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Review Article

Novel coronavirus disease 2019 (COVID-19) and challenges in dental practices

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Abstract

The Covid-19 virus appearing in Wuhan in December, 2019 and acting by binding to ACE-2 receptors in the respiratory system has caused many people to die by spreading to the whole world. The virus, which has been detected to spread faster than SARS-CoV and MERS-CoV viruses, spreads from person to person rapidly. People should not be together because it is transmitted from person to person through the respiratory tract. For this reason, it is recommended not to go to health institutions, provided that it is not urgent. However, many emergency patients go to dental clinics and hospitals for treatment. In this review; with possible contamination routes of Covid-19 such as airborne spread, contact spread and contaminated surface spread during patient diagnosis and treatment to prevent Covid-19 contamination, methods preventing spread such as hand hygiene, personal protective measures for dentists, intraoral rubber dam before dental procedures were indicated. It was also mentioned that the fast rotating tool with valves having negative pressure should be used and most importantly, the materials used in the dental clinic should be disposed in accordance with medical waste protocol.

Keywords: Coronavirus, COVID-19, SARS-CoV-2, pandemic, dental public health, protection ways.

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Introduction

In the 2000s, several viruses threatening life have appeared. In the world these viruses both have raised serious public health concerns and have been responsible for a significant number of human deaths. Modern life potentially creates a risk of spreading the epidemic anywhere in the world due to the extensive journey of people and inanimate beings (1).

Recently, two new viruses namely "middle east respiratory syndrome coronavirus (MERS-CoV)" and "serious acute respiratory syndrome coronavirus (SARS-CoV)" have been reported to be responsible for serious acute diseases (2,3). Finally, the pneumonia infection that occured in Wuhan/China in late December 2019 has spread rapidly from here to many of the provinces and countries (4,5). The World Health Organization (WHO) announced on January 30, 2020 an international public health emergency related to this global pneumonia epidemic (6). The infectious agent of this viral pneumonia occuring in Wuhan has been described as a new coronavirus (2019-nCoV) which is the seventh

member of the family of coronavirus that eventually infect humans (7). On February 11, 2020, WHO called the new vital pneumonia "Corona Virus Disease", while The International Virus Taxonomy Committee proposed to call this new coronavirus name "SARS-CoV-2" due to phylogenetic and taxonomic analysis (8).

The Covid-19 pandemic, which emerged in Wuhan, China in December 2019 and spread to the world, have affected 2,883,603 people in the world and caused 198,842 deaths from this date until 27 April 2020 (9).

New Covid-19

The coronaviruses belong to the family of coronaviridae with the order of Nidovirales, which contains large single plus stranded RNA as genoms. All CoVs are pleomorphic RNA viruses that characteristically have a 80-160 nm size and 27-32 kb positive polarity containing peplomer (10,11). CoVs can cause respiratory, enteric, hepatic and neurological diseases by infecting a wide variety of animals, including humans (12). As the largest known RNA virus, CoVs are also divided into four types; alpha-, beta-, gamma-and delta- coronavirus. In humans, CoVs mainly cause respiratory infections. Until the appearance of Covid-19, 6 human coronaviruses (HCoV) that infect humans have been identified (13). Most coronaviruses can cause infectious diseases in humans and vertebrates. Alpha-CoV and beta-CoV mainly infect the respiratory gastrointestinal and central nervous system of humans and mammals, while gamma-CoV and delta-CoV mainly infect birds (10-12,14,15).

Several members of the coronavirus family often cause mild respiratory disease in humans. SARS-CoV and MERS-CoV from coronavirus caused fatal serious respiratory diseases in 2002- 2003 and 2012 respectively (16-19). SARS-CoV and MERS-CoV belong to the beta – CoV type (18-20). The new coronavirus 2019-nCoV, which emerged in Wuhan, belongs to the beta-CoV type according to the viral genome based pylogenetic analysis (Table 1). Differently, Covid-19 has been observed to spread more rapidly than other coronavirus epidemics (21).

Table 1. Coronavirus genera, species and host receptor usage (22).

Genus	Species	Receptor
Alphacoronavirus	• Alphacoronavirus 1 comprising:	
	Feline Coronavirus (FCoV) serotype 2	Aminopeptidase N
	Canine Coronavirus (CCoV) serotype 2	Aminopeptidase N
	Transmissible gastroenteritis virus (TGEV)	Aminopeptidase N
	• Human coronavirus 229E	Aminopeptidase N
	• Human coronavirus NL63	ACE2
	• Porcine Epidemic Diarrhea Coronavirus (PEDV)	Aminopeptidase N
	• Rhinolophus bat coronavirus HKU2	
	• Scotophilus bat coronavirus 512/05	
	• Miniopterus bat coronavirus 1	
	• Miniopterus bat coronavirus HKU8	
Betacoronavirus	• Betacoronavirus 1 comprising:	
	Bovine coronavirus (BCoV)	Neu 5,9 Ac2
	Human coronavirus OC43 (HCoV-OC43)	Neu 5,9 Ac2
	Equine coronavirus (ECoV)	
	Human enteric coronavirus (HECoV)	
	Porcine haemagglutinating encephalomyelitis virus (PHEV)	
	Canine respiratory coronavirus (CrCoV)	
	• Murine coronavirus comprising:	
	Existing species of mouse hepatitis virus (MHV)	CEACAM1
	Rat coronavirus	
	Puffinosis virus	
	• Human coronavirus HKU9	
	• Rousettus bat coronavirus HKU4	
	• Tylonycteris bat coronvirus HKU5	
	• SARSr-CoV (SARS related Coronavirus) comprising	
	Human SARS-CoV	ACE2
	Rhinolophus bat viruses	
Gamma-coronavirus	• Avian coronavirus comprising:	
	IBV	
	Various coronaviruses infecting turkey, pheasant, duck, goose and pigeon	
	• Beluga Whale coronavirus SW1	
Delta-coronavirus	• Bulbul coronavirus HKU11	
	• Thrush coronavirus HKU12	
	• Munia coronavirus HKU13	

Complete viral genome analysis reveals that the virus shares 88% sequence identity with SARS- like coronavirus (serious acute respiratory syndrome (SARS) derived from two bat) but is more distant from SARS-CoV and MERS-CoV. Therefore, temporarily 2019 was named new coronavirus (2019-nCoV) (22). Coronavirus is an enveloped, single-chain ribonucleic acid (RNA) virus with 9-12 nm long surface having spikes (23,24). 2019-nCoV has a typical coronavirus structure with "spike protein" in the membrane envelope (Fig. 1). There are also RNA polymerase, 3- chymatrypsin- like protease, papain- like protease, helicase, glycoprotein and helper proteins. S protein taken from the coronavirus can bind to host receptors to facilitate viral entry into target cells. Although there are four amino acid variations of the S protein between 2019-nCoV and SARSCoV, 2019-nCoV can bind to the ACE2 receptor of 2019-nCoV, as well as to angiotensin converting enzyme 2 (ACE2) from human, bat, musk, cat and pig cells (25). But it can not connect to cells without ACE2. A recombinant ACE2-Ig antibody, a human monoclonal antibody specific to SARS-CoV, serum taken from an infected patient recovering SARS-CoV- capable of neutralizing 2019-nCoV confirmed ACE2 as the host receptor for 2019-nCoV. There is high affinity between ACE2 and 2019-nCoV S protein. It is said that higher population of ACE2 expression is more sensitive to 2019-nCoV (26-29).

