternal mental health status and insurance type (public versus private).

Previous Care Seeking Behavior

Eight care seeking variables were analyzed, including whether the patient presented elsewhere for their chief complaint before coming to NCHDC, if the patient has an established dental home, how long ago the patient's last dental visit was, if the patient has a primary care physician (PCP) he or she sees regularly for well child checks (WCC), an up to date vaccination status, any recent urgent care (UC) or emergency room (ER) visits within the past three years, and also determined the caregiver's knowledge and attitude towards the meaning of "oral health" and access to dental care".

Diagnosis and Dental Health Outcomes

Eight dental specific variables were evaluated including whether child was in pain at time of presentation, approximate duration of pain prior to seeking care, pain descriptors (pain with hot, cold, eating, or spontaneous), whether the caregiver had medicated child for dental pain prior to presentation, what the clinical diagnosis was, if and what treatment was rendered, if there was a referral made, and if patient was prescribed a medication.

Data Analysis

Survey and retrospective chart review data were entered using Excel, and later analyzed using SAS 9.3 (SAS Institute, Cary, NC) with two-sided p-values considered statistically significant. Group comparisons were performed using chi-squared or Fisher's exact tests.

Results

There were 418 parents of children seeking emergency dental care at the NCHDC between October 1, 2015 and January 31, 2016, who participated in this study.

Sample Characteristics

Demographic statistics for the sample are shown in Table 1. Of the 418 responses, 394(94%) surveys were completed in English, 22(5%) in Spanish, and 2 (<1%) in Somali. Most respondents were Caucasian 227(54%) or African American 161(39%), with 38(9%) identifying as Hispanic, 9(2%) as Somali and only 26(6%) identifying as either Asian, Native American or of a race not specified. Males and females were evenly distributed, 211(52%) and 197(48%) respectively, with the majority residing in Franklin County 288(71%), an additional 10% (328/80%) from counties within the Columbus Metropolitan area (Delaware, Fairfield, Franklin, Hocking, Licking, Madison, Morrow, Perry, Pickaway and Union counties), and 14% (58) from one of the 32 counties that make up Appalachian Ohio. With respect to patient age at the time of presentation, 13(3%) were under 2 years of age, 69(17%) were between 25 and 60 months, 183(45%) were between 61-120 months, 88(22%) were between 121 and 180 months, and 55(13%) were greater than 180 months.

Table 1: Patient Demographics

Demographic Variable	Number of Subjects (percent sample)				
Patient age	0-24 months 13(3%)	25-60 months 69(17%)	61-120 months 183(45%)	121-180 months 88(22%)	>180 months 55(13%)
Sex	Male 211(52%)		Female 197(48%)		
Survey Language	English 394(94%)	Spanish 22(5%)	Somali 2(<1%)		
Race of Child	Caucasian 227(54%)	African American 161(39%)	Hispanic 38(9%)	Somali 9(2%)	Other 26(6%)
Place of Residence	Within County 288(71%)		Outside of County 120(29%)		

Descriptive statistics regarding social determinants of health for the sample are shown in Table 2. A substantial proportion of children experienced multiple social determinants of health, emphasizing the vulnerability of this patient population and the greater likelihood of them having poorer health outcomes.[8] 301(77%) families identified as poor or near poor, earning less than $40,000 a year, which is roughly 200% of the federal poverty level (FPL). 227(67%) children lived in single parent homes, and only 90(22%) parents reported having a bachelor's degree or higher, with 16% (65) having never completed high school. Only 259(63%) of respondents were employed, 61(15%) were unemployed, and the remainder were categorized as "not in labor force". 293(79%) patients had Medicaid insurance, and the vast majority (81%) of parents were between 25-44 years of age; 23(6%) parents were between 12-17 years of age and 23(6%) were between 18-24 years of age. Over 80%(334) of parents had more than one

child at the time of survey, with 56%(230) having 3 or more children. Although only 8(2%) parents reported "hitting or throwing" in response to serious disagreements with household members, 65(16%) parents reported sometimes or usually "arguing or shouting", indicating some level of family conflict that these patients are exposed to. 311(78%) of mothers self-reported very good or excellent mental health, and the vast majority (92%) perceived their neighborhood as being always or usually safe.

