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The New Normal of Dentistry: Review of Recommendations for the Resumption of Dental Care during the COVID-19 Pandemic

Vanessa Paiva Reis,[1] Adriane Batista Pires Maia,[2] Adriana Raymundo Bezerra,[3] Danielle Castex Conde[4]

[1]Oral Maxillofacial Surgery and Traumatology Service, Military Police Polyclinic of Cascadura (Policlínica da Polícia Militar de Cascadura), Rio de Janeiro State Military Police, Rio de Janeiro, RJ, Brazil

[2]Oral Maxillofacial Surgery and Traumatology Service, Military Police Central Hospital (Hospital Central da Polícia Militar), Rio de Janeiro State Military Police, Rio de Janeiro, RJ, Brazil

[3]Oral Maxillofacial Surgery and Traumatology Service, Military Police Central Dental Clinic (Odontoclínica Central da Polícia Militar), Rio de Janeiro State Military Police, Rio de Janeiro, RJ, Brazil

[4]Oral Maxillofacial Surgery and Traumatology Service and Anatomical Pathology Service, Military Police Central Hospital (Hospital Central da Polícia Militar), Rio de Janeiro State Military Police, Rio de Janeiro, RJ, Brazil

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Abstract

Objective: This paper aims to identify the recommendations for the resumption of elective dental care after the epidemic outbreak of COVID-19 and to identify consensus and disagreements among the suggestions found in the documents. **Materials and Methods**: a comparative documentary research was carried out on the recommendations for the resumption of elective dental care after the outbreak of COVID-19. Additionally, a literature review was carried out based on a search in the Brazilian Regional Portal of the Virtual Health Library (VHL), which incorporates Lilacs, SciELO and MEDLINE databases, using the search query: ("COVID-19" AND "dentistry"). **Results:** government documents from the Ministry of Health or corresponding organizations and professional associations from eleven different countries in the world were analyzed and six articles were found addressing the recommendations for the resumption of elective dental care. **Conclusion:** there is a consensus about the requirements for dental facilities, the recommendation of screening patients before scheduling and appointments and the procedures performed during dental care. There is no consensus on the use of preprocedural antiseptic mouth rinses, the systematic use of rapid tests before the appointment, the type of respiratory protection that should be used by the dental team and the minimum interval to be allowed before cleaning the patient room when aerosol-generating procedures are performed.

Keywords: COVID-19; Dental care; Cross-infection, Biosecurity

Introduction

The pandemic of SARS-CoV-2, the infectious agent that causes COVID-19, has become a major global public health challenge. Its transmission can occur directly, through respiratory droplets produced when a person speaks, coughs or sneezes, or indirectly through the contact with surfaces contaminated with SARS-CoV-2 that are then carried to conjunctiva of the eyes or the mucosa of the nose or mouth.[1] Airborne transmission has also been identified in patients undergoing aerosol-generating procedures.[2]

Dental care presents a high risk of spreading SARS-CoV-2 due to the close contact with the patient, the possibility of exposure to biological infectious materials disseminated as droplets and aerosols and the high viral load present in the upper airways and saliva[1]. As a result, dental associations and health surveillance agencies worldwide have recommended postponing elective dental procedures during the epidemic outbreak.[1,3-6]

However, as the epidemic begins to reach the deceleration phase, there will be a gradual and programmed return to activities. For this to happen, the World Health Organization has listed six criteria that must be met: the transmission of the virus must be controlled; health systems must be able to detect, test, isolate and treat all people with COVID-19 and trace their contacts; outbreak risks in special settings such as health facilities and nursing homes must be minimized; preventive control measures must be established in workplaces, schools and other places; capacity to manage new imported cases; and communities must be effective educated on the new standards.[6]

With the relaxation of restrictive measures and reduction of social distance, new peaks of transmissibility may occur.[7,8] Therefore, during the phase of resuming elective dental care, it is essential to ensure that dentists are well informed about the measures to prevent infection and adapt their routine procedures to this new reality.

This article thus aims to identify both the recommendations provided in government and professional association documents on the safe resumption of elective dental care during the COVID-19 pandemic and the consensuses and disagreements found among those recommendations.

Materials and Methods

Our research question in this review was: What are the recommendations provided in government and professional association documents that should be adopted during the

resumption of dental care, after the end of the restrictive phase and as long as COVID-19 epidemic outbreaks persist? The selected documents were compared to analyze the similarities and discrepancies in the following topics: facility requirements and safety precautions to be taken before, during and after dental care is provided.

We carried out a comparative qualitative analysis of 12 dental care protocols made available on governmental websites of the Ministry of Health or equivalent organizations and of professional associations from 11 countries worldwide (Germany, Brazil, Canada, Spain, United States of America, France, India, England, Italy, New Zealand and Portugal) that provided recommendations on the resumption of dental care after the outbreak of COVID-19. As a second step in addressing the results of the documentary analysis, we reviewed the literature on the recommendations found in published articles. The search was carried out on June 15, 2020, on the following databases: Brazilian Regional Portal of the Virtual Health Library (VHL), which includes Lilacs, SciELO, MEDLINE and other information sources such as open educational resources, internet sites and scientific events. The search strategy was based on the query: ("COVID-19" AND "dentistry"); no geographic limitation was stipulated; and the search included the title, abstract and keywords fields. The criteria for inclusion or exclusion of documents were the following: **a) inclusion**: documents that explicitly addressed the resumption of dental care after an initial phase of restriction due to the outbreak of COVID-19; **b) exclusion**: documents providing recommendations only for the period of activity restriction due to the pandemic, which addressed only urgent and emergency care; articles not available in English, Spanish, Italian, French, Portuguese or German; and articles not found.

