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RESEARCH ARTICLE

The Saudi Infection Control Guidance for Re-opening Dental Services in Governmental and Private Sectors During Coronavirus Disease-2019 Pandemic

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Abstract:

Objective:

Novel newly discovered coronavirus, also known as severe acute respiratory syndrome coronavirus-2, is a recently emerging virus that has been rapidly spreading globally since December 2019. Due to the vicinity in oro-dental treatment and aerosol production, people inside the dental office are at high risk of being infected with severe acute respiratory syndrome coronavirus-2. This guideline aims to protect the dental health-care workers during their plans to re-open and increasingly continue their routine services until further notice from their governing body.

Methods:

A panel of experts in dentistry and infection prevention and control reviewed the local and global research and guidelines related to infection prevention and control during coronavirus disease-2019, along with the re-opening guidance provided by different entities.

Results:

Such a document might either be adopted or adapted to any regional and international organization that wishes to use a revised professional guideline in infection prevention and control dental services.

Conclusion:

A careful re-opening plan should be developed and implemented, including strict infection control measures before resuming the dental practice.

Keywords: Dentistry, Dental infection control, Re-opening dental services, COVID-19 guideline, Dental guideline, Infection control.

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1. INTRODUCTION

Novel newly discovered coronavirus, also known as severe acute respiratory syndrome coronavirus-2 (SARS CoV-2), is a newly emerging virus that has been rapidly spreading globally since December 2019. This type of coronavirus causes coronavirus disease-2019 (COVID-19) [1]. Transmission of SARS CoV-2 potentially occurs by direct contact with respiratory mucosa or conjunctivae. Basically, *via* secretions from the respiratory system by direct contact or through in-

termediate body that touched contaminated surfaces, *i.e.*, hands. However, airborne transmission is anticipated within aerosol-generating procedures (AGPs) [2 - 4]. Due to the vicinity in oro-dental treatment and aerosol production, people inside the dental office are at high risk of being infected with severe acute respiratory syndrome coronavirus-2.

The broad international distribution of SARS CoV-2 has impacted dental practice. Dental health-care workers (DHWs) have a high risk of transmission because of the face-to-face contact as the virus is significantly shed in the saliva [5, 6]. Moreover, the asymptomatic transmission of the disease has been reported in the literature [7]. Accordingly, many dental clinics have been suspended from work and have only shifted to urgent treatment under stringent conditions.

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In late March 2020, the Ministry of Health (MOH) limited all dental providers to care only for dental emergencies. Besides, “Dental Emergency Protocol during COVID-19 Pandemic” was released by the General Directorate of Dentistry, MOH, to highlight the safest-best practices in the present pandemic. Nowadays, The MOH began to consistently re-open some of the clinical services for usual conditions. In this guidance, the current distribution status of COVID -19 as well as the drawback of postponing management of dental patients, were considered. Furthermore, Infection control instructions that are accurate, well-planned, and well-trained are considered essential for such a reopening strategy to prevent COVID-19 outbreaks in dental settings.

2. AIM

This guideline aims to protect the DHWs during their plans to re-open and increasingly continue their routine services until further notice from their governing body. It is parallel with Infection Prevention and Control (IPC) documents that were previously issued by other institutions and organizations such as the Centers for Disease Control and Prevention (CDC) and American Dental Association or any other local guidelines. Therefore, they must be carefully read, understood, and applied.

To the best of our knowledge, our manuscript is the only local and international guideline that provides an objective visual triage scoring system and schematic actions for the dental specialty. This will provide a roadmap to categorize the patients and isolate the high-risk individuals before beginning the dental treatment. Thus, it offers an optimum infection control practice during the epidemic.

3. METHODS

A panel of experts in dentistry and infection prevention and control reviewed the local and global research and guidelines related to IPC during COVID-19 and the re-opening guidance provided by different entities. The instructions and evidence-based knowledge was taken into consideration during the development of this guideline.

4. RESULTS

Such a document might be adopted or adapted to any regional and international organization that wants to use a revised professional guideline for infection prevention and control for dental services during the COVID-19 pandemic.

4.1. Dental Infection Control Practices in COVID-19 Pandemic

IPC science was defined as measures that are encountered in the surroundings and through practical operations. They aim to stop and manage the spread, acquiring, and cross of infectious agents within the health-care industry [8]. Therefore, the specifically proposed IPC measures at the COVID-19 pandemic have to be escorted with all previously known standard precautions in a normal situation to provide full protection for the DHWs and patients. These measures include hand hygiene, PPE, covering high touchable surfaces. In this document, more IPC measures are detailed and compelled,

especially for the COVID-19 pandemic.

