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The Impact of COVID-19 on the Oral Health of Patients with Special Needs

Ronald Ettinger, BDS, MDS, DDSc, DDSc(hc)[a],
Leonardo Marchini, DDS, MSD, PhD[b,*],
Samuel Zwetchkenbaum, DDS, MPH[c]

KEYWORDS

• Aged • Frail elderly • Special needs • Mental health • Oral health • COVID-19

KEY POINTS

- Among the populations most impacted by the COVID-19 pandemic were persons with special needs.
- Virtually all nonemergent dental care was strongly discouraged before the general population became eligible for receiving COVID-19 vaccinations.
- As a consequence of these new barriers, there was a large accumulation of dental needs in all populations, especially those with special needs, and particularly those requiring access to the operating room.
- The impact of COVID-19 resulted in dental offices being modified and upgraded to enhance infection control by adding a multitude of preventive equipment and procedures. Those procedures are sometimes overwhelming for persons with special needs.
- Alternatives to circumvent the impact of COVID-19 and reduce barriers to dental care for persons with special needs include teledentistry and noninvasive restorative techniques, as well as the use of silver diamine fluoride.

INTRODUCTION

The World Health Organization (WHO) on March 11, 2020 declared a global public health emergency because of infection by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes COVID-19.[1] SARS-CoV-2 is a retrovirus

[a] Department of Prosthodontics, The University of Iowa College of Dentistry and Dental Clinics, N-409 Dental Science, Iowa City, IA 52242, USA; [b] Department of Preventive and Community Dentistry, The University of Iowa College of Dentistry and Dental Clinics, N337-1 Dental Science, Iowa City, IA 52242, USA; [c] Oral Health Program, Division of Community Health & Equity, Rhode Island Department of Health, Center for Preventive Services, 3 Capitol Hill, Suite 302, Providence, RI 02908, USA
* Corresponding author.
E-mail address: leonardo-marchini@uiowa.edu

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with a single RNA strand presenting with 4 structural proteins: membrane protein, nucleocapsid protein, envelope small membrane protein, and spike glycoprotein.[2] The spike glycoprotein protrudes from the surface and binds to angiotensin converting enzyme 2 (ACE2) receptors to infect the epithelial cells of lung, heart, kidney, liver, gastrointestinal tract, and blood vessels. Under normal circumstances, ACE2 receptors help to regulate blood pressure, wound healing, and inflammation, as part of the renin-angiotensin-aldosterone system.[3] However, SARS-CoV-2 prevents ACE2 receptors from carrying out its normal function, which can cause severe inflammation and tissue injury.[4]

This virus is unique in that it has a high human-to-human transmission rate, but a lower fatality rate compared with other recent epidemics, such as the severe acute respiratory syndrome infection of 2003 and the Middle East respiratory syndrome infection of 2012. Although some persons infected by SARS-CoV-2 stay asymptomatic, COVID-19 symptoms include flulike symptoms, such as fever, dry cough, shortness of breath, headache, muscle pain, fatigue, anosmia, ageusia or dysgeusia, and diarrhea, which can progress to a severe form of viral pneumonia resulting in adult respiratory distress syndrome.[5] As SARS-CoV-2 spreads among different populations, it continually mutates into new variants. Several of these new variants have been shown to be more aggressively transmittable, as they spread more easily and quickly.[6] However, evidence has shown all the current vaccines are effective in preventing serious disease caused by these new variants.[7]

Although people of all ages may be infected, the majority (80%) of COVID-19 infections occur in adults aged 30 to 69, and mortality increases with age and the presence of comorbidities.[4] Death rates vary from 1 in 900 persons aged 18 to 29 years to 1 in 3 aged 85 years or older.[8] Most children and adolescents infected by SARS-CoV-2 have mild or no symptoms, but may have high viral loads and can spread the infection.[9] However, a small number can develop multisystem inflammatory syndrome.[10] The symptoms resemble Kawasaki disease, which is an acute febrile illness that has systemic vasculitis and involves the heart, resulting in coronary artery aneurysms leading to sudden death. Children presenting with these symptoms will need support in pediatric intensive care units to survive.[11]

