Impact of COVID-19 on emergency oral health care in New Jersey

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ABSTRACT

Background. The COVID-19 pandemic led to reduced services of private dental practices. The public emergency clinic of Rutgers School of Dental Medicine (RSDM) (Newark, NJ) faced changing demands during various periods of the pandemic.

Methods. Records of patients visiting the emergency clinic at RSDM during 3 distinct periods (prelockdown, lockdown, teledentistry) from January 10, 2020, through June 30, 2020, were retrospectively reviewed. Qualitative and quantitative attributes pertaining to patient encounters were reviewed and analyzed.

Results. A total of 1,799 records were included in this study. Patient visits increased during the early lockdown but were reduced after the implementation of teledentistry. Trends were noted in patient volume, reasons for visits, treatment needs, symptoms, diagnostic methodology, prescription use, and final disposition of patients.

Conclusions. The lockdown affected emergency dental clinic services at RSDM. Teledentistry visits played a key role in screening patients and in facilitating the delivery of oral health care and timely follow-ups to patients who needed urgent in-person emergency visits.

Practical Implications. Data gathered will lead to a better understanding of patients seen in the emergency clinic and can help with long-term planning for both institutional and smaller outpatient clinics during public health emergencies.

Key Words. Academic dentistry; COVID-19; emergency preparedness; pandemic; teledentistry.

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COVID-19, caused by SARS-CoV-2, was identified at the end of 2019 and had infected 100 million people worldwide by January 2020.[1] By March 11, 2020, COVID-19 was characterized as a pandemic.[2] At that time, federal and state governments began enacting restrictions on the availability of both private and public services as well as limitations on the mobility of the general population, colloquially known as the lockdown. On March 16, 2020, the American Dental Association called on dentists to postpone routine oral health care and stop face-to-face contact with patients.[3] The goal of the restrictions in services and mobility was targeted at limiting the spread and avenues for exposure to the virus. Although this was effective in decreasing the transmission of SARS-CoV-2, it also hindered access to oral health care.[4]

The subsequent closure and reduced services of private dental practices throughout the United States led to decreased availability of oral health care.[5] A consequence often seen as a result of unmet oral health care needs is the increased tendency of patients with dental pain and infection to seek treatment in hospital emergency departments and urgent care centers,[6] which can burden health care facilities already stressed by a pandemic.[7] The functioning of federally qualified health centers and dental school clinics combined with the growing use of teledentistry was seen to alleviate some of these burdens.[8]

The Rutgers School of Dental Medicine (RSDM) is a public health institution and the only dental school in New Jersey. It delivers specialist oral health care services alongside undergraduate and postgraduate training. RSDM provides a walk-in dental emergency clinic service with the primary purpose of clinical teaching while also providing oral health care to the local population. In response to the pandemic, RSDM's emergency oral health care services evolved rapidly in response to challenges and changes in service and policy. The dental emergency clinic was adapted to provide multidisciplinary emergency oral health care to all age groups and was staffed by qualified

dentists and residents from the various dental specialty programs of the school. On April 22, 2020, teledentistry services were made available to patients as a form of screening before emergency clinic visits. These services were operated by the same faculty that staffed the emergency clinic. During the teledentistry period all patients were initially screened, and patients seeking dental prophylaxis and comprehensive oral evaluations or those with other low-acuity chief symptoms were directed to the school screening department for comprehensive care. Patients with pain, swelling, or other conditions requiring urgent treatment were directed to the emergency clinic to be seen the same day or the next day.

Our study analyzes the RSDM experience with patients receiving emergency oral health care services during the first 6 months of 2020. Our study aimed to examine patient throughput, demographics, and treatment before and during the lockdown period as well as after teledentistry was introduced 25 clinical days after the initiation of lockdown on March 18, 2020, where clinical days were defined as the days that the RSDM emergency clinic was open for treatment. Our study could advise future local decision making regarding how to alleviate the load on hospital emergency departments and provide recommendations for dentists and dental practices that need to treat patients in evolving settings such as public health emergencies. Finally, our study also aims to illustrate the usefulness of teledentistry and to offer insight on refining the teledentistry model.

