Early COVID-19 Pandemic Emergency Department Utilization for Pediatric Dental Emergencies

Daniel M. Walsh

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Science in Dentistry

University of Washington

2022

Committee:

Barbara Sheller

Anne Reeves

Bryan Williams

Kristen Carlin

Program Authorized to Offer Degree:

Pediatric Dentistry

University of Washington

Abstract

Early COVID-19 Pandemic Emergency Department Utilization for Pediatric Dental Emergencies

Daniel M. Walsh

Co-chairs of the Supervisory Committee:
Barbara Sheller, DDS, MSD
Anne Reeves, DDS, MSD, MPH
Bryan Williams, DDS, MSD, MEd
Seattle Children's Hospital Department of Pediatric Dentistry

Research supported by the Dr. Bryan Williams Endowment for Pediatric Dental Medicine Seattle Children's Hospital and Seattle Children's Research Institute Research Integration Hub Core Services Research Support Fund Activity ID: CR00006192

Purpose: Early in the COVID-19 pandemic, government-imposed restrictions on dental practices from mid-March to mid-May 2020 effectively curtailed community practice. We analyzed utilization of a pediatric hospital emergency department (ED) for dental emergencies over the six months of maximal dental practice disruption, including dental office closures and reopening, compared to two previous years.

Methods: Records of patients presenting to the ED were analyzed for: volume, presentation time, demographics, dental emergency type and acuity, and treatment(s) provided in the ED. Study patients presented 3/15-9/15/2020; control patients presented 3/15-9/15/2019 and 3/15-9/15/2018.

Results: 138 study patients (mean age 6.4 years) and 171 controls (80 from 2018, 91 from 2019, mean age 7.0 years) were assessed. Emergency types were trauma 68%, caries 25%, and other 7% for both time periods (p=0.997). Increased ED resource use for study trauma patients included suturing (p=0.014), intravenous sedation (p=0.014), and medical radiology (p<0.001). Triage acuity ratings and presenting pain score for trauma patients did not differ: study 87.78% urgent and 72.83% no pain/mild pain versus control 92.31% urgent and 70.44 no pain/mild pain. Differences for study caries patients

were: more presented during weekday business hours (p=0.039), more identified as persons of color (p=0.006), fewer saw their dentist prior to ED presentation (p=0.024), more received sedation (p=0.001), and more received definitive care in the ED (p=0.002). Triage acuity ratings and presenting pain score for caries patients were similar: study 85.29% urgent and 73.53% no pain/mild pain versus, controls 90.48% urgent and 60.97% no pain/mild pain. A non-significant decrease in opioids prescribed at discharge was observed for the study patients.

Conclusions: Provision of care to patients with dental emergencies heightened utilization of ED resources early in the COVID-19 pandemic. Trauma patients consumed more ED services, reflecting both increased trauma severity and decreased use of the ED for minor trauma. Restricted community access to dental care disproportionally affected children of color with caries emergencies; ED presentation during weekday business hours suggests that their usual dental providers were unavailable.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Acknowledgements

I am thankful for the opportunity to work with an incredibly experienced research committee who patiently navigated the logistical challenges of the pandemic to provide a high level of guidance and mentorship. I want to personally thank Dr. Sheller, Dr. Bryan Williams, and Dr. Anne Reeves for initially identifying the need to investigate trends in increased patient volume and how the pandemic was disproportionately affecting underserved children, meeting during evening and weekend hours to discuss patient charts and assist with data abstraction, and their support and careful consideration regarding how this important information can be best presented in a way that is accessible and clear.

I want to express additional appreciation to Kristen Carlin, MPH, for her responsiveness, support, and thorough statistical analysis.

Lastly, I would like to acknowledge the Dr. Bryan Williams Endowment for Pediatric Dental Medicine Seattle Children's Hospital and Seattle Children's Research Institute Research Integration Hub Core Services Research Support Fund for providing additional funding.

DEDICATION

To Amanda, Gabriel, and Griffin Walsh: my wonderful and supportive family.

For the adventures, laughs, and perspective that allow me to be the best version of myself for my family, patients, and colleagues.

INTRODUCTION

In response to the early phase of the COVID-19 pandemic, Washington State imposed restrictions on dental practices from March 19th, 2020 through May 18th, 2020. A Governor's proclamation issued March 19, 2020 prohibited all hospitals, ambulatory surgery centers, and dental, orthodontic, and endodontic offices in Washington from providing healthcare services, procedures, and surgeries requiring personal protective equipment (PPE), which if delayed, were not anticipated to cause harm to the patient within the following three months. Hospitals and ambulatory surgical facilities were permitted to provide surgical care if delaying or canceling the procedure was anticipated to result in adverse health outcomes (e.g., tumor resection or dental treatment for infection). Essentially all non-urgent medical and dental practice was restricted (Inslee 2020).

A proclamation on April 29, 2020 clarified that non-urgent or "elective" procedures were prohibited, and that the risks of contracting COVID-19 should be weighed against risks of deferring medical/dental treatment. Determination of "harm" was left to individual clinicians. This proclamation also referenced PPE usage guidelines. Providers who treated patients outside of these guidelines were subject to criminal penalties. This proclamation allowed some dentists to return to limited or full practice depending upon interpretation of the mandate (Inslee 2020).

A May 18, 2020 proclamation effectively allowed for a full return to dental practice if guidelines were met regarding: PPE requirements, patient screening for COVID-19, and having care delivery plans that could be modified depending upon COVID-19 infection rates in a community (Inslee 2020).

Hospital emergency departments serve as a full-time resource for patients with medical and dental emergencies. Previous research has shown that 79% of patients presenting to the ED with dental related complaints could more effectively and efficiently be treated in a dental office (Chadwick 2017). Studies of patients presenting with pediatric dental emergencies to Seattle Children's Hospital (SCH) have found that children who receive care at a public health dental clinic or had no dentist/dental home were more likely to seek dental care in the ED for caries-emergencies than patients who had a private practice dental home (Rowley 2006).

Numerous studies describe ED utilization during the initial stages of the COVID-19 pandemic. Non-COVID-19 pediatric ED visits declined from January through June 2020 by rates as high as 74% compared to 2019, rebounding to only 50% of pre-pandemic levels by June 2020 (Pines 2020). A decrease in pediatric ED visits related to infectious disease was expected due to school closures,

masking, and recommendations for social distancing; accordingly, patient visits for influenza in 2020 were only 20% of 2019 visits. Unanticipated decreases have been reported for non-infectious emergencies such as appendicitis (19% lower), septicemia (49% lower), and intussusception (42% lower) (Pines 2020).

It is not clear if steep decreases in ED utilization during the early pandemic were due to lower prevalence of serious health issues or if serious medical issues were going untreated. Some initial data suggests that parents may have avoided EDs due to COVID-19 fears (Jeffrey 2020, Lazzerini 2020). Research focused upon the early pandemic reported substantial declines in ED utilization in areas where COVID-19 rates were higher, with pediatric visits showing the most substantial decrease (Hartnett 2020). Though the number of non-dental ED visits decreased, medical resource utilization during visits increased (e.g., laboratory testing, medical radiology, procedures, and medications) (Delaroche 2020).