Primary risk factors, besides older age, include hypertension, immunocompromised state, obesity, diabetes, chronic heart, liver, kidney and lung diseases, and also dementia.[12,13] According to the Centers for Disease Control and Prevention (CDC), persons with chronic medical conditions who are diagnosed with COVID-19 are 6 times more likely to need hospitalization, and 12 times more likely to die of the disease.[14] Persons with HIV infection or other immunocompromising conditions, such as those who have had a solid organ transplant, or who are taking immunosuppressant drugs owing to other conditions, are at very high risk of becoming infected by COVID-19, with a higher risk of dying of the disease, but they were not included in the large vaccine trials. However, recent data have shown many of these individuals do respond adequately to vaccinations for COVID-19, which may reduce their risk for infection if they receive the appropriate vaccinations.[15]

Before the development of vaccines, those most at risk were older adults living in long-term care facilities (LTCFs).[16] However, it must be noted persons with intellectual and developmental disabilities (IDD), especially those with Down syndrome and those who are immunocompromised or suffering from a major chronic disease, are at higher risk for COVID-19.[13] People with IDD and a positive diagnosis for COVID-19 showed higher rates of comorbidities, such as hypertension, heart disease, respiratory disease, and diabetes, which resulted in greater severity and mortality from COVID-19.[17] In fact, an analysis of claims data highlighted patients with developmental

disorders of speech and language, developmental disorders of scholastic skills, and central auditory processing disorders had the highest odds of dying of COVID-19.[18]

Persons living in LTCFs are at higher risk for infection because of close communal living, as few residents have individual rooms, which does not allow appropriate social distancing.[13] Many of their caregivers have limited access to formal education and received minimal training, are required to use public transport, and live in multigenerational households that puts them at a higher risk of getting infected and transmitting the virus to the LTCFs residents.[19] Initially, there was a significant shortage of personal protective equipment (PPE) in LTCFs, which increased the risk of infection for the residents and staff.[16]

The initial impact of COVID-19 on society (March 2020) was to shut down businesses and quarantine populations, except for essential services. Hospitals and intensive care units were overrun by the first wave of severely sick patients with COVID-19, resulting in regional shortages of PPE and ventilators.[20] Business closures and quarantine caused job losses and consequently food insecurity[21] and loss of health insurance, including dental benefits.[22] More than 16 million persons lost their employer-sponsored dental insurance, which resulted in a decrease in routine checkups, hygiene visits, and fluoride applications, but an increase in tooth extractions.[23] Reduced incomes also forced many families to change to a cheaper and more cariogenic diet.[24] The isolation resulted in heightened stress levels, which increased tobacco, alcohol, and drug use.[25] There was also an unequal impact on different socioeconomic groups, for instance, white collar workers could use computers to work from home as opposed to many blue collar workers, who lost their jobs.[26] Many childcare facilities were closed and schools went virtual, which limited parents, especially women, from going to work. It was particularly stressful for children with learning disabilities and those with special needs, as well as their caregivers.[27]

Initially, all health care facilities, public and private, were encouraged to provide only emergency services, and elective procedures were suspended.[28] This situation had a significant impact on the provision of health care as well as oral health care.[29] The greatest impact was on the residents of LTCFs, where there were high rates of infection resulting in death.[16] The LTCFs responded by allowing only their salaried staff to enter the building and interact with the residents. Historically, persons living in LTCFs as well as those with special health care needs have received inadequate oral health care owing to a multitude of barriers, ranging from complex health histories to reduced socioeconomic status and transportation issues. The pandemic added another layer of barriers to providing appropriate dental care for these individuals.[30] The disruption of routine dental care and especially dental general anesthesia greatly impacted the population with special needs.[31]

The Special Care in Dentistry Association (SCDA) defines patients with special needs as those who have physical, medical, developmental, or cognitive conditions that limit their ability to receive routine dental care. This includes people of all ages. However, in this article, the authors focus only on adult patients, as children have different needs. The emphasis of this article is on the consequences of COVID-19 on oral health and disease among patients with special needs, as well as how dentists and dental care for this population have responded to the challenges posed by the pandemic.

