

“An Arduous Journey to Practicable Situation”-Role of Oral Physician in Covid Pandemic

*Dr.Huma Afroz*¹
Post Graduate Student

*Dr.Syeda Arshiya Ara*²
MDS, Ph.D

*Dr Mohammed Rahimuddin*³
MBBS

Department of Oral Medicine & Radiology, Al-Badar Dental College & Hospital, Gulbarga

Abstract - It is a narrative review to illustrate the most accepted models of safety protocols in dentistry and oral medicine, and to propose an easy view of the problem and a comparison (pre- vs post-COVID19). After a brief excursus on all infectious agents transmittable at the dental chair, it is described here all the personal protective equipment (PPE) and their indications, and (before and after COVID-19 onset) the correct safety procedures for each dental practice studied. It has also highlighted the importance of knowing exactly the risk of infections, and to modulate correctly the use of PPE to avoid exposing both the dental team and patients to preventable risks. Dysgeusia is the first recognized oral symptom of novel coronavirus disease (COVID-19). Oral manifestations included ulcer, erosion, bulla, vesicle, pustule, fissured or depapillated tongue, macule, papule, plaque, pigmentation, halitosis, whitish areas, hemorrhagic crust, necrosis, petechiae, swelling, erythema, and spontaneous bleeding. To reduce the risk of disease transmission during radiologic procedures; and examine how intraoral radiography, with its potentially greater risk of spreading the disease, might be replaced by extraoral radiographic techniques for certain diagnostic tasks. , the main host cell receptor of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is highly expressed on the epithelial cells of the tongue and of the salivary glands, which may explain the development of dysgeusia in patients with COVID-19. Lack of oral hygiene, opportunistic infections, stress, immunosuppression, vasculitis and hyper-inflammatory response secondary to COVID-19 are the most important predisposing factors for onset of oral lesions in COVID-19 patients.

Key Words— COVID-19; Personal Protective Equipment (PPE), Oral Medicine Emergency(OME); alcohol-based hand rub (ABHR), of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), Occupational Safety and Health Administration’s (OSHA).

I. INTRODUCTION

The era of Corona-Virus-Disease-19 (COVID-19) is an important historical period from various points of view, from the world health to the huge cascade of socio-economic implications. Everyday habits have been turned upside down, and the way of life of people all over the globe, engaged in all activities, especially in the health sector, will be involved in this necessary change. Dentists, being in close contact with the patient’s droplets and aerosols generated, have to revise the operating protocols to protect the team and the patients from the risk of infectious diseases. The pandemic offers an opportunity for the dental profession to shift more toward non-aerosolizing, prevention-centric approaches to care and away from surgical interventions. On March 11, 2020, the World Health Organization declared the global spread of coronavirus disease 2019 (COVID-19) a pandemic.¹

Severe acute respiratory syndrome coronavirus 2 (SARSCoV-2) is a new virus with no vaccine or treatment, and the population currently has no immunity. The virus is primarily transmitted by direct or indirect personal contact through airborne respiratory droplets from an infected person.² In response to the dynamic circumstances of emerging infections and public health emergency responses, CDC has customarily issued “interim” guidance documents that are updated as new information and insights are gained, once novel interventions become available including through emergency use authorization, or once research reveals greater certainty that permits strengthening or rejecting earlier interim recommendations. CDC staff have developed thousands of documents during the COVID-19 response, including foundational guidance documents that address major areas of concern as well as numerous subsidiary tools and resources adapted from the foundational guidance. The spectrum of the illness of COVID-19 ranges from mild (asymptomatic) to critical (respiratory failure, or multiorgan dysfunction), fortunately, most infection are not severe.³ The route of transmission is not yet fully solved. It is thought to be via respiratory droplets, similar to the spread of influenza.⁴ Besides respiratory droplets, SARS-CoV-2 RNA can be found in blood and stool specimens.^{5,6} Dental procedures using drills or ultrasonic devices can produce aerosol release, which would then increase the risk of transmission

In this commentary, we explain why oral health care should be a public health priority in the response to the pandemic and discuss the aspects of dental care that make it challenging to accomplish this. We will also provide opportunities for improvement, such as focusing more on prevention and non-aerosolizing dental procedures and the means by which to increase access to affordable, more equitable care for vulnerable populations

Transmission: SARS-CoV-2, the virus that causes COVID-19, is thought to spread primarily between people who are in close contact with one another (within 6 feet) through respiratory droplets produced when an infected person coughs, sneezes, or talks. Airborne transmission from person-to-person over long distances is unlikely. However, COVID-19 is a new disease, and we are still learning about how the virus spreads and the severity of illness it causes. The virus has been shown to persist in aerosols for

hours and on some surfaces for days under laboratory conditions. SARS-CoV-2 can be spread by people who are not showing symptoms.

Risk: The practice of dentistry involves the use of rotary dental and surgical instruments, such as handpieces or ultrasonic scalers and air-water syringes. These instruments create a visible spray that can contain particle droplets of water, saliva, blood, microorganisms, and other debris. Surgical masks protect mucous membranes of the mouth and nose from droplet spatter, but they do not provide complete protection against inhalation of infectious agents. There are currently no data available to assess the risk of SARS-CoV-2 transmission during dental practice.

Several guidelines have been issued earlier by DCI, IDA and other organizations and hence there is a need to issue unified guidelines. These guidelines address dental services in the country, and cover:⁷

- ♣ Health care workers who are required to attend dental ailments in remote locations in the government sector.
- ♣ Dental Surgeons working in PHC/ small towns and different locations.
- ♣ Dental Surgeons working in government and private hospitals set up.
- ♣ Dental surgeons working in cities with solo or multi-speciality practices.

Zones and Dental Clinics

1. The dental clinics will remain closed in the CONTAINMENT ZONE; however, they can continue to provide tele triage. Patients in this zone can seek ambulance services to travel to the nearby COVID Dental Facility.
2. In the RED ZONE, Emergency dental procedures can be performed.
3. The dental clinics in ORANGE AND GREEN ZONE will function to provide dental consults. Dental operations should be restricted to Emergency and Urgent treatment procedures only.
4. All routine and elective dental procedures should be deferred for a later review until new policy/guidelines are issued.
5. Due to the high risk associated with the examination of the oral cavity, oral cancer screening under National Cancer Screening program should be deferred until new policy/guidelines are issued.

List of Emergency and Urgent Dental Procedures The clinical conditions of dental origin, which require priority care but do not increase the patient's death risk are categorised as URGENT and which increase the patient's death risk are categorised as EMERGENCY .

Implement Tele-dentistry and Triage Protocols

- Contact all patients prior to dental treatment.
 - Telephone screens all patients for symptoms consistent with COVID-19. If the patient reports symptoms of COVID-19, avoid non-emergent dental care and use the Phone Advice Line Tool for Possible COVID-19 patients. If possible, delay dental care until the patient has ended isolation or quarantine.
- Take steps to ensure that everyone (patients, DHCP, visitors) adheres to respiratory hygiene and cough etiquette and hand hygiene while inside the facility.
 - Post visual alerts icon (e.g., signs, posters) at the entrance and in strategic places (e.g., waiting areas, elevators) to provide instructions (in appropriate languages) about hand hygiene and respiratory hygiene and cough etiquette. Instructions should include wearing a cloth face covering or facemask for source control, and how and when to perform hand hygiene.
 - Provide supplies for respiratory hygiene, including alcohol-based hand rub (ABHR) with at least 60% alcohol, tissues, and no-touch receptacles for disposal, at entrances, waiting rooms, and patient check-ins.
 - Install physical barriers (e.g., glass or plastic windows) at reception areas to limit close contact.
 - Remove toys, magazines, and other frequently touched objects from waiting room that cannot be regularly cleaned and disinfected.
- Ensure that everyone has donned their own cloth face covering, or provide a facemask if supplies are adequate.
- Screen everyone entering the dental healthcare facility for fever and symptoms consistent with COVID-19 or exposure to others with SARS-CoV-2 infection.
 - Document absence of symptoms consistent with COVID-19.
 - Actively take their temperature.
 - Ask them if they have been advised to self-quarantine because of exposure to someone with SARS-CoV-2 infection.
- Properly manage anyone with symptoms of COVID-19 or who has been advised to self-quarantine:
 - If a patient is found to be febrile, has signs or symptoms consistent with COVID-19, or experienced an exposure for which quarantine would be recommended, DHCP should follow all precautions recommended in Section 2 Recommended IPC practices when providing dental healthcare for a patient with suspected or confirmed SARS-CoV-2 infection.
 - If a patient has a fever strongly associated with a dental diagnosis (e.g., pulpal and periapical dental pain and intraoral swelling are present) but no other symptoms consistent with COVID-19 are present, dental care can be provided following the practices recommended in Section 1. Recommended infection prevention and control (IPC) practices for routine dental healthcare delivery during the pandemic.
- People with COVID-19 who have ended home isolation can receive dental care following Standard Precautions.
 - Telephone triages all patients in need of dental care. Assess the patient's dental condition and determine whether the patient needs to be seen in the dental setting.