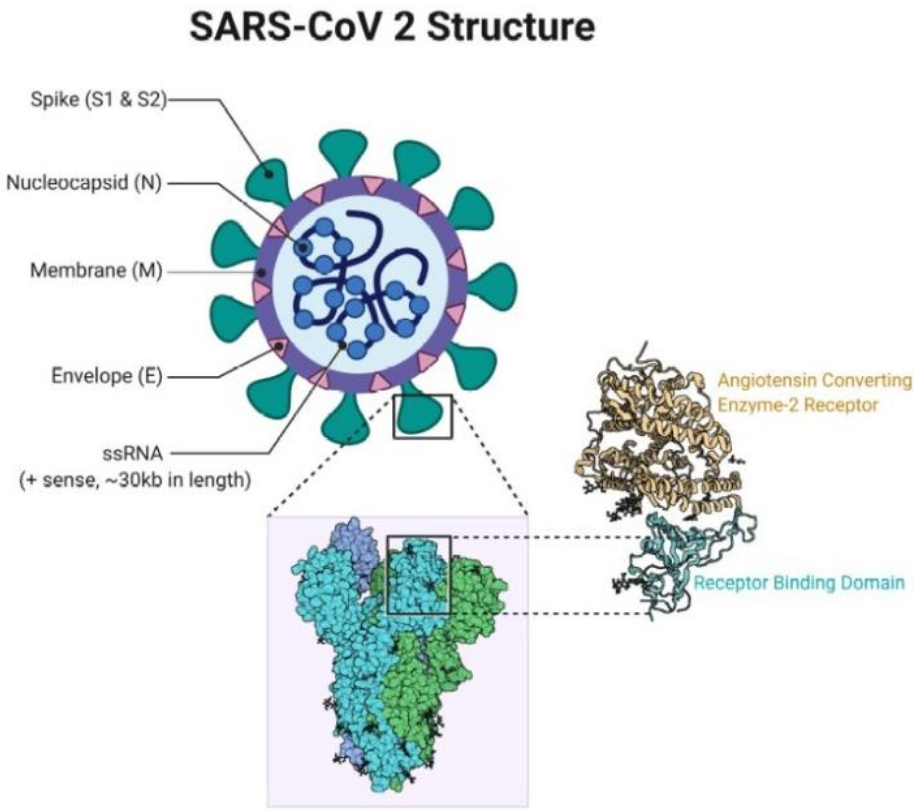


Figure 1. 2019-nCoV Stucture SARS- CoV 2 Structure. Contributed by Rohan Bir Singh, MD; Made with Biorender.com. (https://www.ncbi.nlm.nih.gov/books/NBK554776/figure/ article-52171.image. f3/).

Understanding the clinical symptoms of Covid-19 is important, but clinical symptoms are not specific. Patients with Covid-19 often apply with symptoms of fever, dry cough and muscle pain. In addition, less specified symptoms have been reported as nausea, diarrhea, decreased sense of smell (hyposmia) and abnormal taste (hypergeusia) (30,31). Also computed tomographic findings such as abnormal chest x-ray and ground- class opacities are found in the chest 31. In particular, about 80% of these patients have mild symptoms that are similar to flu and seasonal allergies which can lead to increased undiagnosed cases. These asymptomatic patients can act as carriers and also cause the infection to appear and spread (32). It is noteworthy that although Covid-19 patients are known to be highly contagious when they are the most symptomatic, incubation time can range from 0 to 24 days so contamination may occur before any symptoms occur (30,33). Severe forms of this disease pose a danger to men with an average age of 56 who have chronic diseases such as cardiovascular disease or immunosuppression disease. The high- risk population shows symptoms specific to pneumonia or acute respiratory distress syndrome (30).

Studies have shown that respiratory viruses can be transmitted from person to person directly (by contact with mouth, nose and eyes, mucous membranes) or indirect contact, through coarse or small droplets (6,34). SARS-CoV-2 infections typically spread through respiratory droplets or contact. Therefore, coughing and sneezing by an infected person can carry the SARS-CoV-2 by air and potentially affect close contact (within about 6 ft radius). It has recently led to the proposal for social distancing to minimize the spread of the disease in the community (35). Another important conduction path is that SARS-CoV- 2 droplets descend to inanimate objects near an infected individual and can then be transmitted touched by other people (36,37). It has been determined that 2019-nCoV can infect by saliva directly or indirectly (38,39). It is not only transmitted from patients with symptoms. A 2019-nCoV infection case report in Germany shows that transmission of the virus can also occur through contact with a symptomatic patients (40). Therefore, disinfection of objects and handwashing is necessary to stop the spread of this disease. This proposal is strengthened by considering that people touch their faces on avarage 23 times an hour and 44% of these formations contain the mucous membranes of the mouth and/or nose (36). In addition, studies have shown the presence of SARS-CoV-2 in both saliva and feces of affected patients (41,42). It is known that SARS-CoV-2 can bind to highly concentrated human angiotensin converting enzyme 2 receptors in salivary glands; this may be a possible explanation for the presence of SARS-CoV-2 in secretary saliva. Therefore, Covid-19 is likely to be transmitted by aerosol, families or focal-oral route, which may contribute to nosocomial spread in dental environment dentistry (26,43,44). Intense environmental pollution occurs after an aerosol generating procedure (AGP). Therefore, the environment need to be ventilated (45).

In the light of limited data for Covid-19, evidence from previous studies with human coronaviruses, including MERS-CoV and SARS-CoV was evaluated. Human coronaviruses can survive an inanimate subjects and can live up to 5 days at 22-25°C and 40-50% relative humidity (this is typical in air conditioned indoor environments). Survival on environmental surfaces also depends on the type of surface. An experimental study using Covid-19 strain has reported that it can live up 72 hours in plastic, 48 hours in stainless stell, and 8 hours in copper (46).

Covid-19 affected the whole world, causing many people to die and this number is also expected to increase. Covid-19 spreads through particles in the respiratory system through sneezing and coughing. This compilation is targeted to examine what kind of virus is 2019-nCoV, its spread and effects of it in Turkey. Besides it has been our main target to talk about how dental practices will affect the spread of the virus and what are the ways of protection.

The Effects of Covid-19 in Turkey and The World

Covid-19, which emerged in Wuhan, China in December 2019 and spread all over the world has caused many people to die. In the world from December 2019 to April 27, 2020 it has been reported that the number of people diagnosed with Covid-19 is 2,883,603 and who died is 198,842 (Fig. 2). Considering the countries with the highest number of deaths there is USA, Italy, Spain, France, England, Iran, Germany, China, Netherlands, Brazil, Turkey, Belgium (Fig. 3), respectively. The first case was found in Turkey on March 11 (Fig. 4). On March 17, there was the first death from Covid-19. Turkey has 110,130 people diagnosed with Covid-19 until April 27, while 2,805 people lost their lives (https://covid19.who.int/region/euro/country/tr).

