Infection Control During COVID – 19 (Corona Virus)

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Abstract

The novel coronavirus disease 2019 (COVID-19) has developed into a global pandemic, with its early roots from Wuhan city in China. Many warring nations have placed forward maximum precautionary steps and tools to reduce transmission and decrease fatality rates. Infection control measures are required to prevent the infection and to avoid further spread of the virus and to help control the infection. Restrictive steps such as social distancing, lockdown, case identification, isolation, contact tracing and quarantine of exposed had identified the most effective efforts to monitor the spread of the disease.The risk of cross-infection between patients and dental practitioners may be high due to the characteristics of the dental settings. Strict and reliable guidelines on the prevention of infections are urgently needed for dental practices and hospitals in areas (potentially) affected by COVID-19. This article provides a detailed overview of general and relevant preventive interventions, methods and prevention of infections in the healthcare and public settings.

Keywords: *Infection control, Protocol, COVID19, Pandemic, Safety measures*

Introduction

Today the world is standing in the battle against coronavirus disease 2019 (COVID-19), an emerging viral pandemic that demands a large human toll[1]. With its origins in Wuhan City , China, as a cluster of cases of unexplained aetiology pneumonia, it was soon established as being caused by a novel strain of coronavirus (CoV), now called severe acute respiratory syndrome CoV-2 (SARS-CoV-2), which spread primarily through droplets, respiratory secretions, and direct contact[1]. COVID-19 presents as an asymptomatic or moderate infection in the majority of the population (80 per cent)[1]. However, the disease is known to cause severe pneumonia and multiple complications, especially in certain groups at high risk[1]. In addition to social distance, lockdown, case identification, isolation, quarantine, proper infection control and protection measures are important to avoid this life-threatening emerging corona virus[1].

INFECTION CONTROL IN SARS-coV 2:

The prevalent mode of transmission from person to person in SARS-CoV-2 infection is through close contact with the respiratory droplet-generating infected individuals[1]. The virus is capable of staying active for several hours on environmental surfaces making transmission of fomite likely[1]. However,airborne transmission does not appear to be a significant mechanism[1]. This has unique consequences because of a lack of personal protection equipment in different settings[1]. Aerosol-generating procedures may create smaller particles that can remain in the air for longer periods of time[1]. Distant distribution of such particles seems unlikely to develop secondary infection[1].

Discussion

Strategies needed to prevent or restrict the transmission of COVID-19 in health care facilities include the following[2]:

SCREENING for early detection of patients with suspected COVID-19, and rapid implementation of source control measures[2]:

1) Screening:

To facilitate screening the health-care facilities should:

1. Display information at the entrance of the facility directing patients with signs and symptoms of COVID-19 to report to the designated area for screening[2].

2. Establish entrances for patients with signs and symptoms of COVID-19[2].

3. Train staff on the signs and symptoms of COVID-19 and the most recent case definitions. Encourage health workers to be alert to potential COVID-19 infection in all patients[2].

4. Ensure that screening personnel maintain a distance of at least 1 metre from patients, ideally with a separation created by a glass/plastic screen[2]. If that is not possible, mask and eye protection should be worn[2].

5. All suspected COVID-19 patients advised to wear masks for source control purposes and place themselves in a designated, well ventilated waiting area at least 1 metre apart from each other[2].

6. Ensure there is a process in place to minimise the time reported by COVID-19 patients waiting to be screened[2].

7. Suspected COVID-19 patients with respiratory distress symptoms and significant underlying conditions should be prioritised for medical examination[2].

A) Isolation or designated waiting area:

1. Health care facilities in emergency departments without adequate single isolation rooms should designate a separate, well ventilated area where patients with suspected COVID-19 can stay. This area should have at least 1 metre apart tables, stalls, or chairs[2].

2. The isolation or designated area should have specific toilets, hand hygiene stations and lid-based trash bins for disposal of paper tissues used for respiratory or hand hygiene[2].

3. Screen graphic information to show patients how to practise hand hygiene and respiratory hygiene[2]. In order to avoid the spread of COVID-19 in health care facilities, patients with suspected COVID-19 that have been missed by screening and triage efforts or have become contaminated inside the facility must be identified promptly[2]. This can be quite challenging considering the large number of acute respiratory infections and atypical clinical presentations of COVID-19[2].

B)Health-care facilities should:

1. Encourage health workers to check for possible COVID-19 cases , particularly when there are signs and symptoms of COVID-19 inpatients and no other reasonable explanation for these symptoms is provided[2].

