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Narrative Review

Reopening of Dental Clinics during SARS-CoV-2 Pandemic: An Evidence Based Protocol before Starting Clinical Interventions

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Abstract

COVID-19 is a viral disease caused by SARS-CoV-2 that quickly became a global pandemic during 2020. Considering the recent outbreak, the lack of adequate data regarding SARS-CoV-2, and consequently the risk of dental practice and potential cross-infection, this article attempted to address the information collected so far in accordance with the internationally valid guidelines and to suggest a relatively safe protocol for the management of o patients. In other words, this study describes the essentials that need to be considered for the dental office reopening.

Keywords: COVID-19, SARS-CoV-2, Dental Clinic.

Introduction

Following the severe acute respiratory syndrome coronavirus (SARS-CoV-1) and Middle East respiratory syndrome coronavirus (MERS-CoV), another pathogenic coronavirus called SARS-CoV-2 emerged in December 2019 in Wuhan, China. This virus has similarities with SARS-CoV-1 and causes acute pneumonia. The most characteristic symptom of patients with SARS-CoV-2 is respiratory distress, and most of the patients could not breathe spontaneously. Additionally, some patients with SARS-CoV-2 also show neurologic signs, such as headache, nausea, and vomiting. Increasing evidence shows that coronaviruses are not always confined to the respiratory tract and that they may also influence the central nervous system.[1] SARS-CoV-2 spreads via droplets and contact routes, but some feel that airborne, fecal, or intrauterine transmission may be involved. Its fatality rate is about 6.3%, but it varies in different ages and counties, and it could be over 15%.[2]

Requirements of a study on SARS-CoV-2 aerosols creation and spread in dental practices

Sneezing, coughing, and application of rotary instruments can result in the production of airborne particles (0.001 to 10 000 μm). It has been shown that airborne particles produced during dental procedures decrease to baseline levels within 10 to 30 minutes (Figure-1).

Figure 1 indicates that surfaces in dental care room include:

- Clean and dirty zones that should be marked to reduce cross-contamination risks.
- The room should be properly organized to allow easy access for disinfection.
- Surfaces should be easy to clean, impermeable, and curve up at the wall to avoid sharp corners that are difficult to clean.

An aspirator can evacuate up to 90% of the water spray. To

avoid the contamination spread, it should have external.

Cleaning and disinfection can remove particles that have deposited on instruments and surfaces. Containment of these aerosols is important; otherwise the 'dirty zone' would potentially have to include the whole room and between-patient decontamination would be impossible. Respiratory infections including tuberculosis, legionella, SARS (severe acute respiratory syndrome), and flu are spread by aerosols, and reduction of the risk of occupational infection requires aerosol control and ventilation of the surgery.

Blood may infiltrate saliva after several dental procedures. Although it is known that blood-borne pathogens can be transmitted through mucous membrane exposure and blood-borne viruses can be aerosolized during dental procedures; there is no known evidence to confirm the transmission of blood-borne pathogens via aerosols.[3]