Covid-19 and Dentistry

The scenarios related to Covid-19 transmission to another human have been explained and it has been stated that there may be contamination by contact with droplets from aerosols produced during speech, coughing, sneezing (related to human breathing activities). Large droplets can contribute to the viral transmission to nearby people, but the longer distance is not transmitted by large droplets and smaller droplets are required (47). The diagnosis of COVID-19 can theoretically be diagnosed with samples taken from saliva. In studies on coronavirus, some virus strains were detected in saliva even 29 days after infection (48).

Dentists can be exposed to pathogenic microorganisms, including viruses and bacteria that infect the oral cavity and respiratory tract. Dentists and dental treatment environments always carry the risk of 2019-nCoV infection due to procedures involving face-to-face contact with patients, frequent exposure to saliva, blood and other body fluids and the use of sharp instruments (49). Pathogenic microorganisms can be transmitted through dental treatment environments by inhaling microorganisms that can hang in the air for a long time (6,26). Direct contact with blood, oral fluids, or other patient materials can be transmitted by contact with the conjunctival, nasal, or droplets of the oral mucosa. It can also be transmitted through indirect contact with aerosols and contaminated instruments and / or environmental surfaces that contain microorganisms that can travel up to a short distance produced by coughing or talking by an infected person who does not use a mask (50). Therefore, the presence of infected people in dental clinics and hospitals during the 2019-nCoV epidemic may have increased the transmission rate (Fig. 5) (6).

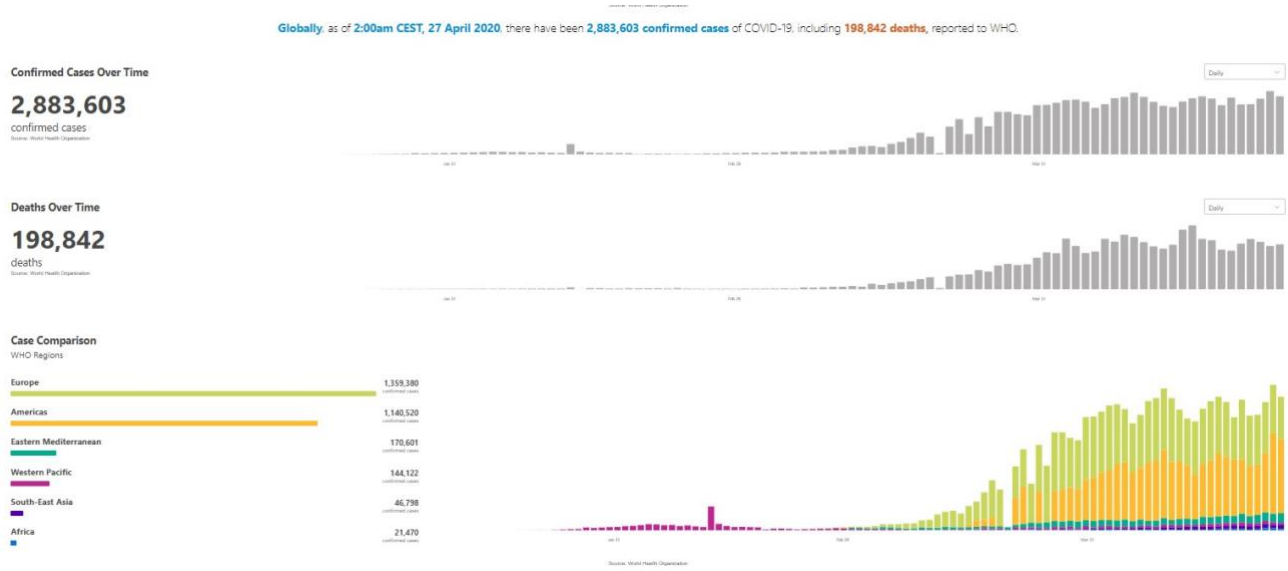


Figure 2. Covid-19 from affected and the number of patients who died in World. (https://covid19. who.nt/. 27 Apr 2020).