2. Ecourage rapid testing and reporting of suspected COVID-19 patients who were diagnosed during hospitalisation[2].

3. Develop recall systems for clinicians to recognise COVID-19 based on signs and symptoms, particularly in areas with transmission to the population[2].

2) Standard precautions for all patients:

Standard precautions seek to reduce the risk of bloodborne and other pathogens transmitted from both known and unrecognised sources[2]. They reflect the basic level of precautions for infection control which should be used in the treatment of all patients at all times[2]. Standard measures include, but are not limited to, hand and respiratory hygiene, risk assessment use of sufficient PPE, environmental sanitation, and responsible waste management[2].

a) HAND HYGIENE:

Hand hygiene Hand hygiene is one of the most important strategies for preventing COVID-19 and other pathogens from spread. Health workers should apply the following guidelines to optimum output in hand hygiene[2].

Five situations[2]:

- Before a patient enters,
- Before conducting any clean or aseptic procedure;
- Exposure to body fluids,
- After touching the patient,
- After the patient has entered the surroundings;

Hand hygiene involves either cleaning hands with alcohol-based hand rubbing (ABHR containing at least 70% alcohol, or soap, water, and disposable towels;

alcohol-based hand rubbing products are favoured when hands are not clearly soiled; washing thoroughly with soap and warm when visibly soiled; using the appropriate technique and duration for hand washing[2].

b) Respiratory hygiene[2]:

Ensure the following steps of respiratory hygiene are applied:

• View graphical information on the need to cover the nose and mouth when coughing or sneezing with a tissue or bent elbow[2].

• Do handwash after contact with respiratory secretions or items possibly infected with respiratory secretion[2].

• Offer suspected COVID-19 patients a wearable medical mask[2].

c) Use of PPE:

Adequate and proper use of PPE decreases pathogen exposure. The PPE 's effectiveness depends heavily on[2]:

• Personnel training on putting on and removing PPE[2].

• Immediate access to appropriate supplies[2].

• Proper hand hygiene[2].

• Enforcement by health workers[2].

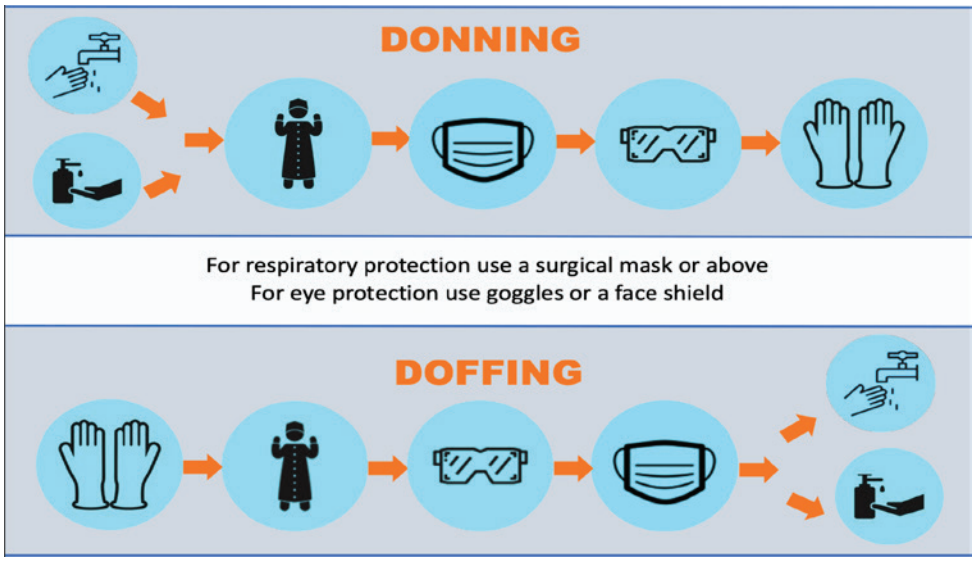
• Daily supervision and feedback by IPC employees[2].

d) Environmental cleaning :

· Ensuring clear and accurate cleaning and disinfection procedures are followed is essential[2].

· All surfaces in health-care facilities should be regularly cleaned and disinfected, especially high-touch surfaces, and should be soiled visibly or contaminated with body fluids[2].

· In settings where patients with suspected or confirmed COVID-19 are admitted, frequency depends on the form of patient area and surface region[2].



