COVID-19 Transmission Risk and Protective Protocols in Dentistry: A Systematic Review

Morteza Banakar

Health Policy Research Center, Institute of Health, Shiraz University of Medical Sciences, Shiraz, Iran.

<https://orcid.org/0000-0003-1715-0198>

Kamran Bagheri Lankarani

Health Policy Research Center, Institute of Health, Shiraz University of Medical Sciences, Shiraz, Iran.

<https://orcid.org/0000-0002-7524-9017>

Dana Jafarpour

Biomaterials Research Center, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran.

Sedigheh Moayed

Department of Orthodontics, Mashhad University of Medical Sciences, School of Dentistry, Mashhad, Iran.

Mohammad Hasan Banakar

School of Dentistry, Yasuj University of Medical Sciences, Yasuj, Iran.

Ashkan MohammadSadeghi (✉ dr.abanakar@gmail.com)

Faculty of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran.

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Abstract

Among several potential sources of transmission for the spreading of the COVID-19, dental services have received a high volume of attention. Several reports, papers, guidelines, and suggestions have been released on how this infection could be transmitted through dental services, and what should be done. This study has systematically reviewed the published literature on dentistry and COVID-19 in order to develop a practically feasible protocol for re-opening and reorientation of dental services. The recommendations identified were tested with a convenience sample of experienced practitioners, and a practical step-by-step protocol is presented in this paper.

Introduction

COVID-19, the newly discovered coronavirus disease first diagnosed in China in 2019, has become pandemic across the world in a relatively short period. It has affected almost all aspects of human life worldwide. Many protocols have been established to minimize the number of infected people, yet this virus has already spread to all five continents, affecting all communities regardless of borders, nationalities, or climate conditions (1, 2). Up to May 31, 2020, the number of people who have been officially reported to be infected by COVID-19 around the globe was more than 5,934,936 individuals, among which 367,166 deaths have been reported (3). It seems that the real numbers might be much higher than those figures.

COVID-19 has transmission pathways similar, but not identical, to those of other SARS-CoV infections, mainly through the respiratory system (4, 5). Many considerations about the possible hazardous activities or workplaces have risen based on both our experience from previous SARS-CoV infections and our observation of the transmission pattern of the SARS-CoV-2 itself in this short time of its appearance. Among them, the potential transmission of the virus through dental procedures and dental settings has attracted much attention leading to either mandatory or voluntary suspension of routine dental care (6, 7).

The concern about dental practice coronavirus transmission has been widely recognized around the world. Recently, The New York Times noted that dentistry was the most at-risk profession for nCoV-19 among various occupations(8). Based on the nature of the dental procedures, and the close proximity of the dental team with patients, the disease could readily spread from infected patients to the dental team, and vice versa, and subsequently to other patients, if appropriate protective infection control measurements are not undertaken (9, 10).

Dental teams, led by the dentist, are very familiar with universal personal protective equipment and other cross infection control measures and risk assessment. Whilst these issues have become prominent during the pandemic; there has been uncertainty regarding the most appropriate Personal Protective Equipment (PPE) and way of working. Each country of the world has been required to develop policy very rapidly and has interpreted medical and scientific evidence and advice from the WHO in very different ways. Similarly, the guidelines written for COVID-19 and advice published for the safe and effective practice of dentistry have shown much variation around the world and also within countries. Perhaps this is due to the lack of evidence-based. It is likely to take some time to develop an effective vaccine and implement widespread immunization, and so it is critical that find new ways of working so that we can offer much-needed care for

patients with oral health issues. The long term consequences of this pandemic are currently unknown but undoubtedly will result in a 'new normal' for the provision of dental care.

Many suggestions and protocols have been issued for re-opening or reorientation of dental clinics in a short period of time. However, many of the protocols have been produced quickly (for understandable reasons) with a focus on the ideal rather than a realistic point of view (11–13). This systematic review focuses on the risk of the transmission of the COVID–19 during dental treatments and provides pathways and protective protocols to minimize them, bearing in mind the long-term necessity of actions and realistic, practical measures.