Based on the search strategy adopted, 56 studies were identified and their abstracts were read by two reviewers. A full-text version was obtained for the articles pre-selected through the reading of abstracts to confirm eligibility and inclusion in the study. When reading the abstract was not sufficient to establish inclusion, the article was also read in full to confirm its eligibility. After applying the exclusion criteria, 6 articles were selected, in addition to other 12 guidance documents, bringing the total to 18 studies included in our analysis.

Results and Discussion

The aim of the resumption of elective care is to treat the conditions left untreated during the restriction phase, always according to the care provider's professional assessment of the urgency, biological risk, patient vulnerability, availability of personal protective equipment (PPE), current local epidemiological phase, and to the guidance from health authorities and health surveillance agencies.[9-11] In case of shortage of PPE and other supplies, priority should be given to those in greatest need and to the most vulnerable patients.[9,10,12]

Recommendations for resuming dental care are summarized in Table 1, showing organizations, authors, country of publication, date of publication or date of the last update, and the measures to be adopted before, during and after dental care is provided for the documents included in this review. These data guided our description and discussion of the review results.

Of the 12 official documents included in this review, only one was produced in Brazil, providing regional rather than national recommendations.[10] This was probably due to regional differences in the country's epidemiological evolution. Most publications were from Europe (Germany, Spain, France, England, Italy and Portugal – with 1 document each), followed by North American countries (Canada, with 1 document; and United States of America, with 2 documents) and only one country from Asia and another from Oceania (India and New Zealand, with 1 document each). No publication on the resumption of dental care was found for African countries, possibly because the epidemic outbreak took longer to reach Africa.

Regarding requirements for dental care facilities, all guidance documents, except one from Germany, recommended the adoption of measures to control infection in the waiting room, which included: a one-meter minimum distance between chairs; installation of acrylic barriers between reception desks and patients; provision of sinks, soap and disposable towels or of 70% alcohol gel dispensers for sanitizing hands; provision of tissue paper and pedal-operated trash cans; limiting the presence of visitor accompanying patients; use of masks by visitors and employees; removal of all objects that may be touched by several patients and that are difficult to disinfect, such as magazines and toys; and a proper ventilation of the dental setting.

Dental care should be provided in individual rooms whenever possible.[9,10,11,13,14] In clinics with several dental offices in the same environment, a two-meter minimum distance should be maintained between chairs; if this is not possible, alternate chairs should be kept unoccupied.[9,10,15] The placement of physical barriers between chairs in clinics is also suggested, provided they are easy to clean and do not interfere with ventilation or with automatic fire prevention systems.[9,10]

As for measures to be adopted before dental care, all documents agree that a previous screening should be done before appointment and care. Schedule screening should be done remotely via phone calls, messaging applications, online forms or video conferences. The screening aims to assess whether symptoms suggestive of SARS-CoV-2 infection are present, whether there has been close contact with people with suspicion or diagnosis for COVID-19, whether patients are in the risk group for serious SARS-CoV-2 infection, and also whether the procedure to be performed will generate aerosols.[3] Before dental procedures, the recommendation is to repeat questions for assessing the possibility of COVID-19, take the patient's temperature[9,10,13,12,16,17,18] and record patient and companion data, in case contact tracking is required.[14,18]

Table 1. Recommendations for resuming dental care according to organization, country of publication, date of the document or last update and measures to be adopted.