Geographical data from 45 million smartphones between March-August 2020 showed that visits to dental offices decreased by 33%, which authors have attributed to state dental practice restriction mandates, patient fears about contracting COVID-19, and financial barriers due to the economic effect of the pandemic on families (Kranz 2021). Many COVID-19 reports in the dental literature address appropriate COVID-19 infection control and dental office practice protocols (Ayub 2020, Bahramian 2020, Falachai 2020, Izzeti 2020, Long 2020, Passraelli 2020**).**

Little to no peer reviewed literature has examined the effect of the pandemic on ED utilization for pediatric patients with dental emergencies. This study examined patients presenting to the SCH – ED with dental emergencies during the first six months of the pandemic and compared them to the same time period in 2018 and 2019.

Hypotheses

H1. The number of patients who presented to the Seattle Children's Hospital (SCH) Emergency Department (ED) with dental emergencies early in the COVID-19 Pandemic during the first six months of maximum impact on dental practice following the governor's restrictions was significantly higher than during the same time-period in the two previous years.

H2. The proportion of patients who presented to the SCH ED with dental emergencies during business hours was significantly higher during the six months of maximum impact of the governor's restrictions on dental practice during the COVID-19 Pandemic than during the same time period in the two previous years.

H3. The proportion of patients who presented to the SCH ED with caries emergencies was significantly higher during the six months of maximum impact of the governor's restrictions on dental practice during the COVID-19 Pandemic than during the same time-period in the two previous years.

H4. Complexity of emergency presentation in patients who presented to the SCH ED with dental emergencies was significantly greater during the six months of maximum impact of the governor's restrictions on dental practice during the COVID-19 Pandemic than during the same time period in the two previous years with complexity defined by utilization of medical and dental services (e.g., laboratory testing, medical radiology, medical and dental procedures completed in the ED).

METHODS

Seattle Children's Hospital (SCH) is a 407-bed tertiary-care pediatric hospital in Seattle, Washington treating patients from birth to age 21 years. The Emergency Department (ED) offers services 24 hours/day. Patients presenting to the ED are triaged by a pediatric nurse. A triage score is assigned from 1 to 5; lower numbers indicate a more acute problem. Pain is scored from 0 to 10 using a standardized scale with higher numbers indicating more severe pain. Following the nursing assessment, ED patients are evaluated by a medical resident then by an ED attending physician. Dental residents and/or attending dentists manage patients when requested by the medical team. During weekday business hours of 8am to 5pm, patients in the ED are evaluated and treated by either a pediatric dental attending or pediatric dental resident. Outside of these hours, patients are evaluated and treated by on-call dental residents with attending dentist support either remotely or in person as necessitated by the clinical presentation.

Study and control patients for this retrospective study were identified from hospital reports. (IRB# 0000619, exemption from consent due to study design). Study patients presented to the ED with dental emergencies 3/15/2020 through 9/15/2020. Control patients presented to the ED with dental emergencies 3/15/2018 through 9/15/2018 and 3/15/2019 through 9/15/2019. Inclusion criteria were: any patient evaluated and treated by the dental team in the SCH ED within the study and control date ranges. Exclusion criteria were: dental emergency patients treated outside the study period, patients managed by Oral and Maxillofacial Surgery without pediatric dentist involvement, and patients with oral complaints managed by ED physicians without pediatric dentist participation.

Data regarding each unique patient visit was manually abstracted from the patient's electronic medical record. Data was entered, stored, and managed using Institute of Translational Health Science Research Electronic Data Capture (ITHS REDCap) hosted by the University of Washington (Harris 2009).

Demographic data collected included date of birth, gender, zip code, dental home status, race/ethnicity, language of care, and payor. Race/ethnicity categories were: Asian, Pacific Islander, Black, Native American, Hispanic, White. For patients with multiple answers, the "other" category was selected. All patients declining to indicate their race/ethnicity were recorded as "unknown".

Emergency visit details included: date and time of ED check-in, triage acuity score, pain score, length of stay, whether the visit was on a holiday, referral source, total venues accessed by the patient prior to presenting to the ED, and the recommended time frame for dentist follow-up after discharge. For purposes of this study, pain was categorized as none (0), low (1-3), moderate (4-6), severe (7-9), or worst pain possible (10).

Visits were classified as either trauma, caries, or other. Trauma patients had a primary or permanent tooth injury, or soft tissue injury. Caries patients had either infection, pain, or suspected infection. "Other" patients had orthodontic issues or soft tissue lesions. Dental treatment recommended and completed was recorded. Patients were classified as healthy, behaviorally complex (e.g. autism), medically complex (e.g., hemophilia), or both. Other dental data collected was known/chronic vs acute problem and whether the patient was up to date with their dental home.

Data recorded about medical services included: medical imaging, laboratory tests, consultations with specialty providers, sedation medication administration, medications given in the ED, type of medications given, intravenous fluids or medications, discharge prescriptions, discharge/admission status, pain score (assigned by ED nurse) and triage acuity score (assigned by ED nurse as immediate, emergency, urgent, non-urgent, or minor).

Isolation protocols were recorded for patients seen in 2020. Strict isolation protocols require use of high-level PPE (such as a continuous air purifying respirators or N-95 masks), while droplet and standard protocols require a mask and face shield.

All ambiguities for data collection were resolved with a senior clinician on the research team prior to entering the data into REDCap.

Data Analysis

Poisson regression was used to compare the number of patient visits between 2018, 2019, and 2020. Descriptive statistics and knowledge about practices and protocols for the 2018 and 2019 patient group were used to determine whether the patients could be combined into a single control group.

Clinical and patient characteristics were compared between the control and sample populations. We compared study to control patients for all visits, trauma visits, and caries visits separately. Continuous variables (e.g., patient age, visit length) were assessed for normality using histograms and QQ-plots and if normally distributed, compared using t-tests. If not normally distributed, Wilcoxon Rank Sums Tests were used. Chi square or Fisher's Exact tests, where appropriate, were used for categorical variables (e.g., gender, payor, race/ethnicity/ language of care, pain score, acuity score, visit type, procedures in the ED) and for an additional category comparing the number of unique visits for white patients and patients of color. Analyses were not adjusted for multiple comparisons due to the exploratory nature of the study. A p-value of 0.05 was considered statistically significant. SAS 9.4 (Cary, NC) was used for all analyses.

Additional analysis for trauma patients were: Chi squared analysis to assess for differences in race/ethnicity, specialty consultations, whether or not the medical team completed a procedure, oral medication administration, IV medication administration, whether sedation was required, intranasal midazolam use, and whether or not the dental team performed a procedure to manage soft tissue injuries. Fisher's exact test with Monte Carlo estimates was used to assess triage acuity and pain scores. Fisher's exact test was used to assess for differences in medical radiology, lab tests, sedation medications, types of medications given, and procedure type.