4.1.1. Dental Health-care Workers Preparedness

DHWs are advised to steadily continue their duties to ensure public health safety and prevent infection. Their awareness and education are fundamentals before restart running the dental facility. An evaluation of the adherence to the IPC guidelines is mandated. Sufficient training on the guidelines must be carefully planned, executed, and guaranteed. Facilities must ensure that all DHWs understand these guidelines and assess their capability to stick to them.

According to the local governing body instructions, dental facilities/clinics have to comply with their working hours. It is an absolute necessity to make sure that IPC guidelines in staff residencies are strictly applied. Including those for housekeepers, if any. The in-need maintenance has to be arranged and coordinated with companies to ensure their compliance with these roles.

A visual triage point at the facility entrance should be established. Employees suffering from these fever $\geq 38^{\circ}\text{C}$, cough, sore throat and/or shortness of breath must not attend and have to report to the management to find medical care. They are not permitted back to duty without clearance from the medical side.

4.1.2. Personal Protective Equipment (PPE)

Usually, the safeguard gears against dentally-generated-aerosolized droplet nuclei are not recommended. However, it is mandatory to use the respiratory protection devices, *e.g.*, non-oil resistant with 95% filtration capacity (N95) respirator or powered air-purifying respirator (PAPR) with other PPE for patients who score > 0 during the pandemic when AGPs are decided to be performed [9].

Facilities have to register the fitting test and training of N95 respirators for their DHWs during the fitting test. The Occupational Safety and Health Administration (OSHA) and/or National Institute for Occupational Safety and Health (NIOSH) are agencies that approve the specifications for N95 respirators. Certified N95 should be used in health-care facilities to assure protection. Alternatively, the third class Filtering Facepiece Respirator (FFP3) can be used as a replacement of the N95 respirator, which follows the standard for the European Committee for Standardization (CEN) EN 149:2001+A1:2009.

NB: Users of PPE should be instructed to take them off normally in the clinic except for N95 or PAPR. They must be removed outside the clinic and discarded in a contaminated-wastecontainer [10].

4.1.3. Air Control

AGPs for patients are better to be performed under one of the following air control options, particularly for suspected patients or confirmed for COVID-19:

- A- Heating, ventilation, and air conditioning “HVAC” system with negative pressure within dental settings [2].
- B- Airborne infection isolation room (AIIR) in a hospital setting provided with portable dental gear.

C- Portable high-efficiency particulate air “HEPA” filter in the dental clinic.

4.1.4. Decontamination of Dental Settings

Thorough terminal decontamination should follow dental procedures for all surfaces. Meanwhile, the postponing decontamination process is obligatory prior to reuse the dental clinic to eradicate aerosols as the surroundings stay contaminated due to AGPs [11 - 13]. The guidance for time-laps before begin decontamination is dependent on the type of air control (Table 1) [3, 9, 14]. It is recommended to use disposable mops and non-woven cloths incorporated in a fresh detergent or detergent combined with low-level disinfectants for non-clinical surfaces. For clinical surfaces, intermediate-level disinfectant wipes or sprays are. Be sure to put on full PPE [with regular masks] during decontamination. Some of the decontamination intermediate-level chemicals suggested in the literature are listed in Table 2 [11].

Table 1. Guidance for time-lapse before beginning decontamination.

Type of Air Control	Recommended Time to postpone Decontamination
Negative pressure HVAC*	At least 20 minutes
HEPA-filtered Room**	Follow manufacturer's instruction for complete air filtration
Neutrally air-ventilated room	At least one hour

*HVAC: heating, ventilation, and air conditioning.

**HEPA: high-efficiency particulate air.

Table 2. Guidance for disinfection chemicals for SARS CoV-2.

Intermediate-level Chemical formula	Dilution Rate
Ethyl Alcohol	62%–71%
Hydrogen peroxide [H2O2]	0.5%
5% sodium hypochlorite* [50,000 part per million chlorine]	0.1% [1,000 of chlorine] 1 volume of 5% sodium hypochlorite to 49 volumes of water

* Cause corrosion to the metallic surfaces in such concentration.

4.1.5. Engineering Control

It is important to eliminate the hazardous conditions to preserve DHWs by a barrier between the staff and the hazard by taking advantage of technology or innovation. For instance, expelling the airborne emissions by exhausted-local ventilation. The most important thing is that technologies and innovations do not intervene with the original procedure, comfort, and outcome. Rather, they must be of substantial impact on safeguarding the workers' health and preventing hazards. In the absence of unequivocal evidence to back up these measurements' significance, their clinical performance in reducing aerosols is worthy of being referred to.