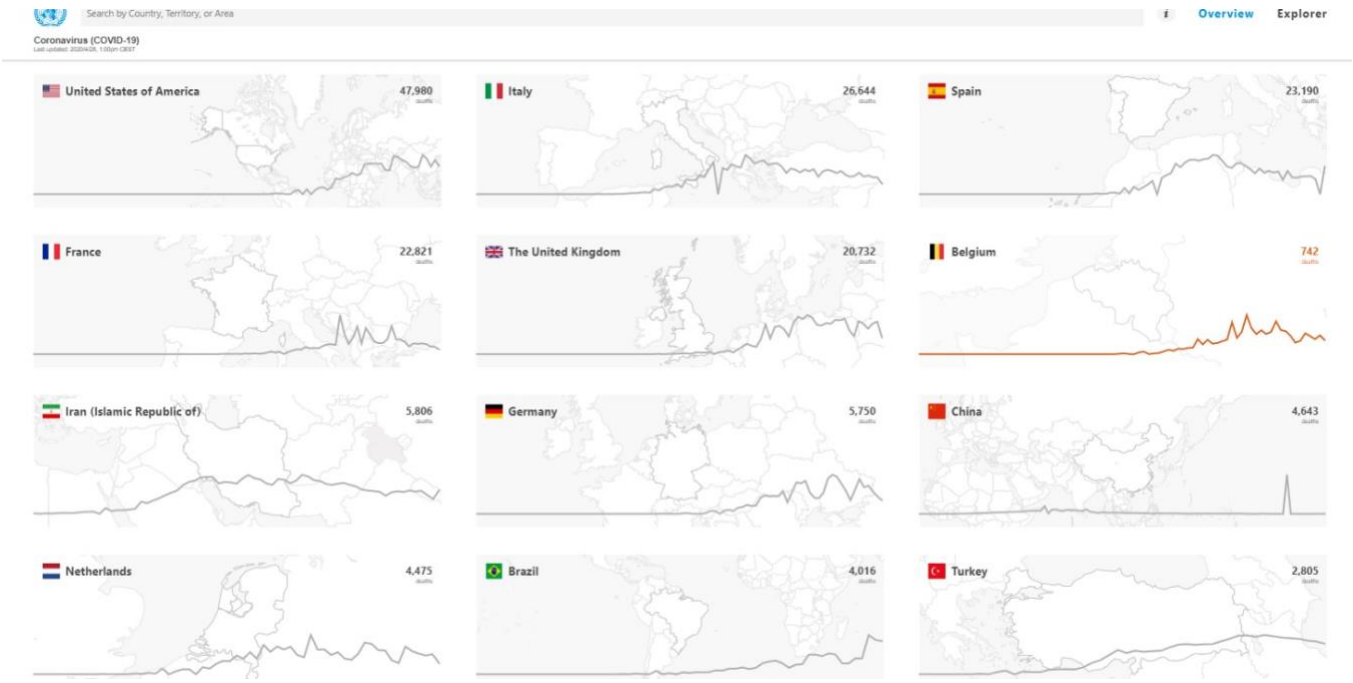
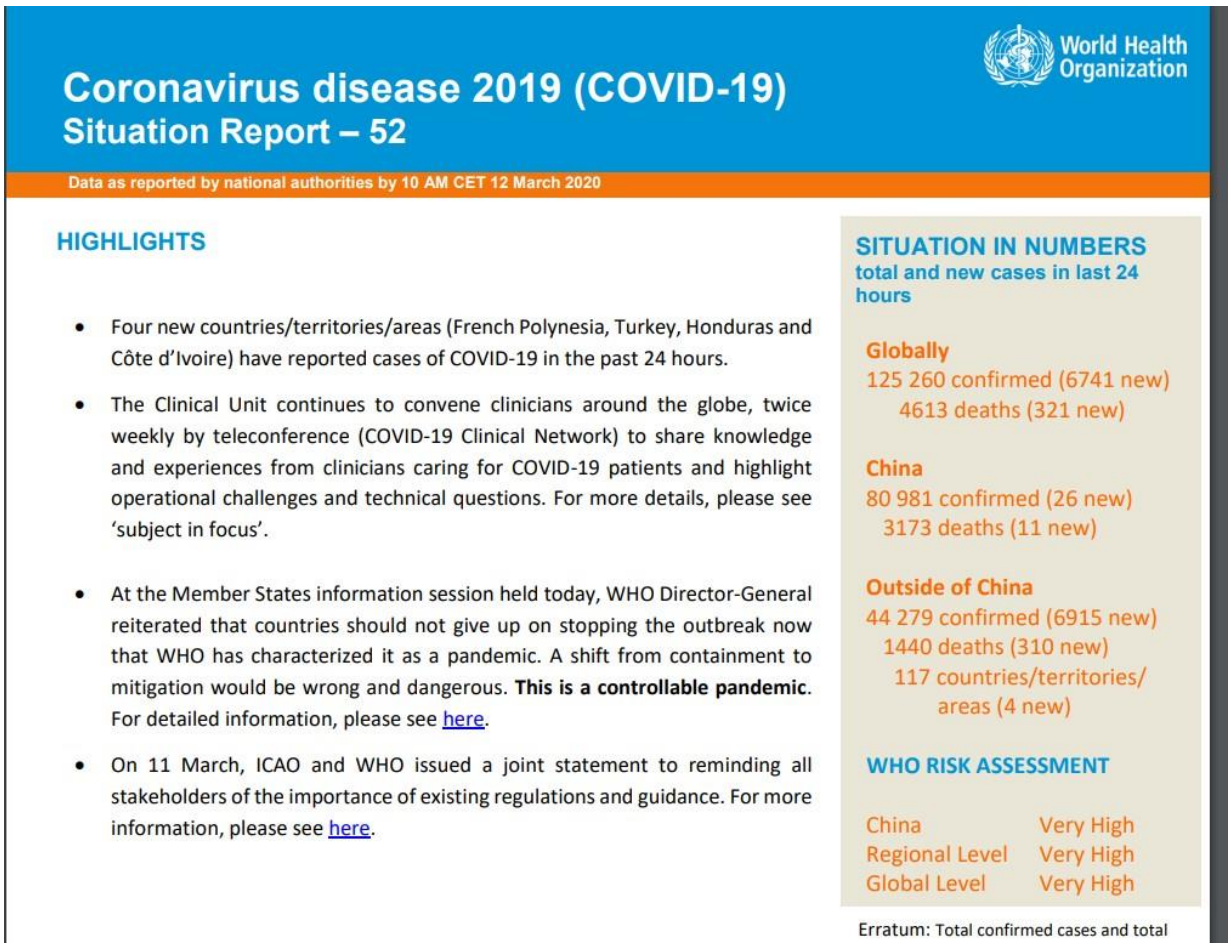


Figure 3. Highest death by country, territory, or area.(https://covid19.who.int/. 27 Apr 2020).

Airborne propagation of SARS-COV has been reported in many literatures (51). Mimic et al. used the terms "aerosol (particles less than 50 micrometers in diameter)" and "splash" in their pioneering work in aerobiology. Aerosols are small enough to remain in the air for a long time before settling on environmental surfaces or entering the respiratory system. Smaller particles (0.5 to 10 m in diameter) of an aerosol have the potential to penetrate into the smaller passages of the lungs and are thought to have the greatest potential for transmission of infections (52-54).



Coronavirus disease 2019 (COVID-19)
Situation Report – 52

World Health Organization

Data as reported by national authorities by 10 AM CET 12 March 2020

HIGHLIGHTS

- Four new countries/territories/areas (French Polynesia, Turkey, Honduras and Côte d'Ivoire) have reported cases of COVID-19 in the past 24 hours.
- The Clinical Unit continues to convene clinicians around the globe, twice weekly by teleconference (COVID-19 Clinical Network) to share knowledge and experiences from clinicians caring for COVID-19 patients and highlight operational challenges and technical questions. For more details, please see 'subject in focus'.
- At the Member States information session held today, WHO Director-General reiterated that countries should not give up on stopping the outbreak now that WHO has characterized it as a pandemic. A shift from containment to mitigation would be wrong and dangerous. **This is a controllable pandemic**. For detailed information, please see here.
- On 11 March, ICAO and WHO issued a joint statement to reminding all stakeholders of the importance of existing regulations and guidance. For more information, please see here.

SITUATION IN NUMBERS
total and new cases in last 24 hours

Globally
125 260 confirmed (6741 new)
4613 deaths (321 new)

China
80 981 confirmed (26 new)
3173 deaths (11 new)

Outside of China
44 279 confirmed (6915 new)
1440 deaths (310 new)
117 countries/territories/areas (4 new)

WHO RISK ASSESSMENT

China	Very High
Regional Level	Very High
Global Level	Very High

Erratum: Total confirmed cases and total

Figure 4. Turkey is also the first case of information by WHO. (https://www.who.int/docs/ default-source/coronaviruse/situation-reports/20200312-sitrep-52-covid-19.pdf?sfvrsn=e2bfc9c0_4).

According to sources, the biggest threat of airborne infection in dentistry is thought to be caused by aerosols due to its ability to stay in the air and its potential to enter the airways (44, 55, 56). The ways of infection spread in a dental clinic are direct contact with the body fluids of an infected patient, contact with material surfaces or instruments contaminated by the patient, and particles suspended in the air from the infected patient (57).