- Request that the patient limit the number of visitors accompanying him or her to the dental appointment to only those people who are necessary.
- Advise patients that they, and anyone accompanying them to the appointment, will be requested to wear a cloth face covering or facemask when entering the facility and will undergo screening for fever and symptoms consistent with COVID-19.

Implement Universal Source Control Measures

Source control refers to use of facemasks (surgical masks or procedure masks) or cloth face coverings to cover a person's mouth and nose to prevent spread of respiratory secretions, when they are talking, sneezing, or coughing.

- Patients may remove their cloth facemask covering when in their rooms or patient care area but should put it back on when leaving at the end of the dental treatment.
- Facemasks and cloth face coverings should not be placed on young children under age 2, anyone who has trouble breathing, or anyone who is unconscious, incapacitated or otherwise unable to remove the mask without assistance.
- When available, surgical masks are preferred over cloth face coverings for DHCP; surgical masks offer both source control and protection for the wearer against exposure to splashes and sprays of infectious material from others.
- Cloth face coverings should NOT be worn instead of a respirator or facemask if more than source control is required, as cloth face coverings are not PPE.
- Respirators with an exhalation valve are not currently recommended for source control, as they allow unfiltered exhaled breath to escape. If only a respirator with an exhalation valve is available and source control is needed, the exhalation valve should be covered with a facemask that does not interfere with the respirator fit
- Some DHCP whose job duties do not require PPE (such as clerical personnel) may continue to wear their cloth face covering for source control while in the dental setting.
- Other DHCP (such as dentists, dental hygienists, dental assistants) may wear their cloth face covering when they are not engaged in *direct patient care* activities, and then switch to a respirator or a surgical mask when PPE is required.
- DHCP should remove their respirator or surgical mask, perform hand hygiene, and put on their cloth face covering when leaving the facility at the end of their shift.
- Educate patients, visitors, and DHCP about the importance of performing hand hygiene immediately before and after any contact with their facemask or cloth face covering.

Encourage Physical Distancing:

Dental healthcare delivery requires close physical contact between patients and DHCP. However, when possible, physical distancing (maintaining 6 feet between people) is an important strategy to prevent SARS-CoV-2 transmission. Examples of how physical distancing can be implemented for patients include:

- Limiting visitors to the facility to those essential for the patient's physical or emotional well-being and care (e.g., care partner, parent).
- Scheduling appointments to minimize the number of people in the waiting room.
 - Patients may opt to wait in a personal vehicle or outside the dental facility where they can be contacted by mobile phone when it is their turn for dental care.
 - Minimize overlapping dental appointments.
- Arranging seating in waiting rooms so patients can sit at least 6 feet apart.

Administrative Controls and Work Practices

Set up operatories so that only the clean or sterile supplies and instruments needed for the dental procedure are readily accessible. All other supplies and instruments should be in covered storage

- If aerosol generating procedures are necessary for dental care, use four-handed dentistry, high evacuation suction and dental dams to minimize droplet spatter and aerosols.
- Preprocedural mouth rinses (PPMR)
 - There is no published evidence regarding the clinical effectiveness of PPMRs to reduce SARS-CoV-2 viral loads or to prevent transmission. Although may reduce the level of oral microorganisms in aerosols and spatter generated during dental procedures.

Implement Universal Use of Personal Protective Equipment (PPE)

For DHCP working in facilities located in areas with no to minimal community transmission

- DHCP should wear a **surgical mask, eye protection (goggles or a face shield that covers the front and sides of the face), a gown or protective clothing, and gloves** during procedures likely to generate splashing or spattering of blood or other body fluids. Protective eyewear (e.g., safety glasses, trauma glasses) with gaps between glasses and the face likely do not protect eyes from all splashes and sprays.

For DHCP working in facilities located in areas with moderate to substantial community transmission

- DHCP should implement the **use of universal eye protection** and wear eye protection in addition to their surgical mask to ensure the eyes, nose, and mouth are all protected from exposure to respiratory secretions during patient care encounters, including those where splashes and sprays are not anticipated.
- **During aerosol generating procedures DHCP should use an N95 respirator or a respirator that offers an equivalent or higher level of protection such as other disposable filtering facepiece respirators, powered air-**

purifying respirators (PAPRs), or elastomeric respirators.

- Respirators should be used in the context of a comprehensive respiratory protection program, which includes medical evaluations, fit testing and training in accordance with the Occupational Safety and Health Administration's (OSHA) Respiratory Protection standard (29 CFR 1910.134^{external icon}).⁸

There are multiple sequences recommended for donning and doffing PPE. One suggested sequence for DHCP is listed below. Facilities implementing reuse or extended use of PPE will need to adjust their donning and doffing procedures to accommodate those practices (see PPE Optimization Strategies).

- Before entering a patient room or care area:
 1. Perform hand hygiene (wash your hands with soap and water for at least 20 seconds or use a hand sanitizer).
 2. Put on a clean gown or protective clothing that covers personal clothing and skin (e.g., forearms) likely to become soiled with blood, saliva, or other potentially infectious materials.
 - Gowns and protective clothing should be changed if they become soiled.
 3. Put on a surgical mask or respirator.
 - Mask ties should be secured on the crown of the head (top tie) and the base of the neck (bottom tie). If mask has loops, hook them appropriately around your ears.
 - Respirator straps should be placed on the crown of the head (top strap) and the base of the neck (bottom strap). Perform a user seal check each time you put on the respirator.
 4. Put on eye protection (goggles or a face shield that covers the front and sides of the face).
 - Protective eyewear (e.g., safety glasses, trauma glasses) with gaps between glasses and the face likely do not protect eyes from all splashes and sprays.
 - Personal eyeglasses and contact lenses are NOT considered adequate eye protection.
 5. Put on clean non-sterile gloves.
 - Gloves should be changed if they become torn or heavily contaminated.
 6. Enter the patient room or care area.
- After completion of dental care:
 1. Remove gloves.
 2. Remove gown or protective clothing and discard the gown in a dedicated container for waste or linen.
 - Discard disposable gowns after each use.
 - Launder cloth gowns or protective clothing after each use.
 3. Exit the patient room or care area.
 4. Perform hand hygiene (wash your hands with soap and water for at least 20 seconds or use a hand sanitizer).
 5. Remove eye protection.
 - Carefully remove eye protection by grabbing the strap and pulling upwards and away from head. Do not touch the front of the eye protection.
 - Clean and disinfect reusable eye protection according to manufacturer's reprocessing instructions prior to reuse.
 - Discard disposable eye protection after use.
 6. Remove and discard surgical mask or respirator.
 - Do not touch the front of the respirator or mask.
 - Surgical mask: Carefully untie the mask (or unhook from the ears) and pull it away from the face without touching the front.
 - Respirator: Remove the bottom strap by touching only the strap and bring it carefully over the head. Grasp the top strap and bring it carefully over the head, and then pull the respirator away from the face without touching the front of the respirator.
 7. Perform hand hygiene.