4.1.6. Respiratory Triage and IPC Management Protocol

Respiratory triage aims to early detect persons who are potentially respiratory infectious and therefore decrease the chance of disseminating the infection inside the facility. A

visual triage scoring form [respiratory triage checklist] is being used as issued from Saudi Center for Disease Prevention and Control (Weqaya).

Depending on the scores, the patients are considered as high risk of transmitting a respiratory disease, including COVID-19 if **score ≥ 4** , moderate risk if **score between 1 and 4**, finally low risk if **score = 0**.

4.1.6.1. Two types of Triage could be Applied for Dental Setting

a- Triage by Telephone [2]:

In case, the patient called the dental clinic for an appointment; in this case, a trained dental assistant will fill the triage scoring form Appendix 1, and ask the patient if he has any dental emergency after that inform him if he can come to the dental clinic for evaluation.

b-Triage upon Arrival of the Patient:

A well-trained dental assistant will fill the triage scoring form Appendix 1, and the patient will be asked if he has any respiratory symptoms then the triage nurse should measure the patient's body temperature using a non-contact forehead thermometer [15].

Illustration of IPC management protocol according to the patients given scores as per the respiratory triage checklist for COVID-19 can be found in Fig. (1).

4.1.7. Additional Measures and Instructions

- When AGPs started, effort should be made to finish the aim of the procedure. Upon completion, single-use PPE must be put in infectious waste bags. Consideration to operate two clinics, whenever feasible, is advisable.

- For those who score ≥ 4 , oral radiographs are best to be postponed or adhere to the radiology department guidelines for extra-oral radiographs. If the patient's case score < 4 or score of zero, instruct the patient to doHH and put on a regular mask for taking anorthopantomogram.

- Using manual instrumentation is preferred and should be prioritized over the use of dental turbines.

- Whenever possible, use a rubber dam or any other appropriate isolation method, *e.g.*, dry shield and isolite, along side high volume suction to reduce aerosol or splatter.

- The 4-handed technique is always useful for the management of aerosolization or splatter.

- Use High-volume evacuators appropriately, *i.e.*, as near as it could be to the operation area within 15 mm. It effectively reduces the aerosols up to 90% immediately at the operation area [16].

- Backflow could occur when the patient closes his mouth on a saliva ejector, posing a risk of cross-contamination.

- Use resorbable sutures whenever possible to eliminate the need to suture removing appointments.

- Decrease the application of the 3-in-1 syringe to the minimum. Droplets might be generated as the water and air are

forced through its narrow tip.

- Patients are eligible to receive dental treatment normally if they are cleared from the COVID-19.

