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Interim Guidance for Dentist Anesthesiologists Practicing in the Office-Based Setting During the COVID-19 Pandemic

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KEY POINTS

- The primary routes of transmission of SARS-CoV-2 (the causative agent of COVID-19) are through contact and respiratory droplets (particles 5-10 μm). Case reports suggest that certain procedures, particularly those in the nasopharyngeal region, may release virus-containing aerosolized particles (particles less than 5 μm) that can exist in the air for an unknown amount of time.
- In addition to our proximity to patients, dentists and anesthesia providers are at a higher risk of exposure due to aerosol-generating procedures (AGP) such as positive pressure ventilation, endotracheal intubation/extubation and many dental procedures.
- Current evidence shows that pre-symptomatic or asymptomatic individuals, including children, can transmit the virus. Dentist anesthesiologists should therefore treat all patients as potentially infected, particularly in places with ongoing community spread.
- This Interim Guidance is intended for the anesthesia provider *in the dental office setting* during the COVID-19 pandemic and will be updated as necessary. Dentist anesthesiologists can significantly reduce their exposure and community transmission by modifying existing protocols and following appropriate precautions.



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The American Society of Dentist Anesthesiologists (ASDA) considers the safety of dentist anesthesiologists to be of critical importance. This interim guidance specifically addresses dentist anesthesiologists practicing in an office-based setting. These recommendations are based upon information currently available. Due to the evolving nature of this disease process, this guidance will change and be updated. **The ASDA does not endorse any particular product and lists examples simply for discussion purposes.** Please consult the CDC¹ website regularly for the most up-to-date information.

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BACKGROUND OF PANDEMIC

Summary

The current pandemic of respiratory disease spreading from person-to-person is caused by a novel coronavirus (SARS-CoV-2), which can develop into COVID-19 (coronavirus disease 2019). COVID-19 is the third novel coronavirus infection in two decades that was originally described in Asia, after Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). Coronaviruses are a large family of viruses that are common in humans and in many different species of animals, including camels, cattle, cats, and bats. Rarely, animal coronaviruses can cross species and infect people and then spread between people as occurred with SARS-CoV, MERS-CoV, and now with SARS-CoV-2².

Clinical Course

The complete clinical picture with regard to COVID-19 is not fully known. Reported illnesses have ranged from very mild (including some with no reported symptoms) to severe, including death. The most common symptoms are fever, dry cough, fatigue and dyspnea. Less common symptoms include **recent loss of smell or taste, headache** and diarrhea. The median time from symptom onset to the development of pneumonia is approximately 5 days and the median time from symptom onset to severe hypoxia and ICU admission is approximately 7-12 days.

The incubation period (the time from exposure to development of symptoms) of SARS-CoV-2 and other coronaviruses (e.g., MERS-CoV, SARS-CoV) ranges from 2–14 days. The onset and duration of viral shedding and the period of infectiousness for COVID-19, however, are not yet clear. This complicates the job of anesthesia providers as it must be assumed that all patients are capable of transmission regardless of symptoms.

Older people (≥ 65 years old) and people of all ages with severe chronic medical conditions seem to be at higher risk of developing serious COVID-19 illness. Recent case reports have described severe hypoxemia without dyspnea and **unusual presentations of acute respiratory distress syndrome (ARDS). COVID-19 also induces a hypercoagulable state that is evidenced by elevated D-dimer levels, leading to microthrombi development which further compromises respiratory function. Whereas COVID-19 is considered primarily a respiratory infection, significant effects have been noted on the cardiovascular, immune and other systems. Patients with preexisting cardiovascular conditions represent large proportions of patients with symptomatic infection, with disproportionately worse outcomes and between 5-10-fold increase in mortality³.**

Routes of Transmission

Current evidence suggests that SARS-CoV-2 is primarily transmitted through droplets (particles diameter 5-10 μm). Person-to-person transmission largely occurs when an individual with the infection emits droplets containing virus particles while coughing, sneezing, and talking. These droplets land on the respiratory mucosa or conjunctiva of another person, usually within a distance of 6 ft (1.8 m) but perhaps farther⁴. The droplets can also settle on stationary or movable objects and can be transferred to another person when they come in contact with these fomites. Survival of the virus on inanimate surfaces has been an important topic of discussion. While there is a dearth of evidence, what is available suggests the virus can remain infectious on some inanimate surfaces at room temperature for up to 9 days. This time is shorter at temperatures greater than 86° F (30° C). The good news is that cleaning and disinfection are effective in decreasing contamination of surfaces, emphasizing the importance of proper infection control, particularly in dental offices.

Airborne transmission is different from droplet transmission as it refers to the presence of microbes within droplet nuclei less than 5 μm in diameter, which can remain in the air for long periods of time and be transmitted to others over greater distances⁵ (>1m). In the context of COVID-19, airborne transmission may be possible in specific circumstances and settings, including those in which aerosolization occurs. Previous studies of SARS-CoV identified tracheal intubation as a significant risk factor for transmission of SARS-CoV to Health Care Workers (HCWs)⁶.

In a recent study of environmental sampling in rooms of patients with COVID-19, many commonly used items as well as air samples had evidence of viral contamination⁷. In the context of the heterogeneity in evidence and possibility of aerosolization of the virus during certain medical procedures, public health agencies, including the Centers for Disease Control and Prevention (CDC) recommend airborne precautions in situations involving patients with COVID-19. This evidence in addition to extrapolated data from SARS-CoV indicates that transmission through aerosols is likely, particularly with procedures such as endotracheal intubation, positive pressure ventilation and dental procedures. Without

adequate testing, it is prudent to practice airborne precautions with any aerosol-generating procedure because asymptomatic patients are known to contribute to the transmission of the virus.

