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## CLINICAL RESEARCH

# Clinical Response to COVID-19 and Utilization of an Emergency Dental Clinic in an Academic Institution



## SIGNIFICANCE

Severe pain from pulpal inflammation was the most common dental emergency observed in an emergency dental clinic during the initial surge of COVID-19 cases in Massachusetts, accounting for 27.7% of clinical encounters.

## ABSTRACT

**Introduction:** The spread of coronavirus disease 2019 (COVID-19) in the spring of 2020 resulted in the temporary suspension of elective dental procedures and clinical dental education in academic institutions. This study describes the use of the Tufts University School of Dental Medicine emergency dental clinic during the peak surge in COVID-19 cases in Massachusetts, highlighting the number of endodontic emergencies. **Methods:** Aggregate data from clinical encounters and call records to an emergency triage phone line from March 30 through May 8, 2020, were used to describe the characteristics of dental emergencies, clinical encounters, and procedures performed. **Results:** A total of 466 patient interactions occurred during this period, resulting in 199 patients advised by phone and 267 clinical encounters. The most common dental emergencies were severe dental pain from pulpal inflammation (27.7% of clinical encounters) followed by a surgical postoperative visit (13.1%). The most frequent procedures were extractions (13.9% of clinical encounters) and surgical follow-up (13.5%); 50.2% of the clinical encounters were categorized as aerosol generating, and 86.1% of encounters would have required treatment in a hospital emergency department if dental care was not available. There were no known transmissions of severe acute respiratory syndrome coronavirus-2 among clinic providers, patients, or staff during this period. **Conclusions:** These results highlight the importance of endodontic diagnosis and treatment in the provision of emergency dental care during a pandemic and demonstrate that dental treatment can be provided in a manner that minimizes the risk of viral transmission, maintaining continuity of care for a large patient population. (*J Endod* 2021;47:566–571.)

## KEY WORDS

Access to care; atraumatic restorative techniques; coronavirus disease 2019; dental; dental emergencies; education

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<https://doi.org/10.1016/j.joen.2020.11.025>

Since its emergence in December 2019, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and its associated disease (COVID-19) caused a global public health crisis<sup>1</sup> and was characterized as a pandemic on March 11, 2020, by the World Health Organization<sup>2</sup>. Because the risk of SARS-CoV-2 transmission cannot be eliminated during aerosol-generating dental procedures in most dental settings<sup>3</sup>, the Centers for Disease Control and Prevention (CDC) recommended that dental services be limited to emergency visits and that elective procedures, surgeries, and nonurgent dental visits be postponed in both academic and private dental clinics during this time<sup>4</sup>. Following state and local guidelines, Tufts University School of Dental Medicine (TUSDM), Boston, MA, discontinued regular clinical care as of March 14, 2020, and opened an emergency clinic designed to provide emergency dental care for patients of record from the predoctoral, postgraduate, and faculty practices. A novel protocol was developed to triage incoming calls to a designated emergency phone line, to screen patients for signs of active COVID-19 disease, and to provide emergency care following CDC recommendations for infection control in a dental setting during the COVID-19 pandemic<sup>4</sup>.

The purposes of this study were as follows:

1. To describe patient use of the TUSDM emergency dental clinic (EDC) during the COVID-19 pandemic from March 30 to May 8, 2020

- To quantify the perceived benefit of the EDC to the affiliated hospital by quantifying the patient visits that were likely to result in referral to the Tufts Medical Center (TMC) if dental services had not been available
- To assess the number of dental emergencies that were pulpal or periapical in origin

It was hypothesized that the majority of patients who presented for emergency care would have required hospital-based emergency treatment if access to dental care had not been available. This study quantified this perceived benefit and will be of use to those involved in the provision of emergency dental services to aid in understanding the frequency of endodontic emergencies and the risks and benefits of providing emergency dental services during the COVID-19 response. Because the protocols and provision of emergency dental services varied significantly among academic dental institutions during this time, this study may provide data that will aid in pandemic response planning for academic dental institutions.