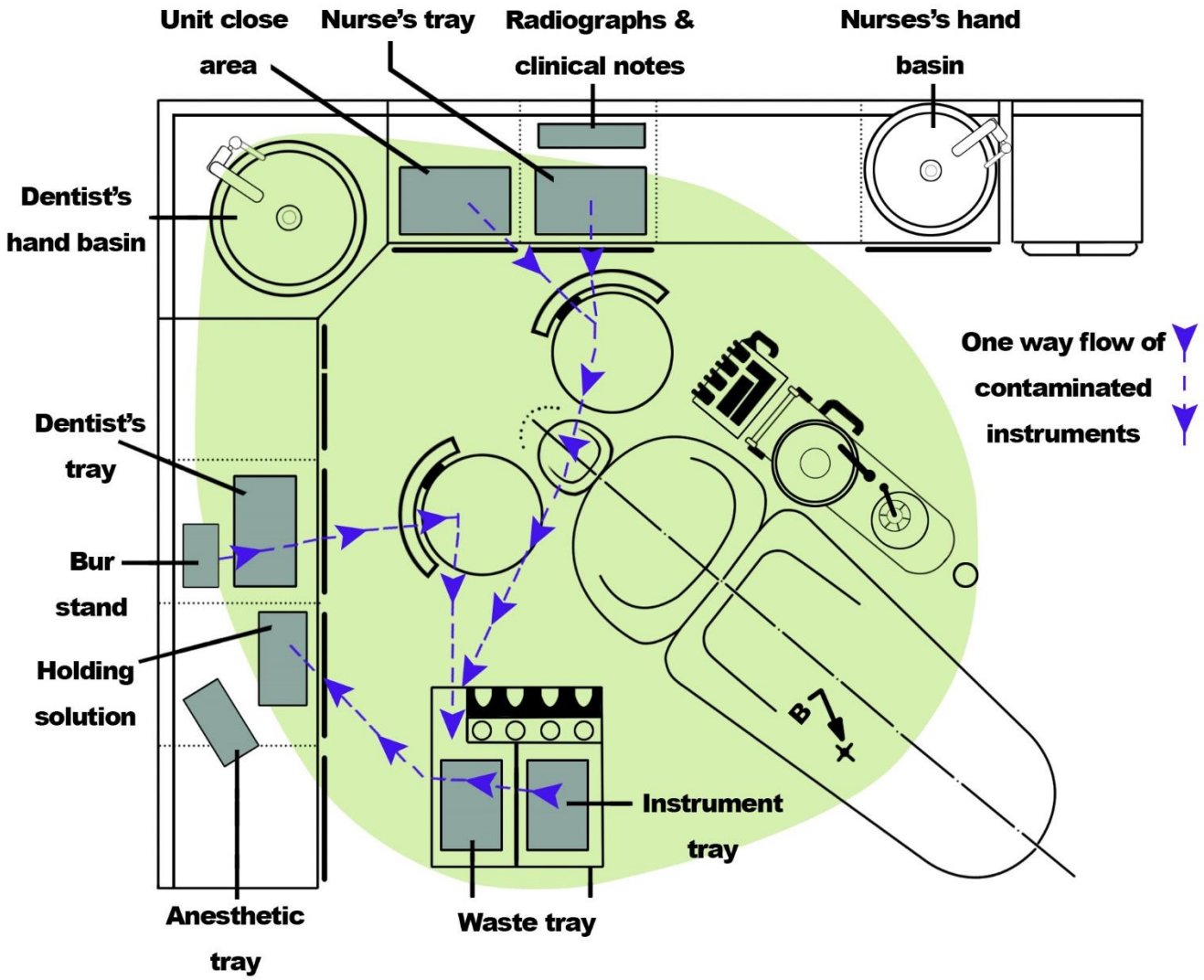

Figure-1. Diagram of zones within the dental surgery where contamination is likely to occur.

Covidified Dentistry Milestones: A Realistic Classification

Near Term: SARS-CoV-2 Pandemic

The incubation period from exposure to the onset of symptoms could be as long as 14 days and uncommonly even longer.[4-6] SARS-CoV-2 infection induces IgG antibodies against N protein that can be detected by serum as early as day 4 after the onset of disease and with most patients seroconverting by day 14.[7] Unfortunately, no effective treatment or therapeutic drug is available for the disease; only supportive treatment and classical intervention measures are available for confronting the SARS-CoV-2 pandemic.[8] The median period from contact to diagnosis and the last positive nucleic acid test was 19 (8 to 24) days and

21.5 (10-36) days, respectively.[9] Between 4%-14% of SARS-C0V-2 infected patients will remain asymptomatic for the entire disease period,[10,11] and a remaining 30% showed few clinical symptoms.[11] The illness is initially difficult to distinguish from other common respiratory infections.