METHODS

Data sources

Our cross-sectional observational study sought to review all patients who visited the emergency clinic at RSDM from January 10, 2020, through June 30, 2020. Our study, which was determined not to be classified as human subjects research, was reviewed and approved by the Rutgers Biomedical and Health Sciences institutional review board (Pro2020002736). Chart review for these patients was conducted after obtaining approval from the Rutgers Biomedical and Health Sciences institutional review board. Aggregate data were retrieved from the school electronic health records (axiUm; Exan Software). Patient information was derived from the American Dental Association's *CDT 2023: Current Dental Terminology* (CDT code) completed and from the clinical note on the date of service.[9] Clinical observations, diagnoses, and treatments were determined from the encounter notes. The data were collected by the principal investigator (PI) (S.A.S.) and research assistant (Z.C.F.). Both were calibrated early in the data collection process and through ongoing chart reviews to ensure consistency. The data were extracted and aggregated using a custom form linked to a spreadsheet in the secured Google Workspace (Google). The PI audited the data collection daily to ensure accuracy in data collection and audited the final data set to verify reliability.

Variables

The outcome variables chosen for analysis were the prelockdown, lockdown, and teledentistry periods. The prelockdown period was defined as January 10, 2020 through March 17, 2020, the lockdown period was defined as March 18, 2020, through April 21, 2020, and the teledentistry period was defined as April 22, 2020, through June 30, 2020. These 3 periods were separated by specific event milestones (initiation of the lockdown and introduction of the teledentistry period at RSDM). Patients seen in the school emergency dental clinic during the teledentistry period had already been screened to have higher-acuity symptoms.

The remaining covariates included sex, age, site of disease, diagnostic classification, presence of swelling or pain, rate at which dental radiographs were used, prescriptions given (antibiotics, pain medications, chlorhexidine), type of specialty referral if needed, and time elapsed until the patient's return for follow-up.

Diagnostic groups were defined by the specialty that most commonly treats the condition at the school. For example, pericoronitis associated with a partially impacted third molar and other facial trauma was classified as oral and maxillofacial surgery. Caries, pulpal disease (necrotic pulp or pulpitis due to caries), and fractured teeth were classified as restorative and endodontic dentistry. A comprehensive list of commonly encountered conditions and their associated diagnostic classification is exhibited in Table 1. Patients may have been referred by an oral health care provider outside of the school or may have been prescribed antibiotics before their visit to the RSDM

ABBREVIATION KEY

CDT: Current Dental Terminology.
NA: Not applicable.
PI: Principal investigator.
RSDM: Rutgers School of Dental Medicine.

Table 1. Classification of diagnoses.

DIAGNOSTIC CLASSIFICATION*	DENTAL CONDITION
Restorative and Endodontics	Caries, pulpal disease (pulpitis, pulp necrosis), fractured tooth
Periodontics	Periodontal abscess, plaque and calculus buildup
Prosthodontics	Missing or fractured fixed or removable prosthesis
Orthodontics	Detached bracket, painful wire
Oral and Maxillofacial Surgery	Trauma, multispace abscess, pericoronitis and other pain associated with third molars, sinus conditions
Oral Pathology	Extraoral and intraoral hard- and soft-tissue lesions
Orofacial Pain	Temporomandibular joint pain, headaches

* Diagnoses were classified by the specialty that most commonly treats the condition at the school.

emergency clinic. Consequently, the referral status and previsit antibiotic regimen of each patient was also tabulated. The degree of swelling and the presence of pain were determined from the clinical note. The degree of swelling was divided into 3 options: parulis (localized to soft tissue adjacent to a tooth), intraoral (localized to vestibule, mucosa, palate), and extraoral (involving deep-plane fascial spaces with visible facial enlargement or asymmetry). The records were also reviewed to determine if a follow-up visit in the school outpatient specialty clinics occurred on the same day, within 1 month, or within more than 3 months. Patients referred to the new patient-screening program at RSDM were classified as referrals for comprehensive oral evaluation. These included patients with low-acuity issues such as asymptomatic tooth fractures, missing restorations, esthetic concerns, or patients seeking dental prophylaxis.

