

Review

An overview on the Infection Control Protocols for Dental clinics in the Pandemic Era

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Abstract

According to the surveys carried out Dental hygienists, Dental assistants and Dentists are at the highest risk of developing Covid 19. This is attributed to the fact that Dentistry is a branch pertaining to directly dealing with the mouth which is one of the highest reservoirs of microorganisms. Almost all the clinical procedures carried out in Dentistry are aerosols generating which puts both the dental personnel and the patients being treated at risk. The dental aerosols due to its small size and composition have the ability to linger in the air for a prolonged time which elevates the health risk.

This article will provide an overview of prevalent guidelines and current practices, recommend correct use of PPE in the dental setting, and discuss various technologies which aid in air management thereby ensuring the safety of the entire dental team and patients during the covid-19 outbreak.

Keywords: Covid-19, Infection Control, Aerosols, PPE.

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INTRODUCTION

As of June 2021 Coronavirus Disease-19 (COVID-19), has infected more than 181 million individuals worldwide and has caused 3.9 million deaths.^{1,2} According to the surveys carried out Dental hygienists, Dental assistants and Dentists are at the highest risk of developing COVID-19.^{3,4} This is attributed to the fact that Dentistry is a branch pertaining to directly dealing with the mouth which is one of the highest reservoirs of microorganisms. Almost all the clinical procedures carried out in Dentistry are aerosols generating which puts both the dental personnel and the patients being treated at risk.⁵ The dental aerosols due to its small size and composition have the ability to linger in the air for a prolonged time which elevates the health risk.⁶

A large number of pathogens are localized in the oral cavity, which can be transmitted in different ways during dental procedures, usually by means of air/water syringe and high-speed instruments.^{7,8} The procedures that are recommended to minimize the dissemination of aerosol includes use of personal protective equipment such as gloves, masks, protective eye wears, face shield and use of high-power suction during dental procedures.

With the current pandemic situation of COVID-19, dentists are in a state of psychological distress and fear while working under such an unprecedented situation. The field of dentistry is experiencing a stage where it is needed to amplify and improvise the way of practice. Though there are plethora of articles on infection control and management, dentists worldwide are still indecisive on how to go about and what technology to choose to equip their clinics for better infection control. This article will provide an overview of prevalent guidelines and current practices, recommend correct use of PPE in the dental setting, and discuss various technologies which aid in air management thereby ensuring the safety of the entire dental team and patients.

Protocols to be followed before the patient enters a dental operatory.

- Thorough screening and triage

- Ensure the patient is wearing mouth mask.
- Check the temperature.
- Make sure everyone always adheres to the infection control etiquettes by posting visual alert signs, posters etc.⁹
- Provide supplies for respiratory hygiene and cough etiquette, including Alcohol-based hand rub (ABHR) with at least 60% alcohol, tissues etc.
- Install physical barriers at reception areas to limit close contact between triage personnel and potentially infectious patients.
- Remove toys, magazines, and other frequently touched objects from the waiting room that cannot be regularly cleaned and disinfected, this limits ways that you can contract or spread the virus while in the office.
- Along with the routine history taking, focus on patient's past or current illness, travel history and details of contacts with any COVID-19 positive cases and document it and refer the patients for appropriate care if there is a suspected positive case.
- In the waiting area ensure the waiting room is adequately ventilated. 60 L/s per patient is considered as adequately ventilated: in rooms with normal ventilation.¹⁰
- Distance of 1meter should be maintained in between the waiting patients throughout.
- Make sure the patients sanitize their hands with ABHRs and if hands are visibly soiled then with water and soap.¹¹

Protocols for the Dentists and other Dental personnel

During routine dental practice, guidelines by CDC (Centers for Disease Control) is usually followed as “Standard precautions of infection control”. The standard precautionary measures should be amplified by implementation of additional precautions to ensure the standards of infection control are adhered, to prevent any potential COVID-19 transmission. The dentists and other dental personnel should seek appropriate knowledge and training on correct use of PPE (Personal Protective Equipment), management of potential COVID-19 carriers and air and surface management of their operatory to avert any contamination.¹²

Every clinic should have a preparedness model for the provision of oral health care during this pandemic. Bordani M and Donnelly L has described a 'Preparedness model' which can aid in guiding individuals to make sense of the situation at hand by looking at available information. This concept helps in understanding the threats posed by COVID-19 by utilizing different perspectives of oral health care providers, administrators, and patients.¹³ Therefore, it enhances the readiness to deal with emergencies and handling the special needs patients in dental offices in this pandemic.