All the above-mentioned data indicates that there is a vital risk for dental healthcare providers (DHCP) to encounter asymptomatic SARS-CoV-2 patients. When practicing in the absence of Airborne Precautions, the risk of SARS-CoV-2 transmission during aerosol-generating dental procedures cannot be eliminated.[12-17] At the date of this paper there are no data available to assess the risk of SARS-CoV-2 transmission during dental practice or to determine whether DHCP is adequately protected when providing dental treatment using Standard Precautions. To date in the United States, no clusters of SARS-CoV-2 positive have yet been reported in dental settings or personnel. The US Occupational Safety and Health Administration's Guidance on_Preparing_Workplaces for SARS-CoV-2 [18] places DHCP in the very high exposure risk category, as their jobs have a high potential for exposure to known or suspected sources of the virus that cause SARS-CoV-2 during specific procedures.

At this stage that enough nationwide testing and rapid point of care tests aren't available, it is recommended that all dental patients SARS-CoV-2 positive,undergo tele-triage of all patients, avoid aerosol-generating procedures when possible, implement basic source control measures and implement Contact, Droplet and Airborne Precautions.

Intermediate-Term: First Milestone

To learn if a dental patient has a current asymptomatic SARS-CoV-2 infection, viral tests may be helpful. Patients may be tested by laboratories or in point of dental settings. Ideally, these points of care tests should give rapid and reliable results, be affordable, and can be performed on saliva samples for lowered sampling risk.[19-23]

An antibody test tells a person had a previous SARS-CoV-2 infection. Recovered patients who tested positive for SARS-CoV-2 likely aren't going to reinfect again.[24] Preliminary result indicated an existing immunity of approx. 14% (anti-SARS-CoV-2 IgG positive, the specificity of the method>, 99%) was determined. in Germany and about 2% of the people had a current SARS-CoV-2 infection determined using the PCR method.[25] The overall infection rate (current infection or already gone through) was approximately 15%.[25]

Nationwide studies will demonstrate the actual existing immunity against SARS-CoV-2 in populations and dentists need to access the patients' SARS-CoV-2 antibody data or request a test for dental patients. At this stage and widespread availability of tests, may basic source control measures and implementing Standard, Contact and Droplet Precautions be sufficient to prevent cross-infection in patients and SARS-CoV-2 infection in DHCP and discontinue Airborne Precautions.

Long Term (New Normal): Second Milestone

SARS-CoV-2 was identified in record time, and its genomic sequence was swiftly made widely available by Chinese researchers.[26-28] We know from studies on SARS-CoV-1 and the related MERS-CoV vaccines that the S protein on the surface of the virus is an ideal target for a vaccine and antibodies targeting the spike can interfere with this binding, thereby neutralizing the virus.[29,30] Several vaccines for SARS-CoV-1 were developed and tested in animal models, including recombinant S-protein-based vaccines, attenuated and whole inactivated vaccines, and vectored vaccines. Most of these vaccines protect animals from challenge with SARS-CoV-1.[31]

SARS-CoV-1 and MERS-CoV vaccines in almost all cases were associated with greater survival, reduced virus titers, and/or less morbidity compared with that in unvaccinated animals, still, we need to ensure that the vaccines, which are developed for SARS-CoV-2, are sufficiently safe.[32] Antibody titers in individuals that survived SARS-CoV-1 or MERS-CoV infections often waned after 2–3 years,[33] and protection in older individuals appears to may require higher neutralization antibody titers than in younger individuals.[34] An effective SARS-CoV-2 vaccine will need to overcome these issues to protect in a scenario in which the virus becomes endemic and causes recurrent seasonal epidemics.[32] Some vaccines have currently started phase I clinical trial recently but the development of SARS-CoV-2 vaccines for human use can take years. For SARS-CoV-2, vaccines might come too late to affect the first wave of this pandemic. However, they might be useful if additional waves occur later or in a post-pandemic scenario in which SARS-CoV-2 continues to circulate as a seasonal virus.

