

Preparation For Dentists During and Post Covid Era

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Abstract: COVID-19 is an infectious disease caused by a coronavirus. Most people infected with the COVID virus will experience mild to moderate respiratory illness and recover without requiring special treatment. There are currently no data available to assess the risk of SARS-CoV-2 transmission during dental practice or to determine whether Dental Health Care Professionals (DHCP) are adequately protected when providing dental treatment using Standard Precautions, but places DHCP in the very high exposure risk category, as their jobs are those with high potential for exposure to known or suspected sources of the virus that causes COVID-19 during specific procedures. This is an attempt to what dentists have to do during and post COVID-19 Era.

Keywords: COVID, Dentists, PPE kit, Masks, Precautions

1. Introduction

The world population has been facing an unprecedented challenge, which has not been experienced from the time of Spanish flu after the First World War. The 2019 novel coronavirus (2019-nCoV) or the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as it is now called, is rapidly spreading from its origin in Wuhan City of Hubei Province of China to the rest of the world that means epidemic at the beginning, escalated into worldwide pandemics¹. Till 14th January 2021 around 10.5M cases of coronavirus disease have been reported, out of which 10.1M have been recovered and 152K deaths have been reported. It now becomes a major challenge in the global world which has become very hard to treat as there is no antidote for the virus to date. 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 the inhalation of infectious agents. There are currently no data available to assess the risk of SARS-CoV-2 transmission during dental practice. This review is an attempt to discuss dental considerations which should be followed during the COVID 19.

2. History

1965	Tyrrell and Bynoe found that they could passage a virus named B814 which was found in human embryonic tracheal organ cultures obtained from the respiratory tract of an adult with a common cold
1965	Hamre and Procknow were able to grow a virus with unusual properties in tissue culture from samples obtained from medical students with colds
The late 1960s	Tyrrell was leading a group of virologists working with the human strains and several animal viruses. These included infectious bronchitis virus, mouse hepatitis virus, and transmissible gastroenteritis virus of swine, all of which had been demonstrated to be morphologically the same as seen through electron microscopy. This new group of viruses was named coronavirus (corona denoting the crown-like appearance of the surface projections) and was later officially accepted as a new genus of viruses ²

Severe Acute Respiratory Syndrome (SARS) Coronavirus

Coronaviruses are enveloped, positive-sense single-stranded RNA viruses with a nucleocapsid of helical symmetry. SARS was determined to be caused by SARS-CoV and emerged in a market where civets were sold³. The causative coronavirus of this outbreak was named SARS-CoV-2 due to its resemblance to SARS-CoV. The SARS-CoV infects ciliated bronchial epithelial cells and type-II pneumocytes through angiotensin-converting enzyme 2 (ACE2) as a receptor⁴. According to previous reports, the aforementioned three coronaviruses are thought to have originated in bats.

Routes of Transmission

SARS-CoV-2 infections typically spread through respiratory droplets or by contact. Another important route of transmission is if droplets of SARS-CoV-2 land on inanimate objects located nearby an infected individual and are subsequently touched by other individuals. Both of these phenomena are most common in dental practice set up³. The 2019-novel coronavirus (2019-nCoV) was detected in the self-collected saliva of 91.7% (11/12) of patients. Hence precautions like facemask and face shield is the minimum requirement for every dentist who is going to be working in the postcovid era⁵. The current scientific consensus is that the transmission of COVID-19 virus occurs via respiratory secretions, in the form of large respiratory droplets rather than small aerosols. Droplets being heavy enough do not travel far; falling from the air after traveling up to a maximum six feet distance. The problem occurs when viral particles are aerosolized by a cough, sneeze, or dental care procedures. According to a study, ultrasonic and sonic transmission during nonsurgical treatments has the highest incidence of particle transmission, followed by air polishing, air/water syringe, and high-speed handpiece aerosolization. Carriers of SARS-CoV-2 include infected COVID-19 patients, asymptomatic patients and patients in their incubation period. The incubation period has been gauged to 5 to 6 days on an average, but may extend to 14 days⁶.