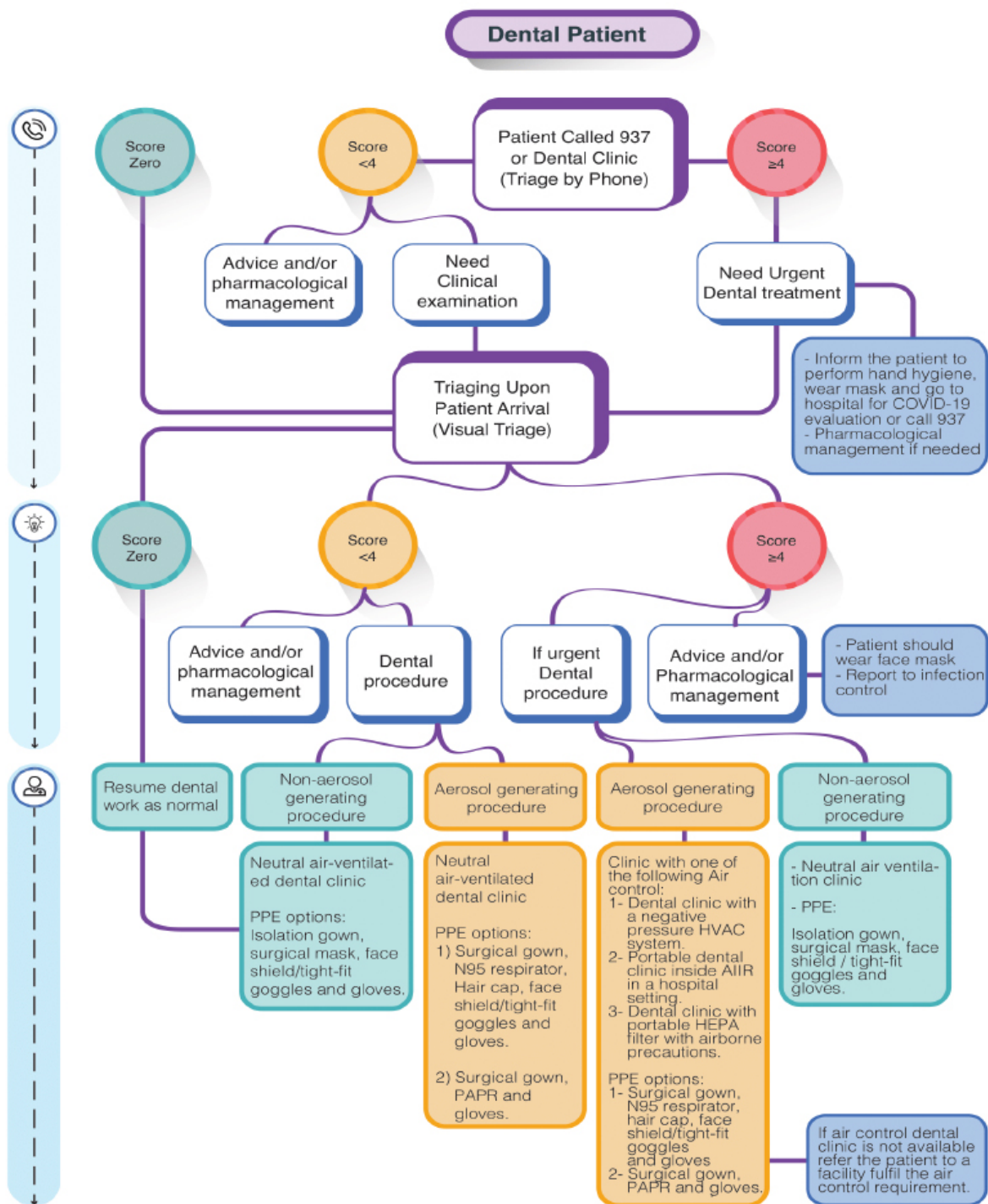


Fig. (1). Illustration of the respiratory triage and IPC management protocol according to the patients given scores for COVID-19.

COVID-19: Coronavirus disease-2019

PPE: Personal Protective Equipment

HEPA: High-Efficiency Particulate Air

AIIR: Airborne infection isolation room

HVAC: Heating, Ventilation, and Air Conditioning

5. DISCUSSION

This guideline aims to help to protect all dental health facilities and DHWs during their plans to re-open and resume their routine services until further notice from their governing body. Different regulatory bodies might benefit from this document by adopting our guidance to their local system. In another way, entities could adapt to such guidelines for their re-opening plans. As for the task force percentage, each system/regulatory body might have its own decision. For example, the Center for Disease Control and Prevention (CDC) does not require any workforce limitation during the re-opening of dental service. Unlike the Saudi national guideline, 50% of the task force is recommended per the whole national policy.

Though there are no particular recommendations for the sterilization process during COVID-19, DHWs should practice good care to prevent any contact with contaminated instruments and sharp injuries. Indirect transmission of the SARS CoV-2 is still a risk after hazardous exposure to such instruments and devices holding the virus.

Using engineering control devices to reduce the contamination of the surrounding air by decreasing the number of floating aerosols is highly recommended. However, attention should be paid if they are going to be used as a substitute for the medical HEPA filter as these devices are equipped with a HEPA filter to capture the tiny micro-organisms. Only devices that match the capacity of air recirculation and the medical HEPA filter's filtering ability are to be used as a replacement.

Since the distribution of COVID-19 is not equal in the whole regions of Saudi Arabia, risk including health and general physical conditions, medical history and demographics of the dental patients should be considered. DHWs with good general health care better to be thought of to provide care for patients. Moreover, consideration to delay elective operations for older patients [65+] and patients with a compromised immune system. Meanwhile, healthy patients without urgency are encouraged to delay dental treatment and maintain optimal oral hygiene.

CONCLUSION

COVID-19 is potentially a high-risk disease to be transmitted through dental practice due to aerosols generating procedures. A careful re-opening plan should be developed and implemented, including strict IPC measures before resuming the dental practice.

ACRONYMS AND NOMENCLATURE

- Neutrally air-ventilated room: this room is provided with an air-conditioner or natural
- ventilation. A single-directed airflow was not invented intentionally across the room.
- HEPA Filter: high-efficiency particulate air (HEPA), alternatively named high-efficiency particle absorption and highly efficient particle capture. Generally standardized, a HEPA air filter must remove at least

99.95% or 99.97% particles $\geq 0.3 \mu\text{m}$ according to the European Standard and ASME, U.S. DOE, respectively. Filtration efficiency is getting high for particle dimensions around the size of $0.3 \mu\text{m}$.