After SARS-CoV-2 vaccination and immunization of DHCP to SARS-CoV-2 and the then broader success of immunization on achieving a level of coverage sufficient to

interrupt transmission of the virus, still, it is possible that SARS-CoV-2 or its new strains become endemic and causes recurrent seasonal epidemics. Coexistence with airborne viruses seems will be a new normal.At this stage may basic source control measures and implementing Standard, Contact, and Droplet Precautions be necessary to prevent cross-infection in patients and SARS-CoV-2 infection in DHCP (Table-1).

Table-1. Post- SARS-CoV-2 Dentistry Milestones: A Realistic Classification

Type of Precautions	Post-SARS-CoV-2 Pandemic	Rapid Point of Care Test	SARS-CoV-2 Vaccine for DHCP
Standard Precautions+ Contact+ Droplet+ Airborne	Near Term	Not Available	Not Available
Standard Precautions+ Contact+ Droplet	Intermediate Term	Available	Not Available
Standard Precautions+ Contact+ Droplet	New Normal	Available	Available

Classification of conditions and treatments in terms of urgency

Therapists should explain to patients that before any appointment, they should discuss their problem by Tele-counseling and strictly avoid any uncoordinated visit. After receiving information, the therapist should give the patient the necessary instructions according to the patient's needs and if the therapist recognized that the patient is in a serious life-threatening or health-threatening situation, she/he can call the patient to the office.[35-38] Clinical intervention should be deferred until the permission is issued by the official authorities; Advice on appropriate telecounseling/ medication therapy.

Management of office and patients

Minimize in-person appointment to emergency conditions; Referral and Telecounseling [38-56]

- Dentists are responsible professionally and ethically to communicate treatment expectations with their patients of record. Failure to communicate with patients and failure to treat patients or refer them for treatment can create legal liabilities for dentists, including charges of negligence or patient abandonment a form of dental malpractice.
- To minimize the risk of exposure and community spread it is critical to reducing physical walk-ins in the dental setting. This can be done effectively by tele-screening and triaging by phone.
- If a dentist is unable to provide emergency services to patients in their office for any reason, she/he should at least be able to provide telecounseling as well as referral of emergency patients to a dental emergency service center.
- By Teledentistry, dental personnel can provide dental care using communication technologies with no need for an in-person visit (Table-2).
- Problems associated with dental implants, restorations, prostheses, and orthodontic fixed and removable appliances are likely to be among the most common urgent conditions that may occur. In the event of such a situation, if the patient is not in an emergency condition, firstly, dentists are obliged to explain the main reason (Patient's own health and prevention of potential cross-infection risk) for the inability to provide them with an in-person appointment. Next, the dentist should guide the patient regarding her/his problem in such a way that the patient can adapt to her/his dental problem as long as it is possible to provide an in-person visit.
- The dentist should guide the patient regarding her/his problem in such a way that the patient can adapt to the dental problem as long as it becomes possible to provide an in-person visit for a definitive solution.
- Today, with the development of communication technologies, the approach of using telephone calls to stay in contact with patients does not seem very logical and optimal.
- It seems that Internet-based communication applications, which are widely used in society currently, can be a good alternative to cellphone calls. One of the notable features of these applications, which makes them preferred to use over the phone calls, is a free and high-quality video call.
- Various applications are offered that provide these services. The main differences between these applications are the quality of service and the number of

their subscribers.

- Health care providers are advised to use the most popular application in their geographical area in order to provide the most optimal platform for communicating with patients. However, given that there is a possibility of using more than one application in an area, and on the other hand, the possibility of occasional disruption in services, it is better for health care providers to suggest more than one way of communication.
- It should be noted that all legal and professional standards that are applied to clinical care, also apply to teleconsultation.
- Since examination of emergency cases may not be feasible via teledentistry, in-person clinical evaluations will be essential.
- Dental health care provider must confirm the patient's identity at the beginning of teleconsultation.
- Dentists are advised to use teleconsultation for assessment and triage of existing patients.
- The possibility of leaking private information of patients in online platforms is much more than in-person meetings. Therefore, the patient's information confidentiality should be preserved strictly. For this purpose, teleconsultation appointments should be conducted in a private environment to ensure that patient information will not be overheard or seen by others.
- However, patients should be notified that since their information is transmitted electronically, there is a possibility of information interception, despite maximum security.
- Keep appropriate records of the teledentistry appointment and note specifically that the care was provided through teledentistry.
- The front-desk staff members should be trained to triage callers based on their emergency severity assessment of the dental condition and the exposure risk categories related to SARS-CoV-2.
- Informed consent for teleconsultation should correspond to the standard, conventional forms. Especially, patients should be informed regarding the potential risk of misdiagnosis and failures in treatments due to the involvement of novel technologies.
- The same charge as an ordinary in-person visit for teleconsultation may be convenient. However, there is no consensus regarding this issue.
- Tables 3, 4 are describing recommendations for oral and maxillofacial surgical procedures, however, these can be used for other surgical procedures in healthcare settings.