Symptoms

Individuals with these side effects or mixes of manifestations may have COVID-19 –

- Cough, dyspnea, fever, chills, continued shaking with chills, muscle torment, cerebral pain, sore throat, loss of taste, relentless agony or weight in the chest⁷
- Further development can lead to severe pneumonia, acute respiratory distress syndrome, sepsis, septic shock and death⁸

General Framework for Cleaning and Disinfection Practices:

Normal routine cleaning with soap and water will decrease how much of the virus is on surfaces and objects, which reduces the risk of exposure. Disinfection using EPA-approved disinfectants against COVID-19 external icon can also help reduce the risk. Frequent disinfection of surfaces and objects touched by multiple people is important.

General Screening of the Patient

- Patients should complete a detailed medical history form, COVID-19 screening questionnaire before the doctor starts screening for the problems.
- 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 pdf icon (e.g., signs, posters) at the entrance and in strategic places (e.g., waiting areas, elevators, break rooms) 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 and cough etiquette, including alcohol-based hand rub (ABHR) with at least 60% alcohol, tissues, and no-touch receptacles for disposal, at healthcare facility entrances, waiting rooms, and patient check-ins.
- Encourage physical distancing - Install physical barriers (e.g., glass or plastic windows) at reception areas to limit close contact between triage personnel and potentially infectious patients.
- Remove toys, magazines, and other frequently touched objects from waiting room that cannot be regularly cleaned and disinfected.

Dental Screening of the Patient

Patients should complete a detailed medical history form, COVID-19 screening questionnaire before the dentist starts screening for the oral problems. These questionnaires are available from the Dental Council Of India and State Dental Council⁵. These questions may include the following:

Do you have fever? Have you experienced cough or difficulty breathing? Do you have any travel history? Have you come into contact with a patient with COVID-19 in the last 14 days?

OPD Protocols

- Promote digital or app-based registration system.
- No attendant is to be allowed with one patient except for child.
- Social distancing of at least 6 feet to be followed at all times as far as feasible in the queue.
- Modify process flow (like unidirectional flow of patients) in OPD to minimize people's movement inside the premises
- Seating arrangement to be made in such a way that social distancing is maintained.

- OPD premises should be disinfected with 1% sodium hypochlorite frequently and after all the patients have been seen.
- Cleaning and regular disinfection (using 1% sodium hypochlorite) of frequently touched equipment such as Mouth mirror, Probe, etc. used in the OPD must be ensured.
- The equipment must also be disinfected after each patient is seen or must be autoclaved properly.

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).
 - Encourage use of alternative mechanisms for patient and visitor interactions such as video-call applications on cell phones or tablets.
 - 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.
 - Arranging seating in waiting rooms so patients can sit at least 6 feet apart.
 - For DHCP, the potential for exposure to SARS-CoV-2 is not limited to direct patient care interactions. Transmission can also occur through unprotected exposures to asymptomatic or pre-symptomatic co-workers in breakrooms or co-workers or visitors in other common areas. Examples of how physical distancing can be implemented for DHCP includes
 - Reminding DHCP that the potential for exposure to SARS-CoV-2 is not limited to direct patient care interactions.
 - Emphasizing the importance of source control and physical distancing in non-patient care areas.
 - Providing family meeting areas where all individuals (e.g., visitors, DHCP) can remain at least 6 feet apart from each other.
 - Designating areas for DHCP to take breaks, eat, and drink that allow them to remain at least 6 feet apart from each other, especially when they must be unmasked.

Diagnostic Test

Reverse transcription polymerase chain reaction (RT-PCR) from a nasopharyngeal swab is routinely used to detect causative viruses from respiratory secretions⁸

General Considerations**Hand hygiene**

- Proper hand-washing not only reduces the spread of Coronavirus (COVID-19), it can prevent the spread of other viral illnesses such as cold and flu. Hand-washing requires five simple steps:
 - Wet: Put both your hands under clean, running water.
 - Lather: Apply a generous amount of soap to the inside and back of your hands as well as your fingertips.

Wash your hands for at least 20 seconds (sing happy birthday) and don't forget to wash under jewellery and fingernails. Your fingertips are especially important as people often put their fingers on their face, nose, and eyes. This is how the virus spreads.

- **Scrub:** Rub both hands together and move your fingertips around both hands. You don't need a scrub brush. You don't need to make harsh, scrubbing movements.
 - **Rinse:** Return both hands to the running water and gently wash away the soap.
 - **Dry:** Completely dry the water from your hands. Using a disposable towel (paper towel) is best to avoid leaving germs on towels. Air dryers, commonly found in public bathrooms, are also effective.
- b) Use of a Sanitizer- Choose hand sanitizers that contain less than 60% alcohol. Rub the gel over all the surfaces of your hands and fingers until your hands are dry
- c) Use of disposable items like face mask, headcover, etc.