Table 2: Social Determinants of Health

Social Determinant	Variable		Number of subjects (percent sample)		
Race of Child	Caucasian 227(54%)	African American 161(39%)	Hispanic 38(9%)	Somali 9(2%)	Other 26(6%)
Employment Status	Employed 259(63%)		Unemployed 61(15%)		Not in Labor Force 90(22%)
Median Household Income	<$10,000 120(31%)	$10,000-39,999 181(46%)	$40,000-69,999 50(13%)	$70,000-99,999 27(7%)	>$100,000 13(3%)
Education Level	No high school diploma 75(18%)		High school graduate, some post secondary 243(60%)		Bachelors degree or higher 90(22%)
Marital Status	Single Parent Household 277(67%)		Married 139(33%)		
Insurance Type	Commercial 73(19%)		Medicaid 293(79%)		Other 3(<1%)
Parental Age	12-17 yrs 23(6%)	18-24 yrs 25(6%)	25-34 yrs 196(47%)	35-44 yrs 139(34%)	>45 yrs 48(12%)
# Children in Household	1 80(19%)	2 104(25%)	3 102(25%)	4 83(20%)	5+ 45(11%)
Family Conflict	Argue Rarely	Argue Sometimes	Argue Usually 12(3%)	Hit/Throw Rarely	Hit/Throw Sometimes

continued

Table 2: Continued

	177(44%)	53(13%)		26(7%)	8(2%)
Maternal Mental Health Status	Excellent 195(49%)	Very Good 116(29%)	Good 68(17%)	Fair or Poor 19(5%)	
Neighborhood Safety	Always Safe 259(63%)		Usually Safe 116(29%)		Never/Sometimes Safe 32(8%)

Descriptive statistics regarding pain history and previous care seeking behaviors of the sample are shown in Tables 3. At assessment, 234(56%) of patients were in pain, and nearly half (49%) had been in pain for 7 days or more. The most common pain descriptors were pain with eating (60%) and spontaneous pain (49%), both of which indicate progressive dental disease, often requiring aggressive treatment, such as dental extraction. 171(41%) parents reported having given their child a medication to help tolerate the pain, with the vast majority of those (88%) receiving an analgesic and 20% receiving an antibiotic.

Table 3: Description of Pain

Variable	Number of subjects (percent sample)			
In Pain at Presentation	Yes 234(56%)		No 181(44%)	
Pain Duration	<24 hours 50(12%)	24 hours-7 days 75(23%)	1-2 weeks 112(34%)	>2 weeks 91(28%)
Pain Descriptors	With cold 119(34%)	With heat 74(21%)	With eating 214(60%)	Spontaneous 172(49%)
Taken Medication	Yes 171(41%)	Antibiotic 34(20%)	Analgesic 151(88%)	Other 18(11%)

Descriptive statistics regarding previous care seeking behaviors of the sample are shown in Tables 4. Almost half of patients (44%) had a dental visit within the last 6 months, and nearly one third of patients (30%) were seen elsewhere before presenting to NCHDC for this emergency visit, and of those seen elsewhere, over half (54%) were evaluated by another dentist. About 27% reported being patients of record at NCHDC, another 27% reported having established dental homes outside of NCHDC, with the remaining patients reporting only sometimes or never having routine dental visits. 226(54%) patients have only ever sought care at NCHDC on an emergency basis, with 47(11%) having their first dental visit at time of emergency visit. Most families (88%) reported getting routine WCCs at least once a year, however chart review data showed that less than half (41%) have actually had a WCC within the past 3 years. A similar discrepancy was found with vaccination histories, with nearly all parents (96%) reporting an up-to-date vaccination status of their child, while in actuality 89% had been flagged for an overdue vaccine in their medical chart. Parents were better at estimating visits to the UC/ED, with parents reporting nearly half of patients (48%) having visited an urgent care or emergency department within the last year, with actual utilization being closer to 60%

Table 4: Previous Care Seeking Behavior

Variable	Number of subjects (percent sample)			
Last Dental Visit	First Dental 47(11%)	Within 6 months 181(44%)	> 6 mos, < 2 yrs 144(35%)	> 2 yrs 42(10%)

continued

Table 4: Continued

Seen Elsewhere for Complaint	Yes 124(30%)	Outside Dentist 67(54%)	UC/ED 41(33%)	PCP 8(6%)	Other 6(5%)
	First Dental 14(12%)	Within 6 months 66(55%)	> 6 mos, < 2 yrs 35(29%)	> 2 yrs 6(5%)	
Routine Dental Checks (Reported)	No 86(21%)	Sometimes 97(24%)	Yes, NCH 108(27%)	Yes, Outside Dentist 110(27%)	
Dental Emergency Visits Only (Actual)	Yes 222(54%)				
Routine Well Checks (Reported)	No 27(7%)		Not regularly 46(11%)		Yes, yearly 333(82%)
Well Check past 3 years (Actual)	Yes 170(41%)				
UC/ED past year (Reported)	No 213(52%)	Once 118(29%)	Twice 51(12%)	3+ Times 30(7%)	
UC/ED past 3 years (Actual)	Yes 246(60%)		No 162(40%)		
Vaccines UTD (Reported)	Yes 391(96%)	No, no time 3(<1%)	No, don't believe in 6(1%)	Don't know 9(2%)	
Vaccine Overdue (Actual)	Yes 364(89%)				

Descriptive statistics regarding parental attitude and knowledge of "oral health" and "access to care" (Table 5) were derived from two multiple choice questions, in which parents were able to circle all answers that apply. Several parents circled all available answers, which resulted in an even distribution for the most part. With respect to the meaning of "oral health", 57% defined it as having no cavities, 45% described it as having no pain, 55% defined it as having all cavities restored, and lastly 51% described

the meaning of oral health as having white teeth. 54% of parents felt that "access to dental care" was characterized by the ability to have restorative dental work when needed, 46% described it as having access to orthodontics for their kids, 58% want access to urgent or emergency care when needed, 53% defined access as having a dentist who accepts their insurance, 51% wanted the opportunity to call and speak with a clinician when they have questions, and 85% wanted access to regular exams and cleanings.