Document, Date, Country.	Measures before dental care	Measures during dental care	Measures after dental care
American Dental Association,[16] May 5, 2020, USA.	Infection control measures in the waiting room, screening before scheduling and on the day of the appointment, temperature check, informed consent.	Hand hygiene, use of PPE (disposable surgical masks for each patient, N95 respirators or similar disposable after AGP, eye protection, disposable waterproof gown for each visit), minimize aerosol generation, manual instrumentation, rubber dam isolation, high-volume suction, limit the number of people in the patient room.	Cleaning and disinfection of surfaces between visits with disinfectants and PPE (gloves, facemask and eye protection). Work clothes must be washed separately by a contractor. Monitor staff and patients for the development of COVID-19 symptoms.
Canadian Dental Association,[13] May 10, 2020, Canada.	Infection control measures in the waiting room, screening before scheduling and on the day of the appointment, temperature check, informed consent. Schedule appointments for vulnerable patients at the beginning of the day and for suspected cases at the end of the day. Preprocedural antiseptic mouth rinse (1% hydrogen peroxide or sodium hypochlorite solution).	Hand hygiene, use of PPE (disposable surgical masks for each patient, N95 respirators or similar disposable after AGP, eye protection, disposable waterproof gown for each visit), minimize aerosol generation, rubber dam isolation, high-volume suction, AGP performance should be limited to one patient room or area.	Wait 10 minutes before cleaning for aerosol purging. If AGP are performed on suspected patients, competent organizations should be consulted for information on air purging time. Work clothes must be removed before leaving. Monitor staff for the development of COVID-19 symptoms.
Centers for Disease Control and Prevention,[9] May 19, 2020, EUA.	Infection control measures in the waiting room, screening before scheduling and on the day of the appointment, temperature check. Consider prior testing. Program AGP preferably for the end of the day. Dental care for patients with COVID-19 should be provided in a room with negative pressure and HEPA filter.	Hand hygiene, use of PPE (disposable surgical mask for each patient, N95 respirators, elastomeric or air purifiers for AGP, eye protection, disposable waterproof gown for each visit), minimize aerosol generation, rubber dam isolation, high- volume suction, limit the number of people present during dental care, preferably in individual rooms.	Wait 15 minutes for aerosol purging. Cleaning and disinfection of surfaces between appointments, sterilization of instruments and proper waste disposal. Airflow from the least to the most contaminated area, consult the possibility of increasing air changes and improving filtering efficiency, keep bathroom exhaust fans activated during working hours, consider using a portable HEPA filter during and after AGP, consider using ultraviolet germicidal irradiation as an adjunct to improve air quality. Monitor staff and all patients for the development of COVID-19 symptoms.
Conselho Regional de Odontologia do Rio de Janeiro,[10] May 29, 2020, Brazil.	Infection control measures in the waiting room, screening before scheduling and on the day of the appointment, temperature check. Prioritize emergency and urgent care, using common sense in situations where postponing treatment may result in more serious damage to the patient's health. Suspected or confirmed cases of COVID-19 must be postponed for 14 days. Preprocedural antiseptic mouth rinse with 1-1.5% hydrogen peroxide (associated or not with subsequent mouth rinsing with 0.12-2% chlorhexidine), 0.05% cetylpyridinium chloride or 0.2% povidone-iodine.	Hand hygiene, use of PPE (disposable surgical mask at each visit, N95/FFP2 respirators for AGP, eye protection, disposable waterproof gown at each visit), minimize aerosol generation, rubber dam isolation, high-volume suction (suction pump), avoid intraoral radiography, limit the number of people present in the patient room, dental care preferably in individual rooms. Ventilate patient room (air conditioning with exhaust, open windows or portable HEPA filters).	Wait at least 15 minutes for aerosol purging. Cleaning and disinfection of the environment (70% alcohol, 0.5% sodium hypochlorite, quaternary ammonium with biguanide, 0.5% peracetic acid, 0.5% hydrogen peroxide), sterilization of instruments and handpieces, proper waste disposal. Monitor staff for the development of COVID-19 symptoms.
Dental Council of India,[18] May 07, 2020, India.	Infection control measures in the waiting room, screening before scheduling and appointment, temperature check. Dental care for patients recovered from COVID-19 must be provided after release by physician. Preprocedural antiseptic mouth rinse (hydrogen peroxide 1%).	Hand hygiene, use of PPE (surgical mask, N95 respirator, FFP3 respirator for dental care of patients with COVID-19, disposable waterproof gown or coverall), minimize aerosol generation, rubber dam isolation, high-volume suction.	Cleaning and disinfection of surfaces after procedures (sodium hypochlorite), sterilization of instruments and proper waste disposal. Ventilate the environment after dental care, consult the possibility of increasing exhaust and directing air flow towards the most contaminated area. Work clothes must be removed and washed separately. Periodic fumigation of the clinic.