Method

In this rapid systematic review of the literature, we searched Pubmed, ISI, and SCOPUS electronic databases using MESH terms and the following keywords: ("Covid–19" OR "Covid19" OR "Corona" OR "Coronavirus" OR "SARS-CoV–2") AND ("Dentistry" OR "Dental"). All articles from the 01.01.2020 until 10.05.2020 that satisfied our selection criteria of being recommendations or guidelines for dental practice during the COVID–19 pandemic were retrieved. Articles were excluded if they were not found to be relevant, produced before the COVID–19 pandemic, or opinion-based without any supporting evidence. Some clinical organizations for example; The World Health Organization (WHO), The Centers for Disease Control and Prevention (CDC), The National Health Service (NHS), The American Dental Association (ADA) and, American Dental Hygienists' Association(AHDA) had also published recommendations and guidelines through their websites. We therefore also undertook a Google search for these and used the English, German, and Farsi languages. These were reviewed by two authors independently and who have experience of infection control in dentistry and medical study methodology. Articles were critically appraised and data extracted to compile a summary clinical protocol for dental practice during the COVID- 91 pandemic. The extracted statements of recommendation, both from the published articles and the clinical organization's publications, were formed into grouped items. We also informed this grouping by including the views of ten dentists with more than five years of clinical in addition to the views of the two authors who had undertaken the data extraction. These additional dentists were selected conveniently based on clinical experience from Iran.

Main Results

This review found 38 articles, of which 9 satisfied our inclusion criteria. The key feature of the nine included studies are summarised in (Table 1). We noted that some researchers had preferred to publish their work rapidly and in alternate ways to using peer-reviewed journals.

Also, some of the guidelines provided by some clinical organizations were reviewed. Since these protocols were very long, these protocols were summarized, and the key elements have extracted from these published guidelines. The recommendations and guidelines identified are shown in Table 2 (3, 22–28).

Discussion

A large number of articles were identified considering the short duration of the search period. Due to the rapid development of the COVID–19 pandemic and the short publication timeframe, some published articles have subsequently been retracted or rejected with newer information. The publication of unreliable papers has several negative consequences that increase the chance of incorrect treatment for patients(29). In this study, we tried to use more valid and practical articles and protocols.

Possible Risk of Transmission of COVID–19 in Dentistry

Whilst it may be difficult to identify the particular mechanism of infection for the individual patients, we are aware of the common routes of transmission. Droplet spread and fomites are the main modes of transmission by the respiratory system in intrapersonal contacts and especially during sneezing, dry coughing, or even talking (30). We also know that COVID–19 is present in saliva, but transmission through this route has not been conclusively confirmed(31). Considering the main path of transmission of COVID-19 disease, dental procedures that lead to the spray of saliva particles into air (which means almost all dental procedures) could higher the possibility of contamination(21). Much effort has been made in the literature to define droplets and aerosols and to distinguish between their ability to carry COVID–19 virus. Knowing which dental procedures produce aerosols that could carry the virus is important to help define the level of risk that these procedures create. This then helps to define what Personal protective equipment (PPE) is appropriate. As a result, both kinds of particles, or better to say, anything that comes out of the patient should be considered hazardous (32–34). Given the fact that the majority of dental instruments are composed of metal and polymers, the COVID–19 could adhere and persist on these surfaces for several days. Consequently, they could present a risk of virus transmission if they are not properly decontaminated(30, 35). Fundamentally, COVID–19 in dentistry may be transmitted through air, droplets, and contact(19, 36). Not only the professionals could act as transmitters, but also, they could become infected during human-to-human transmission, through non-invasive salivary secretions like patients cough or sneeze, or treatment procedures, such as using a high-speed handpiece or ultrasonic instruments which release aerosols which may contain saliva, or blood bacteria and viruses into the environment. Therefore, using appropriate protective wearing is critical, given the fact that the salvia and dental fluids spreading have the potential of virus transmission because of the close distance between patients and professionals (18, 37).