PREOPERATIVE CONSIDERATIONS

Dental Health Care Personnel (DHCP)

Dental health care personnel (DHCP) includes all clinical and administrative staff working in the dental office. All DHCP should self-monitor by remaining alert to any respiratory symptoms (e.g., cough, shortness of breath, sore throat). Additionally, they should check their temperature twice a day, regardless of the presence of other symptoms consistent with a COVID-19 infection. If the temperature is $\geq 100.4^{\circ}\text{F}$ (38°C), they should not be in the dental office. Dental offices should create a plan for whom to contact if an employee develops fever or respiratory symptoms to determine whether medical evaluation is necessary⁸. **All DHCP should don a face covering (e.g., surgical or cloth mask) at all times in the dental office. As testing becomes more widely available, a strategy should be developed to allow for appropriate testing for DHCP.**

The number of personnel in the treatment room should be limited to those essential for patient care and procedural support with minimal exchange of staff for the duration of the case.

Facility

Dentist anesthesiologists commonly provide care in multiple offices so it is important for them to contact their operating dentists to help ensure the facilities they will be practicing in are following recommendations and mandates by appropriate state and federal agencies regarding SARS-CoV-2. Further, fitness of the facility to provide sedation or general anesthesia in a way that minimizes the risk of COVID-19 infection to the patient requiring treatment, subsequent patients and the clinical team must be determined. This includes factors such as the size, isolation and ventilation of the operatory, scavenging, the availability of all required personal protective equipment (PPE) and appropriate intubation armamentarium. Ideally, the dental procedure and recovery will take place in one room with a closed door to prevent aerosols from entering other sections of the office.

Screening patients *prior* to entering the facility is important for all DHCP. **Before entering the reception room, patients and escorts should put on a face covering such as a surgical or cloth mask.** Reception rooms should provide supplies for respiratory hygiene and cough etiquette, including alcohol-based hand rub (ABHR) with 60-95% alcohol, tissues, and no-touch receptacles for disposal⁹. **Reception areas should be arranged such that 6 feet is observed between each individual, and all magazines, toys and inanimate objects difficult to disinfect are completely removed.** It may be prudent to have patients wait outside of the facility until the clinical staff is ready for the dental procedure to minimize contact with staff or other patients.

Screening Patients and the Escort Prior to the Visit

To limit direct patient interaction and exposure, pre-operative evaluation should be conducted via telecommunication (phone or video conference) as much as possible. It is important to screen patients *and* the escort who will be caring for them after the procedure. **When possible, only one person should be in the dental office to escort the patient. All other family members should wait in an area outside the office building, consistent with social distancing measures. If another person must be present (like an interpreter), that person must also be screened appropriately.**

SCREENING RECOMMENDATIONS FOR PROSPECTIVE PATIENTS AND ESCORTS

- In the past 14 days, have you
 - Tested positive or been diagnosed with COVID-19?
 - Been under investigation for possible coronavirus infection?
 - Experienced a loss of taste or smell or flu-like symptoms such as fever, cough, shortness of breath, body aches or diarrhea?
 - Have you been in close contact with another person who has been diagnosed with or under investigation for COVID-19?

Patients who respond 'yes' to any of these questions should not come into the dental office and should be encouraged to contact their primary care physician (PCP) for treatment recommendations. They can also be referred to dental facilities with airborne precautions (e.g., dental schools or hospital dental services) for emergency dental care.

- On the day of the procedure, ask screening questions again and take the temperature of the patient and the escort
 - If 99-100.4° F (37.2-38° C), consider the source of the fever (e.g., dental infection) and decide clinical course
 - If $\geq 100.4^{\circ}$ F (38° C), assess any difficulty with breathing
 - If none, defer treatment and have the patient follow up with their PCP if things worsen
 - If breathing difficulty is observed, consider calling 911 or referring the patient to the emergency room

According to the CDC, people who have been diagnosed or suspected as likely to have contracted COVID-19 and who have completed home isolation or hospitalization can receive urgent dental care¹⁰. This is decided using two strategies: a non-test strategy and a test-based strategy.

- **Non-test strategy:**
 - **At least 3 days (72 hours) have passed since recovery (resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms), *and* at least 7 days have passed since symptoms first occurred. Consider waiting 4 – 6 weeks from resolution of symptoms based on the urgency of procedure and level of procedural sedation or general anesthesia required.**
- **Test-based strategy:**
 - **Patients with laboratory-confirmed COVID-19 *without* symptoms: At least 7 days have passed since the date of the first positive COVID-19 diagnostic test without subsequent development of illness.**
 - **Patients with laboratory-confirmed COVID-19 *with mild/moderate* symptoms: Resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms (e.g., cough, shortness of breath) *and* negative results of an FDA Emergency Use Authorized molecular assay for COVID-19 from at least two consecutive nasopharyngeal swab specimens collected ≥ 24 hours apart (total of two negative specimens). Consider waiting 4 – 6 weeks from resolution of symptoms based on the urgency of procedure and level of procedural sedation or general anesthesia required.**
 - **Patients who required hospitalization: Follow above strategy *and* assessment of persistent organ system dysfunction. Consider waiting 4 – 6 weeks from discharge based on the urgency of procedure and level of procedural sedation or general anesthesia required.**

Special Considerations for Patients at Higher Risk for COVID-19

Special considerations may be indicated for certain patient populations that have a higher risk of severe illness from COVID-19. This group includes patients 65 years of age and older and those with serious underlying medical conditions or who are immunocompromised. The most commonly reported underlying medical conditions associated with COVID-19 are cardiovascular disease, obesity, chronic lung disease, and diabetes mellitus. According to data comparing the severity of disease among COVID-19 patients in the United States, the highest percentage of severe outcomes occurred in people 85 years and older¹¹. As an added precaution, patients in these high-risk categories should be scheduled as the first patient of the day in the dental office in order to minimize the risk of exposure of SARS-CoV-2.