Statistical analyses

Patient information was identified by a unique study number. A cross-walk table was developed that linked the unique study number to the electronic health record. The cross-walk table containing the key to the coded spreadsheet was in a separate password-protected file on the PI's identity authenticated work computer. Data were analyzed and reported in a deidentified aggregate form. Statistics were then derived from the data set. A database was constructed with Excel (Microsoft). Standard quantitative analyses were conducted with Prism 9 (GraphPad Software) and SPSS Statistics (IBM). The assumption of normality for continuous variables, such as average number of patient visit per day and average patient age, was tested with the Shapiro-Wilk normality test and further analyzed by 1-way analysis of variance. The Pearson χ^2 test was used to assess the relationship among the remaining categorical variables with subsequent column comparison analysis performed when the P value was significant. P values less than .05 were considered significant.

RESULTS

Patient demographics

A total of 1,905 patients were seen at the RSDM emergency clinic from January 10, 2020, through June 30, 2020. Of the 1,905 records, 1,799 records were included and 106 were excluded due to missing demographic or clinical information such as an incomplete intraoral examination or unspecified final disposition. The lengths of the prelockdown, lockdown, and teledentistry periods were 46, 25, and 49 clinical days, respectively.

There was an increase in the number of visits to the emergency clinic after the lockdown period started on March 18, 2020, and this elevation continued until April 22, 2020, when teledentistry service was introduced. This increase was related to referrals from oral health care providers in the private practice community who were not providing emergency services. The implementation of teledentistry service returned the patient volumes to the levels seen in the prelockdown period (Figure 1A). The mean age of patients during the lockdown period was also substantially lower than in the prelockdown and teledentistry periods (Figure 1B). The distribution of patient sex remained consistent throughout all 3 periods (Table 2). The proportion of visits by comprehensive dental patients (those that were already registered as dental school patients) increased to 23.5% and 25.3%

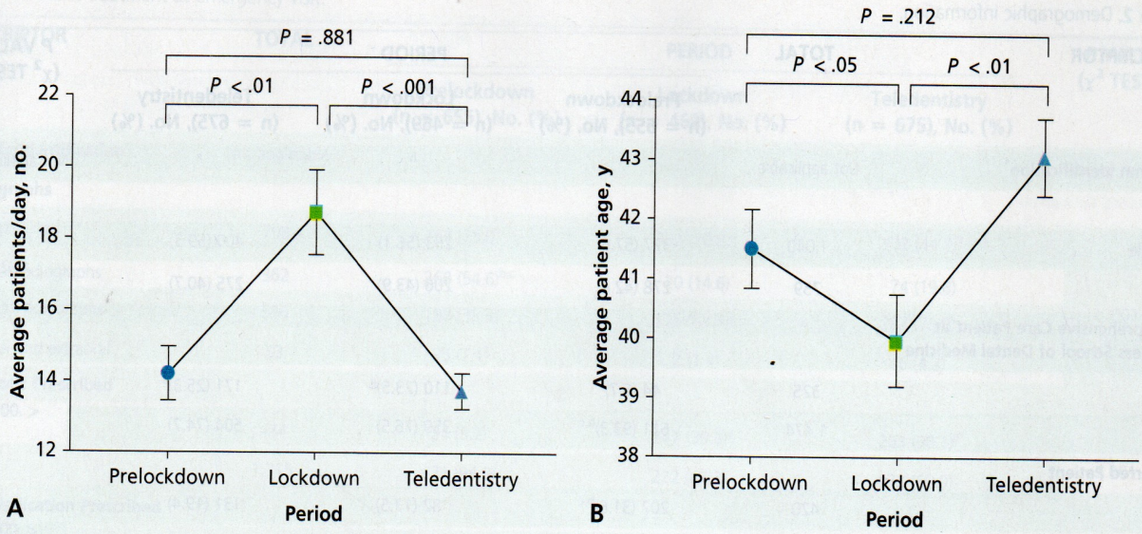

Figure 1. Distribution of the average daily number (**A**) and average age (**B**) of patients who visited the emergency dental clinic with dental problems during the prelockdown, lockdown, and teledentistry periods. Data are expressed as mean (SEM). Differences were considered to be statistically significant at $P < .05$.