Employers should select appropriate PPE and provide it to DHCP in accordance with OSHA's PPE standards (29 CFR 1910 Subpart I) ^{external icon}. DHCP must receive training on and demonstrate an understanding of:

- when to use PPE;
- what PPE is necessary;
- how to properly don, use, and doff PPE in a manner to prevent self-contamination;
- how to properly dispose of or disinfect and maintain PPE;
- the limitations of PPE.

Dental facilities must ensure that any reusable PPE is properly cleaned, decontaminated, and maintained after and between uses. Dental settings also should have policies and procedures describing a recommended sequence for safely donning and doffing PPE. PPE Supply Optimization Strategies Major distributors in the United States have reported shortages of PPE, especially surgical masks and respirators. The anticipated timeline for return to routine levels of PPE is not yet known. CDC has developed a series of strategies or options to optimize supplies of PPE in healthcare settings when there is limited supply, and a burn rate calculator that provides information for healthcare facilities to plan and optimize the use of PPE for response to the COVID-19 pandemic. These policies are only intended to remain in effect during times of shortages during the COVID-19 pandemic. Decisions by facilities to move to contingency and crisis capacity strategies are based on the following assumptions:

- Facilities understand their current PPE inventory and supply chain;
- Facilities understand their PPE utilization rate;
- Facilities are in communication with local healthcare coalitions and federal, state, and local public health partners (e.g.,

public health emergency preparedness and response staff) regarding identification of additional supplies;

- Facilities have already implemented engineering and administrative control measures;
- Facilities have provided DHCP with required education and training, including having them demonstrate competency with donning and doffing, with any PPE ensemble that is used to perform job responsibilities, such as provision of patient care.

For example, extended use of facemasks and respirators should only be undertaken when the facility is at contingency or crisis capacity and has reasonably implemented all applicable administrative and engineering controls. Such controls include selectively canceling elective and non-urgent procedures and appointments for which PPE is typically used by DHCP. Extended use of PPE is not intended to encourage dental facilities to practice at a normal patient volume during a PPE shortage, but only to be implemented in the short term when other controls have been exhausted.

The types of PPE commonly used for high-risk settings are shown with each advantages and disadvantages

TYPE OF PPE	ADVANTAGES	DISADVANTAGES
Medical mask	Easy to wear, disposable, comfortable compared with N95, N99 respirator or PAPR	Controversial adequacy against novel influenza or highly virulent droplet pathogens, not indicated when operator is in contact with highly virulent pathogens during aerosol-generating procedure
Particulate respirators (FFP2, FFP3, N95...)	Indicated for airborne pathogens, able to protect from virulent pathogens during aerosol-generating procedure, disposable	Less comfortable, facial hair and facial deformity prevent sealing mask to face
Powered air purifying respirator (PAPR)	Desired for high-risk aerosol-generating procedures, half or full face piece provides facial protection	Unwieldy, battery-operated, not disposable
Gown	Easy to put on and take off, not causing heat, disposable, more available	Have more openings than coveralls
Coverall	Covers large part of surface area	Causes heat stress unwieldy
Apron	Additional protection when using gowns or coveralls	Disinfection is needed with apron not disposable
Goggles	Easy to wear, Protection to eyes	Affect visibility with fogging, some parts of face may not be protected
Face shield	Less fogging, Easy to wear, covers larger part of face	
Gloves (double gloving)	Reduction of the risk of transmission for high virulent pathogens through glove holes, reduction of contamination risk for hands when removing gloves	Reduction tactile sensation, unwieldy removal process
Head and neck cover	Protects head, neck skin and hair	No evidence about protection in high-risk
Boots	Easy to disinfect, considered a standard equipment in high-risk procedures	Easy to disinfect, considered a standard equipment in high-risk procedures
Shoes with covers	Easy to wear	Not optimal when floors is wet

Proposal of modulation of personal protective equipment (PPE) according to level of risk or common dental procedures both in pre-COVID and post-COVID era.

	Pre-COVID	Post-COVID
Low risk	sterilizable headgear Protective goggles Surgical mask disposable latex gloves	Disposable or sterilizable headgear Protective goggles Surgical mask Disposable or sterilizable gown Double disposable latex gloves
Medium risk	Disposable headgear Disposable/sterilizable visor to remove immediately Surgical mask Protective goggles disposable latex gloves	Disposable headgear Disposable/sterilizable visor to remove immediately Protective respirator (FFP2) Disposable gown Double disposable latex gloves
High risk	Disposable headgear Disposable/sterilizable visor to remove immediately Surgical mask Disposable gown disposable latex gloves	Disposable headgear Disposable/sterilizable visor to remove immediately FFP3 / Powered air purifying respirator (PAPR) Disposable protective suit Double disposable latex gloves Cover shoes

Hand Hygiene

Ensure DHCP practice strict adherence to hand hygiene, including:

- Before and after all patient contact, contact with potentially infectious material,
- Putting on and after removing personal protective equipment (PPE), including gloves. Hand hygiene after removing PPE is particularly important to remove any pathogens that might have been transferred to bare hands during the removal process.
- Use ABHR with at least 60% alcohol or wash hands with soap and water for at least 20 seconds.
- Dental healthcare facilities should ensure that hand hygiene supplies are readily available to all DHCP in every patient care location.

Equipment Considerations

- After a period of non-use, dental equipment may require maintenance and/or repair. Review the manufacturer's instructions for use (IFU) for office closure, period of non-use, and reopening for all equipment and devices. Some considerations include:
 - Dental unit waterlines (DUWL):

Test water quality to ensure it meets standards for safe drinking water as established by the Environmental Protection Agency (< 500 CFU/mL) prior to expanding dental care practices.

Confer with the manufacturer regarding recommendations for need to shock DUWL of any devices and products that deliver water used for dental procedures. Continue standard maintenance and monitoring of DUWL according to the IFUs of the dental operatory unit and the DUWL treatment products. Autoclaves and instrument cleaning equipment Ensure that all routine cleaning and maintenance have been performed according to the schedule recommended per manufacturer's IFU. Test sterilizers using a biological indicator with a matching control (i.e., biological indicator and control from same lot number) after a period of non-use prior to reopening per manufacturer's IFU. Air compressor, vacuum and suction lines, radiography equipment, high-tech equipment, amalgam separators, and other dental equipment: Follow protocol for storage and recommended maintenance per manufacturer IFU. For additional guidance on reopening buildings, see CDC's Guidance for Reopening Buildings after Prolonged Shutdown or Reduced Operation.

Optimize the Use of Engineering Controls

CDC does not provide guidance on the decontamination of building heating, ventilation, and air conditioning (HVAC) systems potentially exposed to SARS-CoV-2. To date, CDC has not identified confirmatory evidence to demonstrate that viable virus. CDC provides the following recommendations for proper maintenance of ventilation systems and patient placement and volume strategies in dental settings.

- Properly maintain ventilation systems.

Ventilation systems that provide air movement in a clean-to-less-clean flow direction reduce the distribution of contaminants and are better at protecting staff and patients. For example, in a dental facility with staff workstations in the corridor right outside the patient operatories, supply-air vents would deliver clean air into the corridor, and return-air vents in the rear of the less-clean patient operatories would pull the air out of the room. Thus, the clean air from the corridor flows past the staff workstations and into the patient operatories. Similarly, placing supply-air vents in the receptionist area and return-air vents in the waiting area pulls clean air from the reception area into the waiting area.

Consult with facilities operation staff or an HVAC professional to

Understand clinical air flow patterns and determine air changes per hour.