CONSEQUENCES OF COVID-19 ON ORAL HEALTH AND DISEASE

At the beginning of the pandemic, as stated earlier, the CDC advised all elective medical procedures should be suspended in order to save limited supplies of PPE and allow all available health care personnel to focus on caring for the persons infected

by COVID-19.[28] Dental offices were asked by the American Dental Association (ADA) and state health departments to limit care to emergency only and delay elective and routine care as the transmission mechanism of the virus was not fully understood.[29] However, this advice was based on literature showing medical procedures, such as intubation/extubation, bronchoscopy, ventilation, and airway suctioning, produced aerosols that transmitted infections.[32] In dentistry, most invasive procedures use ultrasonics, handpieces, air-water syringes, and lasers, which generate sprays, and a fraction of these sprays becomes aerosolized. By analogy with the medical procedures, the aerosols generated in dentistry were thought to be a potential mode of transmission of respiratory pathogens through saliva.[33,34] However, recent research has demonstrated SARS-CoV-2 transmission during dental treatments for asymptomatic patients is not as risky as initially thought, especially when infection-control procedures, such as high intraoral suction and preoperative rinses, are used.[35]

The suspension of elective dental care during the first 9 months of the pandemic delayed the provision of all routine care,[29,34] which allowed for an increase in the burden of dental and oral infections.[36] It has been reported the lockdown of the population was instrumental in causing food insecurity[21] and exacerbating depression, owing to job losses and isolation.[37] This scenario resulted in ingestion of a cheaper and more cariogenic diet,[24,38] which was associated with reduced self-care, including oral hygiene routines.[39] For persons with special needs who required help with their daily oral hygiene, another issue was that some caretakers were hesitant to help them with oral hygiene because of fear of infection.[30] Associated with reduced access to routine preventive dental services caused by the pandemic, the lack/reduction of oral hygiene routines may have led to further oral health deterioration among persons with special needs.[40]

Even among persons with special needs, some were at higher risk of oral health deterioration, for instance, persons with reduced manual dexterity, such as those persons who had rheumatoid arthritis, which makes it difficult for them to hold and manipulate a toothbrush. This also includes persons who have had a stroke that involved their dominant hand. Some of these individuals can perform their own oral hygiene procedures again by modifying toothbrushes to fit their particular problems. In some situations, using an electric toothbrush can help; others will need to depend on family and caregivers.[41] All of this population's problems were exacerbated by COVID-19, because of a lack of access to health care personnel and fear of infection by their caregivers.[30]

Individuals who have lost or are losing their vision may also be at risk for rapid oral health deterioration if they need help from others,[42] especially during the pandemic. Persons presenting with progressive cognitive decline, such as with Alzheimer disease and related dementias, as well as those with severe intellectual disabilities, who traditionally have required help with maintaining their activities of daily living (ADLs), including oral hygiene routines, became at greater risk for rapid oral health deterioration.[43] If they were living in communal housing, or LTCFs, they were at particular risk of being infected by COVID-19.[13] The reasons for this increased risk were these facilities did not have independent rooms for their residents to isolate those who were infected with COVID-19. Also, many of their caregivers lived in multigenerational houses, and many needed to use public transport, which put them at risk of being infected by COVID-19. These persons could not stop working for 2 weeks or more in order to abide by quarantine guidelines, and so carried the infection into the LTCFs.[19]

Persons who have cognitive impairment may have difficulties following CDC guidelines for safe practices during the COVID-19 pandemic. These individuals may not

tolerate wearing masks, be unable to refrain from the need to physically touch surfaces, or understand appropriate social distancing, or the needs for using alcohol-based hand sanitizer or handwashing. This becomes a problem when these persons enter a dental office, and so require the staff and clinicians to be more vigilant and take extra precautions to protect themselves and other patients with appropriate countermeasures. However, the use of face masks and shields may stress people with cognitive impairment and create a barrier for hearing-impaired persons, because they cannot hear well or lip read, which may severely affect communication and informed consent.[19]

Another oral complication associated with the pandemic was an increase in the prevalence of sleep and awake bruxism.[44] During the pandemic, an electronic survey of a Brazilian adult population revealed bruxism increased significantly, and 47.8% of participants reported clenching and grinding caused them myofascial pain.[44] A possible cause for this increase in bruxism and oral facial pain was the stress caused by the pandemic lockdown, which was described as a major life stressor in another electronic survey.[45] In the same survey, COVID-19-related stress and depression were strongly correlated with orofacial pain.[45] During the pandemic in China, an online questionnaire, which included a general population, as well as patients with temporomandibular disorders (TMD), revealed persons with TMD reported higher levels of anxiety and depression than the general population.[46]