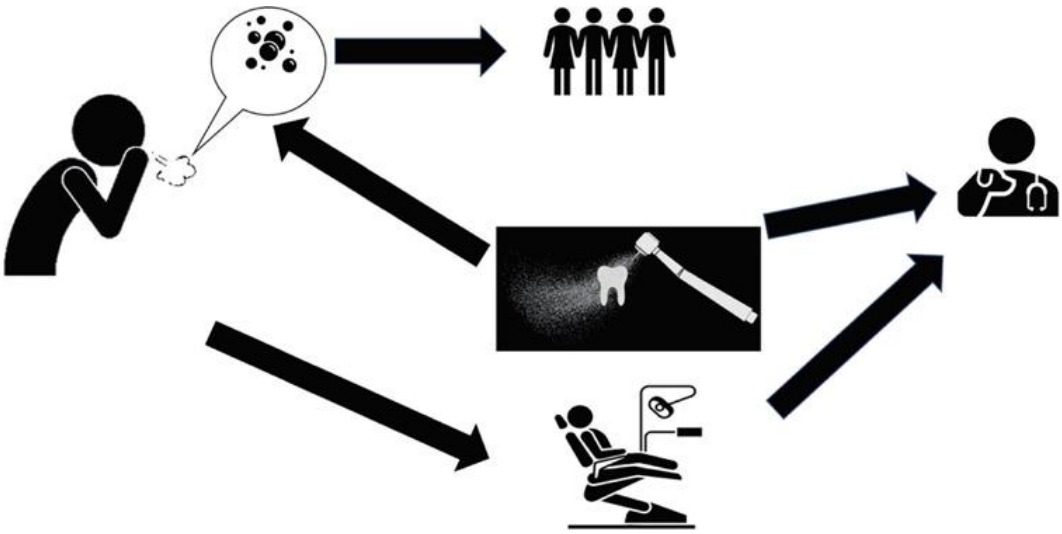


Figure 5. Illustration of transmission routes of 2019-nCoV in dental clinics and hospitals (6).

Miller et al. have examined the properties of aerosols produced by commonly used dental instruments containing blood and have concluded that whole particles emitted around the environment may contain the hepatitis B virus. They reported that these particles can be inhaled and trapped (20-100%) in the human respiratory system (58). As a result of repeated exposure (chronic exposure) to aerosols produced during certain dental procedures, dentists are at high risk of diseases that can be transmitted through the respiratory tract, as they have a relatively small particle size (55, 59). In the light of this information, both dentists, their assistants and other patients in the clinic are at risk in every operation that creates an aerosol in dental clinics. When we think that the 2019-aCoV virus is transmitted through breathing, we can estimate how big this risk is.

Protection Ways From Covid-19

When it is thought that Covid-19 has been recently determined in the saliva of infected patients, teeth, mouth and other health professionals must always be diligent in preventing the spread of infectious diseases (44).

Due to the procedures in which many droplets and aerosols appear in dental treatment applications, standard preventive measures in daily clinical trials are not effective enough to prevent the spread of Covid-19, especially when patients are in incubation. Many patients are not even aware that they have the virus or prefer to hide their infections (55).

Dental patients who cough, sneeze, or undergo dental treatment, including the use of a high-speed handpiece or ultrasonic device, aerosolize their secretions, saliva, or blood into the environment. After using the dental apparatus, it can be contaminated with various pathogenic microorganisms or may be exposed to a contaminated clinical environment. Subsequently, infections can occur by perforation of sharp instruments or direct contact between mucous membranes and contaminated hands (60).

Since the mouth is part of the oronasal pharynx, it contains bacteria and viruses from the nose, throat and respiratory tract. Oral fluids are contaminated with these bacteria and viruses. Also, dental plaque in both supragingival and periodontal pockets is a source of microorganism. The oral environment is naturally wet with saliva, which constantly renews the liquid in the mouth. Any dental treatment procedure that has the potential to aerosolize saliva will cause contamination in the air with microorganisms of some or all of these sources (61).

After the Covid-19 epidemic in Wuhan, China, recommendations have been given on what measures dentists should take to protect against the virus and protect their patients in many countries, especially in China. The Government of the People's Republic of China has published guidelines for dentists stating how Covid-19 is spread, how to identify patients with the infection and what extra protective measures must be taken during application to prevent transmission (6).

Based on patient management and prevention of nosocomial infection, experience from previous SARS-CoV epidemic and data on Covid-19 disease, some specific measures for the dentist are discussed. As a result, to reduce the spread of Covid-19, it is the right step to question whether patients have suspected Covid-19 over the phone before coming to the clinic and to make an appointment accordingly (26). How to do this is summarized in Fig. 6. When the patient comes to dentistry practice after this phone call, a detailed medical history form and Covid-19 screening questionnaire should be performed (Fig. 7). Dentists should measure the patient's body temperature using a non-contact forehead thermometer or cameras with infrared thermal sensors (6). Patients with fever (38 °C) or respiratory disease symptoms should receive deferred elective dental care for at least 2 weeks. According to the Guidelines for Disease Control and Prevention Centers, people suspected of having Covid-19 infection should sit at least 6 meters away from unaffected patients seeking care, separate, well-ventilated waiting area and inform the required units (62). Pharmacological Management is an Pharmacological treatment alternative in the form of antibiotic and / or analgesics needed for conditions such as suspected or approved toothache and / or swelling for Covid-19 infections that require emergency dental care (Fig. 8). This approach can provide symptomatic relief and provide dentists with sufficient time to refer the patient to a specialist or provide complete dental care (26).

Dentist should care both his/her hands and his/her assistant. Hands should be cleaned with soap and water or hand disinfected with an alcohol-based antiseptic. If the hands are not visibly dirty, they are washed with water and soap for 20-30 seconds. However, if the dirtiness is visible, it should be washed for 40-60 seconds (63-65).

Healthcare professionals interested in the direct care of Covid-19 patients should wear protective equipment. These include gowns, gloves, medical masks, and eye protection (goggles or face shield). Specifically, for aerosol-producing procedures (eg, tracheal intubation, non-invasive ventilation, tracheostomy, cardiopulmonary resuscitation, manual ventilation before intubation, bronchoscopy) healthcare workers should wear respirators, eye protection, gloves and gowns (66). PP respiratory masks (eg N95, FFP2 or equivalent standard) have been used for a long time in previous public health emergencies involving acute respiratory diseases when protective equipment is inadequate (67). This gives evidence of wearing the same respirator when looking at more than one patient making the same diagnosis and evidence, it shows that respiratory devices keep their protection when used for a long time. However, using a respirator for more than 4 hours may cause discomfort and should be avoided (68-70).