Dental Council of New Zealand,[14] May 11, 2020, New Zealand.	Infection control measures in the waiting room, screening before scheduling and dental care. Normal dental care for healthy patients (low risk) and urgent and emergency care for suspected or confirmed cases of COVID-19 (high risk). High-risk patients should be scheduled to the end of the day, preferably in individual rooms. Dental care for high-risk patients should be provided in negative pressure rooms if aerosols are generated. Preprocedural antiseptic mouth rinse.	Hand hygiene, use of PPE (disposable surgical masks, eye protection, disposable waterproof gown, use of N95/FFP2 respirators reserved for AGP in high-risk patients), minimize aerosol generation, rubber dam isolation, high-volume suction, use of low-speed dental instruments, limit the number of people present in the patient room, the doors must remain closed during the performance of AGP.	Wait 20 minutes for air change before cleaning negative pressure rooms. Sanitization of the environment in two stages, first with detergent and water and then by disinfection. Sterilization of instruments and proper waste disposal. Work clothes must be removed and washed separately using hot water. Monitor professionals and patients for the development of COVID-19 symptoms.
Direção-Geral de Saúde,[29] May 1, 2020, Portugal.	Infection control measures in the waiting room, screening before scheduling and dental care. Patients suspected of COVID-19 infection should have dental care postponed for 14 days. Patients suspected or diagnosed for COVID-19 urgently requiring face-to-face care should be scheduled to the end of the day. Preprocedural antiseptic mouth rinse with 1% hydrogen peroxide or 2% povidone-iodine.	Hand hygiene, use of PPE (N95/FFP2 respirator for all procedures, eye protection, surgical gown), minimize aerosol generation, rubber dam isolation, surgical aspiration, use of anti-retraction handpieces, avoid intraoral radiographs, limit presence of people in the patient room, keep doors closed during dental care, promote air change preferably by opening windows, air conditioning must be used in exhaust mode, never recirculation.	Cleaning and disinfection of surfaces should be done immediately after dental care (70% alcohol or 0.1% sodium hypochlorite), proper waste disposal, ventilate the environment after each visit. Cleaning and disinfection of surfaces outside the patient room must be carried out at intervals of 1 to 2 hours, work clothes must be removed and washed separately, with hot water.
Institut der Deutschen Zahnärzte,[19] Apr 24, 2020, Germany.	Screening before scheduling, check if the patient was recently tested for COVID-19, informed consent. Suspected or confirmed cases of COVID-19 requiring urgent or emergency care should be referred to dedicated centers or treated in isolation rooms. Preprocedural antiseptic mouth rinse with 1.5% hydrogen peroxide.	Hand hygiene, use of PPE (disposable surgical mask, use of FFP2 respirators reserved for patients suspected or diagnosed for COVID-19, eye protection, waterproof gowns for suspected or confirmed COVID-19 cases), minimize aerosol generation, rubber dam isolation, physical barriers, high-volume suction, protect patient's clothes with waterproof barrier drapes.	Wait 30 minutes for air change before cleaning negative pressure rooms. Cleaning and disinfection of surfaces after dental care, proper waste disposal.
Minestero della Salute,[12] May 30, 2020, Italy.	Infection control measures in the waiting room, screening before scheduling and dental care, temperature check, informed consent. Priority should be given to appointments postponed during the first phase of the epidemic. Preprocedural antiseptic mouth rinse (1% hydrogen peroxide, 0.2% povidone iodine, 0.05-0.1% cetylpyridinium chloride) followed by a second mouth rinse with 0.2-0.3% chlorhexidine.	Hand hygiene, use of PPE (surgical masks for non-AGP, N95/FFP2 respirators for AGP, eye protection, waterproof gown or coverall, physical barriers, minimize aerosol generation, rubber dam isolation, anti-retraction handpieces, high-volume suction, avoid intraoral radiographs, preferably use low-speed handpieces.	Natural ventilation of the patient room for 10 to 15 minutes after dental care. Cleaning and disinfection of the patient room (0.1 to 0.5% sodium hypochlorite, 62 to 71%, alcohol, 0.5% hydrogen peroxide), sterilization of instruments, proper waste disposal. Air conditioning filters must be replaced weekly.
National Health Service,[11] Jun 4, 2020, England.	Infection control measures in the waiting room, remote consultation with patient for screening, assessing risk and determining the procedures to be performed, consider domiciliary visits in some cases. Schedule appointments for vulnerable patients to the early hours of the morning to prevent contact with other patients.	Hand hygiene, use of PPE (disposable surgical mask, N95/FFP2/FFP3 respirators for AGP, waterproof gown, eye protection), minimize aerosol generation, rubber dam isolation, high-volume suction, complete treatment in a single session if possible, maintain doors closed, limit movement of people in the patient room, maintain patient and reception areas ventilated.	When an AGP is performed, allow a 20-minute interval before cleaning in negative pressure rooms and a one-hour interval in neutral rooms (windows must be opened for natural ventilation). Cleaning and disinfection of the patient room, proper waste disposal and sterilization of instruments. Work clothes must be removed at the end of the day and washed separately.
Ordre National des Chirurgiens-dentistes,[15] Apr 30, 2020, France.	Infection control measures in the waiting room, screening before dental care. Use of serological tests before care is not recommended. Healthy patients can undergo all treatments, elective treatment of vulnerable patients must be assessed on a case-by-case basis (in reserved rooms). Defer service of suspected or confirmed cases of COVID-19 for 14 days or if it is not possible, provide dental care in reserved rooms. Preprocedural antiseptic mouth rinses are recommended despite the lack of scientific evidence.	Hand hygiene, use of PPE (disposable surgical masks, FFP2 respirators for AGP and room cleaning, plastic gown for non-AGP, disposable surgical gown for AGP, eye protection), minimize aerosol generation, avoid intraoral radiographs, high-volume suction, rubber dam isolation, prefer the use of low-speed handpieces.	Ventilate the patient room after performing AGP for at least 15 minutes (windows open). Cleaning and disinfection of all surfaces after care (0.1% sodium hypochlorite), sterilization of handpieces and other instruments, proper waste disposal. In rooms that cannot be naturally ventilated, use air conditioning in the exhaust function and regularly replace air filters or use air purification systems with HEPA filter. Work clothes must be removed and washed separately with hot water.

