

**CORONAVIRUS & DENTISTRY: EMERGING AND FUTURE CHALLENGES A
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ABSTRACT

A novel coronavirus (COVID-19) is associated with human-to-human transmission. Given the widespread transmission of Corona and reports of its spread to health care providers dental professionals are at high risk for nosocomial infection and can become potential carriers of the disease. In dental settings risk of cross infection can be high between patients and dental practitioners due to the face-to-face communication and the exposure to handling of sharp instruments, saliva, blood, and other body fluids. This article highlights the clinical features, etiology, transmission and management of COVID-19 and provides recommended management protocols for dental practitioners and students in potentially affected areas.

KEYWORDS: Aerosols, Dentistry, Coronavirus.**INTRODUCTION**

The recent notorious burst of new coronavirus outbreak, Coronavirus Disease 2019 (COVID-19) from Wuhan City, China mainland suddenly rose between November and December 2019 and has currently become a public health emergency globally as stated by the World Health Organization (WHO) on 11 March 2020.^[1] Severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) is etiological agent of the severe acute respiratory syndrome corona virus disease 2019 (COVID-19).^[2] MERS-CoV was first detected in April 2012 and this particular virus had not been seen in humans before then. MERS-CoV used to be called novel corona virus (Corona virus got its named from the crown like spikes on the surface of the virus).^[3]

COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. The first COVID-19 case was reported to the WHO country office in China on 31 December 2019. Similar to SARS-CoV and the Middle East Respiratory Syndrome (MERS-CoV) virus, SARS-CoV-2 is zoonotic virus. Zoonotic viruses can spread from non-human animals to humans. In this case, Chinese horseshoe bats (*Rhinolophus sinicus*) are the most probable origin and pangolin (*Manis javanica*) as an intermediate host.^[4]

Based on findings of genetic and epidemiologic research, it appears that the COVID-19 outbreak started with a single animal-to-human transmission, followed by sustained human-to-human spread. It is now believed that its interpersonal transmission occurs mainly via respiratory droplets and contact transmission. In

addition, there may be risk of fecal-oral transmission, as researchers have identified SARS-CoV-2 in the stool of patients from China and the United States.^[5]

More than that, it remains to be proved whether patients in the recovering phase are a potential source of transmission.^[2] The incubation period for SARS is widely considered to be two to seven days, but occasionally may last up to 10 days. Symptomatically, the illness appears to have two phases: an early, prodromal febrile phase and a secondary lower-respiratory phase. In pathological terms, however, it is a triphasic disease with a primary viral replicative phase, a secondary immune hyperactive phase and a pulmonary destructive phase.^[6]