Special Precautions in Dental Procedure

PPE and hand hygiene should be given very serious attention in a dental clinic at all times, even when no patient is attending (18, 38). Regular hand hygiene could be regarded as a critical element in any controlling protocol to reduce the infection outbreak (38). Due to the fact that dentists have close contact with the patients and their hands are exposed to the mouth fluids and aerosols, using an antiseptic solution before treatment of each patient is urgent. Although broad types of antiseptic solutions are available, the ethanolic solutions (above 70% concentration) are suitable for this process because of the non-toxic entity, While ethanolic solutions are useful to hand hygiene using soap and water is also effective (36). Using masks

with pores less than 50µ m is necessary for dental professionals (37, 39, 40). On the other hand, these particles could be transmitted from the eyes, thereby, using appropriate goggles or face shields could decrease the risk of the infections (25).

As the aerosols spread from the mouth, suggesting patients use antiseptic oxidative mouth rinse would be protective prior to and after treatment. Currently, ADB and CDC only recommend peroxide to eradicate the virus. Moreover, public health authorities have advised 0.2% chlorhexidine mouthwash (CHX), 1% povidone-iodine (PI), 1.5% hydrogen peroxide (H₂O₂), or 0.05% hypochlorous acid (HOCl). CHX is weak in terms of virucidal, and the other three (PI, H₂O₂, HOCl) all have excellent virucidal properties but are weak in substantivity, because saliva flow can potentially replace the virus. Clinically, the most acceptable in terms of virucidal and taste is 1.5% hydrogen peroxide (36, 41–45).

Specific Therapeutic Considerations in Dentistry:

The results of a study on 2,537 patients showed that the nCoV–19 pandemic led to a decrease in the emergency dental treatments in Beijing, China because those patients were reluctant to have dental treatment because of the potential risk of infection by going outside(46). Oral hygiene and preventive practices have always been very important, but now, in the current condition, they are more critical than ever. Higher levels of oral hygiene could decrease the need for a person to attend a dental clinic for urgent matters; and at the same time, could significantly help the person to remove the virus from the body at the early contamination phase in day to day life (47) and also to reduce the bacterial load in the mouth and the risk of bacterial superinfection especially in patients who are prone to altered biofilms due to diabetes, high blood pressure or cardiovascular disease (48).

The COVID–19 epidemic has led to the closure of dental offices around the world. Some countries are currently re-opening or planning to re-open dental services. There are many protocols that need to be considered and integrated into a comprehensive and concise protocol (Table 1 & 2). Smart appointment systems and generally avoiding crowding in dental clinics are vital (49). Adequate time should be given between appointments so that appropriate decontamination procedures can be carried out (49).

If emergency treatment is necessary, the ADA COVID–19 Dental Emergency document (40), recommends that chemomechanical caries removal and hand instrumentation should be prioritized over rotary systems. In the case of symptomatic irreversible pulpitis, reducing pain with a pulpotomy and pulpectomy or vital pulp therapy is recommended over conventional root canal therapies, if possible (18, 50, 51). For periodontal treatments, priority should be given to manual scaling and polishing instead of ultrasonic techniques. In the case of tooth extraction, the use of high-volume saliva ejectors is crucial, preferably in a supine position of the patient. If a suture is required, using absorbable material is advocated (35). For the patients suffering extreme toothache and extensive caries, extraction of the pathogenic teeth could be considered instead of a restorative treatment as this could reduce the time of treatment and subsequently decrease the risk of infection (50, 51). For prosthodontic treatments, enhanced disinfection techniques of prosthetic materials and impressions are highly emphasized to minimize the risk of cross-contamination to prosthodontic laboratories. To avoid gag stimulation, salivary suction is recommended. Finally, for diagnosis purposes,

using extraoral radiographic such as Dental panoramic radiographs (DPRs) or Cone- beam computed tomography (CBCT) are endorsed over the intraoral radiographs(18, 50).