Before entering a patient room or care area:

- Perform hand hygiene (wash your hands with soap and water for at least 20 seconds or use a hand sanitizer).
- Put on a clean gown or protective clothing that covers personal clothing and skin likely to become soiled with blood, saliva, or other potentially infectious materials.
- Put on a surgical mask or respirator and secure it properly.
- Put on eye protection (goggles or a face shield that covers the front and sides of the face).
- Put on clean non-sterile gloves.
- Enter the patient room or care area.

After completion of dental care:

- Remove gloves.
- Remove gown or protective clothing and discard the gown in a dedicated container for waste or linen.
- Exit the patient room or care area.
- Perform hand hygiene (wash your hands with soap and water for at least 20 seconds or use a hand sanitizer).
- Remove eye protection by carefully grabbing the strap and pulling upwards and away from head. Do not touch the front of the eye protection.
- Remove and discard surgical mask or respirator and do not touch the front of the respirator or mask.

- Perform hand hygiene.

Protocols for Aerosol Generating Procedures:

Dental drilling procedures aerosolize saliva and products of drilling, producing particles small enough to penetrate deep into the lungs.¹⁴ Procedures that commonly generate lot of aerosols should be avoided, alternative non-aerosol techniques if available should be utilized or if necessary, should be performed very cautiously.

It is common to use water coolant while performing many dental procedures, The water coolant when combined with bodily fluids such as blood and saliva generates bioaerosols that are contaminated with micro-organisms and have the potential to remain in the air for considerable duration of time, which can be inhaled by the dental personnel or other patients potentially causing disease transmission.¹⁵ Hence, we need to take measures to ensure the aerosol generating procedures are accomplished with appropriate care. In case aerosol generating procedures cannot be avoided and must be performed, the following protocols may help in limiting the dissemination of aerosols.

- Airborne infection isolation room should be utilized for any Aerosol generating procedures.
- Dental Health Care professional (DHCP) in the room should wear an N95 or equivalent or higher-level respirator, as well as eye, gloves, and a gown.
- Only the concerned operator, assistant and patient should be allowed in the room and no visitors should be allowed to accompany.
- Clean and disinfect treatment room surfaces promptly after the completion of the treatment.
- Limit transport and movement of the patient outside of the room to medically essential purposes.
- Patients should be encouraged to wear a facemask or cloth face covering to contain secretions during transport.

- Consider scheduling the possible suspected or confirmed COVID-19 positive patient at the end of the day.
- Do not schedule any other patients at that time.
- When calculating daily volumes of patients consider the time required to clean and disinfect the clinic between patients and follow the Guidelines for Infection Control in Dental Health-Care Settings of 2003.¹⁶
- To clean and disinfect the dental operatory after a patient with suspected or confirmed COVID-19, DHCP should delay entry into the operatory until a sufficient time has elapsed for enough air changes to remove potentially infectious particles.¹⁷

Current Guidelines for PPE

FACEMASKS/RESPIRATORS: Cloth masks are not considered PPE and should be avoided during care of patients with suspected or confirmed COVID-19 case and any procedures that warrant use of respirator or appropriate face mask. For any type of facemask, appropriate use and management are essential to ensure they are as effective as possible.¹⁸

WHO provides the following guidance on the correct use of masks

- Perform hand hygiene before putting on the mask.
- Inspect the mask for tears or holes, and do not use a damaged mask.
- Place the mask carefully, ensuring it covers the mouth and nose, adjust to the nose bridge and tie it securely to minimize any gaps between the face and the mask. If using ear loops, ensure these do not cross over as this widens the gap between the face and the mask.
- Avoid touching the mask while wearing it. If the mask is accidentally touched, perform hand hygiene.
- Remove the mask using the appropriate technique. Do not touch the front of the mask, but rather untie it from behind.
- Replace the mask as soon as it becomes damp with a new clean, dry mask.

- Either discard the mask or place it in a clean plastic resealable bag where it is kept until it can be washed and cleaned. Do not store the mask around the arm or wrist or pull it down to rest around the chin or neck.
- Perform hand hygiene immediately afterward discarding a mask.
- Do not re-use single-use mask.
- Discard single-use masks after each use and properly dispose of them immediately upon removal.
- Do not remove the mask to speak.
- Do not share your mask with others.
- Wash fabric masks in soap or detergent and preferably hot water (at least 60°C/140°F) at least once a day. If it is not possible to wash the masks in hot water, then wash the mask in soap/detergent and room temperature water, followed by boiling the mask for 1 minute.
- Ensure proper design of face shields to cover the sides of the face and below the chin.⁹