during the lockdown and teledentistry periods, respectively, from 6.7% before the lockdown (Table 2). During the prelockdown period, 31.6% of patients visiting the emergency clinic were referred by an oral health care provider outside of RSDM. The number of patients seen first by an outside dentist in the lockdown and teledentistry periods was 17.5% and 19.4%, respectively (Table 2).

Trends in reasons for emergency oral health care

There was no significant difference observed in the number of patients with pain among all groups. Of all visiting patients appearing with some form of swelling, there was a notable increase in patients with swelling during the teledentistry period than in the other groups. Restorative and endodontic, prosthodontic, and periodontal problems remained the top 3 problems throughout the study. Although not statistically significant, a decrease in restorative-classified cases was observed in both the lockdown and teledentistry periods, with an increase in patients seeking emergency oral health care for other reasons such as prosthodontic, orthodontic, and orofacial pain problems. There was a notable decrease in the number of oral and maxillofacial surgery cases during the lockdown period than in the other periods (Table 2).

Trends in use of dental imaging modalities and prescriptions for antibiotics, pain medications, and chlorhexidine

A substantial decrease in dental imaging exposure was noted during the lockdown period than in the prelockdown and teledentistry periods (Table 3). During the prelockdown period, 54.6% of all imaging was in the form of intraoral periapical radiographs. Extraoral panoramic radiography was more commonly done for diagnosis after the lockdown period in both groups (83.9% and 75.9% of all imaging in lockdown patients and teledentistry patients, respectively) (Table 3).

Patients in the lockdown and teledentistry groups were prescribed more antibiotics, pain medications, and chlorhexidine oral rinses than patients in the prelockdown group (Table 3). The prescription most frequently written for patients during the lockdown period was for chlorhexidine (47.5% of all patients) followed by antibiotics (39.3%). Antibiotics were the most frequently prescribed medications (30.1%) in the teledentistry period.

Trends in patient treatment

There was a higher rate of loss to follow-up among patients during the lockdown period (48.9%) than in the prelockdown period (18.6%), with substantial improvement among patients during the teledentistry period (21.8%). The same-day follow-up rate for patients in the prelockdown period

Table 2. Demographic information.

DESCRIPTOR	TOTAL	PERIOD			P VALUE (χ^2 TEST)*
		Prelockdown (n = 655), No. (%)	Lockdown (n = 469), No. (%)	Teledentistry (n = 675), No. (%)	
Column Identification†	Not applicable	a	b	c	Not applicable
Sex					
Female	1,040	377 (57.6)	263 (56.1)	400 (59.3)	.882
Male	759	278 (42.4)	206 (43.9)	275 (40.7)	
Comprehensive Care Patient at Rutgers School of Dental Medicine					
Yes	325	44 (6.7)	110 (23.5)[a]	171 (25.3)[a]	< .001
No	1,474	611 (93.3)[b,c]	359 (76.5)	504 (74.7)	
Referred Patient					
Yes	420	207 (31.6)[b,c]	82 (17.5)	131 (19.4)	< .001
No	1,379	448 (68.4)	387 (82.5)[a]	544 (80.1)[a]	
Previsit Antibiotic					
Yes	375	77 (11.8)	58 (12.4)	240 (35.6)[a,b]	< .001
No	1,424	578 (88.2)[c]	411 (87.6)[c]	435 (64.4)	
Pain					
Yes	1,476	549 (83.8)	358 (76.3)	569 (84.3)	.804
No	323	106 (16.2)	111 (23.7)	106 (15.7)	
Swelling					
Yes	296	98 (15.0)	61 (13.0)	137 (20.3)[a,b]	.046
No	1,503	557 (85.0)[c]	408 (87.0)[c]	538 (79.7)	
Diagnostic Classification					
Restorative and endodontic	1,396	563 (86.0)[b,c]	342 (72.9)	491 (72.7)	.035
Periodontic	107	27 (4.1)	36 (7.7)	44 (6.5)	
Prosthodontic	191	33 (5.0)	69 (14.7)[a]	89 (13.2)[a]	
Orthodontic	28	3 (0.5)	8 (1.7)[a]	17 (2.5)[a]	
Oral and maxillofacial surgery	29	11 (1.7)	3 (0.6)	15 (2.2)	
Pathologic	29	16 (2.4)	6 (1.3)	7 (1)	
Orofacial pain	19	2 (0.3)	5 (1.1)[a]	12 (1.8)[a]	

