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Infection control practices in dental healthcare settings for the corona virus disease 2019 (COVID-19) pandemic

Abstract

The constant presence of bioaerosols in dental procedures represents a challenge for dental healthcare services during the Coronavirus Disease 2019 pandemic (COVID-19). The main transmission pathway of its etiological agent-severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-occurs through droplets. Thus, when considering that saliva is a reservoir for this virus, dentistry is one of the activities with greater exposure to risk, with the need to establish strict safety protocols. This study is based on relevant guidelines and research andreviewed the scientific literature in order to present infection control practices to prevent SARS-CoV-2 contamination in dental healthcare settings.

Keywords: Infection control, practice management, prevention, dental public health

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Introduction

The first cases of the Coronavirus Disease 2019 (COVID-19) were reported in Wuham, China, between December 10 and 31, 2019, when the outbreak was formally announced.[1] On January 8, 2020, a new type of corona virus (2019-nCoV) was officially announced as the pathogen causing COVID-19 by the Chinese Center for Disease Control and Prevention,[2] being officially named the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2).[3] On March 11, the World Health Organization considered the contamination status as a pandemic, since the virus had a rapid spread and was present on all continents in less than 4 months since its onset.[4] On June7, 2020, the world had6,799,713 confirmed cases and 397,388 deaths.[5]

Dentists are positioned as the second profession with the most health risks for having high rates of exposure to diseases and infections.[6] These professionals are exposed to direct contact with the oral mucosa, which has a large amount of blood vessels and salivary glands, and is therefore one of the main routes of transmitting infectious diseases. In addition, rotating instruments disperse large amounts of aerosols with microorganisms into the environment, making it contaminated.[7] Thus, dentistry and infection control measures must work harmoniously.

Transmission of SARS-CoV-2 can occur directly (coughing, sneezing and by droplets), or by contact with mucous membranes[8,9] from symptomatic or asymptomatic patients.[10,11] Aerosol and fomite transmission of SARS-CoV-2 is plausible, since the virus can remain viable and infectious in aerosols for hours and on surfaces for days, depending on the inoculums shed.[12] As a result, dentists can be contaminated more easily due to contact with the oral mucosa and also the aerosols released into the environment. Thus, there is a need to review and add protocols with precautions to aerosols. In view of the above, the objective of this study was to perform a narrative review of the scientific literature in order to present infection control practices to control and prevent SARS-CoV-2 contamination in dental healthcare settings, based on relevant guidelines and research.

Pre-appointment screening process

Prior to patient consultation, it is important to identify possible signs which indicate contact with SARs-CoV-2. This possible identification will take place in the screening process carried out by telephone, in which questioning whether the patient presents or has symptoms and signs consistent with COVID-19 in previous days will occur. If the patient reports COVID-19symptoms (fever; shortness of breath; cough; gastrointestinal problems, headache or fatigue; loss of taste or smell) avoid non-emergency dental care. If possible, delay dental care until the patient has recovered.[13,14]

Reception area

It is recommended that pre-screening with anamnesis be performed to detect Sars-Cov-2 and to measure body temperature.[15] In addition, it is necessary to avoid crowding patients and companions and a distance of two meters between the people present in the reception must be maintained. Supplies for respiratory hygiene and coughing etiquette, including alcohol-based hand rub with 60-95% alcohol, tissues, and no-touch receptacles for disposal in healthcare facility entrances, waiting rooms, and patient check-ins must be made available. Toys, reading materials, remote controls or other communal objects must be removed or cleaned regularly.[13,14]

Hand hygiene

Hand hygiene is a primary prevention known worldwide, and its main objective is to limit the occurrence of diseases, controlling infections and their causes. It is known that hands are one of the

fundamental tools for carrying out procedures in health services and they are also a reservoir of several microorganisms. Thus, especially in the time of Covid-19, it is necessary that dental healthcare professionals carefully wash their hands, considering that any hand contaminated with the virus and its handling with oral, nasal and ocular mucous membranes is characterized as animportant transmission vector.[8,16] Hand hygiene must be done with soap and water for 20-30 seconds or rubbing with 70% gel alcohol, and if there is no visible dirt, for at least 20 seconds. In addition, it is important to remember that it is essential to remove rings, necklaces, earrings, watches and other ornaments in order to perform this cleaning and attend to the patient, as any microorganisms in these objects are not removed with hand washing, in addition to hindering hygiene.[16] In this context, the moments when oral health professionals must clean their hands should be highlighted: before touching a patient; before cleaning/aseptic procedure; after body fluid exposure risk; after touching patient surroundings.[17]