Because reducing face-to-face visits is necessary to reduce the risk of infection. The teledentistry provides an opportunity for many patients to access uninterrupted clinical and supportive care and the chance to triage increasingly critical conditions needing face-to-face clinic visits. Furthermore, teledentistry allows for the continuing clinical training of Dental practitioners (52–54). COVID–19 epidemic may cause enduring transformation in dentistry with the advancement of teledentistry(55), the characteristically visual nature of dentistry makes it perfect for the act of telemedicine(56).

Conclusion

This review focused on the methods, protocols, and recent reports regarding the nCoV–19 infection and the transmission process, which could occur during routine dental treatments and surgeries. While the currently available evidence has not demonstrated a clear and direct relationship between the dental treatment or surgery and the possibility of the transmission of COVID–19, there is clearly the potential for transmission to occur. This could result in either because of contaminated dental fluids, saliva, or aerosol spread during close human-to-human contact during dental treatments or by contact with contaminated instruments or surfaces. While the currently available evidence has not demonstrated a clear and direct relationship between the dental treatment or surgery and the possibility of the transmission of COVID–19, there is clearly the potential for transmission to occur. This could result in either because of contaminated dental fluids, saliva, or aerosol spread during close human-to-human contact during dental treatments or by contact with contaminated instruments or surfaces. Therefore, in accordance with the previous literature, following the protective protocols in the COVID–19 crisis is urgent in a dental setting. Although many articles are published in journals during the Corona Crisis without proper methods and accurate judgment. Careful and comprehensive research is recommended.

Abbreviations

MESH: Medical Subject Headings; PPE: Personal Protective Equipment; WHO: The World Health Organization; CDC: The Centers for Disease Control and Prevention; NHS: The National Health Service; ADA: The American Dental Association; AHDA: American Dental Hygienists' Association; Tx: stands for treatment; Hx: stands for history; ABHR: Alcohol-based hand rub; CHX: chlorhexidine mouthwash; PI: 1% povidone-iodine; H2O2: 1.5% hydrogen peroxide; HOCl: 0.05% hypochlorous acid; CBCT: cone- beam computed tomography; DPRs: Dental panoramic radiographs;

Declarations

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articles and guidelines.

Authors' contributions

Conception or design of the work: MB, KL, AM. Acquisition of data: DJ, SM, MHB. Analysis and interpretation of data: MB, MHB, DJ Draft of the work: MB, AM, DJ. Revision of the manuscript for important intellectual content: DR, MB, MHS, SM, KL, DJ. All authors gave final approval and agreed to be accountable for all aspects of the work.

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Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1 - An overview of the guidelines provided for Corona in Dentistry by articles

ID	Author (Year)/Country	Guidelines offered	Procedural considerations	Authors' comments on the literature gap
1	Alharbi et al. (2020)/Saudi Arabia (14)	<p>I) Emergency Tx (fracture and infection compromising patient's airway, uncontrolled bleeding) for all patients</p> <p>II) Minimally invasive urgent care without aerosol generation for asymptomatic suspect, stable active and recovered patients</p> <p>III) Invasive urgent care with aerosol generation for asymptomatic suspect</p>	<p>I) Restrict Intraoral imaging</p> <p>II) Preprocedural use of 0.23% povidone-iodine mouthwash at least 15 s</p> <p>III) Single-use devices</p> <p>IV) Use a rubber dam</p> <p>V) Avoid aerosol-generating procedures</p> <p>VI) Avoid Ibuprofen</p>	<p>-Lack of a guideline for patients who need dental Tx before an imminent transplant.</p> <p>-Lack of a guide on proper saliva ejectors or surgical aspiration</p>
2	Ather et al. (2020)/The United States (13)	<p>I) Perform dental Tx if lack of travel hx/epidemiological link</p> <p>II) Defer elective care for suspect at least two weeks</p> <p>III) Urgent care for suspect in case of tooth pain and/or swelling using pharmacological management as the first line and emergency care as the secondary management</p>	<p>I) Personal protective equipment and hand hygiene</p> <p>II) Preprocedural mouth rinse</p> <p>III) single-use devices</p> <p>IV) Avoid Intraoral radiography</p> <p>V) Use a rubber dam</p> <p>VI) Minimize ultrasonic instruments, high-speed handpieces, and 3-way syringes</p> <p>VII) Dilute Naocl to 1%</p> <p>VIII) Negative-pressure treatment rooms</p> <p>IX) Disinfect inanimate surfaces</p>	<p>-Lack of a guideline for patients who need dental Tx before an imminent transplant.</p> <p>-Lack of a guide on proper saliva ejectors or surgical aspiration</p>
3	Izzetti	I) Identify potentially	I) 1-min	-Lack of a precise