Patients who reside in nursing homes or long-term care facilities are also considered high-risk for COVID-19 due to a high incidence of medical compromise, increased age, and the need for significant personal interactions. Screening and verification of suspected and confirmed positive COVID-19 contacts at the nursing facility will aid in risk assessment. Patients who reside in these facilities should be considered as the sole appointment of the day, if possible, due to their vulnerability to infection and potential for virus spread once they return to their facility.

Patients with intellectual/behavioral disabilities and special healthcare needs can also present challenges when determining urgency of dental treatment and proper screening for COVID-19. These patients may have significant dental needs, yet may be unable to adequately communicate whether they are in pain or have difficulty eating. Since many of these patients require sedation/general anesthesia for even routine dental examination, the dentist anesthesiologist, treating dentist, and patient caregiver should collaborate in advance to determine the risk and necessity of intervention. Those with significant medical disabilities may be at higher risk of developing severe illness following exposure to SARS-CoV-2 virus, and additional precautions should be taken for those residing in nursing homes or long-term care facilities, as noted above. It is important to ensure that the caregiver bringing the patient to the dental office is also prepared to reduce community transmission, and that any additional consents required to provide dental and anesthesia care during this risk period are discussed with the legal guardian, if the patient cannot give consent on their own accord.

When possible, patients at higher risk for COVID-19 should wear a face covering when they arrive at the dental office and immediately after the dental procedure. The face covering should remain on until they exit the building.

Special Considerations for Patients Recovered from COVID-19

As the pandemic evolves, there is a growing population of recovered patients. The majority will not have developed serious illness; and, in fact, many will be unaware of a positive exposure to SARS-CoV-2 without a positive serology test to confirm antibodies. However, many unanswered questions will remain such as the adequacy and duration of immunity after exposure, even with positive IgG antibody testing, and the potential for long-term sequelae. Clarification may come as outcome data emerge in the future. Since the clinical course is not yet clear, it would seem appropriate to review data available in the SARS-CoV literature.

***Children.* One study¹² from China followed 47 serologically confirmed SARS-CoV children and adolescents who had previously received hospital treatment for the condition. Cardiopulmonary function (treadmill exercise test and lung function tests) and radiological changes were assessed 6 months after the completion of treatment for 21 female patients and 26 male patients (median age 13.6 years). None of the children reported any respiratory or exercise intolerance symptoms and all had a normal clinical examination.**

Pulmonary abnormalities (all mild) were detected on computed tomography (CT) scan in 16 (34%) patients and included air trapping (n=8, 50%), residual ground-glass opacification (n=5, 31.2%) and a combination of air trapping and residual ground-glass opacification (n=3, 18.8%). Three of the five patients with ground-glass changes also had evidence of fibrosis involving a small segment of a single lobe. All three cases with combined air trapping and residual ground-glass changes required oxygen supplementation during the course of illness and two of them required ventilator support. Only one patient who had a CT abnormality had an abnormal lung function test (mild restrictive deficit). Overall, there were no significant differences in lung function between subjects with either air trapping or residual ground-glass opacification, subjects with combined abnormalities and those with normal CT scans. The exercise tolerance tests showed a trend of greater impairment in exercise performance in patients with CT abnormality.

While the incidence of severe illness in children is exceedingly rare, there is evidence of children showing symptoms of multisystem inflammatory syndrome potentially associated with COVID-19¹³. Doctors and health

officials have not determined the exact syndrome, but children in both the United States and Europe have been identified. As of this writing, the symptoms have been described as being similar to toxic shock syndrome or Kawasaki disease and include fever, rash, abdominal pain and diarrhea.

Adults. Looking at various studies from around the globe, the adult trend is similar to the pattern seen with children. A February 2020 study¹⁴ looked at lung sequelae associated with hospital-acquired SARS-CoV fifteen years post illness in 71 patients. The percentage of pulmonary lesions on CT scans diminished from 2003 to 2004 and remained stable thereafter until 2018. Pulmonary function in 2018 was essentially unchanged from 2006, with mildly impaired diffusion function. Pulmonary interstitial damage and functional decline caused by SARS-CoV mostly recovered, with a greater extent of recovery within 2 years after rehabilitation.

Another prospective cohort study¹⁵ showed that 24% and 28% of SARS-CoV survivors demonstrated impaired lung diffusing capacity and abnormal chest radiographs, respectively, at 1 year after illness onset. The functional disability in SARS-CoV survivors appears out of proportion to the degree of lung function impairment and may be due to additional factors such as muscle deconditioning, steroid-related musculoskeletal complications, critical illness-related neuropathy/myopathy, and/or psychological factors.

Patients with a severe COVID-19 course may have more challenges with recovery, and it may be useful to obtain any hospital records. It is not yet known which patients will have long-term sequelae. The immune system activation and dysfunction can lead to target tissue fibrosis, cardiovascular changes and microangiopathy, as was observed in some patients following SARS-CoV. Long-term lung dysfunction or residual cardiomyopathy are concerns. There was also increased cardiometabolic risk reported in patients who recovered from SARS-CoV possibly related to steroid treatment and ongoing renin-angiotensin-aldosterone system (RAS) imbalance¹⁶.

Because of the unknown potential respiratory and cardiovascular complications, delaying anesthesia administration (e.g., 4-6 weeks for non-urgent procedures) and re-evaluation of current physical status may be prudent. This allows for more complete resolution of symptoms and the ability to seek additional medical consultation, as appropriate. For more urgent cases, care can be taken to address the immediate need, preferably without airway manipulation.