Table 5: Definitions of Care

Variable	Number of Subjects (percent of sample)					
Meaning of Oral Health	No cavities 225(57%)	No pain 179(45%)	Cavities fixed 216(55%)	White Teeth 200(51%)		
Meaning of Access to Dental Care	Regular exams and cleanings 353(85%)	Dental fillings when needed 266(54%)	Braces 193(46%)	Urgent Care 240(58%)	Dentist who accepts insurance 222(53%)	Call dental office with questions 213(51%)

Descriptive statistics regarding diagnosis and treatment rendered are shown in Table 6. 247(60%) patients presented with caries related pain, 74(18%) presented with dental trauma, and the remainder were diagnosed with "other", presenting with a variety of complaints ranging from periodontal issues, soft tissue pathology, exfoliating primary teeth, orthodontic emergencies, and growth and development concerns. 237(57%) patients required treatment, with extraction being the most common (42%), especially among children with a caries related diagnosis (61%). Almost half of patients (43%) were

referred for care, with the most common referrals being to the NCH hygiene clinic (54%) to establish a dental home, or to the surgery center (27%) to have dental work completed under general anesthesia due to extent of disease and inability of the child to cooperate in a clinical setting. 51(12%) patient received some kind of medication prescription at their emergency visit; the majority (71%) received a prescription for either Motrin or Tylenol, and 15 patients (29%) received a prescription for an antibiotic.

Table 6: Diagnosis and Treatment

Variable	Number of Subjects (percent of sample)				
Diagnosis	Caries Related 247(60%)	Dental Trauma 74(18%)	Other 93(22%)		
Treatment Required	Yes 237(57%)	Restorative 58(14%)	Pulp Therapy 24(6%)	Extraction 176(42%)	Other (education, prophy, referral) 198(49%)
Treatment for Caries	N = 247(60%)	Restorative 32(13%)	Pulp Therapy 16(7%)	Extraction 149(61%)	Other 82(33%)
Referral	No 179(43%)	Yes 237(57%)			
Of Referrals	Hygiene 101(54%)	Sedation 5(2%)	General Anesthesia 63(27%)	Trauma Thursday 35(15%)	Specialty Care 35(15%)
Prescription	No 365(88%)	Yes 51(12%)			
Of Prescriptions	Analgesic 36(71%)	Antibiotic 15(29%)	Other 6(12%)		

Comparison of SDHs and Care Seeking Behaviors across Diagnosis

A comparison of patient demographics by diagnosis is shown in table 7. African Americans were more likely than patients of all other races to present for trauma (p=0.0316), while Caucasian patients were more likely to present for caries (p=0.0204). Parents of children with an "other" diagnosis tended to be older (p=0.036), and those presenting with caries tended to be from larger families (p=0.0469).

Table 7: Patient Demographics by Diagnosis

Variable		Caries		Other		Trauma		p-value
		N	%	N	%	N	%	
Respondent	Self	9	4	2	2	3	4	0.9071
	Parent	224	91	84	90	67	91	
	Other	14	6	7	8	4	5	
Language	English	230	93	90	97	70	95	0.4963
	Somali	1	0.5	0	0	1	1	
	Spanish	16	6	3	3	3	4	
Race	African American	85	34	36	39	38	51	**0.0316**
	White	148	60	44	47	33	45	**0.0204**
	Asian/PA	3	1	4	4	1	1	0.1688
	Hispanic	23	9	9	10	6	8	0.9349
	Native American	1	0.5	1	1	1	1	0.3565
	Somali	5	2	3	3	1	1	0.719
	Other	8	3	7	8	0	0	**0.0301**
Daycare	Any Daycare	45	18	12	13	21	28	**0.0367**
Marital Status of Respondent	Married	84	34	27	29	27	36	0.2446
	Other	49	20	17	18	7	9	
	Single	113	46	49	53	40	54	
Age of Respondent	12-17	12	5	6	6	5	7	**0.036**
	18-24	16	7	3	3	6	8	
	25-34	126	52	33	35	36	49	
	35-44	71	29	34	37	21	28	

continued

Table 7: Continued

	45+	17	7	17	18	6	8	
# Children	1	39	16	23	25	17	23	**0.0469**
	2	57	23	21	23	26	35	
	3	64	26	26	28	12	16	
	4	51	21	19	20	12	16	
	5+	33	14	4	4	7	9	

A comparison of family socioeconomic factors by diagnosis (Table 8) revealed that diagnosis was significantly associated with income (p=0.0466), education (p=0.0013), and insurance type (p=0.0133), but was not associated with employment (p>0.05). Patients presenting with trauma tended to have higher income and education and were less likely to have Medicaid. Patients with caries and "other" diagnoses were similar.