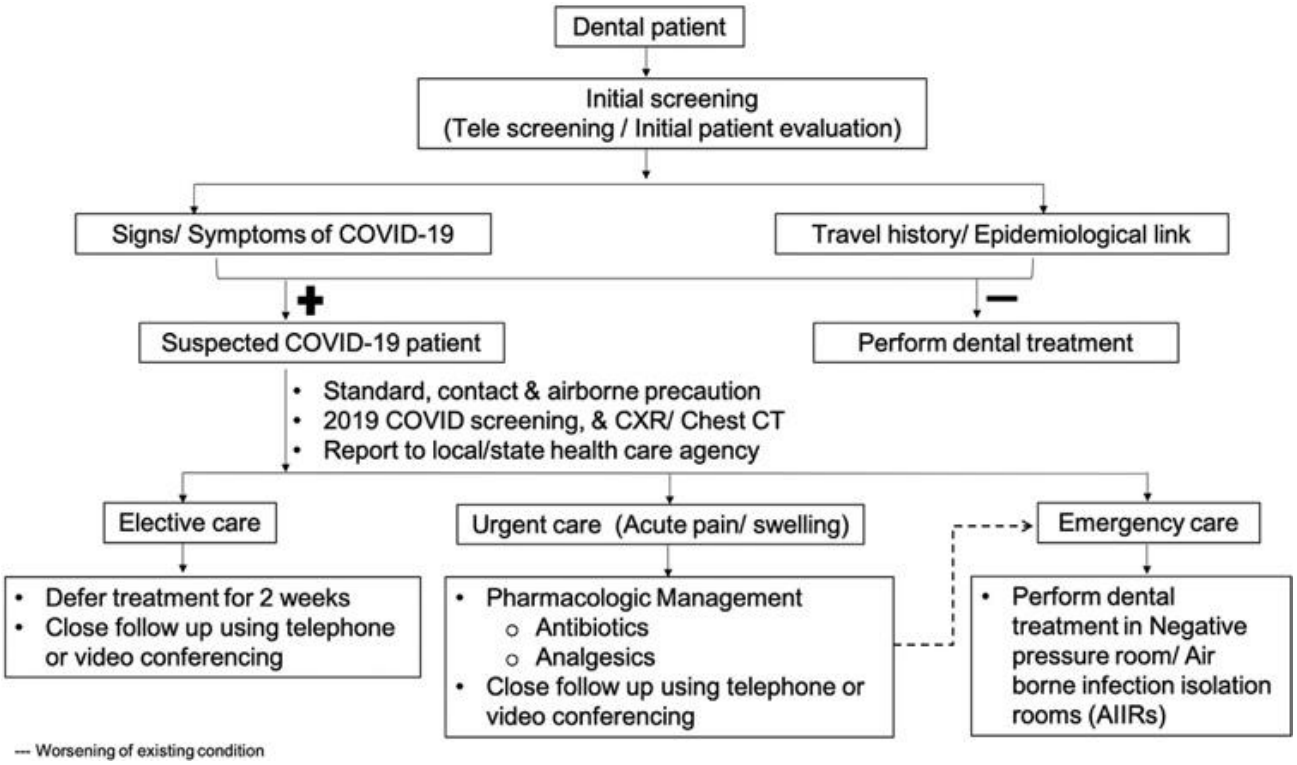


Figure 6. An overview of patient screening for COVID-19 and dental management (26).

Date: _____

Name (last name, first name):_____

Date of Birth (mm/dd/yy):_____

Yes	No	COVID-19 Screening Questionnaire
		In the past 14 days, have you or any household member traveled to areas with known cases of COVID-19? If so, please note location:
		In the past 14 days, have you or any household member had any contact with a known COVID-19 patient?
		Have you or any household member have a history of exposure to COVID-19 biologic material?
		Have you had any history of fever in the last 14 days?
		Have you had any symptoms such as cough, difficulty breathing, diarrhea, nausea, body ache, loss of smell or loss of taste in the last 14 days?
		Urgent Dental Need Question Do you have uncontrolled dental or oral pain, infection, swelling or bleeding or trauma to your mouth?

Figure 7. COVID-19 screening questionnaire (26).

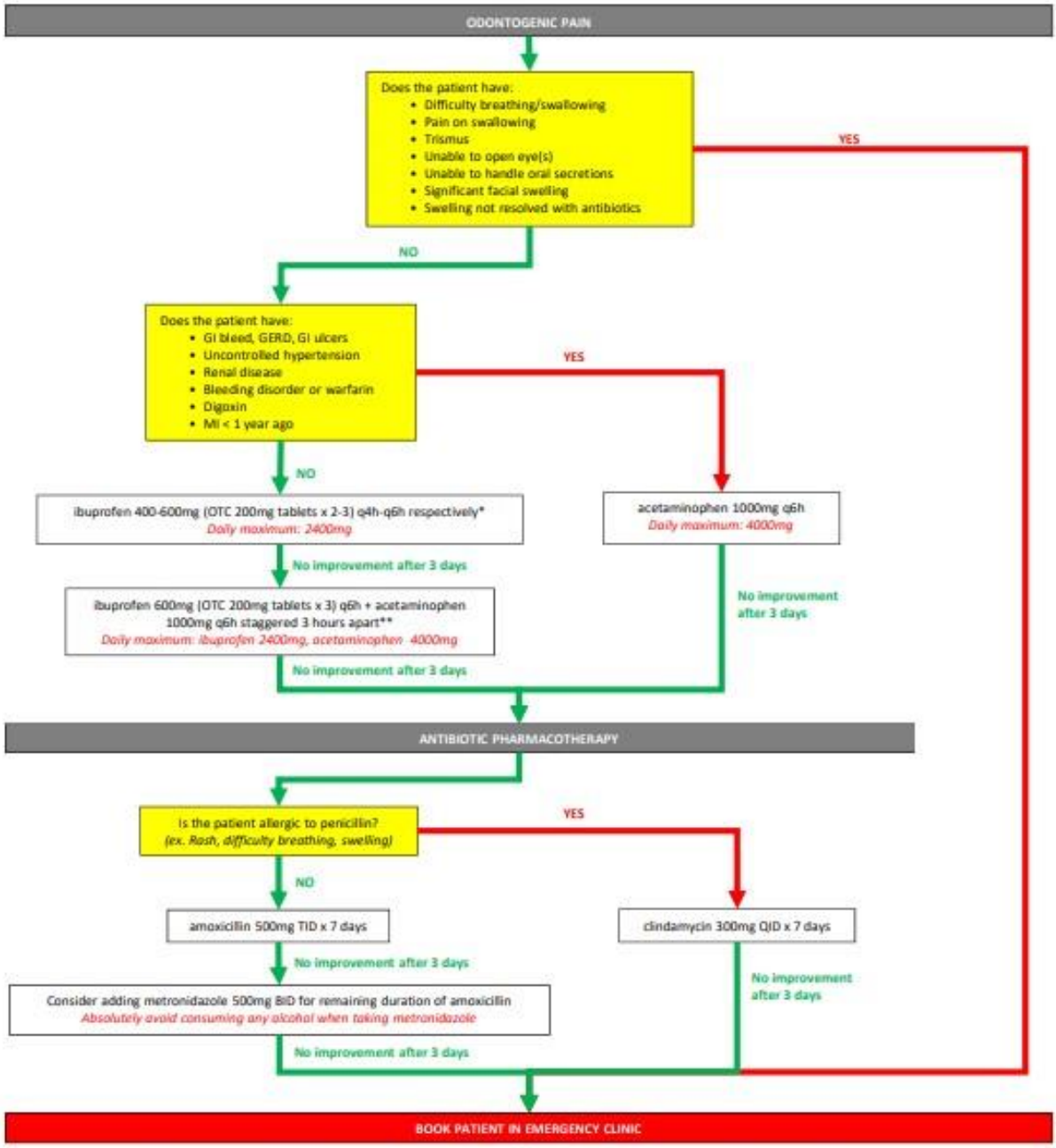


Figure 8. Pharmacotherapy for dental emergencies during COVID-19 pandemic.