Table-2. The most common modalities of teleconsultation

Modalities	Description
Live video (synchronous)	Live, mutual communication via audiovisual telecommunication technologies.
Store-and-forward (asynchronous)	Forwarding recorded information through telecommunication technologies outside of real-time interaction. This may be the most optimal route in dental practice.
Remote patient monitoring (RPM)	Personal health and medical information are collected from individuals for application in care services.
Mobile health (mHealth)	Health care and educations supported by mobile communication devices.

Table-3. Recommendations on patient hospitalization. [57-65]

During hospitalization	
1	Patients' consent form should be signed by the patient regarding SARS-CoV 2 disease
2	The patient should be fully informed about care and protective interventions from the time of admission to discharge
3	the patient should provide relevant SARS-CoV-2 screening tests following the approved recommendations (such as two negative PCR tests with an interval of at least 24 hours or IgM and IgG antibody tests or other diagnostic tests in terms of the regional protocol)
4	Preferably, patients should not have a companion. However, if it is necessary to have a companion he/she must be evaluated for the coronavirus too, and not replaced with another one until the patient is discharged

5	If possible, patients should be admitted to a private room and not in contact with other patients
6	Minimize the traffic in the patient's room as much as possible
7	It is highly recommended to admit patients in centers which are not dedicated to SARS-CoV 2 infected cases and ask patients to quarantine at home for two weeks before hospitalization
8	The path of movement of patients in the hospital should be short and do not pass through infected places
9	If there is a possibility for admission of patients in ICU after surgery, the availability of non-contaminated beds in these places should be considered
10	It is better to avoid surgeries that require blood transfusions during this period

Table-4. Sample recommendations for oral and maxillofacial surgeries.[57-65]

Recommendations for operating rooms	
1	For all of the staff in the operating room, maximum PPE such as mask or respirators, especially N95, protective goggles, face shields, gloves should be provided
2	Surgeons and other personnel should be out of the operating room during anesthesia and return to the room after intubation The time interval between intubation and the surgeon's return to the room allows the operating room ventilation system to remove the maximum number of droplets from the room environment
3	Since one of the serious routes of infection transmission is respiratory secretions, anesthesiologists must use all recommended precautions, such as a protective cover box or other recommended methods
4	It is recommended that the operating room anesthesia machine be equipped with special filters and use only disposable anesthesia masks and tubes
5	It is recommended not to perform surgeries that last more than 3 hours
6	It is better to avoid combined orthognathic and other facial cosmetic surgeries, except for some short time surgeries such as upper blepharoplasty, etc.
7	It is recommended not to perform very large surgeries such as simultaneously face and neck and forehead lift
8	There must be any readiness for complications during the operation.
9	It is better to operate on patients who categorized ASA 1 or ASA 2
10	It is recommended that patients with a high level of BMI or smokers do not undergo surgery
11	Very old or very young patients should not be operated during the high prevalence period of the SARS-CoV 2
12	During marking before the operation, be sure to consider the use of masks and gloves
13	Precautions should be taken when using lasers and other processors that can disperse particles
14	During rhinoplasty, the use of masks and protection of the neck area should be considered seriously. In such patients, preoperative examinations should be performed more seriously in terms of not being infected
15	Avoid from operating cosmetic patients in rooms where emergency patients have been operated
16	In each operation, the least number of personnel should be used and do not move between rooms
17	If possible, use disposable clothing and surgical equipment
18	Personnel who are likely to be in contact with an infected patient or are suspected in this regard should not be present in the operating room
19	It is best to seriously reduce the number of surgeries and to have a good time interval between two surgeries and proper surface disinfection to be done
20	If possible, do not use open drains in surgery