Resumption of Anesthesia Practice

Depending on the extent of community spread in the area of the dental office, local medical resources may be severely affected. The capacity at local hospitals and the availability of emergency department services should be taken into consideration when prioritizing dental procedures.

RECOMMENDATIONS FOR RESUMING DENTAL ANESTHESIOLOGY SERVICES

Data that should be considered when returning to scheduled cases:

- COVID-19 community trends: COVID-19 cases, hospitalizations and deaths; rates of COVID-19 spread; adherence to physical distancing recommendations
- Healthcare system readiness: hospital beds; ICU capacity; ventilator numbers in case of emergency patient transfer
- Availability of adequate PPE
- Testing capacity and availability: number of tests performed each day; testing capacity, including supply chain and speed of results
- Case and contact investigations: ability to rapidly isolate those with COVID-19 and identify/quarantine their contacts
- Risk to vulnerable populations: number of outbreaks in long term care facilities per week; demographic and equity data

Justification and Consent (COVID-19 Specific)

The added risk of transmission of SARS-CoV-2 during aerosol-generating procedures should be explained and disclosed to the operating dentist who should be encouraged to share this information with DHCP in that office. Acknowledgement

and documentation of the added risk should be considered. Further, the discussion between the anesthesia provider and the operating dentist to prioritize emergent/urgent procedures should be documented as well. (See Appendix A)

In addition to the standard anesthesia informed consent with the patient or legal guardian, a separate advisory/consent regarding the increased risk of transmission of SARS-CoV-2, the risks and benefits of various treatment options in regard to COVID-19 and the option to reschedule to a later date should be documented. It may also be useful to have the patient or, if the patient is a minor or unable to give consent, the legal guardian document the symptoms of their urgent dental need. (See Appendix B & C)

PRIORITIZING DENTAL PROCEDURES

On March 27, 2020, the CDC recommended that all United States dental facilities postpone elective procedures and non-urgent dental visits, and prioritize emergency and urgent cases for several weeks, pending the slowing of the COVID-19 epidemic¹⁷. Prioritizing dental emergencies and urgencies can be a complex process that requires consideration of the patient, the patient's condition, dental office environment, professional personnel, and the status of COVID-19 in the community.

As the resumption of scheduled cases continues, prioritization of emergency and urgent cases should continue due to the risk of resurgence of COVID-19.

The following information is taken from guidance documents issued by the American Dental Association¹⁸, The American Society of Anesthesiologists¹⁹ and the Anesthesia Patient Safety Foundation²⁰, and is provided to help the dentist anesthesiologist in determining the appropriateness of providing office-based sedation and general anesthesia for a situation believed to be a dental emergency or urgency.

American Dental Association²¹ (ADA) and State Board Recommendations

As dental practices begin to reopen and provide nonemergency care under the direction of their state, the American Dental Association (ADA) has urged dentists to have robust communication and engage their dental team members to address any concerns related to returning to work amid the COVID-19 pandemic. The ADA believes individual dentists should exercise professional judgment and carefully consider the risks outlined in the ADA's interim guidance and weigh those risks against any possible benefit to the patient, the practice employees, the community at large, and the practitioner. **Consult with your local dental board or state department of health for local recommendations.** Critically important is the availability of appropriate personal protective equipment (PPE) to minimize any risk of transmission during care. Due to the proximity of DHCP and potentially others in the office setting during dental procedures, and the generation of aerosols, dentists, staff and patients are at high risk of transmission. The ADA also recognizes that existing and future local or state government mandates supersede ADA recommendations.

"Dental emergencies" are potentially life threatening and require immediate treatment. Examples include uncontrolled bleeding, cellulitis, trauma to facial bones and conditions that pose a threat to airway patency.

"Dental urgencies" include conditions that require immediate attention to relieve severe pain or arrest and prevent permanent dysfunction. Treatment should be conducted in a minimally invasive manner. Examples include severe dental pain from pulpal inflammation, pericoronitis, post-extraction alveolitis, abscess with localized pain and swelling, fractured teeth with associated soft tissue trauma, dental trauma with avulsion or luxation, final crown/bridge cementation if temporary restoration is lost or damaged and treatment required as part of ongoing critical medical procedures.

Treating emergent and urgent dental conditions in a thoughtful and judicious manner will help alleviate the burden on hospital emergency departments.

American Society of Anesthesiologists (ASA) and Anesthesia Patient Safety Foundation (APSF) Recommendations

ASA and APSF support the recommendations of the Centers for Disease Control and Prevention²² for facilities to reduce non-urgent surgical, diagnostic, and interventional procedures as of March 27, 2020. Urgency of procedures exists along a continuum and those not time-critical should be rescheduled. Time-critical procedures must be prioritized according to

patient need and the resources of the facility. Ambulatory settings for surgery should be considered to reduce demand on hospital resources.

ASA and APSF recognize that decisions to reduce non-urgent procedures are dependent on each facility's geographic location (e.g., the existing and expected community risk for COVID-19 infection), available personal protective equipment (e.g., N95 masks or respirators and body protection), and intensive care resources (e.g., facility and provider capacity). Elderly patients and those with serious chronic medical should postpone non-urgent surgery. Facilities should also consider social distancing and restrictions on patients and visitors who may be asymptomatic, and to monitor the well-being of their healthcare providers. Facility leaders should ensure that all clinical healthcare personnel have access to and training on the personal protection equipment (PPE). This includes availability of N95 masks, powered air purifying respirators, and other PPE, appropriately conserved for use by providers potentially exposed to aerosolized viral particles in clinical settings such as while performing endotracheal intubation and extubation.