Among the general public, people with respiratory symptoms or home care for Covid-19 patients should wear medical masks. It is not recommended to wear any mask for asymptomatic people. Wearing a medical mask when not specified may cause unnecessary costs and supply burdens and create a false sense of security that can lead to neglect of other essential preventive measures (71). Dentists should take precautions against standard, contact and airborne contamination, including proper use of personal protective equipment and hand hygiene practices. In Fig. 9, suggestions of the Centers for Disease Control and Prevention are shown for the installation and removal of personal protective equipment. Table 2 shows the use of protective equipment according to the infection status of the healthcare personnel.

Preoperative antimicrobial mouth rinsing may reduce the number of microbes in the oral cavity (60,72). Because 2019-nCoV is vulnerable to oxidation, mouthwashes containing 1% hydrogen peroxide or 0.2% povidone, such as 1% hydrogen peroxide or 0.2% povidone, are recommended to reduce the density of oral microorganisms, including 2019-nCoV (6,73,74). Based on our experience and relevant guidelines and research, dentists should take strict personal protective measures and avoid or minimize operations

that can produce droplets or aerosols. The 4-hand technique is useful for controlling infection (60,75).

Procedures that can cause cough should be avoided (if possible) or done carefully (76). Aerosol generating procedures, such as the use of a 3-way syringe, should be minimized as much as possible. Intraoral x-ray examination is the most commonly used radiographic technique in dental imaging; however, it can stimulate saliva secretion and cough (77). Therefore, panoramic radiography and cone beam CT extraoral dental radiographs are suitable alternatives during the Covid-19 epidemic (55).

Figure 9a. Centers for Disease Control and Prevention recommendations for putting on and removing personal protective equipment for treating COVID-19 patients (26).

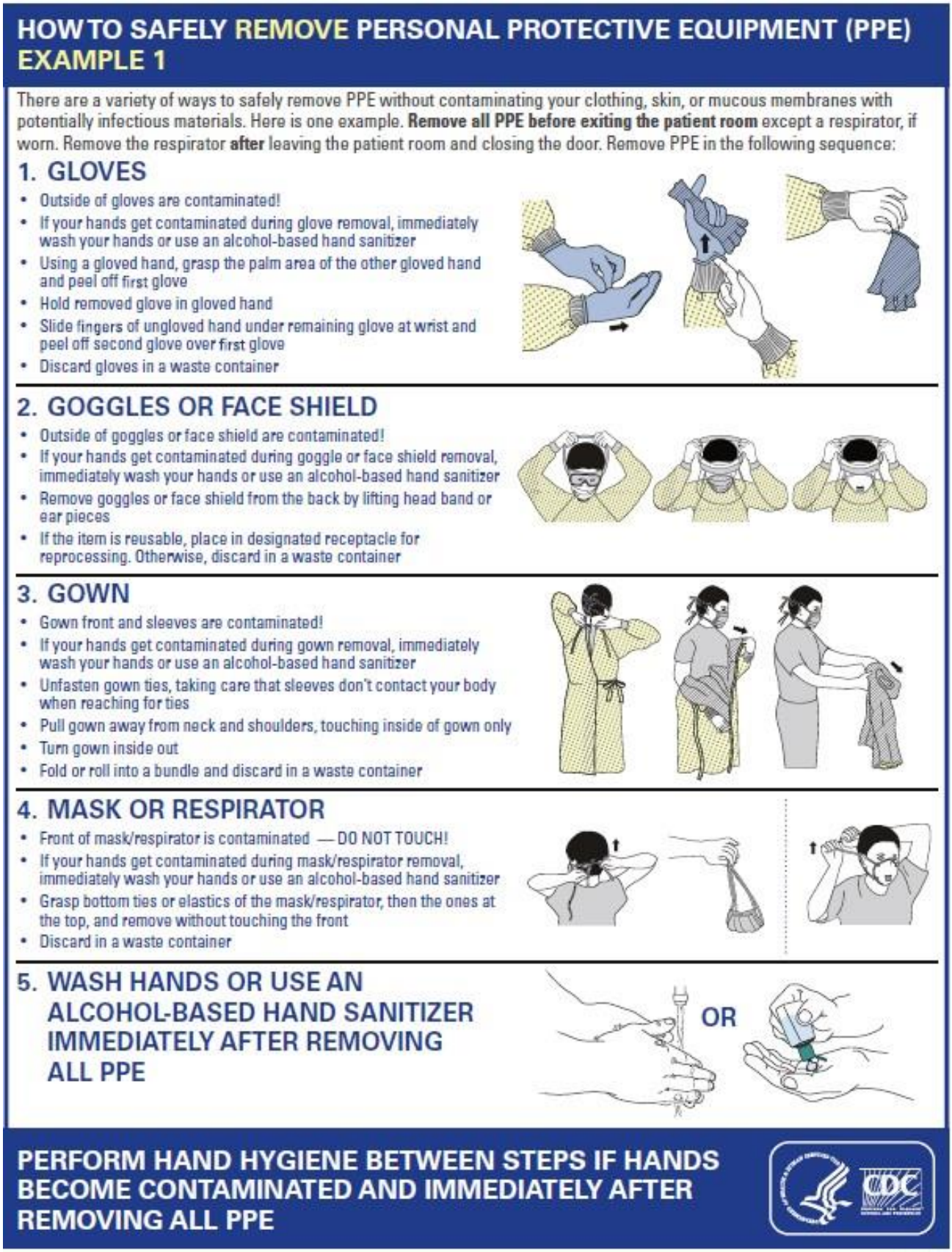


Figure 9b. (Example 1) Centers for Disease Control and Prevention recommendations for putting on and removing personal protective equipment for treating COVID-19 patients (26).