Table 8: Socioeconomic Status by Diagnosis

Variable		Caries		Other		Trauma		p-value
		N	%	N	%	N	%	
Income	<10k	79	34	23	27	17	25	**0.0466**
	10-30k	82	35	31	36	21	31	
	30k-50k	42	18	20	24	9	13	
	50k+	32	14	12	14	20	30	
Education	8th or Less	16	7	5	6	8	12	**0.0013**
	Less than HS	27	11	9	10	0	0	
	HS Grad	87	37	25	28	20	29	
	Some College	66	28	30	34	14	20	
	College Grad	42	18	19	22	27	39	
Employment Status	Employed	152	63	56	62	48	71	0.5636
	Not Employed	31	13	8	9	6	9	
	Other	60	25	26	29	14	21	
Insurance	Medicaid (Epic)	177	83	73	83	47	67	**0.0133**

Table 9 shows a description of pain according to diagnosis. Patients with caries were significantly more likely than those with trauma or "other" diagnosis to be in pain at the time of the survey ($p<0.0001$), and they were more likely to have been in pain for a longer duration, especially compared to trauma patients ($p<0.0001$).

Table 9: Description of Pain by Diagnosis

Variable		Caries		Other		Trauma		p-value
		N	%	N	%	N	%	
Chief Complaint	Caries	235	95	5	5	2	3	**<0.0001**
	Trauma	1	0.5	2	2	71	96	
	Other	11	4	86	92	1	1	
Pain Now	In Pain Now	172	70	39	42	22	30	**<0.0001**
Pain Duration	<24 hr	17	8	10	16	23	52	**<0.0001**
	48 hr	41	18	19	31	14	32	
	7 d	77	35	18	30	4	9	
	14+ days	87	39	14	23	3	7	
Pain Description	With Cold	95	41	10	15	13	25	**<0.0001**
	With Hot	60	26	7	11	6	11	**0.0045**
	With Eating	151	65	41	62	21	40	**0.0024**
	Spontaneous/Nocturnal	149	65	13	20	9	17	**<0.0001**

A summary of care seeking behaviors is shown in Table 10. Comparing care seeking behaviors by diagnosis, patients presenting with caries were less likely to receive

routine dental checks than either "other" or trauma patients (based on parent report, $p<0.0001$), and were less likely to have a regular dentist. Of note, patients presenting with caries were more likely to have only had previous emergency dental visits compared to trauma and "other" diagnoses ($p<0.0001$). According to EMR, patients with caries were significantly less likely to have had any ED/UC visits in the past 3 years ($p=0.0077$). Interestingly, patients who presented to the dental clinic with an "other" diagnosis were more likely to have gone to the ED/UC in the past year ($p=0.0059$), while patients with a caries diagnosis were the least likely ($p=0.0068$). There is no difference in ED/UC utilization between patients who have been to the dental clinic for routine dental care compared to those who have only been to the clinic for emergency appointments.

Table 10: Care-Seeking Behavior by Diagnosis

Variable		Caries		Other		Trauma		p-value
		N	%	N	%	N	%	
ER/UC Visits	At least one other ER/UC visit (Parent report)	107	44	46	51	43	59	0.067
	Epic Report	134	54	66	71	50	68	**0.0068**
Vaccines	Up to Date (Parent Report)	233	95	86	96	68	96	0.9948
	Overdue (Epic)	224	91	79	85	65	89	0.2659
WCC	Routine (Parent)	193	79	76	86	61	86	0.226
	Routine (Epic)	92	37	44	47	34	47	0.1518
Emergency Dental Only	Epic Report	151	61	31	33	42	58	**<0.0001**

Comparison of Sample to Catchment Area Population

Because 71% of our sample came from Franklin County, a comparison was made to see how patients who presented as dental emergencies differed demographically from the population of the hospital's catchment area. Table 11 shows the percentages for NCHDC and Franklin County. In order to do this comparison, several sources of data were used, with some categories from the study being merged to make our data comparable with county surveys. For insurance status, we merged Medicaid, Medicaid MC Cap and Medicaid MC Non-Cap as "Public Insurance". For marital status, we merged single, never married, separated, divorced, widowed and other as "Single Parent". For employment status, employed for wages and self-employed were merged as "Employed", out of work (looking) and out of work (not looking) were merged as "Unemployed" and homemaker, student, unable to work, retired and other were merged as "Not in Labor Force". These data are reported as percentages only and no statistical analysis is provided.