* Statistically significant when $P < .05$. † The χ^2 P value assesses for significant differences across the 3 times for individual descriptors. When the P value is significant, then the columns are compared with one another within the same row by the column comparison test adjusted by the Bonferroni correction. Column comparison symbols: a, b, c (confidence level ≥ 95%). Letters appearing in a cell indicate that the percentage in that cell is significantly higher than the percentage in the same row for the column represented by the letter.

was the highest. Teledentistry patients had the highest follow-up rate within 1 month, and lockdown patients had the highest revisit rate after more than 1 month. A substantially lower proportion of patients was referred to dental specialty clinics during the lockdown period (67.6%) than in both the prelockdown (96.7%) and teledentistry periods (89.2%). Instead of referral to specialty clinics, a large number of patients (33.1%) were referred for comprehensive oral evaluation during the lockdown period, highlighting a significant amount of low-acuity visits during this period. Oral and maxillofacial surgery, endodontics, and prosthodontics received the most referrals across all periods (Table 4).

DISCUSSION

Our retrospective study sought to assess the impact of the COVID-19 pandemic restrictions on emergency dental services at RSDM. Changes were noted in patient demographics, patient composition, their urgent treatment needs, and diagnostic methodologies as well as in the delivery of urgent care and follow-ups over the 3 periods studied.

Table 3. Patient treatment at emergency visit.

DESCRIPTOR	TOTAL	PERIOD			P VALUE (χ^2 TEST)*
		Prelockdown (n = 655), No. (%)	Lockdown (n = 469), No. (%)	Teledentistry (n = 675), No. (%)	
Column Identification†	Not applicable	a	b	c	Not applicable
Radiographs					
None obtained	798	164 (25.0)	332 (70.8)[a]	302 (44.7)[a]	< .001
Intraoral radiographs	362	268 (54.6)[b,c]	20 (14.6)	74 (19.8)	
Extraoral radiographs	586	188 (38.3)	115 (83.9)[a]	283 (75.9)[a]	
Intraoral and extraoral	53	35 (7.1)	2 (1.4)	16 (4.3)	
Antibiotic Prescribed					
Yes	484	34 (5.2)	247 (39.3)[a]	203 (30.1)[a]	< .001
No	1,315	621 (94.8)[b,c]	222 (47.3)	472 (69.9)	
Pain Medication Prescribed					
Yes	125	8 (1.2)	57 (12.2)[a]	60 (8.9)[a]	< .001
No	1,674	647 (98.8)[b,c]	412 (87.8)	615 (91.1)	
Chlorhexidine Prescribed					
Yes	345	3 (0.5)	223 (47.5)[a]	119 (17.6)[a]	< .001
No	1,454	652 (99.5)[b,c]	246 (52.5)	556 (82.4)	

* Statistically significant when $P < .05$. † The χ^2 P value assesses for significant differences across the 3 times for individual descriptors. When χ^2 is significant, then the columns are compared with one another within the same row by the column comparison test adjusted by the Bonferroni correction. Column comparison symbols: a, b, c (confidence level ≥ 95%). Letters appearing in a cell indicate that the percentage in that cell is significantly higher than the percentage in the same row for the column represented by the letter.