Organización Colegial de dentistas de España,[17] May 1, 2020, Spain.	Infection control measures in the waiting room, screening before scheduling and on the day of the appointment, temperature check. Preprocedural antiseptic mouth rinses (1% hydrogen peroxide, 2% iodine-povidone or 0.05-0.1% cetylpyridinium chloride).	Hand hygiene, use of PPE (FFP2 respirators, disposable gown for each patient, double gloves, eye protection), keep doors closed during dental care, minimize aerosol generation, rubber dam isolation, high-volume suction, avoid intraoral radiographs, use of anti-retraction handpieces.	Ventilate the environment for 5 to 10 minutes between visits or if natural ventilation is not possible, use negative pressure rooms and HEPA filter. Cleaning and sanitizing of surfaces (0.1% sodium hypochlorite or 70% alcohol) after each visit, cleaning of floor at least three times a day, sterilizing instruments including handpieces, proper waste disposal. Clothes worn during care should be removed before leaving the office or clinic.
Ge *et al*,[39] May/2020, China.	Precautionary measures in the waiting room. Screening before appointment. Dental care for patients with COVID-19 should be performed in negative pressure rooms. Preprocedural antiseptic mouth rinses.	Hand hygiene. PPE (FFP2/FFP3 respirators, eye protector), rubber dam isolation, patient positioning, minimize aerosol generation, high-volume suction, air purification system with HEPA filter.	Cleaning and disinfection of surfaces (62 to 71% alcohol, 0.5% hydrogen peroxide, 0.5% sodium hypochlorite).
Giudice *et al*,[20] May/2020, Italy.	Screening before scheduling and appointment. Dental care strategy based on diagnostic tests. Patients with positive RT-PCR should have elective treatment postponed. In cases of negative RT-PCR results, but where IgM was positive, postpone treatment and repeat the exam. Elective treatment allowed for healthy (negative RT-PCR, IgM and IgG) or recovered individuals (negative RT-PCR and IgM but positive IgG).	Not mentioned.	Not mentioned.
Jamal *et al*,[23] May/2020, United Arab Emirates.	Infection control measures in the waiting room, screening before scheduling and dental care. Preprocedural antiseptic mouth rinse (1% hydrogen peroxide or 0.2% povidone-iodine). Dental care for suspected or confirmed cases of COVID-19 restricted to emergencies and carried out in negative pressure rooms with at least 6 air changes per hour and HEPA filter.	Use of PPE (disposable surgical mask, N95/FFP2 respirators for AGP, eye protection, gown), minimize aerosol generation, rubber dam isolation, high-volume suction, avoid intraoral radiographs, use of anti-retraction handpieces.	Meticulous disinfection of the patient room and waiting room.
Odeh *et al*,[55] April/2020, Saudi Arabia and Jordan.	Use of tele-dentistry to identify urgent cases.	Use of PPE (mask, gown or coveralls), minimize aerosol generation. Researchers must focus should focus on developing barrier techniques with negative pressure to contain and isolate aerosols generated during dental care.	Not mentioned.
Proffitt,[21] May/2020, England.	Preprocedural antiseptic mouth rinses.	Use of PPE during AGP (FFP3 respirators, gown or waterproof coverall, eye protection), high-volume suction, dental care in negative pressure rooms or rooms with filtration system.	Cleaning and disinfection of the environment.
Volgenant *et al*,[24] May/2020, Netherlands.	Screening before scheduling.	Use of PPE (disposable surgical masks, N95/FFP2 respirators should be prioritized in the care of patients with COVID-19, eye protection, waterproof disposable gown), rubber dam isolation, minimize aerosol generating, high-volume suction. Preferably provide dental care in negative pressure rooms, direct air flow from the cleanest area to the most contaminated area, air exhaustion, natural ventilation.	Ensure sufficient ventilation and wait at least 30 minutes between patients. Cleaning and disinfection of surfaces with 62% alcohol, 0.5% hydrogen peroxide, 0.1% sodium hypochlorite.

PPE: Personal protective equipment. HEPA: High-efficiency particulate arrestance (technology used in air filters with high efficiency in the removal of particles). FFP: Filtering Face Piece. AGP: Aerosol-generating procedures. RT-PCR: Reverse transcription polymerase chain reaction (molecular biology technique using the enzyme reverse transcriptase to transform the RNA of the virus into DNA).

Depending on availability, costs and the speed of results, diagnostic tests may be considered as a strategy to reduce risks before dental care.[9,19,20,21] Rapid tests for antibody detection have the advantage of being capable to be performed in the same setting where dental care is being taken and of providing results in a few minutes. However, due to the lack of sufficient scientific evidence for its sensitivity and specificity, and to the possibility of false negatives during the window period,[9,22] their systematic use is still controversial.[15,16]

All documents recommended deferring elective dental care of patients with COVID-19 symptoms or who have had recent close contact with persons diagnosed or suspected of having contracted the disease. In situations where face-to-face care is essential, this should be done in an isolated room, avoiding or minimizing aerosol production and preferably at the end of the work shift.[9,10,11,13,14,15] Emergency care for patients with COVID-19 should be preferably provided in a negative pressure room equipped with a HEPA filter (High Efficiency Particulate Arrestance) [9,14,15,17,19,23,24] by professionals who are not in the risk group for developing the more serious forms of the illness.[3,9] Patients recovered from COVID-19 may be received in the dental setting after the end of the home isolation period using strategies based on symptoms or testing (Chart 1). [3,9,10]

Chart 1. Dental care strategies for patients recovered from COVID-19 according to the US Centers for Disease Control and Prevention[9]

Symptom-based strategy:
- Waiting at least 3 days since recovery defined as resolution of fever without the use of medication and
- Improvement in respiratory symptoms (e.g. cough, difficulty breathing) and
- Waiting at least 10 days since symptoms first appeared.

Test-based strategy:
- Resolution of fever without medication and
- Improvement in respiratory symptoms (e.g. cough, difficulty breathing) and
- Negative molecular test results from at least 2 consecutive nasopharyngeal swabs collected at intervals greater than or equal to 24 hours.
- People with a positive laboratory result for COVID-19 who have not had any symptoms: waiting at least 10 days since first positive diagnostic test for COVID-19 and having had no subsequent illness.

