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**Rational Perspectives on Risk and Certainty for Dentistry During the COVID-19 Pandemic****Rational Perspectives on Risk and Certainty for Dentistry During the COVID-19 Pandemic**

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**The risk of infection in dentistry**

The practice of dentistry exposes dental health professionals and patients to infectious disease agents.<sup>1</sup> The risk is considered to be higher in dental practices than in other health care settings, mainly because there is close and prolonged contact between provider and patient. In addition, most dental procedures generate aerosols that are contaminated with a patient's saliva, blood, other secretions, or tissue particles.<sup>2</sup> To control this risk, the U.S. Centers for Disease Control and Prevention (CDC) and other organizations developed recommendations and protocols based on the principle of standard precautions.<sup>3, 4</sup> The fundamental elements in these recommendations are the use of physical barriers between patient and provider, instrument sterilization, and environmental reprocessing.

SARS-CoV-2, the virus causing COVID-19, is transmitted primarily through respiratory droplets and aerosols when an infected person coughs, sneezes, or talks.<sup>5, 6</sup> In addition, there is evidence that pre-symptomatic or asymptomatic persons can transmit the virus. COVID-19 is of particular concern for dental settings because of aerosol-creating dental procedures.<sup>5, 6</sup> To address this, the CDC developed "Interim infection prevention and control guidance for dental settings during COVID-19".<sup>7</sup> The CDC's guidance states that the unique characteristics of the dental setting warrant special infection control considerations. In line with this, the Occupational Safety and Health Administration (OSHA) developed a COVID-19 workplace guidance document and an additional update entitled "Dentistry Workers and Employers".<sup>8, 9</sup> OSHA places dental health care providers in the "very high exposure risk" category in their recommendations for preparing workplaces for COVID-19, along with doctors, nurses, paramedics, and emergency medical technicians who perform aerosol-generating procedures on known or suspected COVID-19 patients. The CDC and OSHA, therefore, both stipulate that dental practices require enhanced precautions to protect the clinical team and patients from aerosols generated during clinical care. In addition, the CDC confirmed that care for dental emergencies should be provided at all times during a pandemic, but take into account the specific local risk scenarios.<sup>10</sup>

**The current status of COVID-19 among dental health care providers**

The CDC summarizes data from state health departments on SARS-CoV-2 infection including health care workers using a standardized case form. The CDC form does not differentiate between types of health care workers; specific information on COVID-19 among dental health care personnel is therefore not available.

The CDC published a summary report on the characteristics of U.S. health care personnel diagnosed with COVID-19 in the United States through April 9, 2020.<sup>11</sup> While only 16 percent of all reported total infections contained data on whether the reported individual was a health care professional (HCP), 19 percent of HCP were reported as positive. From this group, 55 percent mentioned contact with a COVID-19 patient only in the health care setting, and the remainder in other settings. Among those infected, 2%-5% were admitted to ICU, and 0.3%-0.8% died.

The CDC report warns that these numbers underestimate both, the infection and mortality rates, due to missing data and lack of information on the nature of interaction with suspected and/or confirmed COVID-19 patients.

It is essential to understand that the lack of reported COVID-19 infections among dental health care personnel should not be taken as evidence for low or negligible risk for those working in dental settings. Rather, the CDC report supports the guidance documents that dental personnel are at high infection risk in a droplet or aerosol-generating environment.

**Dental services during the U.S response to COVID-19**

In response to the rapidly evolving information and evidence, public health and professional organizations have taken the task of regularly reviewing and updating relevant information for dental services. To reduce infection spread during the COVID-19 pandemic, the CDC

recommended that dental care providers delay elective ambulatory care visits, aligned with the recommendations for medical services.<sup>7</sup> The American Dental Association (ADA), similar to other professional national and global organizations, developed guidance taking into account the CDC and OSHA recommendations.<sup>12</sup> In addition, the ADA also published clear definitions of dental emergencies to guide dentists in their decisions.<sup>13</sup> The majority of U.S. dental practices complied with the CDC, OSHA, and ADA advice by offering only emergency services or closing completely.<sup>14</sup> As states are beginning to lift restrictions on small businesses and dental practices, they are leaving the decision to re-open clinics to the individual practice owners and making it challenging to follow the multitude of rapidly evolving guidance. Updated information on state-by-state recommendations for dental services, prepared by the National Network for Oral Health Access (NNOHA) is available at website of the Association of State and Territorial Dental Directors (ASTDD).<sup>15</sup>

Even with re-opening recommendations of professional organizations, including bodies like the Organization for Safety and Asepsis Procedures in Dentistry (OSAP, [www.osap.org](http://www.osap.org)), the question for dental teams remains whether it is safe to provide care in dental practices, and what changes will be required to balance the need for care and the risks of doing so.<sup>12, 16</sup>

### **What we know about COVID-19 infection risk in dental settings**

Central to ongoing discussions around the re-opening of dental services is the evaluation of infection risk. In the absence of more detailed information, assessments of COVID-19 infection risk are done by extrapolation. Extrapolation is common in clinical and public health practice when knowledge and emergency context are rapidly evolving.<sup>17</sup> Such rapid recommendations or guidelines are often labeled as “interim.” That said, there are a number of facts that can provide

a sound basis from which principles for clinical care during the COVID-19 pandemic can be derived:

1) All patients should be considered potentially infectious

Transmission of SARS-Cov-2 can occur in pre-symptomatic or asymptomatic patients. In these encounters, medical history or body temperature offer no assurance of identifying infected individuals. Reliable and valid testing prior to dental care is not an option at this point in time because false-negative results cannot be ruled out. Also, vaccinations are not available, and the status of immunity after an infection is unclear. The only realistic and safe approach is to apply the principle of standard precautions. This means that, for now, all patients must be considered potentially infectious for airborne disease transmission and should be treated with equal and uniform precaution measures.