## MATERIALS AND METHODS

The Tufts Health Sciences Institutional Review Board (IRB) determined that the study was not human subjects research as defined by the US Department of Health and Human Services and Food and Drug Administration regulations and that no further IRB review or approval was required (IRB ID: 00000603). Aggregate data based on a convenience sample of all subjects who called the emergency phone line or presented to the EDC from March 30, 2020, to May 8, 2020, were included, accounting for 466 total patient interactions. This accounted for 30 days, excluding weekends. Data collected from an emergency triage phone log consisted of the date of the call; whether the patient was advised by phone only, prescribed a medication by phone, or recommended to present to the emergency clinic; whether an emergency clinic visit was confirmed; and whether the patient should have been referred for hospital-based care if dental treatment was not available. Data collected from electronic health records included patient age, date of the clinical encounter, the procedure(s) provided, and if a procedure was aerosol generating. The CDC currently advises that there are insufficient data to create a definitive and comprehensive list of aerosol-generating procedures (AGPs) for dental health care settings<sup>5,6</sup>. For the purposes of this study, AGPs were defined in accordance with the protocol used at TUSDM at the time of writing as procedures involving the use of high- or

low-speed dental handpieces, rotary instruments, ultrasonic scalers and/or air-water syringes in a biological environment (ie, intraorally) including manipulation of gingival tissue, or procedures likely to produce droplets at the operative site, including extractions. Examples of non-AGPs included recementing a temporary or definitive crown or bridge without the use of dental handpieces and atraumatic restorative techniques including caries removal with spoon excavation, the application of silver diamine fluoride or sedative restorative material such as intermediate restorative material without the use of matrix bands, and the application of topical fluoride or desensitizing agents. For each clinical encounter, the type of emergency according to the American Dental Association (ADA) criteria for conditions that constitute a dental emergency was recorded, if applicable<sup>7</sup>.

## Statistical Analysis

Descriptive statistics (counts and percentages for categoric variables and means, medians, standard deviations, interquartile ranges [IQRs], minima, and maxima for continuous variables) were calculated using SPSS Version 26 (IBM Corp, Armonk, NY).

## RESULTS

### Demographics

There were 466 total patient interactions (including patients who called the emergency triage phone line for advice or referral for treatment and those who had a clinical encounter without calling the emergency triage phone line ahead of their visit) from March 30 through May 8, 2020, representing 401 unique patients. The demographics of the patient interactions are presented in [Table 1](#).

### Calls to the Emergency Triage Phone Line

There were 361 calls to the emergency triage phone line, averaging 12.0 calls per day (standard deviation [SD] = 4.0; range, 5–20). Among the calls, 115 (31.9%) of patients were advised by phone and no clinical visit was advised, and an additional 49 (13.6%) were prescribed antibiotics by phone. One hundred ninety-seven (54.6%) were referred for a clinical encounter. Of these 197 patients, 155 (78.7%) had a clinical encounter in the EDC ([Table 2](#)).

### Clinical Encounters

There were 267 clinical encounters, averaging 9.2 per day (SD = 4.5; range, 0–19) (excluding a state holiday when the EDC was closed, but the emergency triage phone line remained

**TABLE 1** - Patient Encounter Demographics

Age (y)	n	%
Mean (SD)	46.6 (20.8)	
Range	1–92	
Median (IQR)	49 (31–63)	
Sex		
Female	261	56.0
Male	204	43.8
Nonbinary	1	0.2

**TABLE 2** - Calls to Emergency Triage Phone Line from March 30–May 8, 2020

	n	%
Total calls	361	
Advised by phone, no clinical visit recommended	115	31.9
Prescribed antibiotic by phone, no clinical visit recommended	49	13.6
Referred to emergency clinic	197	54.6
Confirmed emergency visit (of the 197 referred)	155	78.7

opened). Among these encounters, 74 (27.7%) presented with “severe dental pain from pulpal inflammation,” averaging 2.5 per day (SD = 1.7; range, 0–7). The number of clinical encounters per day fluctuated throughout the period of observation. After April 15, there were more than 4 encounters in the EDC daily, and after April 24 there were consistently more than 7 encounters per day.