Investigate increasing filtration efficiency to the highest level compatible with the HVAC system without significant deviation from designed airflow.

Investigate the ability to safely increase the percentage of outdoor air supplied through the HVAC system (requires compatibility with equipment capacity and environmental conditions).

Limit the use of demand-controlled ventilation (triggered by temperature setpoint and/or by occupancy controls) during occupied hours and when feasible, up to 2 hours post occupancy to assure that the ventilation rate does not automatically change.

Consider the use of a portable high-efficiency particulate air (HEPA) air filtration unit while the patient is undergoing, and immediately following, an aerosol generating procedure.

Select a HEPA air filtration unit based on its Clean Air Delivery Rate (CADR). The CADR is an established performance standard defined by the Association of Home Appliance Manufacturers and reports the system's cubic feet per minute (CFM) rating under as-used conditions.

Rather than just relying on the building's HVAC system capacity, use a HEPA air filtration unit to reduce aerosol concentrations in the room and increase the effectiveness of the turnover time.

Place the HEPA unit near the patient's chair, but not behind the DHCP. Consider the use of upper-room ultraviolet germicidal irradiation (UVGI) as an adjunct to higher ventilation and air cleaning rates. Patient placement Ideally, dental treatment should be provided in individual patient rooms, whenever possible. For dental facilities with open floor plans, to prevent the spread of pathogens there should be: At least 6 feet of space between patient chairs. Physical barriers between patient chairs.

Operatories should be oriented parallel to the direction of airflow if possible. Where feasible, consider patient orientation carefully, placing the patient's head near the return air vents, away from pedestrian corridors, and toward the rear wall when using vestibule-type office layouts. Patient volume Ensure to account for the time required to clean and disinfect operatories between patients when calculating your daily patient volume. Environmental Infection Control
- DHCP should ensure that environmental cleaning and disinfection procedures are followed consistently and correctly after each patient .
 - Clean and disinfect the room and equipment according to the Guidelines for Infection Control in Dental Health-Care Settings—2003pdf icon.

- Routine cleaning and disinfection procedures (e.g., using cleaners and water to clean surfaces **before** applying an Environmental Protection Agency (EPA)-registered, hospital-grade disinfectant to frequently touched surfaces or objects for appropriate contact times as indicated on the product's label) are appropriate for SARS-CoV-2 in healthcare settings, including those patient-care areas in which aerosol generating procedures are performed.
 - Refer to List Nexternal icon on the EPA website for EPA-registered disinfectants that have qualified under EPA's emerging viral pathogens program for use against SARS-CoV-2.
- Alternative disinfection methods
 - The efficacy of alternative disinfection methods, such as ultrasonic waves, high intensity UV radiation, and LED blue light against SARS-CoV-2 virus is not known. Therefore, EPA cannot confirm whether, or under what circumstances, such products might be effective against the spread of COVID-19.
 - CDC does not recommend the use of sanitizing tunnels. Chemicals used in sanitizing tunnels could cause skin, eye, or respiratory irritation or damage.
 - EPA only recommends use of the surface disinfectants identified on List Nexternal icon against the virus that causes COVID-19.
- Manage laundry and medical waste in accordance with routine policies and procedures(w-1)

Modifications required for a dental Clinic setup The dental operatories should gear themselves for readiness- Preparatory Phase (I), Implementation Phase(II) and Follow up (III)

Phase I: Preparatory phase for a dental clinic Doctor and health care prophylaxis against COVID 19.

Testing for the Covid-19 before resuming work in the clinics: Health care workers who are asymptomatic and do not fall under the category of being exposed to corona virus infection are not required to undergo a test before resuming to work in the clinics

Hydroxychloroquine Prophylaxis As per the advisory given by the MOHFW dated 22.03.2020, all asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19 are advised to take HCQ prophylaxis after medical consultation

Dental Clinic

Ventilation and air quality management in stand-alone dental clinics

- I. Maintain air circulation with natural air through a frequent opening of windows and using an independent exhaust blower to extract the room air into the atmosphere.
- II. Avoid the use of a ceiling fan while performing procedure.
- III. Place a table fan behind the operator and let the airflow towards the patient. A strong exhaust fan to be so located to create a unidirectional flow of air away from the patient.
- IV. The window air condition system/ split AC should be frequently serviced, and filters cleaned.
- V. Use of indoor portable air cleaning system equipped with HEPA filter and UV light may be used.

In central AC buildings, on-recirculatory system: Blocking off the return air vents in the patient area will temporarily stop air circulation provided AHU will have provision to receive adequate outdoor air supply. Allow fresh air into rooms by opening of windows or doors slightly.

Phase II Implementation Phase Tele-consult Tele-screening

- I. Telephone screening is encouraged as the first point of contact between the patient and the dentist or reception office is encouraged.
- II. Current medical history and past history particularly pertaining to symptoms of Severe Acute Respiratory Illness (fever AND cough and/or shortness of breath) or All symptomatic ILI (fever, cough, sore throat, runny nose) must be analysed.
- III. Any positive responses to either of the questions should raise concern, and care should be postponed for 3weeks except in dental emergencies. IV. Encourage all to download the Arogya Setu App.

Dental history and remote TRIAGE

- I. Obtain m Oral Health(Mobile Phone-based Oral Health) screening about dental history and try to manage problems with advice and analgesics and local measures
- II. Clinics can evolve a web-based form which can also include a consent form.
- III. Comprehend dental treatment according to the urgency of the required treatment and the risk and benefit associated with each treatment.
- IV. Only pre-appointed patients should be entertained in the clinic whose history, problems and procedures are already identified to some extent through previous telephone and remote electronic or web-based systems

Protocol for clinic closure Fogging:

It is used as 'No-touch surface disinfection' and not for disinfection of air after a large area has been contaminated. The commercially available hydrogen peroxide is 11% (w/v) solution which is stabilized by 0.01% of silver nitrate. A 20% working solution should be prepared. The volume of working solution required for fogging is approximately 1000ml per 1000 cubic feet. After the procedure has been completed in the operatory (in case of no negative pressure), exit the room and close the operatory for half hour for the aerosols/droplets to settle down. Perform the 2 Step surface cleaning followed by fogging. The fogging time is usually 45min followed by contact time/dwell time of one hour. After that the room can be opened, fans can be switched on for aeration. Protocol for health care workers on reaching home On the way back home, follow all precautions and on return, follow the removal of shoes, change of clothes, having a wash and disinfect your mobile wristwatch etc.

Phase III Patient follow-up and Review The patient should be contacted telephonically 24 hrs and in a week' time to know if he has developed any symptoms that should warn the dental Staff to undertake appropriate actions.

Health care workers who are required to attend dental ailments in remote locations in the government sector should provide advice and analgesics and refer the patient to dental surgeon for further management.⁹

Protective equipment for examination & procedures:

1. Bouffant cap
2. 3-Ply surgical mask
3. Disposable surgeon's gown
4. Protective eye goggles
5. Disposable latex examination gloves
6. Sterile surgical gloves
7. Disposable shoe covers

Hand Hygiene

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 - Test water quality to ensure it meets standards for safe drinking water as established by the Environmental Protection Agency (< 500 CFU/mL) prior to expanding dental care practices.
 - Confer with the manufacturer regarding recommendations for need to shock DUWL of any devices and products that deliver water used for dental procedures.
 - Continue standard maintenance and monitoring of DUWL according to the IFUs of the dental operatory unit and the DUWL treatment products.
 - Autoclaves and instrument cleaning equipment
 - Ensure that all routine cleaning and maintenance have been performed according to the schedule recommended per manufacturer's IFU.
 - Test sterilizers using a biological indicator with a matching control (i.e., biological indicator and control from same lot number) after a period of non-use prior to reopening per manufacturer's IFU.
 - Air compressor, vacuum and suction lines, radiography equipment, high-tech equipment, amalgam separators, and other dental equipment: Follow protocol for storage and recommended maintenance per manufacturer IFU.
- For additional guidance on reopening buildings, see CDC's Guidance for Reopening Buildings after Prolonged Shutdown or Reduced Operation.