et al.
(2020)/
Italy

(15)

at-risk cases and support them in contacting the health authorities

II) Understand the real need for professional consultation and preferably address the issue with just pharmacologic prescription

III) Organize a contagion-reduced treatment for the subjects with unknown risk of contagion who are experiencing an acute dental problem that requires immediate treatment

mouth rinse with 0.2% to 1% povidone, 0.05% to 0.1% cetylpyridinium chloride, or 1% hydrogen peroxide

II) Hand washing for at least 60 s and then 60% hydroalcoholic solution before wearing a glove

III) Personal protective equipment

IV) Preparation of all instruments in advance

V) Total protection through disposable cover

VI) Avoid, when possible, use of handpieces/ultrasonic instruments

VII) Use a rubber dam

VIII) Surgical aspiration system

IX) If possible, prefer 4-hands technique

X) Limit overall Tx time if possible

guideline on the management of patients at various stages of the disease, from positive to asymptomatic to healed ones.

4	Lee and Auh (2020)/ Korea (16)	<p>I) Routine pre-check the general health status and travel history to epidemic areas</p> <p>II) Patients with suspected or known COVID-19 should be isolated or postpone their non-emergency dental care during the COVID-19 pandemic</p>	<p>I) Use basic personal protective equipment for potential asymptomatic carriers</p> <p>II) Hand washing is essential</p> <p>III) Must avoid or minimize procedures producing droplets or aerosols or stimulate salivary secretion or coughing.</p> <p>IV) Use high-volume saliva ejectors with the four-handed technique</p> <p>V) Minimize using the three-way syringe</p> <p>VI) Acquisition of extraoral radiographs rather than intraoral radiographs</p> <p>VII) Use an oxidative or antimicrobial mouth rinse before dental procedures</p> <p>VIII) Treatment in an isolated and well-ventilated environment</p> <p>IX) Disinfect the surface of</p>	<p>-Lack of a precise guideline on the management of patients at various stages of the disease, from positive to asymptomatic to healed ones.</p>
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			equipment with 62%–71% ethanol before and after dental procedures	
5	Mallineni et al. (2020)/ Saudi Arabia- The United Kingdom- The United States- Brazil (17)	<p>I) Contemporary minimally invasive procedures that minimize or eliminate aerosol generation should be employed where intervention is indicated throughout the pandemic</p> <p>II) Once restrictions begin to be eased, continue management of dental disease with minimally interventive concepts, e.g., atraumatic restorative treatment, fissure sealants, silver diamine fluoride, selective caries removal, and the Hall Technique while viral transmission risk remains high</p>	<p>III) Hand hygiene</p> <p>IV) Personal protective equipment</p> <p>V) Respiratory hygiene/cough etiquette</p> <p>VI) Sharps safety and safe injection practices</p> <p>VII) Sterilization and disinfection of patient-care items and devices</p> <p>VIII) Environmental infection prevention and control</p> <p>IX) Dental unit water quality</p>	-Lack of a precise guideline on the management of pediatric patients at various stages of the disease, from positive to asymptomatic to healed ones.
6	Meng and Hua (2020)/ China (18)	<p>I) In areas where COVID-19 spreads, non-emergency dental practices should be postponed.</p> <p>II) Pulp exposure in symptomatic irreversible pulpitis could be made with chemomechanical caries removal.</p> <p>III) If a tooth needs to be extracted, an absorbable suture is preferred.</p> <p>IV) For patients with facial soft tissue contusion, debridement, and suturing should be performed.</p> <p>V) Life-threatening cases with oral and maxillofacial compound</p>	<p>I) Hand hygiene</p> <p>II) Personal protective equipment</p> <p>III) Thorough disinfection of all surfaces</p> <p>IV) Particulate respirators (e.g., N- 95 masks or FFP2)</p>	-Lack of a precise guideline on the management of patients at various stages of the disease, from positive to asymptomatic to healed ones.

injuries should be admitted to the hospital immediately.