Taken from: http://publichealth.lacounty.gov/acd/docs/CoVPPEPoster.pdf

3) Implementing additional precautions:

According to current evidence, SARS-CoV-2, the virus that causes COVID-19, is primarily transmitted by the respiratory droplets and communication routes between people[2].

Droplet transmission occurs when someone with respiratory symptoms (e.g. coughing or sneezing) is in close contact (within 1 m) and is thus at risk of exposure to potentially infectious respiratory droplets through his / her mucosa (mouth and nose) or conjunctive (eyes). Thus, COVID-19 virus transmission can occur through direct contact with infected individuals and indirect contact with surfaces in the environment or items used on the infected individual[2].

Airborne transmission varies from droplet transmission because it applies to microbes in droplet nuclei. The droplet nuclei are commonly known as particles[2].

Isolation of patients with suspected or confirmed COVID-19:

1. Limit the number of health workers who have contact with each COVID-19 patient[2].

2. Patients should, if feasible, be housed in well ventilated single rooms[2].

3. If single rooms are not available or the occupancy rate is estimated to be 100% or higher, suspected, likely or confirmed COVID-19 patients should be clustered (coordinated) in sufficiently ventilated areas with beds at least 1 metre apart[2].

4. Stop getting patients out of their rooms or locations, unless medically necessary. Using approved portable X-ray equipment and/or other medical instruments[2].

5. Ensure that health workers who transport patients are hand hygienic and wear suitable PPE

6. Facilities should be either single-use and dedicated or disposable. If equipment has to be shared between patients, clean and disinfect each time a different patient uses it[2].

7. Maintain track of all employees accessing the patient's room[2].

Health workers performing AGPs or in settings where AGPs are performed among suspected or confirmed COVID-19 patients (e.g. intensive care units or semi-intensive care units) should:

1. Perform procedures in an appropriately ventilated space-refer in this guidance to the section on environmental and technical control[2].

2. Please note that if the wearer has a beard or other thick facial hair, this can prevent proper respiratory fitting. Other PPE products include eye protection (e.g., goggles or a face shield), long-sleeved gown, and gloves[2]. If gowns are not resistant to fluid, health workers performing AGPs should use a waterproof apron if the operation is expected to produce a large amount of fluid which may penetrate the gown[2].

3. In intensive care units, where AGPs are commonly performed, the health worker may choose to wear a particulate respirator in areas of community transmission during their shift;

Ventilation has three basic criteria[2]:

• **Ventilation rate**: quantity and quality of outside air supplied to the space[2].

• **Airflow direction:** the overall airflow direction should be from clean areas in the building and between the spaces[2].

• **Air distribution or airflow pattern:** the supply of air to each part of the space to improve the dilution and elimination of airborne contaminants produced in the room[2].

4) Duration of contact and droplet precautions for patient with COVID-19:

Standard precautions should be applied whenever possible. Contact and droplet measures should be removed only in consultation with physicians and should take into account the resolution of clinical signs and symptoms, or the number of days after a positive examination with an upper respiratory specimen was performed[2].

1. These additional steps can be withdrawn for symptomatic patients 10 days after the onset of symptoms For at least three consecutive days with no fever or respiratory symptoms; Isolation can terminate for asymptomatic patients 10 days after the initial positive RT-PCR test result[2].

2. Although some patients were tested positive for COVID-19 on the basis of molecular assays several days after symptom resolution, it is still unclear if these patients continue to shed the virus, because only viral fragments of RNA were detected[2].

5) Collecting and handling laboratory specimens from patients with suspected COVID-19:

1. All specimens obtained for laboratory surveys should be treated as potentially contagious. The following precautions and biosafety standards should be adhered to by health workers who collect, treat or transport any clinical specimens[2].

2. Ensure that health care staff who collect specimens, including nasopharyngeal and oropharyngeal swabs, use suitable PPE[2].

3. If the specimen is obtained using an AGP (e.g. sputum induction), the operating staff should wear a particulate respirator[2].

4. Ensure all staff carrying specimens are trained in safe handling methods and decontamination procedures for spills[2].

5. Put specimens in leak-proof container for transport[2].

6. Collect all items, if possible by hand. Do not move specimens using pneumatic-tube systems[2].

7. State clearly the full name of the patient, date of birth and clinical diagnosis of the suspected COVID-19 case on the application form for a laboratory application[2].