Personal protective equipment (Ppe)

Dental interventions have unique characteristics. Saliva can be a large reservoir for viral load, because Sars-CovV-2 can bind to receptors for human angiotensin enzymes which are in high concentration in the salivary glands. Thus, it is necessary to adopt measures such as the use of PPE by professionals, assistants and patients in order to protect the mucous membranes of the eyes, nose and mouth during any procedures, thus providing safe dental care free from spreading pathogens.[7]

Considering the need to adopt precaution measures for aerosols, the most adequate protection in the dental environment would be through the adoption of respirators (N95 or FFP2).[18,19] Filtration performance of facepiece respirators in a 2.5μm particle flow was greater than 95%.[20] FFP2 masks provided adults with about 25 times as much protection as surgical masks.[21] It would be logical to use a respirator (N95/FFP2) when faced with the emergency of a virulent disease such as COVID-19, as it offers resistance to fluid penetration and forms a seal around the mouth and nose.In contrast, surgical masks only provide barrier protection against droplets, including large respiratory particles.[22]

The use and disposal of single-use aprons is essential to prevent contamination of the skin, clothing or lab coat of professionals who are working directly with patients. The minimum weight of non-woven fabric must be 30g/m^2. In more invasive procedures and according to the patient's condition, professionals can assess the need to use a waterproof apron-minimum weight of 50g/m^2. The BrazilianNational Health Surveillance Agency recommends that the apron has long sleeves, mesh or an elastic cuff, posterior opening, be made with good quality material, provide an effective antimicrobial barrier, be comfortable and allow the necessary movement. In addition, it is necessary to discard the apron as well as the hat after each visit, which cannot be made of fabric and must cover the entire hair and ear area.[23] Although the use of disposable covers over shoes is not characterized as an effective measure to prevent infection,[24] this cover has been adopted as an additional safety measure.[25–27]

Standard precautions regarding the use of goggles should be ensured since they promote frontal and lateral protection, as the ocular mucosa is one of the possible pathways of entry of SARS-CoV-2 into the body.[18] This protection is not provided by corrective glasses. In addition, it is recommended to use a face shield,[7,26] as it enables additional protection and an additional barrier which is capable to prevent the deposition of droplets in respirators.

The sequence of placement and removal of PPE also has an influence on the possibility of cross-contamination, and training dental health professionals in their proper usage is essential. The removal of PPE is a critical step for contamination by SARS-CoV-2 (Figure 1).

Bioaerosol management

Bioaerosols are the biological components of air and consist of a combination of viable and non-viable microorganisms (e.g., bacteria, fungi, and viruses) and antigenic compounds of biological origin (e.g., animal and plant debris, endotoxins, mycotoxins, (1→3)-β-d-glucan, proteins, and any other microbial metabolites).[28]

Infectious diseases induced by inhalation of different bioaerosols not only depend on their biological properties and chemical composition, but also on the number of inhaled particles and the place in which they are deposited in the respiratory system.[29] The high viral load present in the upper airways and the very close relationship to dentistry patients translates into a great possibility of exposure to SARS-Cov-2 from dental procedures which originate droplets and aerosols.[23,26] Therefore, referring to the potential for dissemination of this pathogen via aerosol, its production in dental clinics should be minimized or eliminated.