Length and Scope of Procedure

The American Dental Association recognizes a range of situations that might comprise dental urgencies. Common features of these situations include the presence or imminent risk of soft tissue infection, uncontrolled or poorly controlled pain, or the expectation that delaying treatment until community transmission of the SARS-CoV-2 virus is significantly reduced would risk producing an unacceptable outcome. Determining the scope and duration of dental treatment under office-based anesthesia can be a complex, multifactorial process. Important input is needed from both the treating dentist, the dentist anesthesiologist and the patient/legal guardian to make a fully informed judgment. The treating dentist should lead determinations of the diagnosis, prognosis and treatment plan as they will be responsible for the ongoing care of the patient in the future. The dentist anesthesiologist should be the ultimate authority for providing expert consultation regarding the safety and efficacy of providing anesthesia and sedation for the proposed care.

A complex but common situation involves the young child with severe early childhood caries (ECC) who presents with localized pain in one or two teeth but extensive dental caries on other teeth. It is often difficult to determine how rapidly dental caries will spread and lead to pain. It is possible, but rare, for severe ECC to develop into potentially life-threatening diffuse orofacial infections²³, but it is relatively common for children with severe pain and localized infection from ECC to seek treatment in hospital emergency departments. Emergency room care most commonly consists of palliative measures and referral to a community dental office²⁴. Most community hospitals lack the equipment and staff for definitive treatment of the child with pain and infection from ECC.

Full mouth dental rehabilitation of severe early childhood caries provides definitive and comprehensive treatment of the condition, and is among the most common indications for performing general anesthesia on young children in the United States²⁵. However, a viable alternative is providing short, focused dental treatment to teeth currently causing pain during the COVID-19 outbreak, as this may minimize the risk of viral transmission to the patient, anesthesia team, dental team and subsequent patients. When one or two teeth are symptomatic in a child where extensive deep caries is present on multiple asymptomatic teeth, full mouth rehabilitation may be the best option. If only one or two teeth are symptomatic, and caries is otherwise not extensive, focused treatment may be the preferred option. Extraction of teeth may avoid an aerosol-generating procedure and should be considered in lieu of pulpal therapy and crown placement. While community spread increases and available testing is difficult to obtain, each treating dentist, dentist anesthesiologist and the child's legal guardian must weigh the risk and benefits of opting for full mouth dental rehabilitation versus focused, limited treatment on a case-by-case basis.

Aerosol-Generating Procedures (AGPs)

Aerosol-generating procedures are defined as medical and dental procedures that result in the production of airborne particles (aerosols) that create the potential for airborne transmission of infections that may otherwise only be transmissible primarily by the droplet route.

COVID-19 may be spread through aerosols produced by mask ventilation, instrumentation of the airway, numerous dental procedures using high and low speed handpieces (including surgical handpieces), ultrasonic scalers, air/water syringes, and other irrigating devices, and during cardiopulmonary resuscitation. The ADA has promoted these recommendations²⁶ (abbreviated) as strategies to minimize aerosolization and transmission of COVID-19:

- Use 1.5% hydrogen peroxide or 0.2% povidone as a pre-procedural mouth rinse
- Prioritize the use of hand instrumentation
- Use rubber dams if an aerosol-producing procedure is being performed

- Prefer the use of high-volume evacuators
 - DHCP should be aware that in certain situations, backflow could occur when using a saliva ejector, and this backflow can be a potential source of cross-contamination

CONSULTATION AND CONSENT RECOMMENDATIONS FOR DENTIST ANESTHESIOLOGISTS

- Consult with the treating dentist to determine that a dental emergency or urgency exists and requires treatment that cannot be postponed.
 - Consultation should include discussion of alternative treatments such as antibiotic therapy, pain medication, and temporization.
 - Assess the current community spread of COVID-19 and available medical resources (e.g., emergency department, ICU availability).
 - The treating dentist should document degree of urgency, including potential consequences of delaying treatment on a case-by-case basis; this should also be included on justification documentation.
- Consult with the treating dentist on planned dental treatment under sedation or general anesthesia.
 - Discuss anticipated duration of treatment, recognizing that the risks associated with aerosolization is most likely directly related to the length of dental treatment.
 - Discuss possible modifications to treatment in relation to degree of aerosolization and risk of viral transmission.
 - Discuss special considerations for patients, caregivers and DHCP, especially those at higher risk for developing COVID-19 disease.
 - Utilize and prepare experienced dental staff for the purpose of minimizing the duration of the dental treatment.
- Determine the fitness of the facility to provide appropriate sedation or general anesthesia in accordance with current guidelines whereby the risk of transmission of COVID-19 to all patients and DHCP is minimized. Size and ventilation of the operatory, scavenging, disinfection measures and the availability of all required PPE should be considered.
- Discuss risks and benefits of dental treatment, including risks of COVID-19 transmission, with patient and/or patient's guardian. The option to postpone care should be presented. Document mutual consent of the patient, treating dentist and anesthesia provider to proceed with treatment.

INTRAOPERATIVE CONSIDERATIONS

Standard Precautions

- Adequate hand hygiene protocol should be utilized before and after donning/doffing gloves and other personal protective equipment, before and after patient contact, contact with body fluids, and contact with potentially contaminated surfaces.
- Hand hygiene includes either cleaning hands with a 60-95% alcohol-based hand rub or with soap and water for at least 20 seconds.
- Alcohol-based hand rubs are preferred if hands are not visibly soiled.
- Refrain from touching eyes, nose, or mouth with gloved or non-gloved hands.