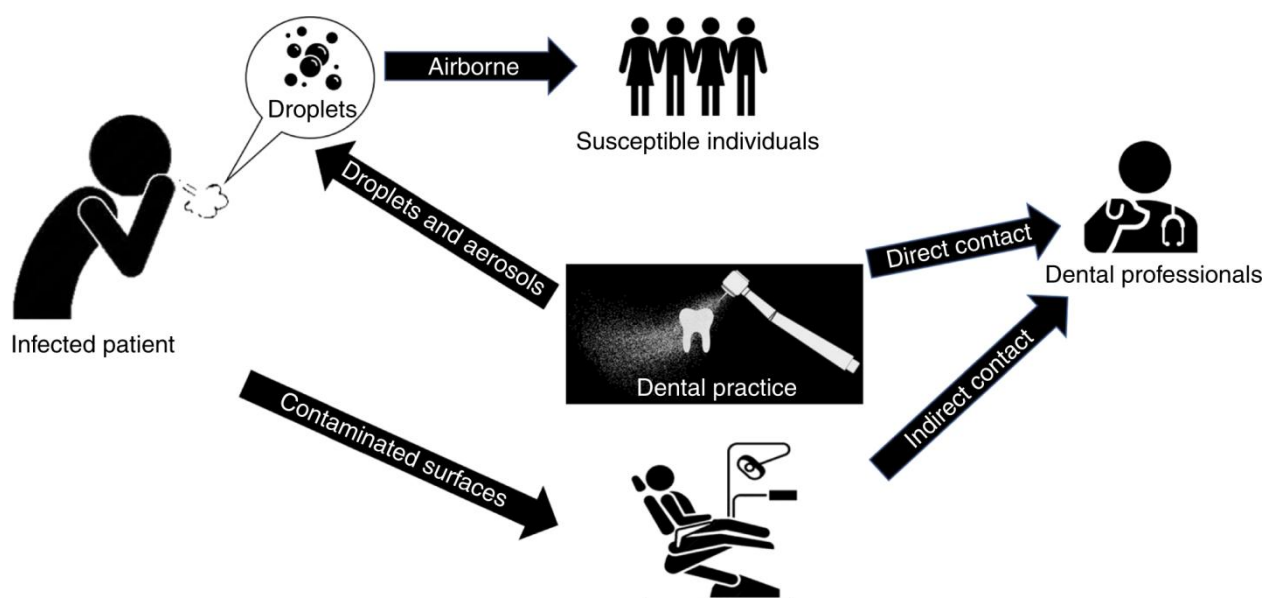


Figure 1: Illustration of transmission routes of 2019-nCoV in dental clinics and hospitals. (source: Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B^[7])

International centers for disease control and prevention are monitoring this infectious disease outbreak; symptoms of COVID-19 infection include fever^[8] (> 38 C) that may be accompanied by chills and rigors. Headache, malaise and myalgia are also common. After three to seven days, the secondary lower-respiratory phase begins with a dry, nonproductive cough or dyspnea that may be accompanied by, or progress to, hypoxemia. In up to one-fifth of the cases, the respiratory illness is severe enough to require intubation and mechanical ventilation.^[6] The gastrointestinal symptoms include diarrhea (2%–10.1%), nausea, and vomiting (1%–3.6%).⁹ More than 80% of cases are mild and recover from the disease without needing special treatment. However, around 15% of cases are categorised as severely ill and the remaining 5% are categorised as critically ill.^[4]

Abnormal chest computed tomography (CT) scan findings such as bilateral and peripheral ground-glass and consolidative pulmonary opacities have been reported.^[10]

Current observations suggest that people of all ages are generally susceptible to this new infectious disease. However, those who are in close contact with patients with symptomatic and asymptomatic COVID-19, including health care workers and other patients in the hospital, are at higher risk of SARS-CoV-2 infection.^[5] As of 26 April 2020, there have been more than 2.9 million cases, and more than 205,000 deaths globally. In response to this challenging pandemic, the Center for Disease Control and Prevention (CDC), American Dental association (ADA), the National Health Service (NHS), as well as other health regulatory bodies have provided advice to dentists to regulate dental services and to

provide them with guidance in order to protect themselves, their co-workers, and their patients from this infection.^[11]

During dental care procedures, many aerosols produced by the high-speed handpiece, water syringe, or ultrasonic scaler, when dentists performed a procedure on patients with COVID-19. Therefore, the dentists need to improve their prevention strategies to avoid COVID-19 infection.^[12]

Inhalation of airborne particles and aerosols produced during dental procedures on patients with COVID-19 can be a high-risk procedure in which dentists are directly and closely exposed to this virus. Therefore, it is crucial for dentists to refine preventive strategies to avoid the COVID-19 infection by focusing on patient placement, hand hygiene, all personal protective equipment (PPE), and caution in performing aerosol-generating procedures.^[8]

Dental Patient Management and Prevention of Nosocomial Infection An updated review of the literature regarding dental care in the COVID era identified four phases in the patient management: patient triage, patient admission into the practice, dental treatment, and patient discharge. To highlight these four key moments, a two-step patient management can be opted: remote (telephoning & triaging) and face-to-face (patient admission into the practice, dental treatment, patient discharge).^[13]

Initial screening via telephone to identify patients with suspected or possible COVID-19 infection can be performed remotely at the time of scheduling appointments.^[14] (Fig. 2).