DENTAL CONSIDERATIONS WHILE DEALING WITH THE COVID PATIENTS

By The Patient

Pre-procedural mouth rinse

This can reduce bacteria in the mouth and keep the patient and dental personnel safer. American Dental Association (ADA) and the Center of Disease Control and Prevention (CDC) have recommended preprocedural mouth rinse as an important protocol to be followed by every dentist. In 2003, the CDC described preprocedural mouth rinses as antimicrobial mouth rinses used by patients before a dental procedure. Following are the list of chemicals that can be used as a preprocedural mouthwash- chlorhexidine 0.12%, hydrogen peroxide 1.5%, povidine iodine 2%, sodium hypochlorite 0.2%

By the Dentists

1) Use of protective equipment gear

Personal protective equipment (PPE)

They are protective gears designed to safeguard the health warrior or workers by minimising their exposure to the biological agents. Components of PPE are eyewear, face shields, mask, gloves, coverall/gowns (with or without aprons), head-cover and shoe cover⁹.

The Centers for Disease Control and Prevention (CDC) guidance includes new recommendations for how to put on and off a PPE kit.

How to Put On (Don) PPE Gear?

- More than one donning method may be acceptable. Training and practice using your healthcare facility's procedure is critical. Below is one example of donning.
- Identify and gather the proper PPE to don. Ensure choice of gown size is correct (based on training).
- Perform hand hygiene using hand sanitizer.
- Put on isolation gown. Tie all of the ties on the gown. Assistance may be needed by other healthcare personnel.
- Put on NIOSH-approved N95 filtering facepiece respirator or higher (use a facemask if a respirator is not available). If the respirator has a nosepiece, it should be fitted to the nose with both hands, not bent or tented. Do not pinch the nosepiece with one hand.

Respirator/facemask should be extended under chin. Both your mouth and nose should be protected. Do not wear respirator/facemask under your chin or store in scrubs pocket between patients.

- **Respirator:** Respirator straps should be placed on crown of head (top strap) and base of neck (bottom strap). Perform a user seal check each time you put on the respirator.
- **Facemask:** Mask ties should be secured on crown of head (top tie) and base of neck (bottom tie). If mask has loops, hook them appropriately around your ears.
- Put on face shield or goggles. When wearing an N95 respirator or half facepiece elastomeric respirator, select the proper eye protection to ensure that the respirator does not interfere with the correct positioning of the eye protection, and the eye protection does not affect the fit or seal of the respirator. Face shields provide full face coverage. Goggles also provide excellent protection for eyes, but fogging is common.
- Put on gloves. Gloves should cover the cuff (wrist) of gown.
- Healthcare personnel may now enter patient room¹⁰.

How to Take Off (Doff) PPE Gear?

- More than one doffing method may be acceptable. Training and practice using your healthcare facility's procedure is critical. Below is one example of doffing.
- Remove gloves. Ensure glove removal does not cause additional contamination of hands. Gloves can be removed using more than one technique (e.g., glove-in-glove or bird beak).
- Remove gown. Untie all ties (or unsnap all buttons). Some gown ties can be broken rather than untied. Do so in gentle manner, avoiding a forceful movement. Reach up to the shoulders and carefully pull gown down and away from the body. Rolling the gown down is an acceptable approach. Dispose in dustbin.
- Healthcare personnel may now exit patient room.
- Perform hand hygiene.
- Remove face shield or goggles. Carefully remove face shield or goggles by grabbing the strap and pulling upwards and away from head. Do not touch the front of face shield or goggles.
- Remove and discard respirator (or facemask if used instead of respirator). Do not touch the front of the respirator or facemask.
- **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.
- **Facemask:** Carefully untie (or unhook from the ears) and pull away from face without touching the front.