Additional analysis for caries patients included: T-test to evaluate for age differences and hours in the ED; Chi squared analysis to assess for differences between white patients and patients of color, day/time in, referral source, laboratory tests, whether sedation was required, intranasal midazolam administration, medications given in the ED, type of medications given, whether IV medications were administered, and whether a primary tooth was treated. Fisher exact test with Monte Carlo estimates was used to evaluated race/ethnicity, DSHS payor type, whether the patient was current with their dentist, whether the patient had treatment pending, triage acuity score, and pain score. Fisher exact test was used to compare referral source, behavioral/medical complexity, medical radiology, sedation

medications, medications given, whether a permanent tooth required treatment, type of treatment rendered, prescriptions given for home, and discharge status.

Patients with the dental emergency classification of "other" were not compared between individual years due to small sample sizes.

RESULTS

Control Patients

A total of 171 patients presented to the ED with dental complaints in the control period (80 patients from 3/15/2018 - 9/15/2018 and 91 patients from 3/15/2019 – 9/15/2019) (Figure 1). Patients in 2018 and 2019 were very similar and there were no major changes in ED practice protocols between the years. Thus, for all comparisons to the 2020 study group, 2018 and 2019 patients were grouped into a single control group.

All Patients with Dental Emergencies

A total of 138 patients presented to the ED with dental complaints in the study period (between 3/15/2020 and 9/15/2020) (Figure 1). There were no significant differences in emergency types between study and control periods; emergencies were: trauma 68%, caries 25%, and other 7% for both time periods (p=0.997). Mean patient age for study patients was 6.35 years (SD=3.61) and for controls was 6.98 (SD=4.19, p=0.164). The percentage of male patients exceeded females in both periods (study 57.97%, control 61.4%, p=0.541). Race/ethnicity was analyzed by white or person of color (study 52.31% white, control 62.42% white, p= 0.084). Few patients required interpreters: study 10.9%, control 9.4% (p=0.66).

Payor did not significantly differ: study patients: 50% private insurance, 45.65% DSHS, 4.35% no coverage; for controls 49.71% DSHS, 47.37% private insurance, 2.92% no coverage (p=0.668). A large majority of patients presented outside of normal business hours: study 89.13%, control 84.8% (p=0.264). Total medical/dental venues visited prior to presenting to the SCH ED for study patients were: 66.7% zero venues, 28.3% one venue, 4.3% two venues, 0.7% three venues. Control patient total venues were: 57% zero venues, 39% one venue, 3% two venues, 1% three or more venues (p=0.106). The mean number of hours spent in the ED for patients who were not admitted to the hospital was 4.37 hours for study patients versus 4.09 hours for control patients (p=0.11). Dental home status for study patients was 54.62% private practice, SCH/OBCC/UW 15.22%, no current dentist 11.59%, 10.14% public health clinics,

and 9.42% first visit ever. Dental home status for control patients was 67.84% private practice, SCH/OBCC/UW 10.53%, no current dentist 8.77%, 6.43% public health clinics, and first visit ever 6.43% (p=0.157) (Tables 1 and 2).

Patients with Trauma Emergencies

Ninety-four study patients and 117 controls had trauma emergencies. No differences were found between study and control groups for age (study mean= 6.42 years, control mean= 6.92 years), gender (study 60.64% male, control 60.68% male), or percentages of white patients versus persons of color (study: white 60.67%, persons of color 39.33%; control white 63.89%, persons of color 36.11%). (p=0.643). Payor mix for study patients was: 60.64% private, 34.04% DSHS, and 5.32% no coverage. Payor mix for control patients was: 58.97% private, 37.61% DSHS, 3.42% no coverage (Table 3).

Nearly all patients presented directly to the SCH ED following dental trauma. Triage acuity classifications did not differ significantly: 87.78% of study patients were urgent and 92.31% of controls were urgent, (p=0.425). Pain score classifications were also similar between study and control patients: 72.83% of study patients and 70.44% of controls had either no pain or mild pain on presentation to the ED. During both time periods, most patients had no medical and behavioral complexity: for control patients 10.26% behaviorally complex, 12.82 medically complex, 17.09 both behaviorally and medical complex; for study patients 6.38% behaviorally complex (p=0.317), 6.38 medically complex (p=0.121), both behaviorally and medical complex 17.09% (p=9.57) (Table 5).

Significant differences were found between study and control patients for many medical services provided by the ED team: medical diagnostic radiology (e.g. CT scan, radiographs of non-head/neck injuries), laboratory tests, specialty consultations, procedures (e.g. extraoral suturing, wound irrigation, placement of casts/splints by orthopedics.), sedation agent, and intravenous administration of medications (Table 6).

In 2020, medical diagnostic radiology increased (study 19.15%, control 2.56%, p<0.001). Laboratory tests were more frequently done in 2020 (study 14.89%, control 0.85%, p<0.001). The number of procedures completed by the medical team increased in 2020 (study 20.21%, control 8.55%, p=0.014). Intravenous medication administration increased: study 14.89%, control 5.13% (p=0.016) (Table 6).

Sedation was the most common medical service provided to dental trauma patients in both time periods: (study 44.68%, controls 41.88%, p=0.683). Use of ketamine for sedation increased in 2020:

28.57% of study patients vs. 8.16% of control patients (p=0.014). There were no other differences in sedation medications or administration between study and control periods (Table 6).

The only significant difference in dental treatment provided between study and control patients was an increase in patients with soft tissue injuries requiring irrigation/suturing: 16.3% study vs. 6.9% control patients (p=0.032). All other dental management was consistent between time periods (Table 7).

Among patients presenting for trauma, droplet/standard precautions were required for 97.22% of patients and strict precautions were required for 3.19% of patients. The total time in the ED for patients with dental trauma did not appreciably change. Study patients spent an average of 4.26 hours (SD=1.49), and average visit length for controls was 3.96 hours (SD=1.39, p=0.132). The number of opioid prescriptions at discharge significantly decreased: 1.92% of study patients and 17.54% of control patients received prescriptions for opioids (p=0.009) (Tables 3 and 8).

Patients with Caries Emergencies

No differences were found between study and control groups for age (study mean age 6.38 years, control mean age 6.86 years, p=0.584), gender (study 52.94% male, control 69.05% male, p=0.151), need for interpreter (study 14.71%, controls 14.29%, p=0.959), or payor (study 70.59% Medicaid, control 78.57% Medicaid, p=0.959). Significantly more study patients identified as persons of color: 69.7% versus 36.84% of controls, p=0.006 (Table 9).

A large majority of patients in both groups had triage acuity rated “urgent”: study 85.29%, controls 90.48%, (p=0.749). Pain score at presentation was also similar between study and control patients: 73.53% of study patients and 60.97% of controls had either no pain or mild pain on presentation to the ED. During both time periods, most patients had no medical and behavioral complexity: 70.59% of study patients and 73.67% of control patients were healthy (Table 11).