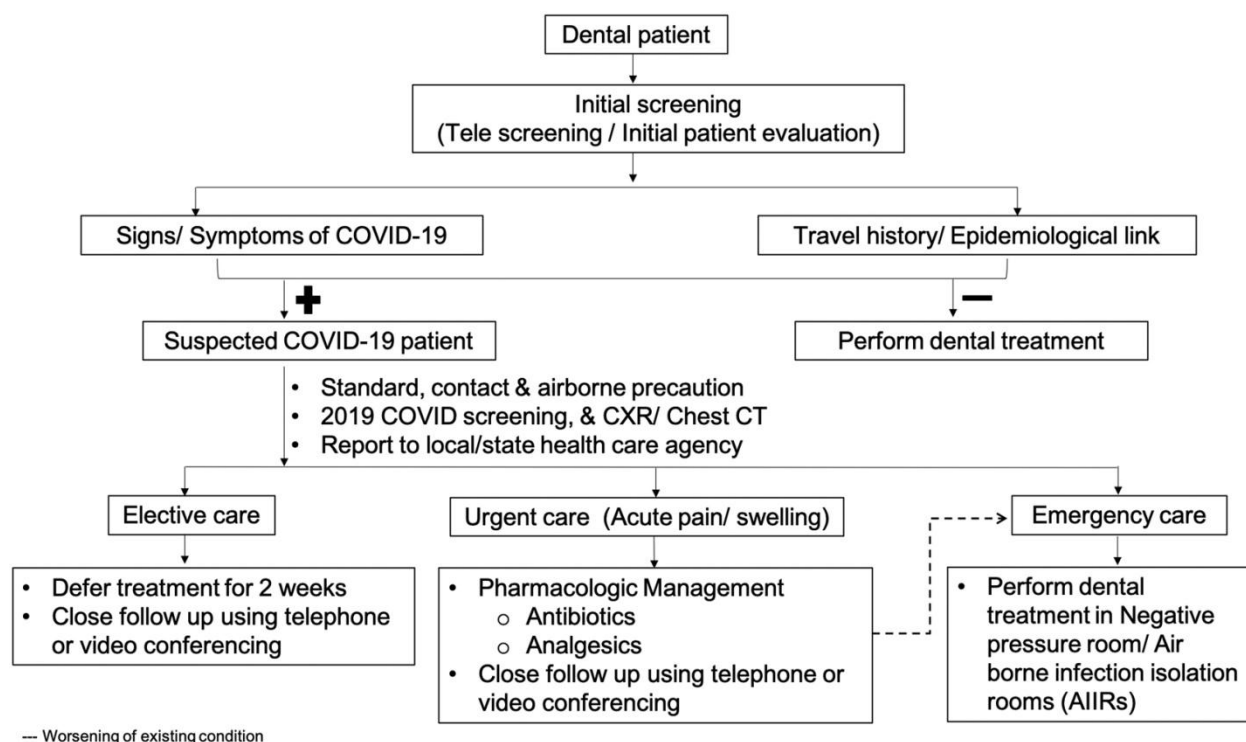


Figure 2: An overview of patient screening for COVID-19 and dental management.^[14]

Most pertinent questions for initial screening should include any exposure to a person with known or suspected COVID-19 presentation, any recent travel history to an area with high incidence of COVID-19 or presence of any symptoms of febrile respiratory illness such as fever or cough. A positive response to either of these questions should raise initial concern, and elective dental care should be deferred for at least 2 weeks.^[14]

Based on the patients signs and symptoms, a decision should be made to determine whether the patient needs to be seen in the dental clinic. We have formed a table based on the information provided by American Dental Association (ADA) that helps to decide what constitutes a dental emergency; however, dentists should use their professional judgment in determining a patient's need for urgent or emergency care.^[13]

Table 1: Information provided by American Dental Association to decide dental emergency.^[13]

Dental emergencies	Urgent dental care	Other urgent dental care
Uncontrolled bleeding Cellulitis or a diffuse soft tissue bacterial infection with intraoral or extraoral swelling that potentially compromises the patient's airway Trauma involving facial bones, potentially compromising the patient's airway	Severe dental pain from pulpal inflammation Pericoronitis or third-molar pain Surgical postoperative osteitis, dry socket dressing changes Abscess or localized bacterial infection resulting in localized pain and swelling Tooth fracture resulting in pain or causing soft tissue trauma Dental trauma with avulsion/luxation Dental treatment required prior to critical medical procedures Final crown/bridge cementation if the temporary restoration is lost, broken, or causes gingival irritation Biopsy of abnormal tissue	i. Extensive dental caries or defective restorations causing pain ii. Manage with interim restorative techniques when possible (silver diamine fluoride, glass ionomers) iii. Suture removal iv. Denture adjustment on radiation/ oncology patients v. Denture adjustments or repairs when function impeded vi. Replacing temporary filling on endo-access openings in patients experiencing pain vii. Snipping or adjustment of an orthodontic wire or appliances piercing or ulcerating the oral mucosa