Several reports[47–49] have described various opportunistic fungal infections, recurrent and herpes simplex virus infection, unspecific oral ulcerations, and gingival infections associated with COVID-19. The most common explanation is that these oral infections are related to decreased salivary flow and an impaired immune system in patients with SARS-CoV-2 infection.[47] A recent article listed the most frequent oral manifestations presented by patients who have had COVID-19 infection. Overall, 84% of the patients had an oral manifestation, which were altered taste (42%), altered smell (39%), salivary gland ectasia (38%), white tongue (28%), dry mouth (24%), and facial muscle weakness (18%). Other oral manifestations were oral ulcers, abnormalities of the temporomandibular joint (TMJ), facial tingling, and trigeminal neuralgia.[49]

Access to operating room time for dental procedures, especially for children and adults with special needs, has been a problem long before the pandemic. However, because of COVID-19, hospitals limited access to their operating rooms even further, except for medical emergencies. Consequently, patients with special needs who could only be treated under sedation or general anesthesia had their appointments curtailed. When vaccines became available and hospitals began to allow elective procedures, competition from medical surgeons resuming elective medical procedures boosted long waiting times for oral health-related procedures, except for emergencies, such as significant pain, disseminated infection, and uncontrolled bleeding. Select health system requirements for pre-procedural COVID-19 testing also adversely impacted access to dental care for persons with special needs who could not tolerate such testing. The consequences of these delays have resulted in a higher rate of unrestorable teeth, which can only be extracted. It has been suggested COVID-19 has legitimized and sustained the bias for denial of access to operating rooms for dental procedures.[50]

HOW IS DENTISTRY ADAPTING TO PROVIDE CARE FOR PERSONS WITH SPECIAL NEEDS AS A RESULT OF THE PANDEMIC?

The initial response to the pandemic was to discontinue all routine and elective dental services, especially those of private practitioners.[29,34] As more knowledge about

SARS-CoV-2 became available, dental offices adapted by improving air filtration with HEPA (high-efficiency particulate air filters) aided with UV radiation.[51] Also, infection control procedures were enhanced by the use of nebulizers, upgraded PPE, which included face shields, eye-protection goggles, N95 respirators, impermeable gowns, and surgical caps[29] (**Fig. 1**). Protocols were developed, which included contacting the patient by telephone or interviewing the patient through virtual conferences to determine their health status and needs.[29] When dentists were allowed to open their offices for nonemergency care, patients were only allowed into the waiting room at the time of their appointment after a temperature check. Accompanying persons were discouraged, and all persons were required to wear masks and social distance from each other, unless they were related. Plexiglass shields were erected between the patients and the front desk staff (**Fig. 2**), who were also wearing masks. These new protocols were overwhelming, especially for older adults, and confusing for patients with special needs.[19] The face shields and N95 respirators reduced the ability of patients with limited hearing capacity to understand questions or directions from the clinician. However, for patients who were deaf or needed to lip read to understand verbal communications, the facial barriers simply precluded communication.[52]

A group of patients who have reacted negatively to the enhanced protections used by the dental profession during the pandemic are those with cognitive impairment, mental health issues, dementia, and developmental disabilities. These patients cannot process what is happening or why people are behaving so differently from what they were used to. Their reactions may have ranged from being afraid to being overtly aggressive and on occasion trying to look under the masks. As a result, it became more difficult to treat these persons in the ambulatory setting, as they became more dental phobic than previously.[19,52]

Patients with reduced mobility who were unable to use regular public transport also faced new barriers owing to COVID-19.[53] Wheelchair-adapted vehicles and ambulances were fully engaged in transporting patients with COVID-19 to and from

Fig. 1. Enhanced PPE used after COVID-19, included head covering, N95 mask covered by a surgical mask, and a face shield.