V) The 4-handed technique is beneficial

VI) Use saliva ejectors with low or high volume

VII) Preoperative antimicrobial mouth rinse

VIII) Minimize aerosol-generating procedures, such as the use of a 3-way syringe

			IX) Acquisition of extraoral radiographs rather than intraoral radiographs	
			X) Rubber dam	
			XI) Isolated and well-ventilated room or negatively pressured rooms if possible	
7	<p>Peng et al. (2020)/</p> <p>China (19)</p>	<p>I) If a patient replies “yes” to screening questions, and body temperature is below 37.3 °C, the dentist can defer the treatment until 14 days after the exposure event.</p> <p>II) If a patient replies “yes” to screening questions, and body temperature is no less than 37.3 °C, the patient should be immediately quarantined and reported to the infection control department.</p> <p>III) If a patient replies “no” to all screening questions, and his/her body temperature is below 37.3 °C, the dentist can treat the patient with extra- protection measures and avoids spatter or aerosol-generating procedures.</p> <p>IV) If a patient replies “no” to all screening questions, but his/her body temperature is no less than 37.3 °C, the patient should be instructed to specialized clinics for COVID-19.</p>	<p>I) Hand Hygiene</p> <p>II) Personal protective measures for the dentists</p> <p>III) A Preprocedural mouth rinse containing oxidative agents such as 1% hydrogen peroxide or 0.2% povidone especially when a rubber dam cannot be used</p> <p>IV) If Using a rubber dam, use extra high-volume suction for aerosol and spatter along with regular suction with a four-hand operation</p> <p>V) If a rubber dam isolation is not possible, manual devices, such as Carisolv and hand scaler, are recommended for caries removal and periodontal scaling</p> <p>VI) the use of dental handpieces without anti-retraction function should be prohibited during the epidemic period of COVID-19</p> <p>VII) Disinfection of the clinic settings</p>	<p>Lack of a precise guideline as to which dental treatments can be performed in case the patient replies “no” to all screening questions and his/her body temperature is below 37.3 °C</p>

<p>8</p> <p>Prati et al. (2020)/ Italy(20)</p>	<p>I) Triaging patients to detect by history and with a respiratory infection, flu, acute respiratory illness, conjunctivitis, and cardiovascular abnormalities</p> <p>II) Separation of patients with respiratory symptoms to limit their contact with the dental staff, students and patients</p> <p>III) Avoiding dental treatment if at all possible</p>	<p>I) Regular, meticulous and effective hand wash</p> <p>II) Use face masks</p> <p>III) Decontamination of all surfaces with 0.1% sodium hypochlorite or 70% ethanol or 0.5% hydrogen peroxide</p> <p>IV) Respiratory hygiene/cough etiquette</p> <p>V) Isolate the patient in a dedicated single-patient room (with closed door)</p> <p>VI) Use a rubber dam</p> <p>VII) Application of powerful air/water surgical suction pump (aspirator) close to the tooth and a second suction close to the nose to prevent aerosol and saliva droplet diffusion</p> <p>VIII) Use high-speed handpiece with no exhaust;</p>	<p>The study provides a guideline for dental school; however, more precise guides on the management of patients at various stages of the disease, from positive to asymptomatic to healed ones, are required.</p>
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			IX) Decontamination of equipment, surgeries/ operatories after reach patients.	
9	Spagnuolo et al. (2020)/ Italy (21)	I) Dentists should avoid the scheduling of any patient: only such urgent dental diseases can be considered during the COVID-19 outbreak.	<p>I) Staff should work at an adequate distance from patients</p> <p>II) Handpieces must be equipped with anti-reflux devices to avoid contaminations</p> <p>III) Avoid or minimize operations that can produce droplets or aerosols</p> <p>IV) Use of saliva ejectors with a low volume or high volume</p>	-Lack of a precise guideline as to which dental Tx should be considered as urgent dental disease