Pre-procedural mouth rinses: The use of antimicrobial solutions to perform mouthwashes prior to treatments reduces the number of microorganisms in the oral cavity, and consequently there is a reduction in the amount of microorganisms on surfaces and in the environment.[30–32] Although there is still insufficient and specific evidence for SARS-CoV-2, it is known that mouthwashes with antimicrobial agents such as chlorhexidine, essential oils, povidone-iodine and cetylpyridinium chloride reduce the level of oral microorganisms and consequently minimize the burden of these pathogens in aerosols.[13] According to Peng et al., mouthwash with 0.12% chlorhexidine which is usually used in dentistry is not effective in preventing the transmission of SARS-CoV-2.[27] However, scientific evidence has shown that chlorhexidine has virucidal activity in enveloped viruses, a structural feature similar to SARS-CoV-2, such as human immunodeficiency virus 1, herpes simplex virus 1 and 2, cytomegalovirus, influenza A, parainfluenza and hepatitis B.[33,34] Although numerous publications indicate the use of 0.5-1% hydrogen peroxide in the pre-procedure mouthwash,[7,8,25–27] there are no clinical or laboratory studies which confirm its successful action on human saliva. Therefore, supporting a clinical decision based on reports must be evaluated.

High volume evacuator: Using the High Volume Evacuator during dental care results in reducing the spread of aerosols to the environment.[35–38] Therefore, in this time of COVID-19 pandemic, continuous aspiration of residual saliva must be performed with a High Volume Evacuator suction system.[13,23] This type of aspiration attenuates the amount of saliva in the oral cavity, which results in a decrease in the amount of aerosols produced in dental procedures.

Ventilation: Frequent renewal of indoor air is essential in order to minimize the spread of SARS-CoV-2 as well as other microorganisms. The ideal scenario is to install a ventilation system capable of allowing air to be renewed in the order of six to twelve changes per hour. The use of a portable HEPA air filtration unit while the patient is actively undergoing an aerosol-generating procedure, and immediately

following should be considered.[13] In addition, for dental offices which do not have these tools, it is recommended to open the windows between patient appointments.[23,39]

Clinical procedures: The use of rubber is recommended for isolating the operative field, as it reduces the production of aerosol contaminated by saliva and blood when high rotation or ultrasonic devices are used.[7,23,25–27] The use of rotary instruments should be reduced, opting for manual removal of carious tissue using ART (Atraumatic Restorative Treatment) and manual scraping in order to minimize aerosol production. The use of the triple syringe should be avoided, especially in its mist form (spray). In addition, the use of ultrasonic instruments should be minimized.