6) Laboratory measures:

· Re - evaluate your procedures and reduce or eliminate steps which may lead to aerosol formation or droplet creation[3].

· Review the situation weekly or biweekly, and make any required changes[3].

· Establish a chain of command, plan for emergencies and plan for contingency[3].

· Implement crowding management measures: review staffing requirements and realign the workload; consider working in shifts to reduced level[3].

· Follow the recommendations for routine handling of specimens by CDC / WHO in compliance with the guidelines[3].

· Process all specimens having measures that

could lead to aerosols or droplets[3].

· Keep updated on the latest developments concerning the COVID-19 pandemic and notify the workers of any new scientific development knowledge; do away with myths[3].

· Remain aware of the current hospital policies and procedures and notify staff of any changes[3].

· Maintain open channels of communication with colleagues and staffs[3].

Don't do:

· Should not trigger needless anxieties or panic, but be honest about the risks[3].

· Don't spread or support rumors or information that doesn't come from a credible source[3].

7) For surgical procedures:

In the COVID-19 pandemic background, any surgical procedure could involve risk to both health workers and patients. Health workers should apply standard procedures as part of their routine clinical practise, and assess possible risks of exposure to infectious material[2].

Before conducting a surgical procedure the following should be considered$_2$:

In the context of the COVID-19 pandemic, every surgical procedure may entail risk for both health workers and patients. As part of their routine clinical practice, health workers should apply standard precautions and assess potential risks of exposure to infectious material[2].

The following should be considered before performing a surgical procedure[2]:

General acknowledges:

· Consider whether non-operative treatments or therapies may be an alternative[2].

· In areas of mass transmission, postpone elective surgery to reduce the risk to patient and health care staff[2].

· Where the operation can not be delayed (e.g., urgent), careful risk assessment should be conducted to test patients for COVID-19 symptoms, signs and history of exposure[2].

· Some healthcare facilities may recommend testing COVID-19 surgical patients prior to the surgical procedure, regardless of the risk assessment for COVID-19, depending on the local testing ability and transmission strength within the region[2].

· Patients with COVID-19 signs should undergo chest X-ray, chest computerised tomography or chest ultrasound, if appropriate, as an early diagnostic tool and as a reference for patient monitoring, if the urgency of the surgical procedure does not provide sufficient time for testing or if testing is unavailable[2].

Surgical procedures in patients suspected or reported as having COVID-19:

· Where surgical procedures can not be delayed in COVID-19 patients, surgical personnel in the operating room should use contact and droplet measures like sterile medical mask, eye shielding, gloves and gown[2].

· Instead of a surgical mask, we can use a particulate respirator. During surgical procedures respirators with exhalation valves should not be used as unfiltered exhaled breath can damage the sterile area[2].

· COVID-19 patients, if allowed, may wear a surgical mask when being taken to the operating room[2].

· Transport workers can use contact and droplet precautions when transportation to the operating room of suspected or confirmed COVID-19 patients[2].

· In-room surgical staff should be restricted to essential personnel[2].

· Operating rooms that have been designed according to the relevant design code should already have a high ventilation rate and should still remain closed during procedures[2].

· Terminal cleaning according to COVID-19 cleaning and disinfection guidelines should be carried out after and surgical procedure[2].

· All operating instruments should undergo normal procedures for delivery, washing, and sterilisation. The staff responsible for cleaning these instruments should

wear surgical masks, eye protection, gloves and gowns prior to sterilisation[2].

8) Recommendation for outpatient care:

Consider other options to face-to - face telemedicine ambulance visits

• Screening, early identification and detection of COVID-19 suspects[2].

• Focus on hand hygiene, respiratory hygiene and medical masks for the use of respiratory symptoms in patients[2].

• Effective use of contact and droplet precautions during clinical review of patients with suspected COVID-19[2].

Prioritization of the symptomaticpatient's medical care[2]:

• When symptomatic patients have to wait, ensure that they have a clear waiting area where patients can sit at least 1 metre apart and have masks for them[2].

• Inform patients and caregivers about the early identification of symptoms, specific measures to be used and what health care services they can turn to if there are signs of COVID-19 in any family member[2].

9) Risk of Nosocomial Infection in Dental Settings:

· Dental patients who cough, sneeze or undergo dental care, through the use of a high-speed handpiece or ultrasonic devices, aerosolize the surrounding environment with their secretions, saliva or blood[4].