- FFP1, FFP2, FFP3
- N95, N99, N100
- Surgical Mask
- Fabric Masks (e.g. Cotton, Silk, Chiffon, Hybrid, Linen, scarf)

Facemasks

Masks have been an essential PPE in this crisis. Despite the initial confusing information on the use of masks in mitigating COVID-19, WHO has recently recommended the

usage of three layers fabric masks for healthy people⁹. There are two types of masks which are recommended for various categories of personnel working in hospital or community settings, depending upon the work environment

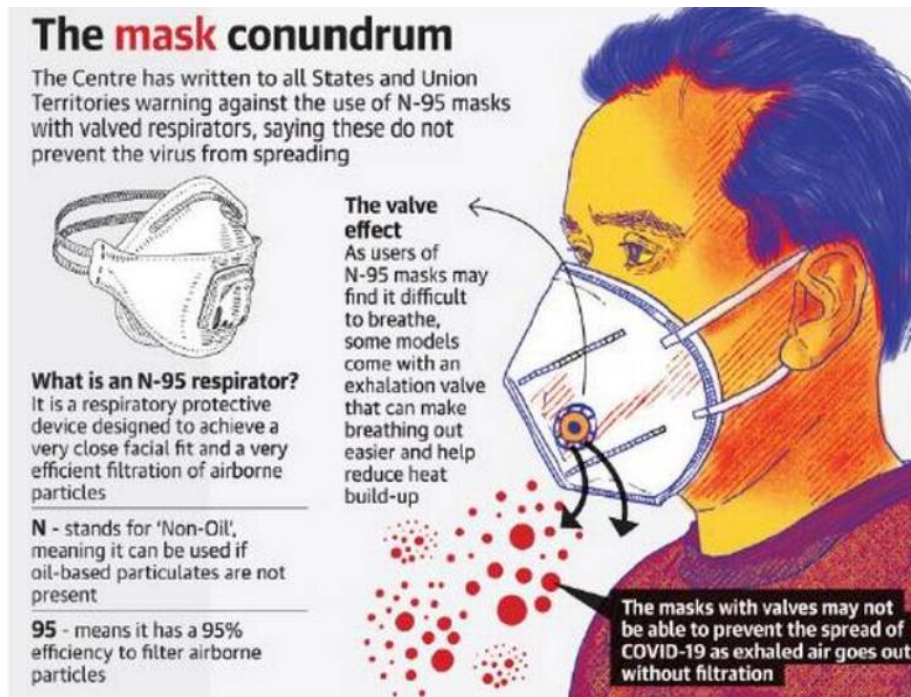
- 1) Triple-layer medical mask
- 2) N-95 Respirator mask

Triple Layer Mask

- A triple layer face mask is a non-medical, fabric face covering which has three layers.
- These will consist of an inner layer of an absorbent material such as cotton, a non-woven middle layer consisting of a material such as polypropylene, and a final, non-absorbent synthetic top layer such as polyester or polyester blend.
- According to the World Health Organisation these should be worn in places where social distancing is not possible, to reduce the risk of Covid-19 infection

Properties of Polypropylene

- Toughness and flexibility
- Large thermal expansion.
- Resistant to organic solvents.
- Resistant to weak oxidizing agents¹¹



How are N95 Masks Made?

A medical N95 respirator consists of multiple layers of nonwoven fabric, often made from polypropylene. The two outward protective layers of fabric, covering the inside and outside of the mask, are created using spun bonding. Spun bonding uses nozzles blowing melted threads of a thermoplastic polymer (often polypropylene) to layer threads between 15-35 micrometers on a conveyor belt, which build up into cloth as the belt continues down the line. Fibers are then bonded using thermal, mechanical, or chemical techniques. The two outer layers of the respirator, between 20 and 50 g/m² in density, act as protection against

the outside environment as well as a barrier to anything in the wearer's exhalations. Between the spun bond layers there's a pre-filtration layer, which can be as dense as 250 g/m², and the filtration layer. The prefiltration layer is usually a needled nonwoven. Nonwoven material is needle punched to increase its cohesiveness, which is accomplished by sending barbed needles repeatedly through the fabric to hook fibers together. The prefiltration layer is then run through a hot calendaring process, in which plastic fibers are thermally bonded by running them through high pressure heated rolls. This makes the pre-filtration layer thicker and

stiffer, so it can be molded to form the desired shape and stay in that shape as the mask is used¹².