Table 2 Guidelines that should be adopted in a dental setting during Covid-19

Prior to dental treatment	Before entering a dental office	- Delay non-urgent dental and cosmetic services.	ADA, CDC, ADHA, NHS
		-Prevent crowding in appointment setting by booking appointments.	ADA
		-Dental procedures in patients with a history of Covid19 should be postponed for at least one month.	WHO
		-High-risk patients like diabetic and immunocompromised patients are treated at the early hours of a dental office opening.	NHS
		-Use telephone triage, teleconferencing, or teledentistry options as alternatives to in-office care, if possible.	CDC, NHS, ADA
		- Ask staff to stay home if they are sick.	CDC, ADA
		-Actively screen and record the temperature of each staff. Send staff home if they develop symptoms while at work.	CDC, NHS
	At dental office	-Actively screen the patient at the time of check-in. Patients with fever should refer to specific medical centers. If the patient is afebrile (temperature < 100.4°F) and otherwise without symptoms consistent with COVID-19, then emergency dental care may be provided.	CDC
		-No accompanying individuals should be allowed.	CDC, ADA
		-Offer hand wash or hydroalcoholic solutions (with 60- 95% alcohol) for hand disinfection upon entrance to the _____ dental office.	NHS, ADA

	-Provide a large room with adequate ventilation in the waiting area.	NHS
	-Appropriate zoning and separation measures should be undertaken. Waiting rooms and reception areas should allow for 2-meter separation, ideally marked on chairs and flooring.	NHS
	-Remove magazines, reading materials, toys, and other objects that may be touched by others and which are not easily disinfected.	ADA
	- Place signage in the dental office for instructing patients on standard recommendations for respiratory hygiene/cough etiquette and social distancing.	ADA
	- Require the use of facemasks or cloth face coverings by everyone entering the dental office	CDC
	- PPE (isolated wearing like N-95 masks, Health or FFP2-standard masks, gloves, face shields, goggles, gown, surgical cap, shoe cover) should be implemented by dental professionals	CDC, NHS, ADA
	-Preparation of materials and instruments in advance and cover surfaces with disposable protections	NHS
	-Materials stored in a refrigerator should be sterilized prior to and after each treatment	WHO
	-Patients should be treated in an isolated and well-ventilated room with negative pressure relative to the surrounding area	CDC
During dental treatment	-Hand hygiene should be performed before and after all patient contact, contact with potentially infectious material, and before putting on and after removing PPE. -Use alcohol-based hand rub (ABHR) with 60-95% alcohol. If hands are visibly soiled, use soap and water for at least 20 seconds before returning to ABHR.	CDC
	-Preoperative antimicrobial mouth rinse like peroxide could reduce the number of microbes in the oral cavity. Since SARS-CoV-2 may be vulnerable to oxidation, use 1.5% hydrogen peroxide or 0.2% povidone as a preprocedural mouth rinse.	ADA
	-Rubber dams and high-volume saliva ejectors can help minimize aerosol or spatter in dental procedures.	CDC, NHS, ADA
	-use extraoral dental radiographs, such as panoramic radiographs or cone-beam CT, as appropriate alternatives of intraoral radiography	ADA
	-If aerosol-generating procedures are inevitable for emergency care, use 4-handed dentistry.	CDC, ADA

-Avoid the use of aerosol-generating procedures, handpieces/ultrasonic instruments, 3-in-1 syringes, and the air-water syringe whenever possible.	CDC, ADA
-Dental professionals should use resorbable sutures to eliminate the need for a follow-up appointment.	ADA

	-Treatment should be completed in one visit wherever possible.	NHS
	-Environmental cleaning and disinfection procedures should be followed promptly after the completion of clinical care.	CDC
After dental treatment	-Clean PPE with soap and water, or if visibly soiled, clean and disinfect reusable facial protective equipment.	ADA
	-Manage laundry and medical waste in accordance with routine procedures.	CDC