Patients who sought urgent oral health care during the lockdown period were younger than those in the prelockdown and teledentistry periods. This suggests that the pandemic had a measurable impact on the oral health care–seeking behavior of people in different age groups, in which older patients may have refrained from seeking oral health care owing to a perceived risk of COVID-19 in the dental setting during the lockdown period.[10-12] However, the implementation of teledentistry provided access to urgent oral health care consultation for these more vulnerable age groups.

The number of patients coming to the emergency clinic who had already been seen by another dentist decreased after the start of the lockdown period, whereas the total number of patient visits increased. This supports previous evidence that many private practice offices were closed to patients during the early period of the lockdown, increasing the burden on public health facilities.[3-5] Qualitatively, based on the chart note review, even patients who had a dental home were directly forwarded to the school for management of emergencies for the same reason.

In general, dental conditions classified under the restorative and endodontic specialty represented the most common cause of emergency visits throughout the entire length of the study. However, the substantial increase in patients with prosthodontic, orthodontic, and orofacial pain problems during the lockdown period showed the limited availability of specialty oral health care due to closure of other specialty clinics outside of the dental school. The increased proportion of comprehensive oral health care patients seeking urgent treatment during the lockdown and teledentistry periods further reinforces the idea that the lockdown stressed the health care system due to most private dental health care providers in the region suspending their services.[5] According to a study based on representative US survey data, 46.7% of adult patients delayed their dental treatment owing to the COVID-19 pandemic.[13] Several studies have shown substantial increases in patients with dental infections and abscesses during the lockdown period.[14,15] These findings were also evident in our study, shown by an increase in the number of patients with swelling in the teledentistry period compared with the preceding periods. These findings highlight that the pandemic led a large number of patients to defer oral health care despite an urgent need for treatment.

Table 4. Disposition of patients.

DESCRIPTOR	TOTAL	PERIOD			*P* VALUE (χ^2 TEST)*
		Prelockdown (n = 655), No. (%)	Lockdown (n = 469), No. (%)	Teledentistry (n = 675), No. (%)	
Column Identification†	NA	a	b	c	NA‡
Required Follow-up					
No	265	20 (3.05)	152 (32.4)[a,c]	73 (10.8)	< .001
Yes	1,554	635 (96.7)[b]	317 (67.6)	602 (89.2)[b]	
Did not return	404	118 (18.6)	155 (48.9)[a,c]	131 (21.8)	
Returned same day	420	236 (45.6)[b,c]	51 (32.1)	133 (28.2)	< .01
Returned within 1 mo	542	238 (46.0)[b]	34 (21.4)	270 (57.2)[b]	
Returned after 1 mo	192	43 (8.3)	77 (48.4)[a,c]	72 (15.3)	
Specialty Follow-up Given					
Oral and maxillofacial surgery	980	463 (73.6)[b,c]	159 (50.2)	358 (59.5)	
Periodontic	10	1 (0.2)	3 (0.9)	7 (1.2)	
Endodontic	230	80 (12.7)	34 (10.7)	116 (19.3)[a,b]	
Special needs	4	2 (0.3)	NA	2 (0.3)	
Prosthodontic	44	6 (1.0)	11 (3.5)[a]	27 (4.5)[a]	
Pediatric	2	NA	1 (0.3)	1 (0.2)	.043
Oral medicine	19	9 (1.4)	2 (0.6)	8 (1.3)	
Orthodontic	17	NA	2 (0.6)	15 (2.5)	
Orofacial pain	16	3 (0.5)	NA	13 (2.2)	
Comprehensive oral evaluation	225	65 (10.3)	105 (33.1)[a,c]	55 (9.1)	

* Statistically significant when $P < .05$. † The χ^2 *P* value assesses for significant differences across the 3 times for individual descriptors. When χ^2 is significant, then the columns are compared with one another within the same row by the column comparison test adjusted by the Bonferroni correction. Column comparison symbols: a, b, c (confidence level ≥ 95%). Letters appearing in a cell indicate that the percentage in that cell is significantly higher than the percentage in the same row for the column represented by the letter. ‡ NA: Not applicable.