· After use or exposure to a polluted clinical setting, dental products may be infected with different pathogenic microorganisms. Infections may then grow by puncturing sharp instruments or direct contact between mucous membranes and infected hands[4].

· Because of the unique characteristics of dental procedures in which a large number of droplets and aerosols can be formed, standard protective measures are not sufficiently effective in everyday clinical work to prevent the spread of COVID-19, especially when patients are in the incubation period, are unaware of being infected or choose to conceal their infection[4].

· Covid-19 patients should not be treated without special attention in standard dental care settings. It needs special protective clothing such as hazardous materials (hazmat) suits[4].

a) Mouth rinses:

The effect of chlorhexidine, widely used in dental practise for pre-procedural mouth washing, has not yet been proved capable of removing COVID-19[5]. However, it is advised that oxidative agents include mouth rinses of 1 percent hydrogen peroxide or 0.2 percent povidone-iodine[5]. Pre-procedural use of mouthwash will significantly reduce the microbial load of oral cavity fluids, especially in cases where it is impossible to use a rubber barrier[5].

b) Rubber dam isolation:

The use of rubber dams by constructing a barrier in the oral cavity effectively reduces the generation of droplets and aerosols mixed with patient saliva and/or blood in the surgical area by 70 percent in 1 m diameter[5]. Even, extra high-volume suction is needed after the dam has been installed for optimum aerosol prevention and spatter from spreading[5].

c) Anti-retraction handpiece:

Usage of any dental handpieces which have no anti-retraction feature should be avoided during the COVID-19 pandemic[5]. Anti-retraction handpieces equipped with anti-retractive valves may play an important role in preventing the spread and dispersion of droplets and aerosols for emergency care[5].

d) Disinfectants:

The novel coronavirus can be resistant to disinfectants such as sodium hypochlorite, 0.5 per cent hydrogen peroxide, 62 to 71 per cent ethanol, and phenolic and quaternary ammonium compounds if used in conjunction with the manufacturer's instructions[5].

10) SCHOOLS AND COLLEGES:

• Academic institutions can temporarily suspend, restrict or transfer online events affecting more than 10 participants, such as seminars, presentations at the Grand Rounds, journal clubs, etc[4].

• Residents and fellows can be taught using computerised slides to use online lectures and unknown workshops, and to encourage and support self-directed learning[4].

• Sign-out with trainees could be achieved on a web platform such as Zoom, but it could slow down the sign-out considerably[4].

• Finally, pathologists can sign a portion of cases on virtual slides (whole slide images) in institutions equipped with US Food and Drug Administration approved high capacity whole slide scanners, if permitted by established rules and regulations after prior validation[4].

Educational measures:

Do's and Dont's for teaching/training residents and fellows:

• Cancel educational session involving more than 10 participants, such as seminars, presentations at the Grand Rounds, journal clubs etc[4].

• Restrict face-to - face events such as seminars, or multiheaded microscope sign-out sessions[4].

• Use the best online teaching resources or platforms available, and reassess them regularly. Keep up with the online teaching innovations and follow best distance learning practises[4].

• Stay in touch with your friends, and follow the working strategies[4].

• Consider having a "working hour" online, and being available during this period to answer trainees' questions. Test the trainees mental and physical well-being[4].

• Don't give up teaching during this undetermined time period. Don't forget the trainees who work from home[4].

Conclusion

COVID 19 has emerged as a threat to public health around the world in the last nine months. Global experience shows that containment measures and active contract tracking are necessary to keep the infection under control until the global community has an approved cure or a vaccine available.

Ethical Clearance – Not required since it is a review article

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Conflict of Interest – Nil

References

1. Varghese GM, John R, Manesh A, Karthik R, Abraham O C. Clinical management of COVID-19. Indian J Med Res 2020;151:401-10
2. World Health Organization. Infection prevention and control during health care whencoronavirus disease (COVID-19) is suspected or confirmed: interim guidance, 29 June 2020.
3. Pambuccian SE. The COVID-19 pandemic: implications for the cytology laboratory. Journal of the American Society of Cytopathology. 2020 Mar 26.
4. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. Journal of Dental Research. 2020 May;99(5):481-7.
5. Fallahi HR, Keyhan SO, Zandian D, Kim SG, Cheshmi B. Being a front-line dentist during the Covid-19 pandemic: A literature review. Maxillofacial Plastic and Reconstructive Surgery. 2020 Dec;42:1-9.