The most common dental emergencies were severe dental pain from pulpal inflammation (27.7% of clinical encounters), a surgical postoperative visit (13.1%), and tooth fracture (12.0%) ([Table 3](#)). The most frequent procedures were tooth extraction (13.9% of clinical encounters) and a surgical postoperative visit for nonelective oral surgery hospital cases (13.5%) followed by recementing a temporary or definitive crown or fixed partial denture (10.5%) ([Table 4](#)).

The number of clinical procedures performed by dental specialty or discipline is presented in [Figure 1](#). Dental procedures were performed in 197 of 267 clinical encounters (73.8%), with endodontic procedures performed in 56 encounters (21.0%). No treatment was provided in 23 encounters (8.6%).

Antibiotics were prescribed in a total of 62 clinical encounters (23.2%); in the majority of encounters, a concurrent dental procedure was not performed (47 encounters, 17.6%). There were no prescriptions for opioids or other controlled

**TABLE 3** - Types of Emergencies in Clinical Encounters

ADA dental emergency*	n	%
Severe dental pain from pulpal inflammation	74	27.7
Surgical postoperative visit	35	13.1
Tooth fracture resulting in pain or causing soft tissue trauma	32	12.0
Defective restorations causing pain (including lost temporary crown)	24	9.0
Crown/bridge recementation	23	8.6
Abscess or localized bacterial infection resulting in localized pain and swelling	20	7.5
Cellulitis or diffuse soft tissue bacterial infection with intraoral or extraoral swelling	18	6.7
Suture removal	10	3.7
Implant loose (implant or crown)	9	3.4
Orthodontic wire or appliances piercing or ulcerating the oral mucosa	6	2.2
Pericoronitis or third molar pain	5	1.9
Dental treatment required before critical medical procedures	5	1.9
Replacing temporary filling on endodontic access openings in patients experiencing pain	4	1.5
Trauma involving facial bones	3	1.1
Denture adjustment or repairs when function impeded	3	1.1
Biopsy of abnormal tissue	2	0.7
Dental trauma with avulsion/luxation	1	0.4
Other	6	2.2
Total clinical encounters	267 <sup>†</sup>	

\*American Dental Association. What constitutes a dental emergency? Available at: [https://success.ada.org/~media/CPS/Files/Open%20Files/ADA\\_COVID19\\_Dental\\_Emergency\\_DDS.pdf](https://success.ada.org/~media/CPS/Files/Open%20Files/ADA_COVID19_Dental_Emergency_DDS.pdf). Accessed June 1, 2020.

<sup>†</sup>N = 267 clinical encounters. The total number of dental emergencies exceeds the total number of clinical encounters because clinical encounters could involve more than 1 type of dental emergency.

substances written in the study period. One hundred thirty-four clinical encounters were categorized as aerosol generating (50.2%), and 133 were non-aerosol generating (49.8%). Two hundred thirty of the encounters would have required referral to a hospital emergency department if emergency dental care had not been available (86.1%). In 6 clinical encounters (2.2%), patients were

**TABLE 4** - The Clinical Procedures Performed from March 30–May 8, 2020

Procedure	n	%
Extraction	37	13.9
Surgery follow-up	36	13.5
Recementing crown or bridge including temporary restorations	28	10.5
Temporary or sedative restoration (intermediate restorative material or glass ionomer cements)	22	8.2
Pulpotomy or pulpectomy	18	6.7
Suture removal	11	4.1
Tightening or recementing implant abutment or crown	7	2.6
Silver diamine fluoride	7	2.6
Topical fluoride or desensitizing agent	6	2.2
Orthodontic emergency	6	2.2
Replacement of provisional restoration (block temporary crown)	5	1.9
Radiographs only (without other procedure)	5	1.9
Occlusal adjustment	4	1.5
Incision and drainage	4	1.5
Denture adjustment/repair	4	1.5
Replace endodontic filling	4	1.5
Definitive/permanent restoration	2	0.7
Extract implant	2	0.7
Soft tissue biopsy	2	0.7
Other	8	3.0

N = 267 clinical encounters. The total number of procedures does not equal 267 encounters because not every encounter had a procedure, and some encounters had >1 procedure.

escorted to TMC either for medical management of their emergency in a hospital setting or for referral for treatment under general anesthesia (pediatric patients).