Optimize the Use of Engineering Controls

CDC does not provide guidance on the decontamination of building heating, ventilation, and air conditioning (HVAC) systems potentially exposed to SARS-CoV-2. To date, CDC has not identified confirmatory evidence to demonstrate that viable virus. CDC provides the following recommendations for proper maintenance of ventilation systems and patient placement and volume strategies in dental settings.

- Properly maintain ventilation systems.

Ventilation systems that provide air movement in a clean-to-less-clean flow direction reduce the distribution of contaminants and are better at protecting staff and patients. For example, in a dental facility with staff workstations in the corridor right outside the patient operatories, supply-air vents would deliver clean air into the corridor, and return-air vents in the rear of the less-clean patient operatories would pull the air out of the room. Thus, the clean air from the corridor flows past the staff workstations and into the patient operatories. Similarly, placing supply-air vents in the receptionist area and return-air vents in the waiting area pulls clean air from the reception area into the waiting area.

Consult with facilities operation staff or an HVAC professional to

- Understand clinical air flow patterns and determine air changes per hour.
- Investigate increasing filtration efficiency to the highest level compatible with the HVAC system without significant deviation from designed airflow.
- Investigate the ability to safely increase the percentage of outdoor air supplied through the HVAC system (requires compatibility with equipment capacity and environmental conditions).

Limit the use of demand-controlled ventilation (triggered by temperature setpoint and/or by occupancy controls) during occupied hours and when feasible, up to 2 hours post occupancy to assure that the ventilation rate does not automatically change.

Consider the use of a portable high-efficiency particulate air (HEPA) air filtration unit while the patient is undergoing, and immediately following, an aerosol generating procedure.

- Select a HEPA air filtration unit based on its Clean Air Delivery Rate (CADR). The CADR is an established performance standard defined by the Association of Home Appliance Manufacturers and reports the system's cubic feet per minute (CFM) rating under as-used conditions.
 - Rather than just relying on the building's HVAC system capacity, use a HEPA air filtration unit to reduce aerosol concentrations in the room and increase the effectiveness of the turnover time.
 - Place the HEPA unit near the patient's chair, but not behind the DHCP.
 - Consider the use of upper-room ultraviolet germicidal irradiation (UVGI) as an adjunct to higher ventilation and air cleaning rates.
- Patient placement
 - Ideally, dental treatment should be provided in individual patient rooms, whenever possible.
 - For dental facilities with open floor plans, to prevent the spread of pathogens there should be:
 - At least 6 feet of space between patient chairs.
 - Physical barriers between patient chairs.
 - Operatories should be oriented parallel to the direction of airflow if possible.
 - Where feasible, consider patient orientation carefully, placing the patient's head near the return air vents, away from pedestrian corridors, and toward the rear wall when using vestibule-type office layouts.
- Patient volume
 - Ensure to account for the time required to clean and disinfect operatories between patients when calculating your daily patient volume.

Environmental Infection Control

- DHCP should ensure that environmental cleaning and disinfection procedures are followed consistently and correctly after each patient .
 - Clean and disinfect the room and equipment according to the Guidelines for Infection Control in Dental Health-Care Settings—2003pdf icon.
- Routine cleaning and disinfection procedures (e.g., using cleaners and water to clean surfaces **before** applying an Environmental Protection Agency (EPA)-registered, hospital-grade disinfectant to frequently touched surfaces or objects for appropriate contact times as indicated on the product's label) are appropriate for SARS-CoV-2 in healthcare settings, including those patient-care areas in which aerosol generating procedures are performed.
 - Refer to List Nexternal icon on the EPA website for EPA-registered disinfectants that have qualified under EPA's emerging viral pathogens program for use against SARS-CoV-2.
- Alternative disinfection methods
 - The efficacy of alternative disinfection methods, such as ultrasonic waves, high intensity UV radiation, and LED blue light against SARS-CoV-2 virus is not known. Therefore, EPA cannot confirm whether, or under what circumstances, such products might be effective against the spread of COVID-19.
 - CDC does not recommend the use of sanitizing tunnels. Chemicals used in sanitizing tunnels could cause skin, eye, or respiratory irritation or damage.
 - EPA only recommends use of the surface disinfectants identified on List Nexternal icon against the virus that causes COVID-19.
- Manage laundry and medical waste in accordance with routine policies and procedures(w-1)

Modifications required for a dental Clinic setup The dental operatories should gear themselves for readiness- Preparatory Phase(I), Implementation Phase(II) and Follow up (III)

Phase I: Preparatory phase for a dental clinic Doctor and health care prophylaxis against COVID 19.

Testing for the Covid-19 before resuming work in the clinics: Health care workers who are asymptomatic and do not fall under the category of being exposed to corona virus infection are not required to undergo a test before resuming to work in the clinics

Hydroxychloroquine Prophylaxis As per the advisory given by the MOHFW dated 22.03.2020, all asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19 are advised to take HCQ prophylaxis after medical consultation

Dental Clinic

Ventilation and air quality management in stand-alone dental clinics

1. Maintain air circulation with natural air through a frequent opening of windows and using an independent exhaust blower to extract the room air into the atmosphere.
2. Avoid the use of a ceiling fan while performing procedure.
3. Place a table fan behind the operator and let the airflow towards the patient. A strong exhaust fan to be so located to create a unidirectional flow of air away from the patient.
4. The window air condition system/ split AC should be frequently serviced, and filters cleaned.
5. Use of indoor portable air cleaning system equipped with HEPA filter and UV light may be used.

In central AC buildings, on-recirculatory system: Blocking off the return air vents in the patient area will temporarily stop air circulation provided AHU will have provision to receive adequate outdoor air supply. Allow fresh air into rooms by opening of windows or doors slightly.

Phase II Implementation Phase Tele-consult Tele-screening

- a. Telephone screening is encouraged as the first point of contact between the patient and the dentist or reception office is encouraged.

- b. Current medical history and past history particularly pertaining to symptoms of Severe Acute Respiratory Illness (fever AND cough and/or shortness of breath) or All symptomatic ILI (fever, cough, sore throat, runny nose) must be analysed.
- c. Any positive responses to either of the questions should raise concern, and care should be postponed for 3 weeks except in dental emergencies. IV. Encourage all to download the Arogya Setu App.
- d. Dental history and remote TRIAGE
- e. Obtain m Oral Health(Mobile Phone-based Oral Health) screening about dental history and try to manage problems with advice and analgesics and local measures
- f. Clinics can evolve a web-based form which can also include a consent form.
- g. Comprehend dental treatment according to the urgency of the required treatment and the risk and benefit associated with each treatment.
- h. Only pre-appointed patients should be entertained in the clinic whose history, problems and procedures are already identified to some extent through previous telephone and remote electronic or web-based systems

Protocol for clinic closure Fogging:

It is used as 'No-touch surface disinfection' and not for disinfection of air after a large area has been contaminated. The commercially available hydrogen peroxide is 11% (w/v) solution which is stabilized by 0.01% of silver nitrate. A 20% working solution should be prepared. The volume of working solution required for fogging is approximately 1000ml per 1000 cubic feet. After the procedure has been completed in the operatory (in case of no negative pressure), exit the room and close the operatory for half hour for the aerosols/droplets to settle down. Perform the 2 Step surface cleaning followed by fogging. The fogging time is usually 45min followed by contact time/dwell time of one hour. After that the room can be opened, fans can be switched on for aeration.

Protocol for health care workers on reaching home

On the way back home, follow all precautions and on return, follow the removal of shoes, change of clothes, having a wash and disinfect your mobile wristwatch etc.

Phase III Patient follow-up and Review The patient should be contacted telephonically 24 hrs and in a week' time to know if he has developed any symptoms that should warn the dental Staff to undertake appropriate actions.