There were several notable comparisons that differed from the Franklin County catchment demographic, that will be displayed in percentages as follows: (sample/catchment). African-American and Hispanic patients were doubled in their representation compared to the county population (AA: 39%/22%) (Hisp: 9%/5%). Notably more children in our sample had Medicaid insurance compared to private (79%/28%), were of single parent households (67%/33%), had parents with lower levels of education (60%/90% completed a high school education), parents who were

unemployed (15%/6%), and parents with a lower median annual income ($40,000/$51,890).

Table 11: Comparison of SDH between NCHDC and County

	Variable	NCH Dental Clinic (%)	County Population (%)
Race	Caucasian	54	69
	African American	39	22
	Hispanic	9	5
	Other	6	4
Sex	Males	52	49
	Females	48	51
Marital Status	Single Parent	67	39
	Married	33	61
Parent Education	Never Completed High School	16	10
	High School Graduate or	60	90
	Higher	22	37
	Bachelor's Degree or Higher		
Employment Status	Employed	63	64
	Unemployed	15	6
	Not in Labor Force	22	31
Income	Median Household income	$40,000	$51,890
Insurance Status	Public	79	28
	Private	20	68

Associations between Social Determinants of Health and Care Seeking Behaviors

Employment status was significantly associated with first visit status, well child checks, vaccination status, dental checks, and arguing, with unemployed parents being most likely to report always arguing (p=0.0001), to have had a WCC in the last three years (p=0.0247), and only sometimes receives routine dental care (p=0.0109). Patients of employed parents are more likely to have an overdue vaccination status compared to unemployed parents (p=.0.0267).Income is associated with routine visits, with routine

dental visits (p=0.0044) and routine well child checks (p=0.0567) being more common with increasing income. Higher income is associated with better mental health (p=0.0325), while always arguing is more common with lower income (p=0.0380). The likelihood that a patient has only presented for dental emergency visits increases with the level of parental education; only 29% of patients whose parents have an 8th grade education or less compared to 72% of patients whose parents have at least a college degree only have emergency visits (p=0.0049).

Looking at associations between care seeking behaviors and parental stress, patients of single parents are more likely to have at least one ED/UC visit in the past year (p=0.0387). Younger parents were more likely to bring their child in for caries (p=0.0046). Patients with less educated parents were more likely to have presented for their first dental visit as an emergency (0.0030), and are less likely to receive routine well child checks (p=0.0009).

Discussion

It was determined that the same social determinants of health identified by Von Kaenel to be associated with non-urgent dental ED visits[37] were also associated with dental emergency care seeking behaviors: minority status, single parent household and public insurance. Approximately 50% of the patients presenting for emergency care were of a minority background, with representation of both African Americans and Hispanics being nearly doubled compared to their catchment representation of Franklin County. This is in line with previous studies that have found minorities to be at higher risk of poor overall health outcomes, which our study supports extends also to poor dental outcomes.

Additional social determinants of health including income, employment status and level of parent education were also correlated with episodic care seeking and dental caries, supporting previous observations made by others. The majority of these children had multiple social determinants of health, reflecting a severely vulnerable and at risk patient population seen at NCHDC, with these findings being broadly consistent with those of Larson and others supporting the concept that increasing numbers of social risk factors negatively impact that child's overall health status, including dental health.

Several comparisons to Franklin County census data were made because 71% of our sample resided in Franklin County at the time of survey, and we desired to compare differences between the patients presenting for a dental emergency compared to the general population. The typical child in our study was minority, lived at 200% or below

of the poverty line, had parents who may had no more than a high school education and who were often not employed, lived in a single parent home, and utilized public insurance programs at a much higher rate than the catchment population; approximately 79% of children in our sample were covered by Medicaid compared to 28% in the catchment. Our findings are consistent with previous studies that have shown that single parent homes, living below the poverty line, receiving welfare and public health insurance are risk factors that predict poor overall health outcomes in children. We were able to identify several social determinants of health that were correlated with emergency care seeking behaviors for dental pain, and this delayed, episodic care seeking behavior can be added to the long list as a risk factor associated with poor oral health outcomes[37].

With respect to care seeking behaviors, our data supported the observation of a 2012 study that found parents delayed seeking dental care for acute dental pain, opting to manage with analgesics prior to presenting for definitive dental care.[38] We found that more than half of patients (56%) were in pain at the time of survey, with 49% having been in pain for minimally 7 days. Of concern, 41% of patients had taken some kind of medication for acute dental pain, of which 20% had been prescribed an antibiotic, which are ineffective in the definitive treatment for dental caries. Acute dental pain is primarily inflammatory in nature, originating from acute and chronic infections of the pulp tissue, requiring operative intervention rather than antibiotics.[39]. A recent study comparing antibiotic prescription patterns and the awareness of antibiotic resistance between general dentists and pediatric dentists found that there is a general lack of awareness with regard

to guidelines for prescribing antibiotics in both groups[40]. This is concerning, as The World Health Organization (WHO) recently recognized antibiotic resistance as one of the biggest threats to global health today.