A higher percental of study patients presented outside of business hours (study 85.29%, controls 64.29%, p=0.039). Most patients in 2020 came directly to the ED rather than first being evaluated at dental office, urgent care, or outside hospital: median venues prior to ED for study patients = 0, median venues prior to ED for controls = 1, p<0.001 (Table 9). Fewer study patients with caries were initially seen then referred to the ED by their dentist (study 8.82%, controls 30.95%, p=0.024). Although the percentage of patients with dental homes in private practice decreased (study 47.06%, control 64.29%), this difference was not statistically significant p=0.456 (Table 10).

The number of children with known caries/infection showed a significant increase in the study period: 100% of the parents of study patients with caries were aware of a documented/diagnosed dental problem, compared to only 81% of parents of control patients (p=0.007). Percentages of patients planned for treatment of caries in a clinic or under general anesthesia did not differ between study and control time periods (Table 10).

The only significant difference found between study and control patients for medical services provided by the ED team was that 85.3% of study patients versus 50% of control patients received sedation (p=0.001). No differences between patient groups were found for medical diagnostic radiology, laboratory tests, specialty consultations, procedures, sedation agents, medications given in the ED, or intravenous administration of medications. While admission to hospital from the ED for IV antibiotics increased to five patients in the study from three patients in the control group, this difference was not significant (p=0.455) (Table 12).

In both study and control patient groups, the most frequent dental treatment was extraction of a primary tooth, p=0.434 (Table 13).

For patients presenting with caries, 73.53% required droplet/standard isolation protocols and 26.47% required strict isolation. The total time spent in ED by patients with caries did not change: study mean 4.7 hours (SD=1.52) versus control mean 4.62 hours (SD=1.74), p=0.842. Although prescription of opioids at discharge decreased: study 0%, controls 21.74%, this was not significant, p=0.061 (Table 14).

DISCUSSION

This study examined a group of pediatric patients who sought care for dental emergencies at a hospital ED in the early months of the COVID-19 pandemic and analyzed how these patients used ED resources. The study period includes the ten-week initial dental practice closure per government mandates and the four months of return to practice. Multiple studies have shown decreases in patient visits to the ED for non-dental reasons during the early months of the pandemic (Hartnett 2020, Jeffrey 2020, Pines 2021).; one study reported an increased service utilization by patients while at the ED (DeLaroche 2021).

Dentists at the study hospital noted increased demand for dental services in the ED during the pandemic beyond previous approximately 5% yearly increases in dental ED patient volumes. Some initial data showed decreases in dental office visits early in the pandemic, however there are no known studies on how this may have affected dental visits to the ED (Kranz 2021). Our findings validated anticipated

marked increased patient volumes and increased use of ED resources during visits for dental emergencies. Surprisingly, the proportion of patients with trauma versus caries versus other dental emergencies and the percentage of patients presenting outside of business hours did not differ from the control time period.

Trauma patients presented in 2020 with similar characteristics to previous years: mean age six years, male, white, healthy, privately insured, had a private practice dentist, and came directly to the ED as a self-referral. Interestingly, the study patients with trauma received more medical and dental services while in the ED compared to controls. More patients had medical diagnostic radiology, laboratory tests, procedures completed by the medical team, soft tissue injuries requiring irrigation and/or sutures by the medical team, and ketamine sedation when sedation was utilized. Increased services could be due to more severe trauma presentations and/or the ED/dental teams chose to provide more diagnostic services and definitive care with the understanding that patients would have difficulty accessing follow up dental care following discharge from the ED. The increased volume of dental trauma patients and possible increased severity may have been due to children functioning in a remote learning environment with increased time at home for unstructured play. Interestingly, during a similar time period as our study, one AAPD publication actually noted decreased ED visits due to (non-dental) acute trauma (DeLaroche 2021). It would seem that during a time when schools and playgrounds were closed and organized athletic events were shut down, children were still sustaining dental trauma in our community at a high level. Due to an increased level of severity of trauma presentation, it's possible that parents of children with more minor injuries may have elected to self-monitor and avoid the ED.

Dental caries is a progressive disease. Notably, 100% of parents of patients with caries emergencies were aware of a dental issue prior to seeking care in the ED. The effects of preventing patients from accessing routine care are incalculable: had practices remained open, it is likely that many children with dental caries would have received treatment prior to development of symptoms.

We attribute the increased volume of patients with caries emergencies to multiple factors. When practices were closed or operating at limited capacity due to mandates, more children with caries emergencies presented to the ED during normal business hours on weekdays. Fewer children saw their dentist prior to presenting to the ED. It seems clear that many patients came directly to the ED when, without practice restrictions, their dentists would have typically taken care of them. Imposing dental practice restrictions disproportionately affected children of color with caries emergencies, as these

children presented in higher proportion than in control periods. In our area, many patients with Medicaid receive care through public health clinics. It is possible that private practices were better equipped to meet the needs of their patients with caries emergencies in terms of personal protective equipment and dentist autonomy to interpret government practice restrictions on a case-by-case basis, while public health clinics were subjected to more oversight and may have lacked ability to interpret the guidelines to consider care for an individual patient.

Once patients with caries were in the ED, more received sedation and extractions. Our data suggests that the hospital medical and dental teams were provided more definitive care to patients with dental infection during the early pandemic. Providers had been coached by hospital leadership to consider barriers to post-ED discharge access to care when deciding whether or not to perform treatment in the hospital.

Incidentally, our data captured a trend of decreased opioid prescriptions for all patients with dental emergencies upon discharge from the SCH ED in 2020. This overlaps with a requirement for three hours of opioid training prior to renewal of professional state licensure. In terms of dental patients, this data reflects the successful implementation of policies to combat the prescription opioid epidemic.

In comparison to dental care in a dental clinic, it is clear that dental treatment in the ED is inefficient. Visits can be over four hours and each patient can have at least seven providers participating in their care: nurse, medical resident, fellow, medical attending, two pediatric dental residents, an attending dentist, and any other specialty services required (e.g. Child Life, oral surgery, otolaryngology, plastic surgery). For patients who can be treated in a regular dental clinical setting, ensuring that there is appropriate access and resources may help relieve the strain on hospital resources and dramatically reduce the time commitment and financial burden for patients and families.

Other factors may have contributed to this influx of dental patients to the ED. Initial evidence about COVID-19 included limited data on transmissibility, time was needed to develop practice protocols, and many dentists were donating high level PPE to hospitals to help reduce shortages. One case study has suggested that families may have been avoiding timely care in hospitals for serious medical issues due to fear of infection with COVID-19 (Lazzerini 2021). Even as dental practices began returning to more regular operation, some families may have assumed that practices were still closed or avoided dental care until absolutely necessary due to fears of contracting COVID-19. Any patient with a fever, be it dental disease or viral in nature, would not have passed screening protocols at dental offices

when operation was resumed and these patients are still being advised to seek care in the ED due to access to negative pressure rooms, high-level PPE, and COVID-19 testing. Today, we know with confidence that enhanced infection control protocols in dental offices are effective. COVID-19 transmission from patients to dentists is likely quite low, as less than 1% of practicing dentists contracted COVID-19 according to the Journal of the American Dental Association (Estrich 2020).