Health care workers who are required to attend dental ailments in remote locations in the government sector should provide advice and analgesics and refer the patient to dental surgeon for further management.⁹

Protective equipment for examination & procedures:

1. Bouffant cap
2. 3-Ply surgical mask
3. Disposable surgeons gown
4. Protective eye goggles
5. Disposable latex examination gloves
6. Sterile surgical gloves
7. Disposable shoe covers

Oil resistance	NIOSH Class	Filtration percentage % filtration of airborne particles
Not oil resistant (N)	N95	95%
	N99	99%
	N100	99.97%
Somewhat resistant to oil (R)	R95	95%
	R99	99%
	R100	99.97%
Strongly resistant to oil (P)	P95 P99 P100	95% 99% 99.97%

Instrument Sterilization:

It is necessary to clean all instruments with detergent and water before sterilization¹⁰. During washing, it is advisable to avoid splashes of water a wear gloves and face protection. The instruments that penetrate the tissues must be sterilized in an autoclave. It is advisable to heat sterilize items that touch the mucosa or to at least disinfect them, for example, with the immersion in a 2% glutaraldehyde solution in a closed bid, naturally following the instructions of the producer. Anything that cannot be autoclaved must be disinfected. The handpieces should be able to drain the water for two minutes at the start of the day. After sterilization, all instruments must be kept safely in order to avoid recontamination for a maximum of 30 days, 60 days if closed in double bags. Sterilization completely kills all vital agents and spores too. The classic sterilization procedure expects the use autoclave, with cycles at 121 °C for 15–30 minutes, or at 134 °C for 3–4 minutes²³. It is necessary to thoroughly wash and dry all items before sterilizing them as dirt and water can interfere with sterilization. Steam sterilization cannot be used for all facilities and a possible alternative can be the use of chemical sterilization using ethylene oxide gas, formaldehyde gas, hydrogen peroxide gas,

liquid peracetic acid, or ozone. The disinfection processes do not destroy the bacterial load, rather reducing it to acceptable levels. Commonly used disinfectants are described below commonly used chemical disinfectants.

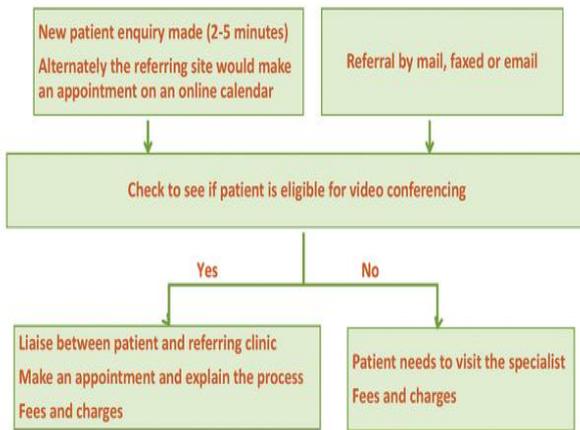
	Concentration of the preparate	Level of activity on Target Agents	Other characteristics	Recommended uses
Alcohol	• 70%	<ul style="list-style-type: none"> • Bacteria (high) • Tubercle bacilli (high) • Spores (low) • Fungi (high) • Viruses (active only on some viruses) 	<ul style="list-style-type: none"> • Volatile with fast action • low penetration into organic matter • Inflammable 	• Disinfection of clean surfaces and skin
Diguanides	<ul style="list-style-type: none"> • Chlorhexidine - Aqueous 1:1000 • Chlorhexidine - 0.5% in 70% Ethanol • Chlorhexidine + Cetavlon - Aqueous 1:100, 1:30 • Chlorhexidine + Cetavlon - 1:30 in 70% Ethanol 	<ul style="list-style-type: none"> • Bacteria (high for gram-positive) • Tuberculosis bacilli (low) • Spores (low) • Fungi (high) • Viruses (low) 	<ul style="list-style-type: none"> • Inactivated by organic matter, soap and anionic detergents 	<ul style="list-style-type: none"> • Disinfection of skin and mucous membrane • Use opened bottle of aqueous skin disinfectant for maximum 24 hours
Glutaraldehyde	• 2%	<ul style="list-style-type: none"> • Bacteria (high) • Tuberculosis bacilli (high) • Spores (high but slow) • Fungi (high) • Viruses (high) 	<ul style="list-style-type: none"> • Slow penetration of organic matter • Irritation of eyes, skin and respiratory mucosa • Alkaline solution requires activation and has a limited useful life (14–28 days) 	<ul style="list-style-type: none"> • Disinfection of selected not autoclavable instruments • Use only closed containers to reduce the escape of irritant vapours
Hypochlorites	<ul style="list-style-type: none"> • 1% (one part of 5.25% hypochlorite solution in 4 parts of water) • 0.1% (one part of 5.25% hypochlorite solution in 49 parts of water) 	<ul style="list-style-type: none"> • Bacteria (high) • Tuberculosis (high) • Spores (high) • Fungi (high) • Viruses (high) 	<ul style="list-style-type: none"> • Inactivated by organic matter • Corrosive on metals • Diluted solutions decay rapidly and should be made up daily • Addition of ammonia or acids causes 	• instrumental disinfection for selected items

			release of toxic chlorine gas	
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Modified from: Guidelines on Infection Control Practice in the Clinic Settings of Dept of Health. 2019. ¹¹

Initial screening :(tele screening & initial patient evaluation)

Video conferencing has been successfully used in oral medicine.²⁰ the most common oral medicine emergencies usually include severe vesiculobullous lesions and giant cell arteritis. The video conferencing triage and management of these emergencies are summarised in Table 1. We also proposed a guideline for the practitioners, and it is based on the New Zealand Dental Association “COVID-19 Safety Standards”, and Australian Dental Association Guidelines for Teledentistry (Figs. 1 and 2).^{21,22}



Administration flow chart

Install appropriated software from developer and passwords:¹⁰

ORAL MEDICINE EMERGENCY	VIDEO CONFERENCING TRIAGE	MANAGEMENT
Oral mucosal diseases Pemphigus vulgaris (Severe)	Generally middle aged 50-60; Sore mouth; Widespread bullae formation on the skin and oral mucosa; Skin are fragile and break down rapidly to form crusted, eroded lesion.	Hospital admission immediately; Assessment of volume status and resuscitation; Removal of possible triggers, such as drugs; Ocular assessment; Systemic corticosteroid according to the guideline; Consider other immune suppressive drugs such as azathioprine, mycophenolate mofetil, cyclophosphamide and rituximab
Mucous membrane pemphigoid (Severe)	Generally over 60 years; Sore mouth; Widespread bullae formation on the skin and oral mucosa; Intact bullae may be present.	Hospital admission immediately; Assessment of volume status and resuscitation; Removal of possible triggers, such as drugs; Ocular assessment; Systemic corticosteroid according to the guideline; Consider other immune suppressive drugs such as azathioprine, mycophenolate mofetil, cyclophosphamide.
Erythema multiforme	History of herpes simplex virus, or mycoplasma pneumonia infection; Target-like lesions on the skin; Sore lips; Lips erosion often accompanied by crusting and bleeding.	Evaluation by oral medicine specialist; Supportive care.s
Stevens-Johnson syndrome and toxic epidermal necrolysis	Extensive necrosis and detachment of the epidermis	Hospital admission immediately; Management similar to burn; ICU care.