11% of patients had their first dental visit as an emergency, which is a lower percentage than what was previously noted in a similar profile study of patients presenting as dental emergencies to a university-based pediatric dentistry clinic for care.[21] Nearly half of patients (44%) reported seeing a dentist within the last 6 months, indicating that they were patients of record (27% were patients of record at NCHDC, the other 27% were patients of record elsewhere). We had hypothesized that there is a cohort of patients who are episodic care seekers, utilizing dental and medical care facilities on an acute problem basis, which was supported by our data: 54% of patients have only ever had emergency dental visits at NCH. This is significant, as this cohort has knowledge of and access to routine oral health care, however only present on a problem basis. This kind of delayed, problem-focused care seeking behavior is detrimental to the child's oral and overall health, as they are living with chronic pain and end up requiring more invasive treatments that could have otherwise been avoided. The data supports this claim, with 59% of patients presenting with caries-related diagnosis, a chronic disease that for the most part is preventable. Of those treated on the day of survey, dental extraction was the most common treatment (61%), which can have a negative impact on the child's growth and development. Early loss of teeth can lead to a space loss, reduction in arch length, drifting of neighboring teeth and resulting malocclusions. As previously mentioned, most

of the children being treated are low-income, and will lack access to orthodontics fix these resulting issues that could have been otherwise avoided with routine dental care.

Our data challenged the assumption made by the American Dental Association (ADA) and Dental Quality Alliance that patients seeking emergency dental care have not attempted to seek out care by a dentist. Nearly one third of patients (30%) were seen elsewhere before presenting to the hospital dental clinic for evaluation; of those, 54% were seen by an outside dentist and 40% were seen by a physician. The study did not determine whether it was a physician or dentist who prescribed antibiotics, which would be interesting to see whether these inappropriate prescriptions are due to physicians not fully understanding the inflammatory origin of dental caries, or if dental practitioners lack of awareness with regard to the guidelines for antibiotic prescribing. We also did not determine the exact reasoning for why patients failed to receive definitive care at outside dental offices, however common examples given were that their dentist was not comfortable treating children with acute dental pain and their dental home was unable to accommodate the child on short notice for emergency care.

The hospital dental clinic acts as a dental safety net for families who do not have an established dental home due to limited access to care. 14% of patients presenting for dental emergencies live in Appalachian Ohio, an area that is historically underserved. A 2012 Data Brief on the Oral Health in Appalachian Ohio identified that this area continues to experience poor oral health and significant barriers to getting dental care. Significant disparities exist between children in Appalachian Ohio and children elsewhere in the state in percentage of dental caries, untreated disease, early or urgent

dental needs and reported tooth aches. Twenty-five of the 32 counties in the area are designated as federal dental Health Professional Shortage Areas, with thousands of residents living at least 25 miles from dental specialty care services, including pediatric dentistry. Not enough dentists take Medicaid, leaving a large number of children who are Medicaid-eligible unable to obtain needed care. In 2009-2010 it was found that children in Appalachia had a 59% higher rate of untreated cavities compared to children elsewhere in Ohio. As such, it is not surprising that of our study's total sample, 14% of patients came from an area where people struggle to find eligible providers due to lack of specialty care and providers accepting Medicaid.

We did not find a significant relationship between medical and dental care utilization. We had hypothesized that patients who utilize the dental clinic on an acute care basis would be more likely to seek acute medical care at urgent cares and emergency departments. We found that there was no difference in ED/UC utilization between patients who are patients of record have been to the dental clinic for routine dental care compared to patients who have only utilized the clinic for emergency appointments. A possible explanation for this is convenience, in that parents have learned that they can walk in and receive same day care for dental problems. Due to the size of our clinic and the need of the community, it is often difficult for parents to schedule appointments, as they fill up so quickly. For this reason, it may be more convenient for parents to present on a problem basis.

Conclusion

Parents of children with dental pain often delay seeking care which results in patients presenting with progressive dental disease that frequently necessitates irreversible treatment, such as dental extractions. Low income, low education, minority status, public insurance and single parent home are social determinants that associated with emergency dental care seeking behaviors and poor oral health outcomes requiring emergent dental treatment. Our findings are consistent with previous studies that have shown the negative impact on overall health associated with numerous social determinants of health, and emergency care seeking behavior for dental pain can be added to the long list of social risk factors correlated with poor oral health outcomes.

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Appendix A: Informed Consent

Study Title: Social Determinants and Behavior Characteristics of Families Seeking Emergency Dental Care for Child Dental Pain

Principal Investigator: Ashok Kumar

1. **Introduction – Why are we doing this research study?**

   We invite you to be in this research study because of its potential to improve pediatric dental care in the future. This is a study to find out why parents bring their children to the dentist for emergency dental treatment. If you choose to be in the study, you will be given a demographic survey to complete. If you are here because your child is having pain due to cavities you will be given an additional survey that measures parental stress. The dentist will then record information about your child's teeth and medical record prior to performing the regular dental treatment that your child needs. The study should not increase the length of the dental visit more than 10-15 minutes.