Preparing the patient before dental care involves the cleaning of face and hands, as well as the use of preprocedural antiseptic mouth rinses. Although the literature shows that the use of antiseptic mouth rinses reduces the microbial load in aerosols generated in dental care,[25-28] there is no scientific evidence of clinical relevance of this reduction in the prevention of SARS-CoV-2 transmission.[9,16,24] In addition, due to the high viral load present in airways and saliva, there is the possibility of oral cavity recontamination after the rinsing.[24] Although controversial, most documents recommend the use of preprocedural mouth rinses,[10,12-15,17-19,29] with particular emphasis in cases where rubber dam isolation cannot be employed.[30] Hydrogen peroxide was the most mentioned antiseptic substance,[10,12,13,17-19,29] followed by povidone-iodine.[10,12,17]

Dental setting preparation includes only exposing materials and instruments strictly necessary for the procedures, installation of barriers (plastic films) on frequently touched surfaces and on difficult-to-clean equipment such as keyboards.[9,15-17,19,29] Water reservoirs and lines should be checked to ensure a safe water supply for handpieces and air-water (3-in-1) syringes as a measure to reduce the risk of aerosol contamination.[9,10,11,13,16,18,31,32] It is recommended that 0.3 ml of 1% sodium hypochlorite be added to each 500 ml of water in the reservoir, with daily replacement of the solution after cleaning the containers.[10]

The measures to be adopted during the resumption of dental care are similar to those for the phase of restriction and include: hand hygiene, use of PPE and the employment of techniques to reduce aerosol generation. All documents mention hand hygiene as a critical measure in preventing SARS-CoV-2 transmission, which should be performed before and after contact with every patient, after contact with potentially infected material, and before and after the removal of PPE. The use of working uniforms, which should be removed before leaving the dental setting, was also recommended.[11,13,14-17,29]

PPE should be selected according to the procedure's profile and the transmission risk. Administrative staff should wear surgical masks during their entire stay in the dental office or clinic.[9,15-18,29] The respiratory protection of the dental team was the most controversial topic in the documents reviewed. Most of the guidance publications recommended the use of disposable surgical masks during non-aerosol-generating procedures,[10-15,19] while others recommended N95/FFP2 respirators.[9,16-18,29] Almost all documents recommended the use of respirators N95/FFP2/FFP3 for aerosol generating procedures (AGP), with the exception of publications from Germany and New Zealand, which limited the use of this equipment to dealing with suspected or confirmed cases of COVID-19.[14,19] This difference in approach might be due to the fact that these countries have implemented policies for mass testing and contact tracking. [33,34] All documents agree in indicating a disposable waterproof long-sleeve gownper patient and eye protection, which can be reused after cleaning and disinfection. [9,10,12,17,29] During AGP, face shields are more indicated since several studies have shown that dentists' faces are among the places most contaminated by aerosols. [35,36]

Aerosol control was a recommendation common to all documents, with an emphasis on the use of mitigation techniques such as: restricting or limiting the use of aerosol

generating devices,[9-19,29] rubber dam isolation,[9-19,29] high-volume suction[9-19,29] and avoiding intraoral radiographs due to the risk of coughing.[10,15,17,29] The use of devices such as high-speed handpieces, ultrasonic scalers, sodium bicarbonate jet and air-water (3-in-1) syringe generate splashes and aerosols that may be contaminated with microorganisms present in saliva, oropharyngeal secretions and biofilm.[32,37,38] Therefore, to reduce contamination it is essential to avoid or minimize the use of these devices.[9-19,29] In periodontics, the use of ultrasonic scalers and sodium bicarbonate jets should be avoided, with hand instrumentation being preferred.[10,11,15,16,19] The use of low-speed handpieces instead of high-speed devices is also a strategy mentioned.[11,14,15,17,19]

All documents advocated the use of rubber dam isolation to reduce the dissemination of droplets and aerosols, in addition to providing a protective barrier against contamination of saliva and secretions from the oropharynx.[23,24,30,32,39] The disadvantage of rubber dam isolation is the impossibility of its use in procedures requiring subgingival instrumentation and in periodontal procedures and surgeries.[39]

High volume suction for aerosol removal was recommended by all documents to reduce airborne contamination. A study that analyzed the number of colony forming units in bioaerosols generated during ultrasonic prophylaxis demonstrated that the use of preprocedural antiseptic mouth rinsing (chlorhexidine) associated with a high volume evacuator significantly reduced aerosol contamination ($P < 0.001$).[28] Even though the culture medium used in this study only allowed the assessment of aerobic bacteria growth, it reinforces the importance of these techniques in reducing aerosol contamination. However, for a better efficacy, the suction cannula must have a large diameter (8 mm or greater), be adapted to a powerful evacuation system (vacuum pump) and be kept at a distance between 6 to 15 mm from the tip of the ultrasound.[28,40,41]

Due to the great risk of airborne transmission from aerosol generating procedures, measures must be adopted to ensure proper ventilation, avoid contamination of areas adjacent to the consulting room and improve air quality.[42-44] The primary factor in the dissemination of airborne diseases is the ventilation of the environment. The greater the ventilation rate, the more diluted the airborne microorganism will be.[24,42,44] The following strategies are mentioned for improving ventilation: use of mechanical ventilation systems; use of air conditioning units in exhaust mode, never in recirculation mode; and keeping windows open during dental care.[9,42-44] Regular replacement of air conditioning filters is recommended, according to the technical specifications of the appliance or consultation with specialists in environmental sanitation engineering.[9,12,15,43]

Contamination of areas adjacent to the consulting room is prevented by correctly directing the airflow and using negative pressure systems. Doors should be kept closed and the entry of people limited, especially if AGP are being performed.[9-11,14,17,29,43] Air inlets and outlets must promote ventilation, always from the least to the most contaminated area of the environment.[9,15,17,18,36,45]