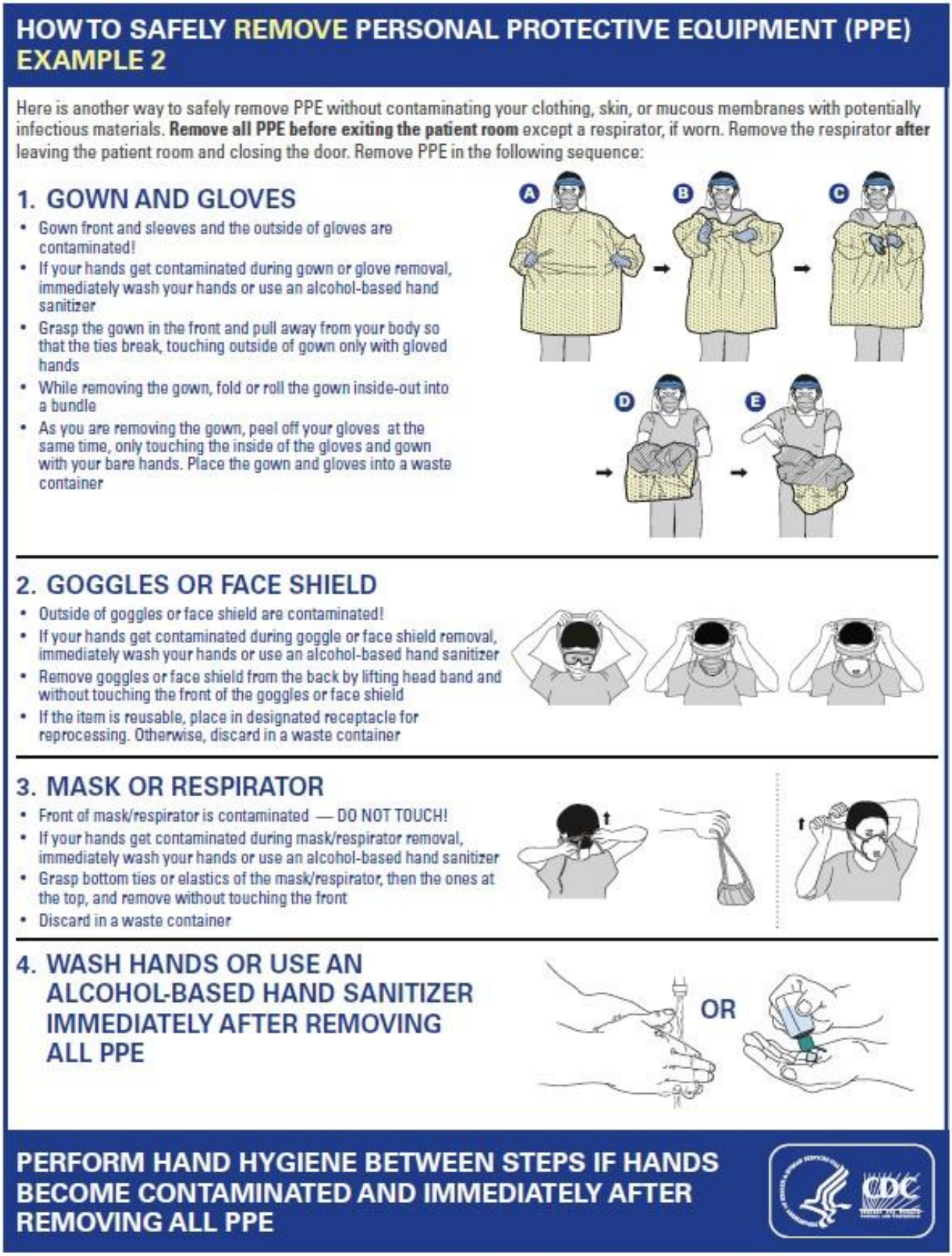


Figure 9c. (Example 2) Centers for Disease Control and Prevention recommendations for putting on and removing personal protective equipment for treating COVID-19 patients (26).

Table 2. Personal protective equipment (PPE) for care of patients with pandemic COVID-19.(https://cdn.dal.ca/content/dam/dalhousie/pdf/dentistry/DENT_PPE_Checklist_NS.pdf).

Dentists	**Personel Protective Equipment (PPE) checklist for suspected/positive Covid-19 patients: Non-aerosol generating procedures**	• **Level 3 mask** • **Eye protection (Goggles or face shield)** • **Gown/lab coat** • **Gloves**
	PPE checklist for suspected/positive Covid-19 patients: Aerosol generating procedures (AGP)	• N95 mask • Goggles • Face shield • Cap/bouffant • Gown/lab coat • Film gown/apron • Booties
Triage	PPE checklist for suspected/positive Covid-19 patients:	• Level 1 mask • Eye protection • Gown/lab coat • Scrubs • Gloves • Maintain spatial distance of at least 2m
Disinfecting Operating Rooms	PPE checklist for suspected/positive Covid-19 patients: Wait appropriate time after completion of AGP	• Level 1 mask • Eye protection • Gown/lab coat • Booties • Gloves
Laundry	PPE checklist for laundering of garments used during treatment of Covid-19 positive patients:	Gloves Disposable apron
Doffing PPE Checklist For Suspected/Positive Covid-19 Patients:	Following an aerosol generating procedure:	1. Gloves OFF 2. Hand hygiene 3. Gown OFF 4. Hand hygiene 5. Bouffant and shield OFF 6. Hand hygiene 7. LEAVE ROOM 8. Goggles OFF into bin 9. Hand hygiene 10. N95 mask OFF 11. Hand hygiene
Doffing PPE Checklist For Suspected/Positive Covid-19 Patients:	Following a non-aerosol generating procedure:	1. Gloves OFF 2. Hand hygiene 3. Gown OFF 4. Hand hygiene 5. LEAVE ROOM 6. Eye protection OFF 7. Hand hygiene 8. Mask OFF 9. Hand hygiene

Although dental clinics are closed, there are patients going to clinics for emergency treatments. While emergency treatment procedures are being performed, precautions should be taken against aerosols that may occur after the physician takes all preventive measures. For this purpose, primarily rubber dam should be applied to suitable patients and fast rotating tools with anti-return valves should be used (78). Tools that do not have anti-return valves can aspirate and eject debris and liquids during application. More importantly, microorganisms, including bacteria and viruses, can further contaminate the air and water tubes within the dental unit, thereby potentially causing cross-infection. High-aspirating aspirators should be used to quickly aspirate water from rotating instruments (6,55). In some cases, patients do not want to lose their teeth and we may have to use a rotating tool that will create an aerosol. In such a case, the patient should be planned as the last patient and the risk of nosocomial infection should be reduced (55).

The speed of aerosols cleaning in an enclosed space depends on the degree of any mechanical or natural ventilation. The higher the number of air changes per hour (ventilation rate), the sooner the aerosol will be cleaned. Therefore, the treatment room should be frequently ventilated after each patient (55) and the materials that need to be sterilized should be sterilized, and those that cannot be sterilized should be disinfected with appropriate disinfectant (26). Covid-19 can live in an aerosol and prefer more for humid conditions (79). It can survive up to 3 days on inanimate surfaces at room temperature. Therefore, clinical staff should ensure that they have recently disinfected inanimate surfaces using chemicals approved for Covid-19 and provide a dry environment to prevent Covid-19 from spreading (80). For this reason, surfaces (unit tray, hoses, headrest, reflector arm, etc.) should be cleaned with a quick-disinfectant gauze or disinfectant wipe (the surface is cleaned with the first wipe, the surface is wiped again with a second wipe and waited for the effect of the disinfectant). Medical waste (including disposable protective equipment) should be transported to temporary storage area after use (56).

Conclusion

One of the transmission ways of the 2019-nCoV virus, which caused the pandemic by affecting the whole world in the first half of 2020, is inhalation by respiratory tract. Dental clinics are suitable environments for the spread of many microorganisms, such as 2019-nCoV, through aerosols formed during dental treatments. This poses a threat to dentists, dentist assistants and patients. For this reason, all non-emergency dental treatments should be postponed, and in emergency treatments, rotary instruments with gloves, masks, visors, protective glasses, disposable gowns, rubber dam, anti-pullback valves should be used and mouthwashes containing oxidative agents should be used in patients. Of course, unless necessary, the social distance rule should be maintained.

There is a need for further research on the still undergoing COVID-19 pandemic and for states to increase measures on this issue.

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