In the event of severe, acute signs or symptoms where the initial palliative medication therapy does not show improvement, urgent on-site dental care has to be provided. Prior to scheduling such an appointment, a screening protocol has to be followed to obviate the potential exposure to COVID-19.^[15] Firstly, patients should be asked whether they are positive for COVID-19.^[14] A detailed history of patient who has history of recent travel to any epidemic regions or has been quarantine for 14 days along with fever, cough, sneezing, or COVID-19 related symptoms or contact with a close family member who is confirmed with the infection is advised to undergo a medical examination in a designated hospital.^[16] Furthermore, body temperature should be taken using a contact-free forehead thermometer (World Health Organization, 2020a).^[15]

Measures by Health Care Professionals to Limit Virus Spread

1. Since the fecal-oral route is considered one of the 2019- nCoV transmission routes, attention to hand hygiene before, during, and after dental practice is important.^[17] Perform hand hygiene with soap and water for at least 20 seconds, 60% alcohol based Sanitizers should be used.^[18] Dentists should exercise extreme caution to avoid contact with their own facial mucosal surfaces including their eyes, mouth, and nose.^[17]
2. Personal protective equipment (PPE) includes gloves, gown, head cover, shoe cover, eye protection including goggles or a disposable/reusable face shield that covers the front and sides of the face, and a N95 or higher level respirator.^[14]
3. The dental treatment is undertaken with a focus on minimizing aerosol-generating practices by decreasing the usage of the rotary and high-speed handheld devices, together with high-powered suction, rubber dam application, and hand curettage instead of ultrasonic cleaning.^[19]
4. Extraoral radiographs and cone beam computed tomography are preferable over intraoral radiographs to prevent cough or vomiting reflexes and, consequently, aerosol generation. Moreover, during dental procedures it is recommended to avoid stimulate trigger zones of cough and vomiting including base of the tongue, fauces, uvula, palate, and posterior pharyngeal wall.^[20]
5. It is crucial that medical and dental teams follow an effective and strict disinfection protocol for both clinical and communal areas. All surfaces in the clinical areas must be cleaned and disinfected to the highest standard according to the local guidelines and requirements.^[21] To clean and disinfect environmental surfaces and patient care equipment using hospital grade germicides (quaternary ammonium-based, phenol-based, and alcohol-based products), as the SARS-CoV-2 can survive for 72 hours on surfaces of stainless steel and plastic, 24 hours in cardboard and from 40 minutes to 2 hours 30 minutes in aerosolized form or in dust.^[20] Heat sensitive semi-critical items can be processed with

high-level disinfection e.g. 2% Gluteraldehyde. High touch/clinical surfaces that are difficult to clean must be covered using a physical barrier for every patient or disinfected between patients (E.g.: 1 % Sodium hypochlorite or 70% alcohol). Use moistened wipe / cloth to clean all surfaces with freshly prepared disinfectant solution. (E.g.: 1 % Sodium hypochlorite or 3% hydrogen peroxide). Always Discard remnant diluted solution.^[21] Mopping the floor with 1% sodium hypochlorite and disinfecting waterlines with 0.01% sodium hypochlorite can help reduce the risk of cross infection.^[13] Recent WHO guidelines deemed water and detergent followed by disinfectants (bleach 1:50) effective against COVID-19.^[23]

Measures to be taken in case of accidental exposure

Aerosol-generating procedures should be programmed at the end of the working day. If performing these procedures with a surgical mask (without N95 respirators), dentists are at a moderate risk of COVID-19 transmission. Given that asymptomatic patients could still be infectious, CDC suggests a 14 days quarantine. Alternatively, the patient can be tested for COVID-19 straight after dental treatment; if positive, DHCP should be quarantined for 14 days.^[23]

Conclusions and Future challenges

In conclusion, COVID-19 has been deemed as a global health emergency which has affected worldwide everything and has had many immediate complications for dentistry. Prevention and control measures like hand hygiene, protective equipment and respiratory hygiene should be updated in all dental clinics. New approaches such as Teledentistry will help dentists assist patients without adding the risk of cross infection. Before vaccination is available, less strict recommendations may be required to prevent infection and nosocomial transmission in dentistry.

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