- PAPR: powered air-purifying respirator is a battery-powered air pumper that forces flow positively within the filter system to a headcover. The kind of filter system required for the PAPR is specified according to the magnitude of airborne pollutants [17]. It is used by those who do not find a particular fit-tested N95, did not fit for the N95 fitting test, or who has a beard.
- Aerosols: a blend of various sizes of particles. These are classified as droplet nuclei [$\leq 10 \mu\text{m}$], droplet [$\leq 50 \mu\text{m}$], and splatter [$> 50 \mu\text{m}$]. The majority of the aerosols produced in the dental office are excessively small [0.5 to $5 \mu\text{m}$] [15, 18, 19].
- Aerosol-Generating Procedures [AGPs]: operations able to produce dangerous tiny particles [$\leq 10 \mu\text{m}$]. A high risk of transmission of viruses was linked with AGPs [e.g., SARS-CoV and MERS-CoV]. Such operations include cardiopulmonary resuscitation, the use of dental turbines, nasopharyngeal swabbing, non-invasive ventilation, tracheotomy, and tracheal intubation.
- Standard Precautions: infection control practices used to evade disease transmission can be gained by handling or contacting mucous membranes, non-intact skin [including rashes], blood, and body fluids [20].
- Transmission-Based Precautions: precautions to be practiced in conjunction with standard precautions for specific infection types or infectious agents. These extra precautions are needed to avoid transmission [20].
- Clinical contact surfaces: surfaces that are touched repeatedly during patient care. Contamination with blood and other body fluids might quickly occur, and then infectious agents might pass to instruments, devices, hands, or gloves [20]. Appropriate treatment of these surfaces is desired before the care of the following patient.
- Housekeeping surfaces: those surfaces that do not include hands or devices used for dental procedures [e.g., floors, walls, and sinks] [21].
- Emergent care: all probable life-threatening situations which require immediate intervention in the hospital emergency department. Emergencies include uncontrolled bleeding, sizeable facial swelling, and trauma potentially jeopardizing the patient's airway, significant infection (e.g., space infection, cellulitis).
- Urgent dental care concentrates on the management of acute or uncontrolled signs and symptoms that will not be subsided by the patient and demanding a visit to the dental facility.
- Non-urgent dental care: involves regular and elective clinical procedures.
- Advice care: symptoms that are not severe- are managed on distance by the dentist (on the phone), providing advice and management with analgesics and antimicrobials.

AUTHORS' CONTRIBUTION

Orfali selected and composed the committee to design and develop the current guideline. He performed all of the administrative requirements and offered facilitation to the committee. Alrusayes and orfali provided the committee with support in the scientific materials, writing the introduction, and the 2nd and 3rd “final” revisions, respectively. AlAhdal, Almalaq, and Al-Huraisi structured the guideline by reviewing the literature and international guidelines then writing up the "Dental Infection Control Practices in COVID-19 Pandemic" section. The same group completed the 1st revision of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals/humans were used for studies that are the basis of this research.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The data sets used during the current study can be provided from the corresponding author [A.A], upon reasonable request.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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APPENDIX

Appendix 1. A visual triage scoring form (Respiratory Triage Checklist) issued by saudi center for disease prevention and control (Weqaya).

Respiratory Triage Checklist		
Date:	Time:	
Name:	Hospital:	
Circle the number reflecting the patient's condition (exposure and clinical picture) and calculate the final score:		
Risks for Acute Respiratory Illnesses	Score	
A. Exposure Risks	Any Patient {Adult or Pediatric}	
A history of travel broad during the 14 days prior to symptom onset.	-	
OR	-	
Visiting or being resident of a high-risk area for COVID-19 in the kingdom during the 14 days prior to symptom onset*.	-	
OR	-	
A close physical contact with a confirmed case of COVID-19 or MERS-CoV in the past 14 days.	-	
OR	3	
An exposure to camel or camel's products (direct or indirect**) in the past 14 days.	-	
OR	-	
Working in a healthcare facility.	-	
B. Clinical Signs and Symptoms and Medical History	Pediatric	Adult
1. Fever or recent history of fever.	1	2
2. Cough (new or worseni ng).	1	2
3. Shortness of breath (new or worsening).	1	2
4. Nausea, vomiting, and/or diarrhea.	-	1
5. Chronic renal failure, CAD/heart failure, immunocompromisd patient.	-	1
Total Score	-	-

* As determined and announced by the Ministry of Interior or Ministry of Health. Updated regularly on: www.covid19.cdc.gov.sa/

** Patient or household

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