There are limitations due to the retrospective nature of the study. Not all variables of interest were consistently documented. Not all patients presenting to the SCH ED with dental concerns were seen by the dental team and included in the study, as patients with minor issues are triaged and managed by the medical team without involving dentistry.

Conclusions

Significantly more patients sought care at the SCH ED for dental problems during the early pandemic. The ED medical and dental teams served as a safety net for the public health and private practice dental community during the early pandemic, particularly for children of color with dental caries. Possible strain on tertiary medical facilities and resources should be considered when closing venues for management of routine dental emergencies; it would have been more time efficient, cost-effective and less resource intensive to manage patients with dental emergencies within their dental homes.

Table 1. Demographic information and characteristics of all patients presenting to the SCH ED with dental emergencies

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Age	171		138		T-Test	0.164
Mean	6.98		6.35			
SD	4.19		3.61			
Range	0.00-19.77		0.85-15.41			
Gender						
Male	105	61.4	80	57.97	Chi Square	0.541
Female	66	38.6	58	42.03		
Race/Ethnicity						
Asian	18	10.53	14	10.14	Fisher Exact Test with Monte Carlo Estimates	0.005
Pacific islander	0	0	2	1.45		
Black	10	5.85	17	12.32		
Native American	0	0	5	3.62		
Hispanic	15	8.77	19	13.77		
White	98	57.31	68	49.28		
Other	16	9.36	5	3.62		
Unknown	14	8.19	8	5.8		
Race/Ethnicity						
White	98	62.42	68	52.31	Chi Square	0.084
Person of Color	59	37.58	62	47.69		
Payor						
DSHS	85	49.71	63	45.65	Chi Square	0.668
Private	81	47.37	69	50		
No Coverage	5	2.92	6	4.35		
Interpreter	16	9.4	15	10.9	Chi Square	0.66
Type of Emergency						
Trauma	117	68.42	94	68.12	Chi Square	0.997
Caries	42	24.56	34	24.64		
Other	12	7.02	10	7.25		

Table 2. Additional demographic data and patient characteristics for all patients presenting to the SCH ED with dental emergencies

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Day & Time In						
8am-5pm Monday-Friday	26	15.2	15	10.87	Chi Square	0.264
Off-Hours (Evening, Weekends, Holidays)	145	84.8	123	89.13		
Total Venues Before ED					Wilcoxon Rank Sums	0.106
Median	0		0			
IQR	1		1			
Range	0-4		0-3			
Hours in ED	171		138		T-Test	0.11
Mean	4.09		4.37			
SD	1.5		1.49			
Range	0.80-10.10		1.40-9.60			
Dental Home						
CPD/OBCC/SCH	18	10.53	21	15.22	Chi Square	0.157
Community Clinic	11	6.43	14	10.14		
Private Practice	116	67.84	74	53.62		
No current dentist	15	8.77	16	11.59		
First visit ever	11	6.43	13	9.42		

Table 3. Demographic information for patients with dental trauma

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Age	117		94			
Mean	6.92		6.42			
SD	3.97		3.74			
Range	0.74-18.27		0.85-15.26			
Gender						
Male	71	60.68	57	60.64		
Female	46	39.32	37	39.36		
Race/Ethnicity						
Asian	13	11.11	10	10.64	Did not test	
Pacific islander	0	0	2	2.13		
Black	5	4.27	9	9.57		
Native American	0	0	3	3.19		
Hispanic	8	6.84	9	9.57		
White	69	58.97	54	57.45		
Other	13	11.11	2	2.13		
Unknown	9	7.69	5	5.32		
Race/Ethnicity						
White	69	63.89	54	60.67	Chi Square	0.643
Person of Color	39	36.11	35	39.33		
Payor						
DSHS	44	37.61	32	34.04	Did not test	
Private	69	58.97	57	60.64		
No Coverage	4	3.42	5	5.32		
Interpreter	8	6.84	7	7.45	Did not test	
Day & Time In						
8am-5pm Monday-Friday	7	5.98	8	8.51	Did not test	
Off-Hours (Evening, Weekends, Holidays)	110	94.02	86	91.49		
Total Venues Before ED						
Median	0		0		Did not test	
IQR	1		1			
Range	0-2		0-2			
Hours in ED						
Mean	3.96		4.26		T-Test	0.132
SD	1.39		1.49			
Range	0.80-10.10		1.40-8.60			

Table 4. Dental history for patients presenting with dental trauma

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Dental Home						
CPD/OBCC/SCH	10	8.55	11	11.7	Did not test	
Community Clinic	4	3.42	8	8.51		
Private Practice	84	71.79	54	57.45		
No current dentist	11	9.4	11	11.7		
First visit ever	8	6.84	10	10.64		
Referral Source						
Dentist unavailable/refused	10	8.55	14	14.89	Did not test	
SCH/OBCC/CPD	4	3.42	3	3.19		
Community clinic	0	0	0	0		
Dentist saw + referred	4	3.42	2	2.13		
Self-referred	66	56.41	45	47.87		
Another ED/UC	33	28.21	31	32.98		
PCP referred patient	1	0.85	3	3.19		

Table 5. Dental trauma patient presentation

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Triage Acuity Score						
1 Immediate	0	0	0	0	Fisher Exact Test with Monte Carlo Estimates	0.425
2 Emergency	5	4.27	4	4.44		
3 Urgent	108	92.31	79	87.78		
4 Non-Urgent	4	3.42	7	7.78		
5 Minor	0	0	0	0		
Pain Score						
0	57	49.57	41	44.57	Fisher Exact Test with Monte Carlo Estimates	0.259
1-3	24	20.87	26	28.26		
4-6	27	23.48	17	18.48		
7-9	5	4.35	8	8.7		
10	2	1.74	0	0		
Behaviorally Complex	12	10.26	6	6.38	Chi Square	0.317
Medically Complex	15	12.82	6	6.38	Chi Square	0.121
Behaviorally and/or Medically Complex	20	17.09	9	9.57	Chi Square	0.115