Negative pressure rooms are isolation environments that use a controlled air exchange system, in which the exhaust airflow rate is higher than the air intake. This pressure difference prevents contaminated air from escaping to adjacent areas such as corridors and waiting rooms.[44] As the air-change rate per hour is known, it is possible to accurately calculate how much time is needed for purging airborne contaminants from the room.[45] Negative pressure rooms are considered the safest environment for treating airborne diseases,[9,44] but adapting dental offices to this system requires specific knowledge and has a high cost.[24,42] Some documents mentioned the use of natural ventilation by keeping windows open during dental care.[10-12,15,17,29] This strategy is easy to implement, has low or no cost, but depends on climatic conditions and may allow contaminants to enter the dental setting.[42-44]

The use of portable HEPA filters is also mentioned as an option for improving indoor air quality.[9,10,15,17,23,39,43,45,46] These devices are highly efficient in filtering small particles, but do not ventilate the environment when used alone.[39,47] Its efficiency is influenced by its position in the work environment.[47] It has been demonstrated that aerosol contamination is greater within a radius of one meter from the patient's head,[24,36,38,48] therefore, to ensure greater filtering efficiency, this device should be positioned within this zone.[47] The filter should not be positioned behind the professional, between the professional and the patient or directing air flow to the professional's breathing zone.[9]

Regarding measures to be adopted after dental care, all documents state that used materials must be removed and sent for washing and sterilization. Protective barriers should be removed and used handpieces must be disinfected and sterilized.[10,15,18] Dental setting cleaning and disinfection may be performed immediately after the patient leaves when procedures performed do not involve aerosol generation.[10,15]

If AGP are performed, it is necessary to wait for suspended particles to settle down before carrying out cleaning and sanitation procedures.[9-13,15,18] The time required for air purging is controversial because there are no studies evaluating how long SARS-CoV-2 persists in aerosols generated by dental care procedures, nor the minimum infectious dose for airborne transmission.[24]

A study that measured airborne microorganism contamination during dental care showed that the concentration of airborne bacteria returned to normal levels within 10 to 30 minutes. This study associated a higher risk of air contamination in periodontal procedures using sonic

and ultrasonic instruments and recommends that, after the procedure is completed, a 30-minute interval should be respected before the entry of the next patient.[38] Another study that evaluated the dispersion characteristics of bacterial aerosols produced during ultrasound prophylaxis demonstrated that aerosols remained suspended in the air for 20 minutes.[36]

An experimental study conducted in the laboratory demonstrated that SARS-CoV-2 remained viable (infectious) for up to 3 hours in aerosols generated by a Collison nebulizer.[49] In another experimental laboratory study, researchers tested the stability and viability of SARS-CoV-2 viral particles associated with aerosols (<5 μm). Under environmental conditions of 23±2°C and 53±11% relative humidity, viable viral particles were detected at all times over a period of 16 hours (total time of the experiment).[50] However, both studies assessed aerosols that were confined to drums, therefore undiluted by air changes.[51] The longer suspension found in the second study may be possibly due to the use of a rotating drum, which may have prevented the settlement of viral particles in the environment.[52]

Although in real conditions the time for viral particles to settle is probably shorter, there are still no studies estimating how long it would take. But both studies point out that, in environments without air changes, the virus can remain infectious in aerosols for long periods. For this reason, experts in environmental sanitation engineering should be consulted in order to propose measures to increase air changes, in addition to properly positioning and directing air outlets.[9,10,17,43,46] The recommended air change rate should be at least 6 air changes per hour, without recirculation.[10,13,23,43,46]

Most documents mentioned that a 15-minute period is reasonable for particles to settle after AGP in neutral rooms,[9,10,12,15] while others mentioned periods of 10 minutes,[13,17] 30 minutes[24] and 1 hour.[11] The adjustment of the "post-AGP interval" must take into account factors such as the amount of aerosols generated, use of aerosol mitigation techniques, size of the room, rate of air changes per hour, possibility of natural ventilation, use of high-efficiency filtration devices and the patient's risk level.[10,13,53] For example, the post-AGP interval should be longer if the next patient to enter the room is from the risk group vulnerable to severe forms of COVID- 19. Likewise, the post-AGP interval should also be longer if an AGP was performed on a patient with suspected SARS-CoV-2 infection.

Cleaning should be carried out from the cleanest to the most contaminated area, with special attention to the area closest to the patient (reflector, chair, stand, exam stool).[10,12,17] All documents reinforce the need to clean frequently touched surfaces, such as switches, door handles, waiting room furniture surfaces, bathroom surfaces and taps. PPE use is mandatory for the dental worker responsible for cleaning and includes goggles, waterproof aprons, surgical mask or N95/FFP2 respirator if AGP are performed and thick gloves of a different color from those used in the processing of instruments.[1,10,15,29] Suction system hoses should be cleaned after each treatment with hypochlorite.[9-11,13,15,18]

The disinfectants that were mentioned the most were 70% alcohol[10,12,17,24,29,39] and 0.5% sodium hypochlorite.[10-12,15,17,18,24,29,39] Disinfection must be preceded by cleaning with neutral detergents, as organic matter can prevent the direct contact of the disinfectant with the surface and inactivate its germicidal properties.[10,14,15] Blends of quaternary ammonium compounds and biguanide can simultaneously clean and disinfect, optimizing the cleaning time between appointments.[10] Disinfectant sprays may not be effective, thus disinfectant application with disposable cloths or soaked tissues is recommended.[10]