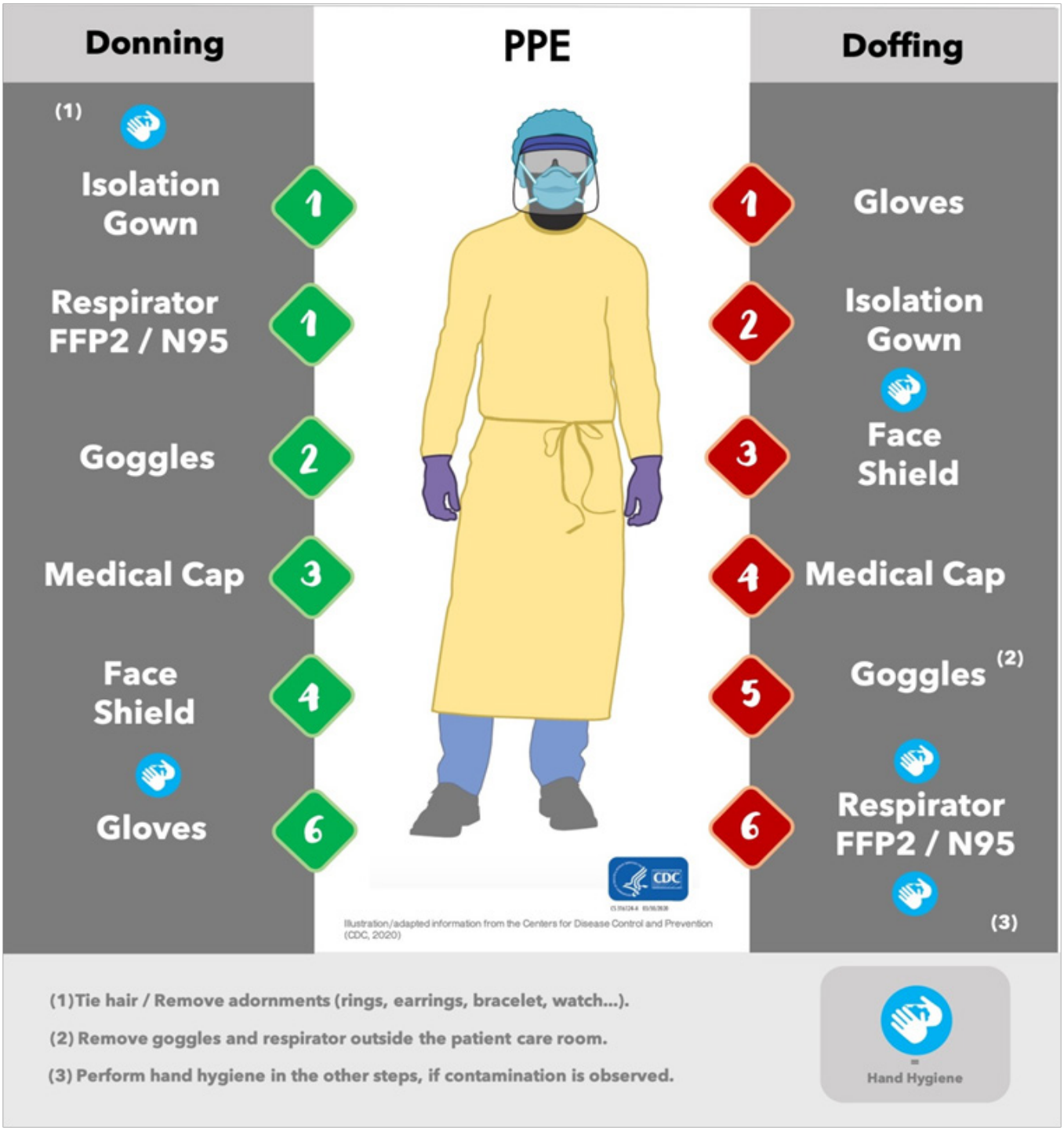

Figure 1 Illustrates the fundamental PPE for dental healthcare workers, and shows the sequence for appropriate donning and doffing, as well as the ideal moments for hand hygiene in this process.

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Cleaning and disinfection of surfaces

Particularly with a pandemic caused by SARS-CoV-2, many health services have revised their infection control protocols, since the surfaces can be contaminated with droplets from symptomatic and asymptomatic patients from COVID-19.[2,9–11] However, the usual standard precautions related to the use of cleaning and disinfecting products must be followed. Thus, products based on alcohol (70%), chlorine (1%), hydrogen peroxide (0,5%), and quaternary ammonium with associations continue to be the indication as sanitizing agents for surfaces.

Time between appointments

The spread of SARS-CoV-2 may require an important change in habits in dental offices in which patients are usually scheduled on a first-come, first-served basis, causing a crowd. From this perspective, it is important that patients are scheduled by appointment, with a safety period between dental appointments which avoids creating crowds.[39]It is necessary to schedule appointments spaced sufficiently apart in order to minimize possible contact with other patients in the waiting room and to allow proper procedures for the prevention and control of infections in dental offices.[13,23,26,40]

According to the American Centers for Disease Control and Prevention, it is relevant to wait 15 minutes after the completion of each patient to clean and disinfect the dental office.[13] On the other hand, The National Health System of England recommends that the rooms are left vacant with the door closed for 20 minutes in a negative pressure isolation room or for 1 hour for a neutral pressure room before performing a terminal cleaning. Windows to the outside in neutral pressure rooms can be opened.[39,40]

Conclusion

Dental healthcare workers are extremely exposed to possible contamination by SARS-CoV-2. However, patient care can be reestablished, even in the pandemic situation, when infection control measures are adopted. Such measures are within the reach of health services and should be practiced. Otherwise, dentistry may prove to be the professional category most affected by COVID-19.

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Conflict of interest

The authors declare that there is no conflict of interest.

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