## DISCUSSION

TUSDM's commitment to developing a protocol for the triage and treatment of dental emergencies for patients of record served several purposes, including alleviating resource strain on the affiliated emergency department at TMC. In March and April 2020, modeling predicted that the critical care capacity of US hospitals would be inadequate to handle the potential outbreak of COVID-19 cases<sup>8</sup>. Hospitals throughout Massachusetts facilitated emergency mobilization to expand the capacities of facilities, staff, and supplies<sup>9</sup>. It was believed that the availability of emergency dental care at TUSDM would alleviate the burden on TMC's emergency

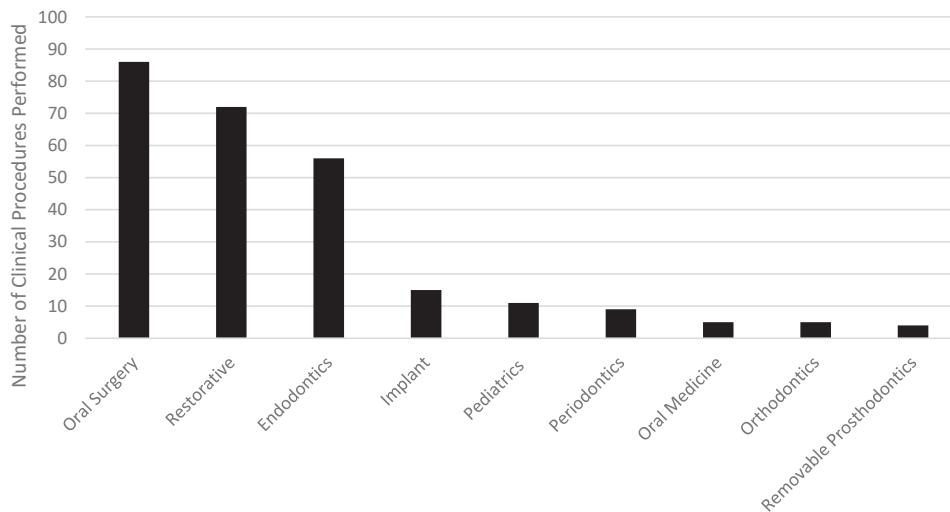
department and also limit the risk of viral exposure for patients without COVID-19 symptoms. Based on the results of the current study, 230 emergency room visits were avoided based on the availability of emergency dental care at TUSDM. Furthermore, studies have demonstrated that dental care provided in a hospital setting is less effective in managing oral health diseases and represents a highly inefficient use of hospital resources. The majority of visits to a hospital emergency department for a dental diagnosis result in the prescription of antibiotic and/or pain medications and/or a referral for dental follow-up<sup>10-12</sup>. Dental procedures may be performed in less than 10% of hospital visits for dental complaints<sup>11</sup>. The high percentage of procedures performed at the EDC during the period of study (in 73.8% of the clinical encounters) may be a result of the robust protocol for prescreening and triage, which prioritized emergent conditions and allowed for patients whose condition could be managed with antibiotics prescribed by phone to avoid an in-person visit.

The procedures developed at TUSDM for emergency triage and clinical care were designed to limit exposure and minimize the risk of virus transmission for providers, staff, and patients. Procedures included prescreening patients, providers, and staff for symptoms of active COVID-19 disease and clinical protocols intended to minimize the production of aerosols. Protocols were modified as updated guidance for infection prevention in dental settings from the CDC<sup>4</sup> and other sources became available.

Before reporting to the facility, all personnel were asked to complete a self-assessment survey. During the period of observation, this self-assessment consisted of the following questions:

1. Do you have a fever more than 100°F (38°C)?
2. Do you have a cough?
3. Do you have a sore throat?
4. Do you have shortness of breath?
5. Do you have flu-like symptoms?
6. Have you had close personal contact with a suspected or laboratory-confirmed COVID-19 patient within the past 2 weeks?
7. Have you traveled to or from China, Iran, Italy, Japan, or South Korea within the past 2 weeks? (Question 7 was discontinued mid-April.)