2. **Participation is voluntary.**

   Participation is voluntary. If you do not want to be involved with this study, all regular and standard medical and dental care will still be available to you here or at another institution. You also have the right to leave this study at any time, even if you agree to join now.

3. **What are possible Risks/Discomforts?**

   We believe that there is very little risk associated with being in this study. It is possible that you could feel upset when answering questions about your diagnosis or medical treatment, but it may be more likely that you find the questions or feedback process a little boring. If you do find any of the questions upsetting or don't want to answer a question, you don't have to, and the study coordinator will be available to discuss this with you further. Although we will take every precaution, there is a small chance of loss of confidentiality of your study information.

4. **What are potential Benefits?**

   Although there may be no benefit to you from being in this study, we hope to learn something that could help others patient seeking emergency dental care in the future.

We want to provide the best care possible to our patients!

5. How will my information be kept private?

Information collected for this study includes information that can identify you. This is called "protected health information" or PHI. By agreeing to be in this study, you are giving permission to Dr. Ashok Kumar and the study staff to collect and analyze your PHI for this research study and for future research purposes.

6. Is there any payment/compensation for participation?

There is no extra charge or compensation for participating in this study. The treatment done during today's dental visit as a part of routine clinical care will be billed to you and to your insurance company or third party payer. You may have to pay any costs that the insurance company or third party payer does not pay.

7. Who can I contact for additional information?

If you have questions about anything while on this study or you have been injured by the research, you may contact the Principal Investigator at 614-722-5650, Monday – Friday, between 9AM and 5PM.

If you have questions, concerns, or complaints about the research; if you have questions about your rights as a research volunteer; if you cannot reach the Principal Investigator; or if you want to call someone else - please call (614) 722-2708, Nationwide Children's Hospital Institutional Review Board, (IRB, the committee that reviews all research involving human subjects at Nationwide Children's Hospital).

Appendix B: Survey

Characterization of Patients Presenting for Dental Emergencies Survey

1. What is the patient's race/ethnicity?
    a. African-American
    b. White
    c. Asian or Pacific Islander
    d. Hispanic or Latino
    e. Native American or American Indian
    f. Somali
    g. Other: (please specify) _____

2. What is your relationship to the patient?
    a. Self (I am the patient)
    b. Mother
    c. Father
    d. Grandparent
    e. Sibling
    f. Aunt/Uncle
    g. Legal guardian
    h. Foster parent
    i. Other _____

3. What is the parent's marital status?
    a. Single, never married
    b. Married or domestic partnership
    c. Separated
    d. Divorced
    e. Widowed
    f. Prefer not to state

4. Who is the primary caretaker for this child (circle all that apply)?
    a. Mother
    b. Father
    c. Grandparent
    d. Foster Parent
    e. Legal guardian

5. What is the parent's age?
    a. 12-17
    b. 18-24
    c. 25-34
    d. 35-44
    e. 45-54
    f. 55-64
    g. >65

6. How many children are in the patient's household?
    a. 1
    b. 2
    c. 3
    d. 4
    e. 5 or more

7. Is the patient in daycare?
    a. No
    b. Yes, a family member takes care of him/her
    c. Yes, Head Start
    d. Yes, private daycare

8. What is the highest level of school that parent completed?
    a. No schooling completed
    b. Nursery school to 8th grade
    c. Some high school, no diploma
    d. High school graduate, diploma or equivalent (ex. GED)
    e. Some college credit, no degree
    f. Trade/technical/vocational training
    g. College degree
    h. Graduate or professional degree
    i. Prefer not to answer

9. Is the patient's guardian currently employed for wages?
    a. Employed for wages
    b. Self-employed
    c. Out of work, looking for work
    d. Out of work, but not currently looking for work
    e. Homemaker
    f. Student
    g. Military
    h. Unable to work
    i. Retired
    j. Other_____
    k. Prefer not to answer

10. What is your total household income?
    a. Less than $10,000
    b. $10,000-$19,999
    c. $20,000-$29,999
    d. $30,000-$39,999
    e. $40,000-$49,999
    f. $50,000-$59,999
    g. $60,000-$69,999
    h. $70,000-$79,999
    i. $80,000-$89,999
    j. $90,000-$99,999
    k. $100,000-$149,999
    l. More than $150,000

11. Does the patient see a medical doctor for routine well-child checks?
    a. No
    b. Yes, when he/she were young but not anymore
    c. Yes, at least once a year

12. Does the patient see a dentist for regular cleanings and check-ups?
    a. No
    b. Sometimes
    c. Yes, seen here at Children's Hospital Dental Clinic every 6-8 months
    d. Yes, seen at outside dental office every 6-8 months

13. Is the patient up-to-date with vaccinations?
    a. Yes
    b. No, I have not had time
    c. No, I don't believe in vaccinations for my child
    d. I don't know

14. Has the patient or a sibling been to any Urgent Care or the Emergency Room in the past year for any reason? (If yes, please specify ex. head injury, broken arm, rash, respiratory infection, etc.)
    a. No
    b. Yes, one time _____
    c. Yes, two times _____
    d. Yes, more than three times_____