Personal Protective Equipment (PPE)

COVID-19 is different from the flu, the common cold and SARS-CoV and may require different precautions than dental teams have been employing since the early 1980s.

For procedures that are potentially aerosol producing, which includes intubation and extubation, but also the vast majority of dental procedures, dentist anesthesiologists should wear a properly fitted and seal tested²⁷ N95 mask with a surgical mask over the N95 during the entire patient encounter and during disinfection of equipment following the procedure. N95 masks fulfill the filtering efficiency criteria of the National Institute for Occupational Safety and Health (NIOSH) and are approved for protection against droplet and airborne transmission of 95% of particles greater than 0.3 µm in size. N95

masks are believed to offer protection against the contact and droplet spread of the coronavirus; however, they are likely not fully resistant to virus penetration in aerosol. Therefore, wearing a surgical mask offers additional protection while also preventing droplet deposition on the N95 if it will be reused in the future. Because most dental procedures are not true sterile procedures, N95 masks with an exhalation valve can be used and may allow for improved comfort during periods of continuous use. Although powered air purifying respirators (PAPRs) may be a preferred option to prevent virus inspiration, at the time of this publication, all PAPRs should be reserved for hospital use in dealing with critically ill patients in the hospital.

The inventor of the material used in the N95 mask, Dr. Peter Tsai, suggests that droplets and viable viruses will dry and no longer carry risk of transmission if the masks are not obviously soiled and are carefully stored in brown paper bags (so that air can circulate to them for drying) for at least 3 days²⁸. The CDC supports this approach if necessary due to N95 supply issues, but suggests a 5-day period of drying^{29,30}. A practical application, if sufficient numbers of N95 masks are available, would be to allocate 5 masks to each anesthesia personnel, and then have them rotate the use and storage of these 5 masks in a cycle. The recommendations for approved respirators and their reuse are changing on a daily basis because of the limited PPE available nationwide. Check the CDC and FDA website³¹ for approved respirators and additional means for disinfection^{32,33}.

Depending on concerns regarding residual airborne virus, an N95 mask can be considered at all times in the dental office. Because N95 masks may be in short supply, options for anesthesia personnel have been promoted that are likely better than a simple surgical mask alone. Since most anesthesia providers have face masks and viral filters, one solution is described here: <http://www.childrenshospital.org/research/departments-divisions-programs/departments/surgery/surgical-innovation-fellowship>. The ASDA does not endorse any homemade devices but encourages dentist anesthesiologists to consider alternatives should N95 masks not be readily available in your area; however, use caution when purchasing non-FDA approved masks as many fraudulent products have been imported to the US.

In addition to wearing an N95 and surgical mask during aerosolizing procedures, eye protection (goggles or a disposable face shield that covers the front and sides of the face), a gown, head covering, and gloves should also be worn. Due to aerosolization and droplet formation during most dental procedures, shoe coverings are strongly encouraged as shoes may act as a fomite.

For procedures that do not generate aerosol, all PPE as described above is recommended with the exception of the N95 respirator. In this circumstance, a surgical face mask is appropriate for all members of the procedural team.

Procedures for proper donning and doffing of PPE are critical but often overlooked and the use of a cognitive aid is highly encouraged (See Appendix D). Routine hand hygiene should be performed before donning gloves and immediately after doffing, as per usual protocol. Any PPE component that becomes heavily soiled during treatment should be replaced immediately³⁴. PPE should be donned prior to entering the operatory. All PPE should be removed prior to exiting the operatory with the exception of the N95 respirator, only after room disinfection has taken place, since recovery should ideally take place in the treatment room. An alternative is to have a dedicated room adjacent to the treatment area where removal of PPE can take place. A link to a video demonstrating the CDC recommendations for donning and doffing can be seen here: <https://www.utmb.edu/covid-19/health-care-workers/ppe-and-testing-information/don-and-doff-ppe>

Because the dentist anesthesiologist cannot be sure of the viral status of dental health care personnel within the office setting, it is recommended that at least a surgical mask be worn and standard distancing precautions be followed at all times. If this is not feasible, the N95 mask should be worn at all times in the dental office. This is especially true following any aerosol producing procedure as the number of air turnovers and status of the office ventilation system cannot be ascertained in most cases. Scrubs worn under PPE should be carefully removed and stored for transport before leaving the dental office.

The number of people in the treatment room should be limited to those essential for patient care and procedural support with minimal exchange of staff for the duration of the case. Ideally the dental procedure and recovery can take place in one room with a closed door to prevent aerosols from entering other sections of the office.

PPE RECOMMENDATIONS FOR DENTIST ANESTHESIOLOGISTS

The minimum recommended equipment for aerosol-generating procedures (AGP) includes:

- N95 or higher-level respirator
- Surgical mask worn over the N95
- Eye protection-face shield or goggles with side shields (no personal glasses)
- Disposable head covering (e.g., bouffant, surgical cap)
- Disposable fluid-resistant long-sleeved gown
- Non-sterile gloves (double gloves are recommended during anesthesia procedures)
- Shoe coverings

Environmental Infection Control & Aerosolization Risk Mitigation

Proper environmental infection control is critical to the safety of dentist anesthesiologists and all dental health care personnel. Routine cleaning and disinfection procedures (e.g., using cleaners and water to pre-clean surfaces prior to applying an EPA-registered, hospital-grade disinfectant³⁵) to frequently touched surfaces or objects for appropriate contact times as indicated on the product's label are recommended for areas in which aerosol-generating procedures are performed. All areas within at least 6 feet of the source of aerosolization should be disinfected, **including the floors**.

Potentially exposed unused consumables should be discarded or appropriately disinfected after treatment of each patient.