Testing Methods for N95 Masks

Like surgical masks, N95s go through several tests to ensure their effectiveness. You can find out more about the tests in detail on the C.D.C.'s website, but in this section, we'll be giving a brief overview. At the C.D.C., N95s are conditioned for 24 hours before testing by being kept in a 38 degree C environment with 85% relative humidity. During tests, the respirator's filtration ability must stay above its certification class level at all times. N95s are tested with:

- Charge neutralized sodium chloride aerosol spray, which features particles with a median of 0.3 microns in diameter. This tests for particle penetration.
- An airflow of 85 L per minute, which tests for a moderately high work rate.
- A breathing resistance test at 35 mm or below water column height pressure, and exhalation resistance at 25 mm or below water column height pressure (A millimeter of water column height pressure is the pressure from one millimeter of water at 39 degrees F).
- At least 200 mg of aerosol loading, which simulates a high level of exposure by clogging up the mask with aerosol particles.

Eye protection- The adaptable edge of goggles ought to give great seal the skin of the face, covering the eyes and the encompassing regions and in any event, protecting from solution spills

Gloves-

- Nitrile gloves (comfortable and grippy, and made with a puncture-resistant, latex-free material.) are favored over latex gloves since they oppose synthetic concoctions, including certain disinfectants, for example, chlorine. Be that as it may, if nitrile gloves are not accessible, latex gloves can be utilized.
- If latex or rubber gloves to be too tight or stuffy, one can consider PVC gloves, which are made from a thin and lightweight plastic. The non-toxic material is safe for food handling.
- The latest CDC guidelines say one should consider wearing disposable gloves, in addition to covering your face.

Gowns, Head Covers- for the most part, spread the head.

- Those utilizing outfits should utilize a head spread that covers the head what's more, neck while giving clinical consideration to patients. Hair and hair expansions should fit inside the head spread.
- For a medium to high risk of contamination where a wide critical zone is needed, ANSI or AAMI PB70 Level 3 or 4 insulation gowns are recommended. For all exposure levels, surgical gowns at levels 1-4 can be worn when in surgery, and ANSI/AAMI PB70 Level 1 or 2 gowns can be worn for activities with limited exposure risk. Gowns should cover the wearer's back even when they bend over or sit.
- Coveralls - In place of gowns, coveralls can be worn. They offer better protection, but, due to the added insulation, they are still more inconvenient for most healthcare workers. In addition, health care personnel are

also more unfamiliar with coveralls, which, if coveralls are not properly removed, can lead to risks.

2) Scheduling the appointment during COVID-19 outbreak

To decrease the risk of nosocomial infection, after treatment, environmental cleaning and disinfection procedures should be followed. Alternatively, patients could be treated in an isolated and well-ventilated room or negatively pressured rooms if available for suspected cases with COVID-19. Defer the treatment if there is no emergency.

3) Use of disposable materials

Most, if not all of the instruments we use in our clinic are disposable. These include gloves, face shields, masks, gowns, and items used in the exam itself, like gauze, brushes, and floss. All are safely discarded after each use

Precautions Implemented in Various Dental Departments

Oral medicine and radiology

- Autoclaving of all equipments
- The gag or cough reflex may be stimulated by certain procedures, such as posterior intraoral and bite-wing radiographs. Preventive measures can be implemented by controlling the gag or cough reflex during examination and dental procedures.
- Extraoral radiographs may be considered as an interim alternative to intraoral radiographs for examination.
- Disposable PMT set can be considered.
- Proper sanitization of each dental chair after each patient.
- Instruments that are opened on the sterile field, whether used or not used, during the surgical procedure must be thoroughly decontaminated prior to disinfection and/or sterilization.
- Use of transparent barrier in between dental chairs so as to segregate each and every single dental chair in OPD area .

Periodontology

Use of hand scalers rather than using ultrasonic scalers.

Endodontics

- Emergency endodontic treatment - Pain, pulp exposure, and swelling could be done using chemo-mechanical method
- Use of a rubber dam

Oral Surgery

- Use of saliva ejector rather than using 3 way syringe to avoid spraying.
- Life-threatening cases with oral and maxillofacial compound injuries should be advised for RT-PCR

Disinfection of dental clinic setting

Exhaust air should be vented outside to prevent the recirculation of contaminated air¹³. Contaminated air can be managed by improving dental clinic ventilation. An ideal airflow pattern combined with a minimum of 3 air changes per hour has been recommended for dental settings^{14,15}. Moreover, although its use in dental clinics is unconfirmed, ultraviolet germicidal irradiation may be installed and is