Protocols for Eye Protection, Gloves and Gowns

EYE PROTECTION

- Wear an eye protection (i.e., goggles or a face shield that covers the front and sides of the face) upon entry to the patient room or care area.
- Avoid eyewear (e.g., safety glasses, trauma glasses) with gaps between glasses and the face likely do not protect eyes from aerosols.
- Ensure that eye protection is compatible with the respirator, and they do not hinder the functions of one another.
- Remove eye protection after leaving the patient room or care area, unless implementing extended use.
- Reusable eye protection (e.g., goggles) must be cleaned and disinfected according to manufacturer's reprocessing instructions prior to re-use. Disposable eye protection should be

discarded after use unless following protocols for extended use or reuse.¹⁹

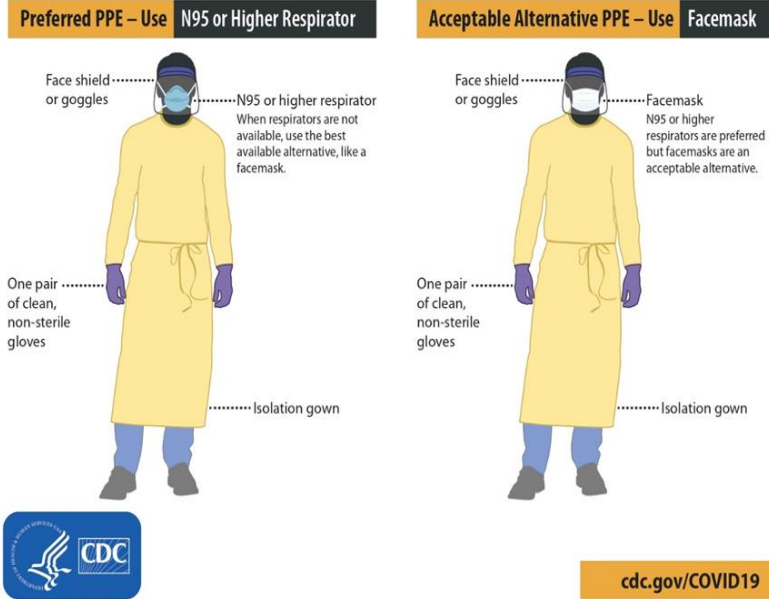
GLOVES

- Put on clean, non-sterile gloves upon entry into the patient room or care area.
- Change gloves if they become torn or heavily contaminated.
- Remove and discard gloves before leaving the patient room or care area, and immediately perform hand hygiene.
- Double gloving is not recommended when providing care to patients with suspected or confirmed Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection.¹⁹

GOWNS

- Put on a clean isolation gown upon entry into the patient room or area. Change the gown if it becomes soiled. Remove and discard the gown in a dedicated container for waste or linen before leaving the patient room or care area. Disposable gowns should be discarded after use. Reusable (i.e., washable or cloth) gowns should be laundered after each use.
- In general, HCP caring for patients with suspected or confirmed SARS-CoV-2 infection should not wear more than one isolation gown at a time.¹⁹

COVID-19 Personal Protective Equipment (PPE) for Healthcare Personnel



Picture 1- Personal Protective equipment

Facemask Do's and Don'ts

For Healthcare Personnel

When putting on a facemask

Clean your hands and put on your facemask so it fully covers your mouth and nose.



DO secure the elastic bands around your ears.



DO secure the ties at the middle of your head and the base of your head.

When wearing a facemask, don't do the following:



DON'T wear your facemask under your nose or mouth.



DON'T allow a strap to hang down. DON'T cross the straps.



DON'T touch or adjust your facemask without cleaning your hands before and after.



DON'T wear your facemask on your head.



DON'T wear your facemask around your neck.



DON'T wear your facemask around your arm.

When removing a facemask

Clean your hands and remove your facemask touching only the straps or ties.



DO leave the patient care area, then clean your hands with alcohol-based hand sanitizer or soap and water.



DO remove your facemask touching ONLY the straps or ties, throw it away*, and clean your hands again.

*If implementing limited-reuse: Facemasks should be carefully folded so that the outer surface is held inward and against itself to reduce contact with the outer surface during storage. Folded facemasks can be stored between uses in a clean, sealable paper bag or breathable container.

Additional information is available about how to safely put on and remove personal protective equipment, including facemasks:

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/using-ppe.html>



CS316404 June 2, 2020 11:30 AM

cdc.gov/coronavirus

Picture 2- Protocols for wearing and removing masks

PROTOCOLS FOR HANDLING OF CONTAMINATED LAUNDRY OR PPE

- Contaminated laundry should be handled as little as possible with a minimum of agitation.