Single-use and disposable equipment are preferred and should be disposed of after treatment of each patient (e.g., anesthesia circuits/masks, filters, reservoir bags, gas sampling lines, video laryngoscope blade covers, etc.).

Dedicated equipment (e.g., anesthesia machine, stethoscopes, monitors) should be cleaned and disinfected between use with an EPA-approved disinfectant or 70% ethyl alcohol.

In an effort to minimize virus aerosolization during intubation, some suggestions include placing a clear plastic drape over the patient or utilizing an acrylic box. According to a recent NEJM study³⁶, the use of a clear acrylic "aerosol box" is currently being researched as a possible means of limiting the amount of aerosol spread during AGPs. More research and testing are necessary to determine the feasibility of use in dentistry. A link to a video demonstrating its use can be seen here: <https://www.nejm.org/doi/full/10.1056/NEJMc2007589>

The amount of time required for aerosolized particles to settle in a dental procedure room is dependent on the hourly number of air changes, which could vary depending on the office. An NEJM paper³⁷ dated March 17, 2020, found COVID-19 in tiny particles in the air even three hours later. However, this was a highly controlled artificial laboratory setting and some experts warn this has no relevance to the clinical setting for patients, as it does not simulate coughing in any way³⁸. There are no studies to date that measure SARS-CoV-2 aerosolized viral particles in any dental procedure rooms.

Upon leaving the room, entry should be delayed until sufficient time has elapsed for enough air changes to remove aerosolized infectious particles³⁹ or to allow the suspended particles to settle. It is unclear how long to wait for virus-containing aerosol deposition to completely descend to surfaces. Some authors have suggested as little as 30 minutes⁴⁰ while others recommend over 3 hours. Both the University of Washington (UW) School of Dentistry and University of California-Los Angeles (UCLA) School of Dentistry wait one hour between patients. University of Southern California (USC) School of Dentistry waits three hours between patients. Since each dental office has different characteristics (e.g., room size, ventilation, enclosed vs. open), the dentist anesthesiologist should discuss with the dentist the appropriate time for room disinfection to take place to allow for aerosol deposition on surfaces.

The use of multiple treatment rooms should be considered to extend the amount of time between patients in each room. This can allow for maximum time for aerosol deposition and dispersion before disinfection takes place. Another reasonable approach is to adjust the turnover time in the same treatment room based on the extent of generated aerosols, quality of room ventilation, number of air turnovers per hour, size of treatment room and the use mitigation techniques. Many experts agree 30-60 minutes^{41,42} should be a practical amount of time in most dental offices.

Environmental infection and aerosolization risk may be mitigated with the following techniques*:

- **Containment:** Adding the use of plastic wrap enclosures, drapes or acrylic boxes.
- **Disinfection:** Follow the top-down technique for disinfection. Of particular importance is the floor in addition to all equipment and surfaces; aerosols that fall to the floor may be re-circulated with the movement of personnel within the room as well as with opening and closing doors.
- **Suction:** A high-volume evacuator (HVE) should be used throughout the dental procedure. The use of the HVE has been shown to reduce contamination arising from the operative site by more than 90%^{43,44} if used meticulously. In addition, extraoral large portable suction units can be used to vacuum aerosol, typically placed as close to the operative site as possible. These units can come with filters and/or use UV-C light.
- **UV-C light:** The duration of treatment depends on the size of the room and different times may be needed for different materials in the room (e.g., steel vs. soft materials). Some large units that can be used in an enclosed room with doors closed to limit human exposure can “disinfect” a room within 10 minutes. Each unit must be evaluated for the intended use.
- **Air purifiers:** These units use air and High-Efficiency Particulate Air (HEPA) filters (removes 99.97% of particles sized at 0.3 µm) to remove airborne particles, gases and chemicals.
- **Fogger:** These units create pressure waves at the surface of different solutions including hydrogen peroxide and disperses a thick fog made up of sub-micron-sized droplets that spread quickly throughout a closed room, cling to porous and non-porous surfaces and eradicates harmful pathogens.

The CDC’s guidelines for disinfection and sterilization in healthcare facilities can be found here:

<https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html>

*Some of these devices may not be easily mobilized and implementation may require consultation with the owner of each practice. To ensure safety, devices should be used in accordance with manufacturer guidelines.

Anesthesia Equipment Considerations

For intubated general anesthetics, a high-quality viral filter rated to remove at least 99.7% of airborne particles 0.3 µm or greater should be utilized in order to protect the anesthesia machine and gas analyzer from contamination by a potentially infected patient.

Using two filters will increase filtration efficiency, but at minimum, one viral filter should be positioned at either of two positions in the circle circuit system. A high-quality viral filter may be placed between the mask and anesthesia circuit and/or at the end of the expiratory limb to protect the anesthesia machine, if the gas analyzer is otherwise protected; several commercially available water traps provide viral filtration, while other systems depend on scavenging the analyzed monitor gas to an anesthesia machine scavenging system to the outside environment. A 0.2 µm drug injection filter may also be placed between the sampling line and the water trap. Alternatively, the viral filter may be placed at the Y-connector of the anesthesia circuit, proximal to the gas sampling line connection, such that patient exhalations are filtered prior to sampling. For spontaneously breathing patients, the work of breathing may be increased with the filter in this position. There is no evidence that the CO₂ absorber needs to be changed between patients if the anesthesia machine is protected by a viral filter. A viral filter should also be placed on emergency equipment such as the bag-valve-mask to protect the equipment from contamination, if used.