15. Other than this appointment, do you have a child who has an appointment in the dental clinic or at a different department in the hospital today?
    a. No
    b. Yes, dental clinic
    c. Yes, other (please specify department)_____

16. What does the term "oral health" mean to you? (Circle all that apply)
    a. My child is not in pain
    b. My child's teeth look white when he/she smiles
    c. My child's cavities have been fixed with white fillings and silver caps
    d. My child does not have any cavities

17. What does the term "access to dental care" mean to you? (Check all that apply)
    a. My child can get regular cleanings and exams every 6 months
    b. My child can get dental fillings when they are needed
    c. My child can get braces to straighten their teeth
    d. My child can get urgent care when he/she needs it for tooth problems
    e. My child can get a dentist who will see my child and accept my payment/insurance
    f. I can call a dental office whenever I have a question

18. In your opinion, how safe is the neighborhood in which the patient currently lives?
    a. Never safe
    b. Sometimes safe
    c. Usually safe
    d. Always safe

Please only answer the following questions if you are the <u>patient's legal guardian</u>:

1. How often do you argue heatedly or shout in response to a serious disagreement with a household member?
    a. Sometimes
    b. Usually
    c. Always
    d. Rarely
    e. Never

2. How often do you end up hitting or throwing things in response to a serious disagreement with a household member?
    a. Sometimes
    b. Usually
    c. Always
    d. Rarely
    e. Never

3. How would you describe your overall mental health status?
    a. Excellent
    b. Very Good
    c. Good
    d. Fair
    e. Poor

YOUR DENTIST WILL FILL OUT THE NEXT PAGE

TO BE FILLED OUT BY DENTAL RESIDENT (Will eventually be updated to EPIC tab)

1. Chief Complaint
    a. Parent reported problem:
        i. Caries Related
        ii. Trauma
        iii. Other
    b. Is patient/parent able to localize problem?
        i. Yes
        ii. No

2. Pain History (*Fill out Faces Pain Scale is under Purpose and History Tab)
    a. Is child in pain right now?
        i. Yes
        ii. No
    b. How long has the patient been in pain?
        i. N/A (not in pain)
        ii. <24 hours
        iii. 48 hours
        iv. 7 days
        v. 14 days
        vi. > 2 weeks
    c. Pain Descriptors (select all that apply)
        i. Pain with cold
        ii. Pain with hot
        iii. Pain with eating
        iv. Spontaneous/nocturnal pain
    d. Has patient taken any medications for this problem?
        i. No
        ii. Antibiotic
        iii. Analgesic (Tylenol/ibuprofen/narcotic)
        iv. Other (Orajel, etc.)

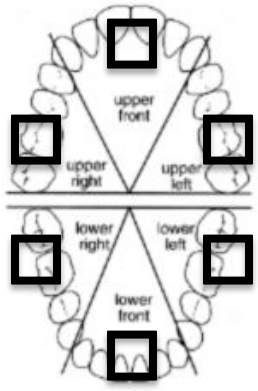
3. Past Dental History
    a. Does the patient have a dentist that he/she sees for regular care?
        i. No
        ii. Yes, here at NCH
        iii. Yes, outside dentist

    b. When was the last time patient was seen by a dentist?
        i. First dental visit
        ii. Within last 6 months
        iii. >6 months, < 2 years
        iv. > 2 years

    c. Has the patient been seen somewhere else for this problem prior to coming here?
        i. No
        ii. Outside dentist
        iii. Urgent Care/Emergency Department
        iv. Primary Care Physician
        v. School Nurse
        vi. Other

4. **Tooth Charting (in EPIC as needed)**

5. **Provisional Charting** (discrete data) Check affected sextants



6. Clinical Assessment

- a. Diagnosis
  - i. Caries Related
  - ii. Trauma
    1. Primary tooth trauma
    2. Permanent tooth trauma
  - iii. Other
- b. Does Chief Complaint match clinical presentation?
  - i. Yes
  - ii. No
- c. Emergency treatment required
  - i. Yes
  - ii. No

7. Current Treatment Plan (Note in Epic)

8. Treatment

- a. Treatment rendered (same as before)
  - i. Dental health education only
  - ii. Oral prophylaxis and/or scaling and root planing
  - iii. Restorative treatment (ex. fillings, SSC, bandaids, etc.)
  - iv. Nerve treatment (pulpotomy, pulpectomy, pulp cap, etc.)
  - v. Dental extractions
  - vi. Incision and drain
  - vii. Other
- b. Referral made?
  - i. No
  - ii. Hygiene
  - iii. Sedation
  - iv. General Anesthesia
  - v. Outside specialty care (specify_____)
  - vi. Trauma Thursday
- c. Prescription written?
  - i. No
  - ii. Antibiotic
  - iii. Analgesic
  - iv. Other (_____)