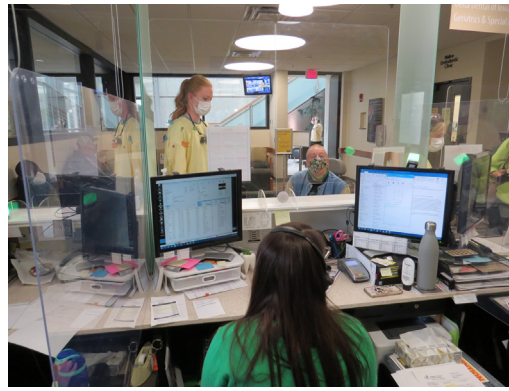

Fig. 2. Plexiglass barriers to protect patients and front desk personnel from cross-contamination by airborne particles.

hospitals, leaving no room for nonemergency transportations to and from dental facilities. If they were living in a LTCF, transportation supplied by the LTCF was only available to a hospital. Patients with reduced mobility often require more frequent recalls to maintain the health of their dentitions, and COVID-19 did not allow for these visits, increasing the patient's risk for rapid oral health deterioration.

When dental offices resumed routine care, in-office procedures were modified, which included the reduction of aerosol-generating procedures (AGPs), such as the use of handpieces and ultrasonic scalers. External suction devices (**Fig. 3**) were added to enhance aerosol reduction when combined with intraoral high-volume suction.[4] To reduce aerosols during professional tooth cleaning, hand scalers were used instead of ultrasonic scalers for plaque and calculus removal. To prevent aerosol production during caries removal, conservative procedures, such as the use of hand excavation, atraumatic restorative treatment (ART) technique, and silver diamine fluoride (SDF), were used to treat caries.[19]

The ART technique consists of manual soft caries excavation followed by the application of glass ionomer cement (**Fig. 4**) using cotton-roll isolation. ART is simple and might reduce patient anxiety and discomfort during caries removal. As a consequence, ART has been extremely successful for caries management for frail older adults and especially for persons with special needs. Long-term observations of ART-restored teeth showed similar survival rates to conventionally restored teeth.[54]

Fig. 3. External suction device is shown in the clinical setting during the restoration of a tooth, using a high-speed handpiece.

Fig. 4. A glass ionomer restoration done by the ART technique can be seen on tooth number 22 for a noncooperative, cognitively impaired 72-year-old patient showing poor plaque control, and chronic gingivitis with loss of attachment. ART was used to avoid generating aerosols by the use of a handpiece, as well as to provide a less traumatic experience for the patient, by reducing noise, and the use of local anesthetic.

When providing care outside of the dental office for frail older adults and persons with special needs or to patients with limited cooperation in the dental chair, ART has been shown to be particularly useful, cost-effective, and well accepted by patients.[55,56]

In many countries, SDF has been used to arrest and prevent caries for a long time, but it has only been available in the US market since 2014. SDF consists of 24% to 27% silver, 7.5% to 11.0% ammonia, and 5% to 6% fluoride.[57] Silver ions provide the antibacterial effect, by destroying the cell wall, denaturizing cytoplasmic enzymes, and inhibiting DNA replication. Fluoride and ammonia improve formation of fluorapatite and enhance remineralization.[58] Applying SDF is relatively easy and inexpensive, and it has been proven to be safe[59] (**Fig. 5**). As a result, SDF is very effective for caries prevention and arresting caries among frail older adults,[60,61] as well as for persons with special needs.[62]

Teledentistry was seldomly used before the pandemic. During the crisis, teledentistry was used to evaluate patients who were medically compromised and were unable

Fig. 5. The application of SDF for an intellectually disabled older adult with a history of interproximal caries. The lesion on tooth number 21 is situated partially subgingivally and will be very difficult to restore without crown lengthening, which was rejected by the power of attorney. The use of SDF will arrest the caries and allow for a less invasive procedure and so prolong the survival of the tooth.

to visit a dental office because of their health, increased risk for infection or because they were quarantined.[63] It also became an important tool for diagnosis, management, prevention, and provision of psychosocial support for patients through telephone and online consultation. For example, teledentistry is a cost-effective way to screen and evaluate any patient who has acute dental pain. These patients may need a prescription for analgesics, or if they have a facial swelling, an antibiotic. A decision needs to be made if the patient can be treated in the dental office or if he or she needs to be referred to a hospital emergency department that has a dental service. It also has become useful to monitor patients who have had an invasive procedure recently performed in the office. Teledentistry has also been used to guide patients and caregivers in self-management, especially for patients with bleeding disorders, such as hemophilia.[64] In addition, teledentistry can help to guide caregivers in placement of fluoride varnish and SDF for patients living in LTCFs.[65]