Table 6. Medical treatment for patients with dental trauma

Radiology (Medical)	**3**	**2.56**	**18**	**19.15**	**Fisher's Exact Test**	**<0.001**
Laboratory Tests	1	0.85	14	14.89	Fisher's Exact Test	<0.001
Laboratory Tests						
COVID Test	0	0	11	78.57	Did not test	
Other	1	100	3	21.43		
Consultations (Aside from Dental)	6	5.13	9	9.57	Chi Square	0.212
Consultations Service						
Oral Surgery	4	66.67	2	22.22	Did not test	
ENT	0	0	0	0		
Other	2	33.33	8	88.89		
Procedure Completed by Medical Team	10	8.55	19	20.21	Chi Square	0.014
Sedation	49	41.88	42	44.68	Chi Square	0.683
Sedation Medication Given in ED						
Ketamine	4	8.16	12	28.57	Fisher's Exact Test	0.014
Nasal Midazolam	43	87.76	32	76.19	Chi Square	0.149
Nitrous Oxide	0	0	0	0		
Morphine	1	2.04	3	7.14	Fisher's Exact Test	0.332
Other	2	4.08	1	2.38	Fisher's Exact Test	1
IV Midazolam	2	4.08	0	0	Fisher's Exact Test	0.497
Fentanyl	2	4.08	1	2.38	Fisher's Exact Test	1
Medications Given in the ED	57	48.72	52	55.32	Chi Square	0.34
Medication Type Given in the ED						
Ibuprofen/Acetaminophen	43	75.44	35	67.31	Chi Square	0.347
Antibiotics (PO)	3	5.26	2	3.85	Fisher's Exact Test	1
Antibiotics (IV or IM)	0	0	3	5.77	Fisher's Exact Test	0.105
Opioid	10	17.54	1	1.92	Fisher's Exact Test	0.009
Other	15	26.32	15	28.85	Chi Square	0.768
Ondansetron	9	15.79	14	26.92	Chi Square	0.155
IV fluids (dehydration)	2	3.51	4	7.69	Fisher's Exact Test	0.422
IV Medication Given	6	5.13	14	14.89	Chi Square	0.016

Table 7. Dental treatment for patients with dental trauma

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Permanent Tooth Requiring Tx	47	40.52	31	33.7	Chi Square	0.313
Treatment for Permanent Tooth						
Splint	27	57.45	13	41.94	Chi Square	0.18
Palliative Restoration	23	48.94	21	67.74	Chi Square	0.101
Extraction	3	6.38	0	0	Fisher's Exact Test	0.272
Open/Broach	1	2.13	0	0	Fisher's Exact Test	1
Other	0	0	0	0		
Primary Tooth Requiring Tx	43	37.07	29	31.52	Chi Square	0.404
Treatment for Primary Tooth						
Splint	0	0	0	0		
Palliative restoration	0	0	0	0		
Extraction	42	97.67	28	96.55	Fisher's Exact Test	1
Open/broach	0	0	0	0		
Other	1	2.33	1	3.45	Fisher's Exact Test	1
Soft Tissue Requiring Dental Procedure	8	6.9	15	16.3	Chi Square	0.032

Table 8. Discharge information for patients with dental trauma

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Overnight Admission for IV ABX	0	0	1	1.06	Did not test	
Rx Given for Home by ED	37	31.62	34	36.17	Did not test	
Rx Type Given						
Antibiotics	12	32.43	11	32.35	Did not test	
Opioid Analgesic	4	10.81	1	2.94		
Non-Opioid Analgesic	11	29.73	6	17.65		
CHX Rinse	20	54.05	23	67.65		
Other	4	10.81	4	11.76		
Covid-19 Category (2020 only)						
Tx Cancelled/Delayed due to COVID	0	0	0	0	Did not test	
Office Closed Due to COVID	0	0	1	1.06		
COVID Not a Factor	117	100	70	74.47		
Unknown COVID Effect	0	0	23	24.47		
Discharge Status						
Home	117	100	93	98.94	Did not test	
Inpatient Admission	0	0	1	1.06		
Timeliness of Follow-Up Needed						
Within 1 month (ASAP)	113	96.58	83	88.3	Did not test	
Greater than 1 month (not time sensitive)	4	3.42	11	11.7		
Isolation Protocols (2020 only)						
Strict			3	3.19		
Droplet			86	91.49		
Airborne Strict			0	0		
Standard			5	5.32		

Table 9. Demographic information for patient with caries/dental infection

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Age	42		34			
Mean	6.86		6.38		T-Test	0.584
SD	4.28		3.13			
Range	0.20-19.77		1.95-14.17			
Gender						
Male	29	69.05	18	52.94	Chi Square	0.151
Female	13	30.95	16	47.06		
Race/Ethnicity						
Asian	4	9.52	2	5.88	Fisher Exact Test with Monte Carlo Estimates	0.038
Pacific islander	0	0	0	0		
Black	5	11.9	7	20.59		
Native American	0	0	2	5.88		
Hispanic	4	9.52	9	26.47		
White	24	57.14	10	29.41		
Other	1	2.38	3	8.82		
Unknown	4	9.52	1	2.94		
Race/Ethnicity						
White	24	63.16	10	30.3	Chi Square	0.006
Person of Color	14	36.84	23	69.7		
Payor						
DSHS	33	78.57	24	70.59	Fisher Exact Test with Monte Carlo Estimates	0.415
Private	8	19.05	10	29.41		
No Coverage	1	2.38	0	0		
Interpreter	6	14.29	5	14.71	Chi Square	0.959
Day & Time In						
8am-5pm Monday-Friday	15	35.71	5	14.71	Chi Square	0.039
Off-Hours (Evening, Weekends, Holidays)	27	64.29	29	85.29		
Total Venues Before ED						
Median	1		0		Wilcoxon Rank Sums	<0.001
IQR	1		1			
Range	0-4		0-3			

Table 10. Dental history for patients with caries

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Dental Home						
CPD/OBCC/SCH	3	7.14	6	17.65	Fisher Exact Test with Monte Carlo Estimates	0.456
Community Clinic	7	16.67	6	17.65		
Private Practice	27	64.29	16	47.06		
No current dentist	3	7.14	5	14.71		
First visit ever	2	4.76	1	2.94		
Referral Source						
Dentist unavailable/refused	1	2.38	3	8.82	Fisher's Exact Test	0.319
SCH/OBCC/CPD	0	0	3	8.82	Fisher's Exact Test	0.085
Community clinic	0	0	0	0		
Dentist saw + referred	13	30.95	3	8.82	Fisher's Exact Test	0.024
Self-referred	23	54.76	19	55.88	Chi Square	0.922
Another ED/UC	4	9.52	6	17.65	Fisher's Exact Test	0.328
PCP referred patient	1	2.38	1	2.95	Fisher's Exact Test	1
Parent Aware of Problem	34	80.95	34	100	Fisher's Exact Test	0.007
Most Recent Visit						
Within 6 months	35	89.74	18	75	Fisher Exact Test with Monte Carlo Estimates	0.125
6-12 months	0	0	3	12.5		
Greater than 1 year	2	5.13	2	8.33		
Never	2	5.13	1	4.17		
Treatment Pending						
No Tx pending	5	12.5	3	8.82	Fisher Exact Test with Monte Carlo Estimates	0.605
Known issue (no Tx planned)	22	55	23	67.65		
Waiting for Tx by dentist	4	10	4	11.76		
Waiting for Tx by SCH/CPD	4	10	3	8.82		
Waiting for GA date	5	12.5	1	2.94		