Germicidal ultraviolet light is a disinfection method used in environments contaminated by airborne microorganisms, and can be used as an adjunct to improve air quality and disinfect surfaces.[9,10,17,32,54] However, the use this method depends on expert evaluation, since exposure time, dose, ventilation, humidity and ambient temperature need to be adjusted for ensuring its effectiveness.[10,54] As UV irradiation is absorbed by the skin and eyes, dermatosis and photokeratitis (inflammation of the cornea), with or without keratoconjunctivitis (inflammation of the conjunctiva), are reported occupational complications.[54] As it is a complementary procedure, manual methods of surface disinfection should also be used.[10] Its high installation cost is another mentioned disadvantage.[32]

Finally, regarding after-care measures, many documents recommend the monitoring of patients and health professionals for symptoms of COVID-19.[9,10,13,14,16] Return-to-work strategies that may adopted for health professionals recovered from COVID-19 are shown in chart 1.[9,10]

All of these recommendations are prophylactic measures to avoid cross-contamination; however, it is not possible to guarantee the total elimination of risks.[24,30] Due to the impracticality of reliably performing quick exams before dental care and the possibility of asymptomatic transmission, these measures should be adopted for all patients.[1] Table 2 summarizes the adjustments that should be made in the new normal of dental care, pointing out the similarities and discrepancies between documents.

As with any scientific study, ours has limitations. Some of them are due to the lack of studies assessing stability of SARS-CoV-2 in aerosols in environments with air changes and minimum infectious dose. There is also a

need for clinical studies that prove the effectiveness of preprocedural antiseptic mouth rinses in reducing the risk of transmission of SARS-CoV-2. Finally, there is a dearth of documents addressing infection control measures during the resumption of dental care, which made it difficult to compare the effectiveness of the recommendations provided in guidance documents t documents. As it is a new virus, we expect that in the future new publications will point to evidence that will demand further adjustments in dental care protocols.

Table 2: Similarities and discrepancies between the documents regarding the infection control measures recommended in the resumption of dental care.

Dental facility requirements	
Minimize the number of patients in the waiting room	Consensus
Arrange chairs with a minimum distance of 1 meter between them	Consensus
Do not allow or limit visitors accompanying patients in the waiting room	Consensus
Use of masks by patients, companions and staff	Consensus
Provide hand hygiene supplies	Consensus
Remove objects from the waiting room that may allow cross-infection	Consensus
Installation of acrylic barrier between reception area and patient	Consensus
Constant ventilation	Consensus
Provide dental care in individual rooms whenever possible	Consensus
Installation of partitions between chairs in open plan environments	Consensus
Minimum distance of 2m between each chair in open plan environments	Consensus
Provide dental care for patients with COVID-19 in respiratory protection rooms	Consensus
Before dental care	
Screening before scheduling (remote)	Consensus
Screening before appointment and temperature check	Consensus
Rapid point-of-care testing for COVID-19	Controversial
Preprocedural antiseptic mouth rinse	Controversial
During dental care	
Minimum exposure of objects, instruments and materials in the patient room	Consensus
Use of physical barriers on surfaces that are frequently touched and equipment that is difficult to clean	Consensus
Hand hygiene	Consensus
Use of personal protective equipment	Controversial*
Avoid or minimize use of aerosol-generating devices	Consensus
Prioritize hand instrumentation (avoid ultrasonic scalers)	Consensus
Avoid intraoral radiographs	Consensus
Rubber dam isolation	Consensus
Aerosol removal through high-volume suction	Consensus
After dental care	
Proper disposal of infectious waste	Consensus
Sterilization of all critical instruments, including handpieces	Consensus
Ventilation in the patient room	Consensus
Aerosol clearance time	Controversial
Cleaning and disinfection of the patient and reception rooms after each visit	Consensus
Use exclusive work clothes, washed separately with hot water	Consensus

* There is controversy only about respiratory protection. PPE: Personal protective equipment

Conclusions

During the phase of resuming elective dental care, much of the measures adopted during the activity restriction phase of the pandemic are expected to remain in place, especially regarding aerosol mitigation measures and air changes in the dental setting. The analysis of the documents allowed us to conclude that:

• There is a consensus on the requirements indicated for dental care facilities.

• Regarding pre-care recommendations, there is a consensus on the need to perform patient screening before (remote) scheduling and dental care. Schedules should allow longer intervals between patients to allow aerosol purging, cleaning of the room and avoid crowding. There is no consensus on the use of preprocedural antiseptic mouth rinses or on the systematic use of rapid tests before dental care.

• Recommended measures during dental care are reiterated in all documents, with disagreement only on the indication of the type of respiratory protection that should be used by the dental team.

• Regarding the measures to be adopted after dental care, there is no consensus on the minimum time required for the settlement of aerosol particles before cleaning the dental setting, although the documents analyzed in this review mentioned a period varying from ten minutes to one hour.

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Mini Curriculum and Author's Contribution

1. Vanessa Paiva Reis - DDS. Contribution: Literature review, preparation, writing and manuscript revision. ORCID: 0000-0001-7682-547X
2. Adriane Batista Pires Maia - DDS; PhD student. Contribution: Bibliographic survey, preparation, writing and manuscript revision. ORCID: 0000-0001-6081-707X
3. Adriana Raymundo Bezerra - DDS; MSc. Contribution: Preparation, writing and manuscript revision. ORCID: 0000-0001-9487-1904
4. Danielle Castex Conde - DDS; PhD. Contribution: Preparation, writing and manuscript revision ORCID: 0000-0002-8492-9145

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Corresponding author

Vanessa de Paiva Reis

E-mail: vanepreis1@gmail.com