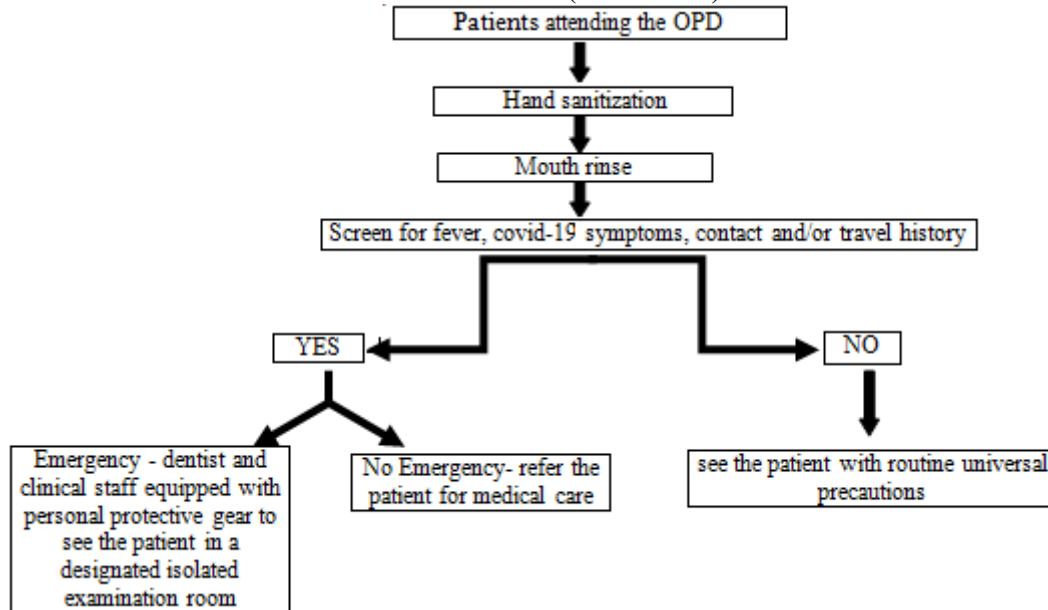
effective against fungi, viruses, and bacteria, namely, tubercle bacilli and anthrax

Implement Teledentistry and Triage Protocols

Contact all patients prior to dental treatment	
Telephone screen all patients for symptoms consistent with COVID-19	
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,	No symptoms then assess patient's dental condition and determine whether patient needs to be seen in dental setting. Use

delay dental care until the patient has ended isolation or quarantine. Telephone triage all patients in need of dental care	teledentistry options as alternatives to in-office care. Request that the patient limit the number of visitors accompanying him or her to the dental appointment to only those people who are necessary
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Patient Flow Chart (Annexure-1)



Segregation of Personnel Safety Devices

- The use of protective gears should be made mandatory for all the personnel handling waste.
- Gloves: Heavy-duty rubber gloves should be used for waste handling by the waste retrievers. This should be bright yellow in colour. After handling the waste, the gloves should be washed twice. The gloves should be washed after every use with carbolic soap and a disinfectant.
- Aprons, gowns, suits or other apparels: Apparel is worn to prevent contamination of clothing and protect skin. It could be made of cloth or impermeable material such as plastic. People working in incinerator chambers should have gowns or suits made of non-inflammable material.
- Masks: Various types of masks, goggles, and face shields are worn alone or in combination, to provide a protective barrier. It is mandatory for personnel working in the incinerator chamber to wear a mask covering both nose and mouth, preferably a gas mask with filters.
- Boots: Leg coverings, boots or shoe-covers provide greater protection to the skin when splashes or large quantities of infected waste have to be handled. The boots should be rubber-soled and anti-skid type.

3. Conclusion

Safely managed water, sanitation, and hygiene (WASH) services are an essential part of preventing and protecting

human health during infectious disease outbreaks, including the current COVID-19 pandemic. One of the most cost-effective strategies for increasing pandemic preparedness, especially in resource-constrained settings, is investing in core public health infrastructure, including water and sanitation systems. Good WASH and waste management practices, that are consistently applied, serve as barriers to human-to-human transmission of the COVID-19 virus in homes, communities, health care facilities, schools, and other public spaces. Before or after the ongoing development of vaccine also, one should follow all these precautions as precautions are always better than cure.

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