2) Droplets and aerosols are the primary sources of infection

COVID-19 is, therefore, an airborne infection because the primary sources of infection for SARS-CoV-2 are droplets and aerosols containing the virus. The practice of dentistry produces aerosols and droplets, involves direct contact with potentially infected mucosa, and comprises procedures that may induce gagging or coughing of patients, all carried out in close proximity to the patient's mouth and nose.<sup>18</sup> Dental practice exposes dental health personnel to these potentially infectious droplets and aerosols. Eliminating aerosol-generating procedures is the best protection. However, if care is acutely required and droplets are unavoidable, donning a comprehensive set of personal protective equipment (PPE) will reduce the risk of transmission. Such PPE is also used by respiratory therapists to intubate COVID-19 patients in health care settings. Other unique procedures for dentistry such as rubber dam, high-power suction, and physical barriers between patients and providers, may further reduce, but not eliminate the risk. Some novel aerosol scavenging systems (bioaerosol control devices) have been registered with

the FDA, but there is no information on their efficacy in preventing airborne infections, especially in a dental setting.

3) Airborne infections may require higher infection control measures than standard precautions

The 2003 CDC recommendations for infection control focused on bloodborne pathogens, including hepatitis and HIV, and were later updated to address risk reduction of airborne pathogens like tuberculosis.<sup>3, 19</sup> The latter guideline requires airborne infection isolation rooms (AIIR) using negative pressure ventilation to reduce airborne transmission risk. However, dental operatories are generally not designed as AIIR. Current clinical evidence indicates that for aerosol-generating procedures, enhanced PPE alone (handwashing, gloves, goggles, face shields, N95 face masks, and protective gowns), without AIIR, may reduce risk of transmission by approximately 90%.<sup>20</sup> Thus, a risk of transmission persists without AIIR, and infection with airborne pathogens cannot be ruled out. The current absence of evidence cannot be taken as evidence of absence.

4) Personal Protective Equipment (PPE) required for dental care should be as safe as possible

The CDC interim guidance for aerosol-generating dental procedures recommends the use of the highest level of PPE when treating COVID-19 patients.<sup>7</sup>

With the remaining uncertainties about transmission risk beyond the evidence above, it is an ethical imperative to assume that all dental patients should be considered as potentially infectious. In acting with the principle of not doing any harm, maximum protective measures should be taken. Combined with the design limitations of dental operatories to appropriately and safely handle the risk of SARS-Cov-2 transmission, any consideration about providing dental care other than interventions that do not generate aerosols must be made with utmost caution.

**Reconciling risks and uncertainties with safety and increasing service challenges**

Based on our current knowledge, the COVID-19 pandemic will change the way dental services are provided. Aerosols need to be controlled, while PPE measures and patient triage procedures need to be enhanced. The possible availability of a vaccine in the mid-term provides only limited assurance because it will take time to reach effective vaccination rates and resurgence of COVID-19 or other viral outbreaks are expected.<sup>21</sup>

Every practicing clinician, patients, staff, families, communities, and professional dental associations are at a crucial point of the pandemic. Dental health personnel are obliged to follow the ethical principle of providing the best possible dental care, including the elimination of potential risks and harms. At the same time, as owners of private practices or as health care companies providing dental services, they are facing existential impacts from reduced patient visits and loss of income resulting from service limitations or practice closures.

Reconciling the conflict of risking their life or their livelihood in the context of the COVID-19 pandemic is not a welcome or easy choice. Decisions in this context must be based on scientific evidence or sound guidance when the evidence is still evolving. Solutions and compromises need to be revisited as the pandemic, and economic conditions change.<sup>17</sup> A pandemic is a highly dynamic process with differing scenarios within a country or state. Containment measures may entail that strict service limitations are required in one location or circumstance, but not in another, or that conditions for re-opening of services vary depending on the pandemic evolution over time. For some settings, just the availability of PPE may be a major constraining factor. Whatever the scenario, it will have domino effects with serious impacts on all oral health stakeholders. These changes will include dental supplies and manufacturers, the insurance industry, dental education, and research.

Thus, there is an immediate and existential need for dentistry to develop rapid response protocols that limit the impact of this pandemic through the continued provision of safe dental care that minimizes risk and avoids procedures with aerosols. The concept of SAFE Dentistry (Safe Aerosol-free Emergent Dentistry) may be a step in this direction.<sup>22</sup>

The pandemic has also unmasked inequities that characterize access to dental care and financial coverage in the U.S. From this perspective, a better, more equitable system that ensures everyone's health and safety is needed. The profession needs to strive towards a future of oral health care that addresses population oral health needs, includes reliable surveillance to assess risk and outcomes, as well as improves preparedness and risk protection, while defining the best policy options for the current and future pandemics.

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