Table 11. Caries patient presentation

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Triage Acuity Score						
1 Immediate	0	0	0	0	Fisher Exact Test with Monte Carlo Estimates	0.749
2 Emergency	1	2.38	2	5.88		
3 Urgent	38	90.48	29	85.29		
4 Non-Urgent	3	7.14	3	8.82		
5 Minor	0	0	0	0		
Pain Score						
0	19	46.34	13	38.24	Fisher Exact Test with Monte Carlo Estimates	0.359
1-3	11	26.83	12	35.29		
4-6	6	14.63	4	11.76		
7-9	4	9.76	1	2.94		
10	1	2.44	4	11.76		
Behaviorally Complex	5	11.9	3	8.82	Fisher's Exact Test	0.725
Medically Complex	6	14.29	5	14.71	Fisher's Exact Test	1
Both Medically and Behaviorally Complex	3	7.14	2	5.88	Fisher's Exact Test	1

Table 12. Medical treatment for patients with caries

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Radiology (Medical)	3	7.14	3	8.82	Fisher's Exact Test	1
Laboratory Tests	6	14.29	9	26.47	Chi Square	0.185
Laboratory Tests						
COVID Test	0	0	8	88.89	Did not test	
Other	6	100	6	66.67		
Consultations (Aside from Dental)	5	11.9	4	11.76	Did not test	
Consultations Service						
Oral Surgery	5	100	1	25	Did not test	
ENT	1	20	0	0		
Other	1	20	3	75		
Procedure Completed by Medical Team	0	0	1	2.94	Did not test	
Sedation	21	50	29	85.3	Chi Square	0.001
Sedation Medication Given in ED						
Ketamine	4	19.05	6	20.69	Fisher's Exact Test	1
Nasal Midazolam	15	71.43	24	82.76	Chi Square	0.34
Nitrous Oxide	0	0	0	0	N/A	
Morphine	0	0	0	0	N/A	
Other	0	0	1	3.45	Fisher's Exact Test	1
IV Midazolam	3	14.29	1	3.45	Fisher's Exact Test	0.297
Fentanyl	2	9.52	2	6.9	Fisher's Exact Test	1
Medications Given in the ED	30	71.43	21	61.76	Chi Square	0.373
Medication Type Given in the ED						
Ibuprofen/Acetaminophen	18	60	17	80.95	Chi Square	0.113
Antibiotics (PO)	4	13.33	2	9.52	Fisher's Exact Test	1
Antibiotics (IV or IM)	11	36.67	7	33.33	Chi Square	0.806
Opioid	5	16.67	2	9.52	Fisher's Exact Test	0.685
Other	3	10	3	14.29	Fisher's Exact Test	0.68
Ondansetron	5	16.67	8	38.1	Chi Square	0.084
IV fluids (dehydration)	4	13.33	2	9.52	Fisher's Exact Test	1
IV Medication Given	12	28.57	10	29.41	Chi Square	0.936

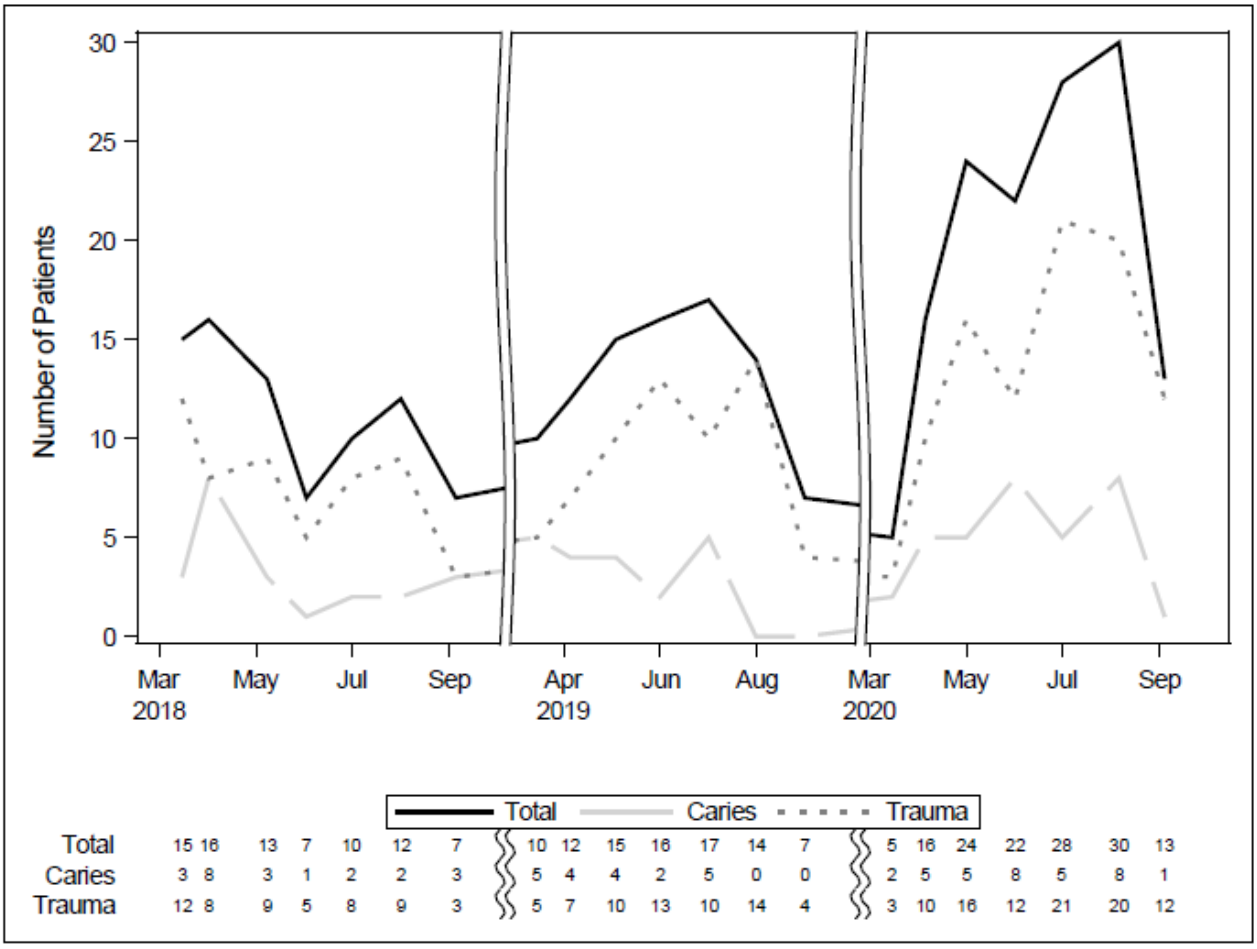
Table 13. Dental treatment for patients with caries