Oral health care during the prelockdown period frequently involved the use of intraoral imaging techniques. The literature shows that aerosols may be dispersed by such intraoral techniques by way of coughing, salivary secretions, or stimulation of gag reflexes.[16-18] During the pandemic, many studies recommended considering extraoral imaging modalities as alternatives to minimize aerosols.[16-18] Our findings also suggest that extraoral imaging substituted for intraoral imaging for adequate emergency diagnosis while also minimizing aerosol exposure to the provider.

Restricted access to urgent oral health care services during the pandemic resulted in increased prescription of antibiotics and pain medications.[19-22] Our findings also showed that antibiotics, pain medications, and chlorhexidine were the primary prescriptions written for urgent oral health care during the lockdown period, and their prescribing progressively decreased in the subsequent teledentistry period. Given that the main indications for antibiotics and prescribed pain medications are reserved for infection and severe acute pain, respectively, these increases also reflect that patients may have sought treatment in a more acute state because of delayed oral health care. In addition, prescriptions for antibiotics and pain medications showed a decreasing trend after the adoption of teledentistry, although the decrease is not considered statistically significant. This may indicate that teledentistry allowed for efficient triaging of patients and led to a decrease in medications being prescribed to patients as definitive treatment became more accessible.

In addition to chlorhexidine being prescribed to patients to treat their chief symptoms, studies have shown that chlorhexidine gluconate has both antiviral action plus substantivity against SARS-CoV-2.[23-27] RSDM quickly adapted such infection prevention and control practices in the early stages of the lockdown period during patient encounters to complement other personal protective equipment, with the goal of reducing virus transmission.

The triage-based teledentistry strategies implemented by RSDM were successful in 2 core ways. First, with the introduction of teledentistry, physical visits to the emergency dental clinic were reduced. Second, patients in the teledentistry group had the highest rates of pain, swelling, and

prescription of previsit antibiotics. The increased rate is likely due to effective triaging through teledentistry, leading to a decrease in visits to the emergency clinic by patients with low-acuity issues. Therefore, higher-acuity patients could be seen and treated in the dental clinic without resulting in high patient volumes.

As a retrospective study, there is an inherent risk of bias during data collection and interpretation. The data were extracted from notes and codes completed during patient encounters. Because patients were seen by different providers without much time for calibration, there may be differences in examination methods, including differences in terminology and classifications that could influence extrapolation of data. Also, because of high patient volumes at the emergency clinic and rapid implementation of teledentistry, CDT codes for anticipated procedures were not always recorded during the visit. Future studies may aim to calibrate study providers near the beginning of the data collection period to standardize examination and recording methods. Another limitation of our study is the restriction of data sources to only 1 institution in 1 locale. Certain specialties such as orthodontics and orofacial pain saw only a few patients throughout all 3 periods and did not reveal any significant trends. Future studies should include additional dental schools in other states to expand the data set.

CONCLUSIONS

The RSDM emergency dental service endured throughout the changing face of the early COVID-19 pandemic, underscoring the importance of institutional emergency dental clinics in providing urgent oral health care in times of crisis.[28] When private practices closed their doors to the public during the early weeks of the COVID-19 pandemic, public health institutions continued to provide emergency oral health care to decrease the burden on hospital emergency departments. RSDM remained open and adapted to changing protocols by changing examination methods and incorporating teledentistry to provide patient evaluation and treatment while limiting stress on facilities. The findings from our study can be used to refine models for dental emergency preparedness and public health emergencies. ■

DISCLOSURE

None of the authors reported any disclosures.

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