Oral mucositis (Severe)	Cancer patients undergoing chemotherapy or radiotherapy; Widespread ulcers with extensive erythema; Patient cannot swallow food.	Hospital admission immediately; Management should be consulted with oncologist.
Orofacial pain Giant cell arteritis	Patient over age of 50 years with new headaches, abrupt onset of visual disturbances, jaw claudication, tenderness of temporalis muscles to palpation	Hospital admission immediately; Consider steroids prior to temporal artery biopsy; Ophthalmologist evaluation; If the patient is in the remote area, a course of high dose prednisone should be given to prevent possible ophthalmic complication.
Other chronic maxillofacial pain conditions	Pain history, medical history, personal history, treatment history and family history; Ruling out red flags or warning signals.	Trigeminal autonomic cephalalgias - Medication as per diagnosis; Trigeminal Neuralgia Oxcarbazepine/Carbamazepine, Gabapentin, Pregabalin; Temporomandibular joint dysfunction- Non-surgical self-help, CBT online, pain medications

*practioner should be mindful of medicolegal risks

*Video conferencing guideline in oral medicine

MANAGEMENT OF ORAL MUCOSAL DISEASE EMERGENCIES

Exacerbation or acutely presentation of vesiculobullous diseases, such as pemphigus vulgaris, mucous membrane pemphigoid, erythema multiforme, Stevens-Johnson syndrome, and toxic epidermal necrolysis could be potentially life-threatening.

Oral medicine emergency, video conferencing triage & management⁽¹⁾

ORAL MEDICINE EMERGENCY	VIDEO CONFERENCING TRIAGE	MANAGEMENT
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Erythema multiforme	History of herpes simplex virus, or mycoplasma pneumonia infection; Target-like lesions on the skin; Sore lips; Lips erosion often accompanied by crusting and	Evaluation by oral medicine specialist; Supportive care.s

	bleeding.	
Stevens-Johnson syndrome and toxic epidermal necrolysis	Extensive necrosis and detachment of the epidermis	Hospital admission immediately; Management similar to burn; ICU care.
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Oral manifestations of covid patients:

Oral manifestations included ulcer, erosion, bulla, vesicle, pustule, fissured or depapillated tongue, macule, papule, plaque, pigmentation, halitosis, whitish areas, hemorrhagic crust, necrosis, petechiae, swelling, erythema, and spontaneous bleeding. The most common sites of involvement in descending order were tongue (38%), labial mucosa (26%), palate (22%), gingiva (8%), buccal mucosa (5%), oropharynx (4%), and tonsil (1%).

Other diagnoses of the lesions were aphthous stomatitis, herpetiform lesions, candidiasis, vasculitis, Kawasaki-like, EM-like, mucositis, drug eruption, necrotizing periodontal disease, angina bullosa-like, angular cheilitis, atypical Sweet syndrome, and Melkerson-Rosenthal syndrome. Oral lesions were symptomatic (painful, burning sensation or pruritus) in 68% of the cases. Oral lesions were nearly equal in both genders (49% female, 51% male). Latency time between appearance of systemic symptoms and oral lesions was between 4 days before up to 12 weeks after onset of systemic symptoms.

Enanthema can develop in various types of viral diseases including dengue fever disease, Ebola virus disease, herpangina, human herpes virus (HHV) infections, measles, and roseola infantum. Infectious diseases, especially of viral etiology, constitute approximately 88% of causes of enanthema. Different types of enanthema such as aphthous-like ulcers, Koplik's spots, Nagayama's spot, petechiae, papulovesicular, or maculopapular lesions, white or red patches, gingival and lip swelling have been reported with various viral infections. Also, swelling of oral cavity (including palatal, lingual and gum) was reported by 8% of the patients. Furthermore, appearance of oral lesions was simultaneously found with loss of taste and smell in the patients and more severe and disseminated oral lesions were reported in older patients and in severe COVID-19.

Aphthous-like lesions: Aphthous-like lesions appeared as multiple shallow ulcers with erythematous halos and yellow white pseudomembranes on the both keratinized and non-keratinized mucosae. In one patient, oral lesions appeared simultaneously with systemic symptoms and in other patients, latency time was between 2 and 10 days. One patient had positive history of recurrent aphthous stomatitis (RAS) and 2 patients had positive PCR for herpes simplex virus (HSV) 5-9, 38. Aphthous-like lesions without necrosis were observed in younger patients with mild infection, whilst aphthous-like lesions with necrosis and hemorrhagic crusts were observed more frequently in older patients with immunosuppression and severe infection. Regression of oral lesions was in parallel association with improvement of systemic disease. Increased level of tumor necrosis factor (TNF)- α in COVID-19 patients can lead to chemotaxis of neutrophils to oral mucosa and development of aphthous-like lesions. Stress and immunosuppression secondary to COVID-19 infection.

Herpetiform/zosteriform lesions: Herpetiform lesions presented as multiple painful, unilateral, round yellowish-grey ulcers with an erythematous rim on the both keratinized and non-keratinized mucosae. Manifestations of these lesions preceded, coincided

with, or followed systemic symptoms. In one case, geographic tongue appeared after recovery of herpetiform lesions.

Ulcer and erosion: Ulcerative or erosive lesions appeared as painful lesions with irregular borders on the tongue, hard palate, and labial mucosa. Lesions appeared after a latency time of 4-7 days and in one case, lesions appeared 3 days before the onset of systemic symptoms and recovered after 5-21 days.

White/red plaques: White and red patches or plaques were reported on dorsum of tongue, gingiva, and palate of patients with confirmed or suspected COVID-19.

EM-like lesions: EM-like lesions appeared as blisters, desquamative gingivitis, erythematous macules, erosions, and painful cheilitis with hemorrhagic crust in patients with cutaneous target lesions in the eyes.

Angina bullosa-like lesions: Angina bullosa-like lesions presented as asymptomatic erythematous-purple blisters without spontaneous bleeding on the tongue and hard palate in 2 confirmed cases of COVID-19.²⁴

Melkerson-Rosenthal syndrome: There was a report of a 51-year-old woman presenting with complaint of malaise and unilateral lip swelling, fissured tongue and right facial paralysis. She had past history of Melkersson-Rosenthal syndrome since 4 years ago that was spontaneously cured with no relapse. Laboratory data demonstrated an increased level of CRP and computed tomography (CT) scan showed ground-glass opacities in both lungs.

Atypical Sweet syndrome: There was a report of 61-year-old female who presented complaining of fever, fatigue, arthralgia, myalgia, several erythematous nodules on the scalp, trunk and extremities, and minor aphthous ulcers on the hard palate and buccal mucosa. RT-PCR for COVID-19 was positive.

Kawasaki like disease: Oral lesions including cheilitis, glossitis and erythematous and swollen tongue (red strawberry tongue) appeared in COVID-19 patients with Kawasaki-like disease (Kawa-COVID).

Necrotizing periodontal disease: There was a report of a 35-year-old female suspicious for COVID-19 who presented with fever, submandibular lymphadenopathy, halitosis, and oral lesions. Oral lesions included a painful, diffuse erythematous and oedematous gingiva with necrosis of inter-papillary areas. The suggested diagnosis was necrotizing periodontal disease due to bacterial coinfections (especially *Prevotella intermedia*) along with COVID-19.

Vesicles and pustules: We found a report of a 9-year-old female presenting with fever, weakness, abdominal pain, and diarrhea that coincided with oral and acral erythematous papular exanthema. Oral lesions included vesicular eruptions and erosions on the tongue and buccal mucosa. PCR test for COVID-19 was positive. There was also another report on a 51-year-old male presented with fever, fatigue, dry cough, dysgeusia, anosmia, and a positive serology for COVID-19.

Petechiae: In a few studies, Petechiae were reported on the lower lip, palate, and oropharynx mucosa. Thrombocytopenia due to COVID-19 infection or the prescribed drug were suggested as possible causes of petechiae^{19,20,21,22}.

Non-specific lesions (mucositis): Erythematous-violaceous macules, patches, papules and plaques on the tongue, lip mucosa, hard palate, and oropharynx were reported in several studies. Thrombotic vasculopathy, vasculitis, hypersensitivity associated to COVID-19 could be the causes of mucositis in patients with COVID-19. Mucosal hypersensitivity secondary to COVID-19, thrombotic vasculopathy, and vasculitis might be the possible causes of mucositis in COVID-19^{9,16,22,24}.