	2018-2019		2020		Test	p-Value
	n	%	n	%		
Permanent Tooth Requiring Tx	1	2.38	1	2.94	Fisher's Exact Test	1
Treatment for Permanent Tooth						
Splint	0	0	0	0	N/A	
Palliative Restoration	0	0	0	0	N/A	
Extraction	1	100	1	100	N/A	
Open/Broach	0	0	0	0	N/A	
Other	0	0	0	0	N/A	
Primary Tooth Requiring Tx	23	54.76	30	88.24	Chi Square	0.002
Treatment for Primary Tooth						
Splint	0	0	0	0	N/A	
Palliative restoration	0	0	1	3.33	Fisher's Exact Test	1
Extraction	22	95.65	30	100	Fisher's Exact Test	0.434
Open/broach	0	0	0	0	N/A	
Other	1	4.35	0	0	Fisher's Exact Test	0.434
Soft Tissue Requiring Dental Procedure	0	0	0	0	N/A	

Table 14. Discharge information for patients with caries

Overnight Admission for IV ABX	**3**	**7.14**	**5**	**14.71**	**Fisher's Exact Test**	**0.455**
Rx Given for Home by ED	23	54.76	17	50	Chi Square	0.679
Rx Type Given						
Antibiotics	18	78.26	15	88.24	Fisher's Exact Test	0.677
Opioid Analgesic	5	21.74	0	0	Fisher's Exact Test	0.061
Non-Opioid Analgesic	5	21.74	6	35.29	Fisher's Exact Test	0.477
CHX Rinse	0	0	0	0	N/A	
Other	1	4.35	0	0	Fisher's Exact Test	1
Covid-19 Category (2020 only)						
Tx Cancelled/Delayed due to COVID	0	0	8	23.53	Did not test	
Office Closed Due to COVID	0	0	1	2.94		
COVID Not a Factor	42	100	13	38.24		
Unknown COVID Effect	0	0	12	35.29		
Discharge Status						
Home	39	92.86	28	82.35	Fisher's Exact Test	0.284
Inpatient Admission	3	7.14	6	17.65		
Timeliness of Follow-Up Needed						
Within 1 month (ASAP)	41	97.62	32	94.12	Did not test	
Greater than 1 month (not time sensitive)	1	2.38	2	5.88		
Isolation Protocols (2020 only)						
Strict			9	26.47	Did not test	
Droplet			23	67.65		
Airborne Strict			0	0		
Standard			2	5.88		

Figure 1. Total number of patient visits by emergency type, month, and year



REFERENCES

Ayub K, Alani A. Acute endodontic and dental trauma provision during the COVID-19 crisis [published correction appears in Br Dent J. 2020 Oct;229(8):555]. *Br Dent J*. 2020;229(3):169-175. doi:10.1038/s41415-020-1920-0

Bahramian H, Gharib B, Baghalian A. COVID-19 Considerations in Pediatric Dentistry. *JDR Clin Trans Res*. 2020;5(4):307-311. doi:10.1177/2380084420941503

Chadwick S, Sheller B, Schiff M. (2017). A comparison of patient and dental condition characteristics presenting to a pediatric hospital emergency department versus urgent care with non-emergency dental complaints (Unpublished masters thesis). University of Washington

DeLaroche AM, Rodean J, Aronson PL, et al. Pediatric Emergency Department Visits at US Children's Hospitals During the COVID-19 Pandemic. *Pediatrics*. 2021;147(4):e2020039628. doi:10.1542/peds.2020-039628

Estrich CG, Mikkelsen M, Morrissey R, et al. Estimating COVID-19 prevalence and infection control practices among US dentists. *J Am Dent Assoc*. 2020;151(11):815-824. doi:10.1016/j.adaj.2020.09.005

Falahchai M, Babaee Hemmati Y, Hasanzade M. Dental care management during the COVID-19 outbreak. *Spec Care Dentist*. 2020;40(6):539-548. doi:10.1111/scd.12523

Hartnett KP, Kite-Powell A, DeVies J, et al. Impact of the COVID-19 Pandemic on Emergency Department Visits - United States, January 1, 2019-May 30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(23):699-704. Published 2020 Jun 12. doi:10.15585/mmwr.mm6923e1

Insley J. PROCLAMATION BY THE GOVERNOR AMENDING PROCLAMATION 20-05, 20-24 RESTRICTIONS ON NON URGENT MEDICAL PROCEDURES. State of Washington. March 2020.

Insley J. Interpretive Statement Related to Proclamation by the Governor 20-24, Restrictions on Non Urgent Medical Procedures. State of Washington. April 2020.

Insley J. PROCLAMATION BY THE GOVERNOR AMENDING AND EXTENDING PROCLAMATIONS 20-05 AND 20-24. 20-24.1. Reducing Restrictions on, and Safe Expansion of, Non-Urgent Medical and Dental Procedures. State of Washington. May 2020.

Izzetti R, Nisi M, Gabriele M, Graziani F. COVID-19 Transmission in Dental Practice: Brief Review of Preventive Measures in Italy. *J Dent Res*. 2020;99(9):1030-1038. doi:10.1177/0022034520920580

Jeffery MM, D'Onofrio G, Paek H, et al. Trends in Emergency Department Visits and Hospital Admissions in Health Care Systems in 5 States in the First Months of the COVID-19 Pandemic in the US. *JAMA Intern Med*. 2020;180(10):1328-1333. doi:10.1001/jamainternmed.2020.3288

Kranz AM, Chen A, Gahlon G, Stein BD. 2020 trends in dental office visits during the COVID-19 pandemic. *J Am Dent Assoc*. 2021;152(7):535-541.e1. doi:10.1016/j.adaj.2021.02.016

Lazzerini M, Barbi E, Apicella A, Marchetti F, Cardinale F, Trobia G. Delayed access or provision of care in Italy resulting from fear of COVID-19. *Lancet Child Adolesc Health*. 2020;4(5):e10-e11. doi:10.1016/S2352-4642(20)30108-5

Long RH, Ward TD, Pruett ME, Coleman JF, Plaisance MC Jr. Modifications of emergency dental clinic protocols to combat COVID-19 transmission. *Spec Care Dentist*. 2020;40(3):219-226. doi:10.1111/scd.12472

Passarelli PC, Rella E, Manicone PF, Garcia-Godoy F, D'Addona A. The impact of the COVID-19 infection in dentistry. *Exp Biol Med (Maywood)*. 2020;245(11):940-944. doi:10.1177/1535370220928905

Pines JM, Zocchi MS, Black BS, et al. Characterizing pediatric emergency department visits during the COVID-19 pandemic. *Am J Emerg Med*. 2021;41:201-204. doi:10.1016/j.ajem.2020.11.037

Rowley ST, Sheller B, Williams BJ, Mancl L. Utilization of a hospital for treatment of pediatric dental emergencies. *Pediatr Dent*. 2006;28(1):10-17.