- They should be bagged or containerized and should not be sorted or rinsed in the location where it was used.
- They should be transported in clearly labelled or colour coded bags.
- If there is risk of leakage from the bag due to wet laundry, use leakproof bags.
- Regular washing cycles can be used.
- Personnel handling the laundry should be geared up in appropriate PPE.²⁰

VENTILATION SYSTEM

The World Health Organisation (WHO) has advised medical personnel to consider taking 'airborne precautions'. It is important to protect dentists and patients and reduce the amount of spatter produced during dental procedures. In order to prevent airborne transmission, dental offices should be sufficiently ventilated, with great emphasis placed upon removing bioaerosols.⁵

To facilitate natural ventilation, WHO recommends the use of negative pressure room with a minimum of 12 air changes per hour or at least 160L/s per patient. Mechanical ventilation should commence before treating the next patient. For room with natural ventilation, 60L/s per patient is considered adequate ventilation.²¹

AIR AND SURFACE MANAGEMENT

Engineering controls through mechanical ventilation and air filtration are considered a higher level of precaution than PPE and are important mechanisms to reduce the risks of airborne disease transmission in an indoor environment such as the dental treatment rooms. The US CDC guidance recommends that dental offices consider improving the building mechanical ventilation systems and/or adding a portable air cleaner (PAC) to minimize potential risks associated with aerosols in dental offices.²²

The commonly used devices are high-volume evacuator (HVA) and high efficiency particulate arrestor (HEPA) filters. HVA is

the easiest way to remove the dental aerosols. The device is held at approximately 6-15mm from the active ultrasonic tip. It is effective in removing air at a rate of up to 2.83m³ per minute and it can potentially reduce contamination by 90%.²³ Assistants are needed in operating it. However modified versions are available which address this issue.

HEPA filters

A study by Ren YF et al (2021) on the effects of mechanical ventilation and portable air cleaner suggest that addition of PAC with a HEPA filter significantly reduced aerosol accumulation and accelerated aerosol removal.²²

Although HEPA can remove 99.9% of the particles measuring 0.3µm in diameter, one disadvantage of HEPA is that it may retain the microorganisms which can proliferate and enter back into the filtered air.²⁴

SURFACE MANAGEMENT

The contaminated fingers could sequentially transfer virus to up to seven clean surfaces.²⁵ In dentistry, conventional manual disinfection of medical device surfaces is used, and this needs a two-stage disinfection procedure which includes surface rehydration followed by disinfection, for effective inactivation of bacteria and viruses on dry surfaces. The most effective disinfectants are ethanol at strong concentration while sodium hypochlorite and hydrogen peroxide require a minimal concentration to be effective with a low impact on human health. Also, ethanol at 62% and 71% is similarly efficacious against coronavirus but can be used for small surfaces. Ethanol has been widely used for the decontamination of hands based on 80% ethanol or 75% 2-propanol, and these are sufficiently efficacious. For cleaning the workstation surfaces, sodium hypochlorite is suitable at a concentration of 0.05% with efficient and sufficient procedures and when used at a concentration of 0.1%, it is effective in 1 min. Also, hydrogen peroxide is effective with a low concentration of 0.5% and an action time of 1 min. It is used

for cleaning and disinfection implant drills because it preserves the drill structure after 50 cycles of decontamination.²⁶

A study by Scarano Antonio (2020) concluded that the decontamination technique that best suits the needs of the dental clinic is peroxide and hypochlorous which can be sprayed via a device at high turbine speed with the ability of producing small aerosol particles, recommendable also for their low cost.²⁷

Kampf et al (2020) revealed SARS and MERS can persist on inanimate surfaces up to 9 days. Certain disinfectants like 62% - 71% ethanol, 0.5% hydrogen peroxide and 0.1% sodium hypochlorite can be used in tackling them.²⁶

Although germicidal agents have advantages against Covid-19, studies have shown Alcohol-based hand sanitizers can potentially cause dry skin, infection, and alcohol poisoning especially amongst children, along with other health problems. Possible risks with disinfectants should be known and appropriate measures have to be taken to ensure the associated risks are averted.²⁸

CONCLUSION

Limiting or controlling aerosols in the dental operatory should be the main concern of dentists worldwide, so choosing the right technique and technology is very critical. Although, total eradication of aerosols during dental treatment is next to impossible, it is possible to minimize the risk of transmission by a strategic combination of various protective procedures along with the application of the universal barrier technique. These aerosols represent a potential route for disease transmission. This transmission can be minimized by incorporating several infection control measures into the routine precautions used during the patient care.

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