Upon entering the facility, the temperatures of all personnel were taken, and the self-assessment questions were reiterated. Personnel were asked to call in sick and contact their primary care physician if their temperature was more than 100°F (38°C) or if



**FIGURE 1** – The clinical procedures performed by discipline in the emergency dental clinic from March 30–May 8, 2020.

they responded affirmatively to any of the screening questions. Masks were required at all times upon entering the facility.

Patients were encouraged to contact the emergency triage phone line if they required emergency care. Trained call representatives recorded the nature of their chief complaint and alerted the assigned on-call faculty representing the appropriate dental specialty or department. The on-call faculty interviewed the patient by phone and further characterized their chief complaint, screening for conditions that constitute a dental emergency according to the ADA criteria<sup>7</sup>. Patients with suspected pulpal or periapical pathosis were referred to on-call faculty from the Department of Endodontics. Based on the results of this interview, the faculty either advised the patient by phone and prescribed antibiotics if indicated or recommended that the patient present for a clinical appointment. Antibiotics were prescribed by endodontic faculty according to criteria suggested by the American Association of Endodontics<sup>13</sup> and the ADA<sup>14</sup>. Only patients with a suspected dental emergency according to the ADA criteria<sup>7</sup> were referred for treatment.

Upon arrival, patients were given a mask and hand sanitizer and had their temperature taken. Patients were interviewed for symptoms of COVID-19 disease with the use of screening questions. Patients could be accompanied only by the support people considered essential to the successful completion of an appointment. Patients with confirmed or suspected virus cases were escorted to an isolation room equipped with a HEPA filter, where they were treated by a faculty member equipped with personal protective equipment including a fluid-resistant gown, shoe covers,

hair bouffant, a fit-tested filtered face respirator (N95), eye protection, face shield, and gloves. If a procedure was required for a patient with suspected COVID-19 disease and emergent dental needs that could not be managed medically at TUSDM, the faculty was to transfer the patient’s care to TMC.

Patients responding negatively to the COVID-19 screening questions were escorted to a waiting room with seating arranged 6 feet apart and equipped with a HEPA filter. At the time of treatment, patients were asked to wear masks until the intraoral examination and were instructed to swish with a 1:6 mixture of 3% hydrogen peroxide and water for 30 seconds immediately before the examination. Minimally invasive procedures were prioritized where possible; the use of an air-water syringe was discouraged, and ultrasonic devices were prohibited to minimize aerosol production. Providers were equipped with PPE consisting of a hair bouffant, shoe covers, gown, eye protection, face shield, gloves, and a fit-tested filtered face respirator (N95) covered by a surgical mask. At the end of each clinical encounter, the operatory was left vacant for 15 minutes before it was disinfected, as was recommended by the ADA during the study period<sup>15</sup>.

After the clinical encounter was complete, the on-call faculty from the Department of Endodontics reviewed the patient’s electronic health record to provide their assessment of whether a referral for hospital-based treatment would have been recommended if dental care was not available. Their opinion was based on clinical experience and judgment. Priority was placed on signs of systemic disease such as severe pain, swelling, lymphadenopathy, fever, and/or

continued pain after a previous evaluation. The finding that 86.1% of clinical encounters would have required hospital-based care suggests that the screening protocols were effective in identifying suspected dental emergencies.

Other goals of providing emergency dental services are to continue TUSDM’s academic mission while meeting the ethical requirements of the profession, which include the provision of reasonable arrangements for the emergency care of patients of record, as stated in Section 4.B. of the ADA Principles of Ethics and Code of Conduct<sup>16</sup>. The EDC dental providers were faculty and postgraduates from the school’s residency programs, supported by third- and fourth-year predoctoral students who volunteered as front desk staff and dental assistants. At least 1 endodontic resident was present on the clinic floor at all times. This allowed predoctoral students to gain experience in an emergency clinical setting while minimizing the overall treatment time for patients, therefore reducing the production of aerosols. There were no known transmissions of SARS-CoV-2 to clinic providers or staff during the period of the study.