Post-inflammatory pigmentation: There was one report of pigmentation in the attached and interpapillary gingiva in a 40-year-old female. Increased levels of inflammatory cytokines [including interleukin-1(IL-1), tumor necrosis factor (TNF)- α] and arachidonic acid metabolites (prostaglandins) secondary to production of stem cell factor (SCF) and basic-fibroblast growth factor (bFGF) from keratinocytes of basal layer lead to post-inflammatory pigmentations²¹

Guidelines for oral and maxillofacial imaging: COVID-19 considerations:

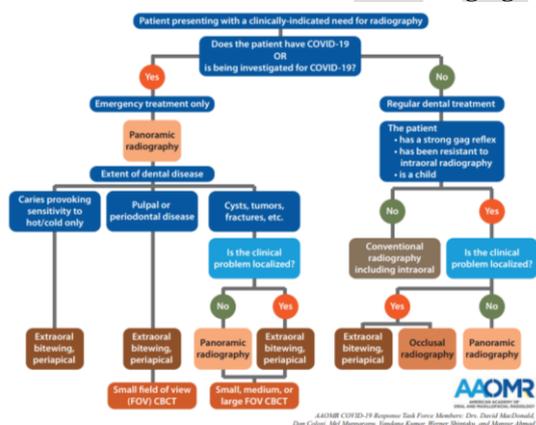


Fig. 1. Flowchart for decision making in managing patients in the time of the COVID-19 pandemic with respect to oral and maxillofacial radiology.

How COVID-19 may cause changes in the prescription of radiographic techniques:

In light of COVID-19, the ADA has provided interim guidance for DHCPs, recommending the avoidance or reduction of intraoral radiography during the COVID19 crisis. In one study, the overall frequency of gagging during intraoral radiography was 13% but the frequency differed significantly between patients radiographed by trained radiographers (frequency of 9%) and by students (frequency of 26%).

Recommendations of the ADA for radiographic prescription for common dental tasks (selection criteria) were first published in 1982; the most recent guidelines appeared in 2012.¹⁸

These problems prompt us to consider different technologies, such as dental panoramic radiographs (DPRs) and cone beam computed tomography (CBCT), to accomplish the goals of intraoral radiography, particularly in those cases where an aerosol is

most likely to be generated by gagging or coughing.

GUIDELINES FOR HANDLING, TREATMENT & DISPOSAL OF WASTE GENERATED DURING TREATMENT/DIAGNOSIS/ QUARANTINE OF COVID-19 PATIENTS

In order to deal with covid-19 pandemic, state & central government have initiated following specific guidelines for management of waste generated during diagnostic & treatment of covid-19 suspected / confirmed patients

- Treat the routine waste as general solid waste & the same need to be disposed as per SWM rules
- Report to SPCB's/PCC about receiving waste from covid-19 isolation wards/quarantined homes/ covid testing centres
- Operator of CBWTF shall ensure regular sanitization of workers involved in handling & collection of bio medical waste
- Operator should maintain separate record for collection, treatment & disposal of covid-19 waste
- Ensure proper collection & disposal of biomedical waste as per BMW rules , 2016 & SoPS given

The infectious medical and domestic waste of suspected or confirmed COVID-19 patients should be disposed of in double-layered yellow color bags with gooseneck ligation.¹² The bags should be marked and disposed of in accordance with the Biomedical Waste Management and Handling Rules⁴

RESTORING SMILES IN PANDEMIC [VACCINATION]:

The vaccine is to be used in conjunction with other control measures. In the longer term, the vaccine is intended to be used for active immunization of people at-risk to prevent COVID-19.

The COVID-19 vaccines under development use one of the following techniques:

1. Virus Vaccine
2. Viral vector vaccine
3. Nucleic acid vaccines
4. Protein based vaccine

Virus vaccines These vaccines use the virus itself in a weakened or inactivated form. Vaccines against measles and polio (oral) are made in this manner. There are two types of virus vaccines under development against coronavirus, weakened virus and inactivated virus vaccines.¹⁰

Viral-vector vaccines in the development of these vaccines, a virus (such as adenovirus or measles), is genetically engineered to produce coronavirus proteins in the body, but the virus is weakened and cannot cause disease. The two types of viral-vector vaccines under development are replicating viral vector (can replicate within cells) and non-replicating viral vector (cannot replicate within cells).

Nucleic-acid vaccines in these vaccines, nucleic acid (DNA or RNA) is inserted into human cells. These human cells then produce copies of the virus protein which produces an immune response. The two types of nucleic-acid vaccines under development are DNA vaccine and RNA vaccine.

Protein-based vaccines These vaccines use virus protein fragments or protein shells which are injected directly into the body. The two types of protein-based vaccines being developed against the coronavirus are the protein subunit vaccines and virus-like particle vaccines.

Now, we have COVID-19 vaccines to add to the other tools we've all been using to fight the pandemic - like wearing masks, washing our hands and avoiding crowds. Here's what the CDC (and your dentist!) want you to know about COVID-19 vaccines.

1. The Vaccines are Safe and Effective

As doctors of oral health, credible scientific information is important to us when recommending treatments for our patients.

2. The Vaccine Won't Make You Sick, But It Does Have Some Side Effects

There is no possible way COVID-19 vaccines can give you COVID-19. They might, however, come with some side effects that make you feel uncomfortable for a short time.

Because vaccines teach your body how to recognize and fight off a COVID-19 infection, you might feel some of the symptoms you'd get if your body were fighting off the real virus, such as a fever, according to the CDC.

3. You Should Still Get the Vaccine Even If You've Had COVID-19

Those who have recovered from COVID-19 have some natural immunity that may protect them from getting sick again. Data from the CDC shows that vaccination of people who have had COVID-19 significantly improves their level of protection against being infected again and against having serious COVID-19 illness.

4. Get All Recommended Doses

Generally, if you are receiving the Pfizer or Moderna vaccines, you need two doses to get the same level of efficacy seen in the clinical trials. For the Pfizer vaccine, the second dose is recommended three weeks after the first. For the Moderna vaccine, the second dose is recommended four weeks after the first. And if you get the Johnson & Johnson vaccine, you only need a single dose.

In some cases, people who have received Pfizer a third dose may be recommended. Ask your healthcare provider if this recommendation applies to you.

The FDA has also granted emergency use authorization for a booster dose of the Pfizer vaccine to be administered six months after the second shot for:

- People 65 and older
- Long-term care residents and staff
- People 18+ who have underlying medical conditions such as asthma, diabetes and obesity
- People 18+ who work and live in places that put them at high risk of infection like health care workers like dentists,

teachers or grocery store employees

6. Mask Guidance: Depends on the Environment

Vaccines can help you resume the activities you enjoyed doing most before the pandemic. Being vaccinated is your best projection against becoming seriously ill with COVID-19.

With the rise of the Delta variant, the CDC has updated its guidance to recommend that everyone – regardless of vaccination status – wear masks in public indoor settings and even outside in areas with crowds. This is because the Delta variant is very effective at infecting people who aren't vaccinated, including those too young to be vaccinated.

7. You Can Get the Vaccine If You Are Planning to Get Pregnant

The American College of Obstetrics and Gynecology (ACOG) recommends vaccination for those who are pregnant. Whether you are planning to get pregnant soon or in the future, you should still get the vaccine when it is available to you. The CDC states there is no evidence that the antibodies created from COVID-19 vaccines will cause problems with a pregnant.

CONCLUSION:

In the face of the COVID-19 pandemic, dentists can play an important role in stopping the transmission chain, if operating in adherence to adequate safety protocols. However, consult regularly with your state or local health department for region-specific information and recommendations. Oral medicine emergencies can be carefully evaluated and triaged via video conferencing and sometimes phone contact, to avoid life-threatening risks while realising the limitations by both patient and clinician.

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