It has been suggested teledentistry is not a substitute for in-office treatment for the most common dental diseases. However, for patients living in rural areas, for patients living in LTCFs, and for those with mobility or transportation problems, teledentistry may be beneficial by providing oral health advice.[66] When using teledentistry, dentists should only consult with their own patients or with patients who have been referred to them. The protocol requires the dentist to properly identify the patient and have the patient's clinical record available. There is a need for the dentist to provide the patient with information about the limitations associated with a consultation via teledentistry. A detailed record of the appointment must be written into the patient's record at the end of the teledentistry appointment.[30]

The development of vaccines helped to change the environment. Persons living in LTCFs, those over the age of 80, persons with special needs, including persons with multiple comorbidities, and health care professionals were prioritized to receive the first available vaccinations. In most states, all hospital-based health professionals (including dentists) were vaccinated first. Community-based health professionals were the next to get vaccinated, and it included most of the dentists. However, in some states, dentists and other dental personnel were assessed at a lower tier among health care professionals to be vaccinated.[67] Concomitantly, more has been learned about the virus, and the guidelines from the CDC have been changed and updated. As a result, dental care has become normalized, but many of the procedures used for enhanced infection control have been incorporated into the "new normal." In addition, oral health professionals who care for patients with special needs are now needing to deal with the accumulated disease owing to nearly a year of limited care.[36]

The use of enhanced PPE and reduced scheduling owing to COVID-19 has resulted in increased baseline costs for dental practices. For these changes to be sustainable, patients and insurance companies will need to reimburse the dentist to cover these higher costs. Currently, some dental insurance companies are paying a limited fee to support teledentistry and providing some support for PPE acquisition. The ADA supports dentists charging a fee for the increased costs associated with treating patients during the pandemic. Oral health professionals and organized dentistry will need to lobby for changes in reimbursement rates from third-party companies to cover the additional costs.[68]

SUMMARY

Due to the spread of COVID-19, the WHO declared a global public health emergency (pandemic) in March 2020. Because of the pandemic, all non-urgent medical and dental care was suspended, and the shutdown disproportionally affected persons

with special needs. The SCDA defines patients with special needs as those who have physical, medical, developmental, or cognitive conditions that limit their ability to receive routine dental care. This includes people of all ages. However, in this article, the authors focused only on adult patients.

Persons with special needs have a higher risk of morbidity and mortality if they became infected with COVID-19. The reasons for this are many of them have comorbidities and live in communal societies, where they receive supportive care from staff who themselves are at risk of infection because they live in multigenerational households and often need to use public transportation. Because of the pandemic, access to medical and dental services was limited to emergency care. Telehealth, including teledentistry, evolved as a method reaching these and other at-risk populations. Teledentistry was used to provide diagnosis, management, prevention, and provision of psychosocial support for these populations. Acute orofacial pain and/or infection could be managed by prescriptions of analgesics and antibiotics or, if necessary, referral to a hospital emergency department.

When elective dental care was resumed, dental offices adopted many procedures to minimize the risk of airborne infection. These procedures included improving the air filtration systems by using UV light and efficiency particulate air filters, more rigorous surface disinfection, enhanced PPE, including N-95 respirators, face shields, impermeable gowns, and head caps. Clinically, to reduce aerosol contamination, high-speed suction associated with extraoral suction devices was used. Also, more dentitions were hand scaled, and where possible, the concept of minimally invasive dentistry, including the ART technique and SDF, was used to manage caries.

CLINICS CARE POINTS

- The burden of oral health problems during the COVID-19 crisis was more intense for persons with special needs or residents of long-term care facilities.
- Changes in oral health care protocols owing to COVID-19, especially social distancing and having dental personnel wear face shields and masks, inhibited communication and exacerbated fears for persons with special needs (mainly those with hearing impairment, cognitive impairment and mental health problems).
- The expansion of the use of teledentistry was beneficial for the dentist as well as for persons with reduced access to dental facilities, especially those with special needs.
- The need to reduce aerosol-generating procedures resulted in the increased use of the atraumatic restorative treatment technique, the use of silver diamine fluoride, and the use of hand scalers for calculus and plaque removal.
- The enhanced preventive procedures and personal protective equipment, caused an increase in baseline costs for the dentist, which has made oral health care more expensive. Only some insurance companies have been prepared to subsidize these costs.

DISCLOSURE

The authors have nothing to disclose.

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