The results of this study demonstrate the predominance of endodontic emergencies among dental emergencies. Although the most common dental emergency was severe dental pain from pulpal inflammation (27.7% of clinical encounters), the most frequent clinical procedure was tooth extraction. Endodontic procedures including pulpotomy or pulpectomy were performed in 21.0% of clinical encounters. The prevalence of endodontic procedures seen in this study is similar to the findings of a study characterizing emergency dental procedures at the School and Hospital of Stomatology at Wuhan

University, Wuhan, China, which found that 18% of patients with dental emergencies were referred for endodontic treatment<sup>17</sup>.

Previous studies have shown a greater proportion of male patients presenting with dental emergencies<sup>18–20</sup>, including the Wuhan University study, which found a ratio of 1.1:1 male to female patients presenting with dental emergencies during the COVID-19 outbreak<sup>17</sup>. In the present study, there was a higher number of clinical encounters for patients identifying as female, which may be accounted for by the lack of access to nonemergency dental care and possibly by a reduction of trauma cases as an indirect result of the lockdown.

This study found that the percentages of AGPs and non-AGPs were nearly equivalent (50.2% aerosol generating and 49.8% non-aerosol generating). Although it is impossible to completely eliminate the creation of aerosols during a dental encounter<sup>6</sup>, these results indicate that many dental emergencies can be effectively managed in a manner that minimizes aerosol production.

A limitation of this study is a lack of distinction between periodontal and periapical dental emergencies. The ADA criteria for conditions that constitute a dental emergency<sup>7</sup> define emergencies by their clinical characteristics rather than their etiology; therefore, categories such as “abscess or localized bacterial infection resulting in localized pain and swelling” and “cellulitis or diffuse soft tissue bacterial infection with intraoral or extraoral swelling” may include pathologies of both endodontic and periodontal origin. Similarly, “tooth fracture resulting in pain or causing soft tissue trauma”

is often considered an endodontic emergency depending on the extent of the fracture (32 encounters, 13.1%). Because pulp sensibility testing results were not available for all encounters, clinical data could not be separated by pulpal or periodontal diagnoses or by etiology. Combined data for all categories where endodontic pathosis is suspected or must be clinically ruled out reveal a higher prevalence of potential endodontic emergencies. Including those categories noted earlier and “replacing temporary filling on endodontic access openings in patients experiencing pain” and “dental trauma with avulsion/luxation,” the number of clinical encounters involving potential endodontic emergencies was 149 (55.8%). This suggests that proper endodontic diagnosis and treatment are of critical importance in the provision of emergency dental care, particularly where routine dental care is unavailable.

Another limitation of this study is the relatively short observation period. Future studies may quantify the effect of the cessation of elective dental care at a population level as access to nonelective and preventive care resumes. Furthermore, the results of the study are specific to a single academic institution and may not be generalizable to other clinical settings.

## CONCLUSIONS

The novel protocol for triage, screening, and treatment of emergency patients at TUSDM during the discontinuation of elective dental procedures in the COVID-19 response

resulted in 267 clinical encounters in a 5-week period, representing the initial surge in local cases from March 30 through May 8, 2020. Severe pain from pulpal inflammation represented the most common dental emergency observed, and endodontic procedures were performed in 21.0% of clinical encounters. These findings suggest that the emergency dental clinic at TUSDM served an important role in maintaining continuity of care for the institution’s patient population during the COVID-19 pandemic and highlight the important role of endodontic diagnosis and treatment in an emergency setting.

## CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

**Jessica Langella:** Investigation, Data curation, Writing - original draft, Methodology, Visualization. **Britta Magnuson:** Methodology, Writing - review & editing. **Matthew D. Finkelman:** Data curation, Formal analysis, Validation, Writing - review & editing. **Robert Amato:** Conceptualization, Supervision, Writing - review & editing, Project administration.

## ACKNOWLEDGMENTS

*The authors would like to thank Dr. Patrick McGarry for his leadership of the emergency clinic at TUSDM and Dean Nadeem Karimbux for his leadership throughout the COVID-19 pandemic.*

*The authors deny any conflicts of interest related to this study.*

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