Admission of in-person visits [49-56]

- Triage of all patients via teleconsueling before visiting the office is required. If the patient is not in an emergency, it is best to postpone the treatments and give the patient the necessary advice via teleconsueling in order to minimize in-person visits in the current situation.
- Any treatment, even for patients with emergencies, should be strictly avoided if basic personal protective equipment (PPE), such as masks and shields, are not

accessible. The most appropriate option in such a situation is to refer the patient to a well-equipped clinic.

- If in telecounseling, the patient's condition is recognized as an emergency in a way that the patient needs to be visited in-person at the office, the patient should be asked to come to the office alone, preferably via a private vehicle.
- If the patient is not able to go to the office alone and it is inevitable for her/him to have a companion, the patient's companion should only have the right to accompany her/him outside the office building and should not be allowed to enter the office.
- Patients should be advised to wear a face mask and gloves before entering the office and to avoid contact with persons and surfaces such as elevator push buttons and door handles as much as possible.
- As soon as the patient arrives at the office, it is best to ask him or her to throw his or her gloves and mask into the trash and give him or her new gloves, face mask, head cover, and shoe cover instead.
- The possibility of rapid screening tests for the disease in the future is not far-fetched. The use of such products will help to improve the control of infection in offices and will significantly reduce the psychological stress caused by exposure to this disease for staff and patients. Another important achievement of using such rapid screening tests is to prepare for the resumption of elective treatments in offices.
- Due to the fact that fever is one of the main symptoms of this disease, in the absence of rapid screening tests, the simplest tool that can be used to assess the patient's health at the beginning of the visit, is a contact-free forehead thermometer.
- Recently, some recommendations have been made for the prophylactic use of hydroxychloroquine (400 mg twice on day 1, then 400 mg once a week thereafter) in healthcare workers. However, there is no peer-reviewed publication that evaluates either drug for exposure prophylaxis of SARS-CoV- 2 infections so far. Also, the possibility of serious long-term complications, such as Cardiotoxicity and Retinal toxicity, suggests that further studies are needed to conclude on the prophylactic use of this drug.
- Prior to entering the care area, DHCP should put on an N95 respirator (or respirator that provides a higher level of protection), eye protection (goggles or a full face shield), gloves, and a clean isolation gown. If respirators with a high level of protection are not available, surgical masks and full-face shield should be put on simultaneously. Obviously, personal eyeglasses and contact lenses cannot provide reliable eye protection.
- The office secretary is required to schedule appointments for emergency patients so that no more than one patient is present at the office at a time. This requires careful scheduling and punctuality of office staff and patients. Otherwise, a social distancing of at least one meter between patients must be enforced.
- Due to the high risk of exposure to sources of the SARS-CoV- 2 in dental offices, patients are required to complete the informed consent forms at the beginning of their visit to the office.
- Both patients and staff should strictly avoid eating and drinking in the office.
- The waiting room should be ventilated properly. 60 L/s per patient for a room with natural ventilation seems to be optimal.
- A dental practice has a legal and ethical obligation to inform patients if a staff person they have been in contact with has tested positive for SARS-CoV-2.

Conclusions

This study provides an outlook regarding the available evidence and findings to propose a comprehensive protocol for the dental office reopening. We believe that following the data of this study can inform readers with a suitable overview of the arrangements and measures that should be considered for the gradual reopening of dental offices.

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Not applicable.

Authors' Contribution

All authors pass the four criteria for authorship contribution based on the International Committee of Medical Journal Editors (ICMJE) recommendations.

Conflict of Interests

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