Each nitrous oxide delivery system should be used and disinfected in accordance with the manufacturer’s guidelines. Disposable hoods should ideally be utilized and disposed of after use. Reusable hoods must be autoclaved. All remaining tubing can be autoclaved and any fixed equipment should be disinfected. Some units have a directional valve at the mixed gas outlet that prevents contamination of the reservoir bag; however, each unit must be evaluated to determine this. If the unit does not have the valve, an option is to place a viral filter between the outlet and the tubing or to autoclave the reservoir bag. If gas analysis is used, a gas sampling line with a filter should prevent any contamination in the water trap and monitor. If nitrous oxide is not needed, it may be preferable to use a disposable nasal cannula or other oxygen delivery device.

A heat and moisture exchange filter (HMEF) which also provides viral filtration may also be appropriate (a separate viral filter should be used in conjunction with HME units which do not provide filtration). Since the HMEF may increase dead space and is more easily clogged, positioning an HMEF between the patient’s airway and circuit may significantly increase the work of breathing, particularly for pediatric patients. Of note, while humidification may be a significant benefit for patients undergoing prolonged anesthesia and the ASA/APSF recommends HMEFs while using anesthesia machines

as ventilators during long-term ventilation of COVID-19 positive patients, it likely provides less benefit during shorter anesthesia cases in dentistry.

Gas sampling tubing should be changed after each patient case, but appropriate filter use should prevent the need to replace the water trap. The exterior of the water trap should be disinfected along with other dedicated anesthesia equipment. For non-intubated anesthetics, consider utilizing a filter on the gas sampling line or replacing the water trap after patient treatment. It is also a viable option to use a pretracheal stethoscope instead of capnography if supplies are limited, particularly for non-intubated cases where capnography is not as accurate in the dental setting (if permitted by state regulations).

The use of transparent plastic drapes is recommended to cover the anesthesia machine, infusion pump(s), monitor and anesthesia monitoring cables during AGPs to minimize the potential of SARS-CoV-2 contamination. Also consider plastic barriers for patient positioning devices (e.g., ramps, wrist restraints, gel cushions). These should be replaced after treatment of each patient, if disinfection cannot take place. Proper removal of drapes and barriers yields concern similar to that of PPE removal regarding viral transmission. These items should be disinfected or replaced according to the type and porosity of material following patient treatment.

ENVIRONMENTAL INFECTION CONTROL RECOMMENDATIONS FOR DENTIST ANESTHESIOLOGISTS

- Wait at least 30-60 minutes for the aerosolized particles to descend before routine cleaning and disinfection of anesthesia equipment and supplies. The actual time needed to wait before routine cleaning is variable based on room size, room isolation, ventilation and other parameters. Use professional judgment.
- All surfaces should be disinfected in a top-down format with an EPA approved disinfectant, including the floors.
- The use of disposable transparent plastic drapes to cover anesthesia equipment likely limits contamination.
- Keep additional airway supplies in anesthesia cart until necessary for use (unless a difficult airway is anticipated).
- Single-use and disposable equipment are preferred.
- Unused but potentially exposed consumables should be discarded or appropriately disinfected.
- Utilize a high-quality viral filter to protect the anesthesia machine from contamination.
- Gas sampling tubing should be discarded after each patient. The viral filter should be placed in a location to prevent virus transmission via gas sampling tubing.

Record Keeping

Electronic or paperless anesthesia charting is ideal due to the inability to properly disinfect paper with EPA-approved disinfectant after patient treatment. A tablet and input device can be used for electronic record-keeping. Photo editing software can be used to mark up an image of an anesthesia record, then it can be saved and exported. Many of the tablet and input device systems, such as the iPad® and Apple Pencil®, are capable of working through plastic barriers. Air water syringe sleeves can be placed over the input device and a plastic head barrier placed over the tablet. According to a University of Hong Kong study, no infectious virus could be detected from printed paper after a 3-hour incubation period⁴⁵. The timeframe at which the virus titer is at a non-transmissible level on printed paper surfaces is, however, unknown.

Anesthetic Management – General Considerations

Dentist anesthesiologists provide the full range of anesthesia options for dental procedures, the choice of which is based on multiple factors. For the foreseeable future, limiting the spread of the SARS-CoV-2 virus will be an additional consideration.

For older children, adult patients and those able to at least partially cooperate with dental procedures, moderate sedation may be a preferred option as this allows easy distancing for the dentist anesthesiologist from the surgical field and may provide acceptable operating conditions for the dentist/surgeon and meet patient needs. Most urgent procedures that require advanced anesthesia techniques (e.g., single tooth extraction, incision and drainage, etc.) will generally be brief and may not produce significant aerosol. The use of nasal cannula oxygen should be used at the lowest effective flow rate since higher flows may increase exhaled patient gases.

For patients with extreme dental needle phobia but for whom IV access can be completed, a very brief period of general anesthesia may be considered for local anesthesia administration followed by maintenance of moderate sedation for the dental procedure.

For pre-cooperative or school age children unable to cooperate and patients with intellectual or behavioral disability that prevent the provision of dental care, general anesthesia is necessary. Due to the COVID-19 pandemic, additional considerations for airway management have arisen for these patients.

Airway Management

Airway management is a critical consideration in efforts to reduce the spread of COVID-19 in the operating environment. The concern of potential increased exhalation of virus even in non-aerosolized procedures should be considered. The risk of virus spread during aerosolized procedures is thought to be significantly increased beyond normal breathing. No specific recommendations for anesthetic management for dental procedures have been provided by any major surgical or anesthesiology group. Recommendations from the ASA that are relevant include:

- If dispersion of potentially contaminated exhaled gases from an open airway is a risk, consider alternate anesthesia plans. Potential contamination of the workspace and room should be considered. The safety of healthcare providers is paramount.
- Endotracheal tubes provide the most secure airway for upper GI endoscopy procedures in patients suspected of having COVID-19.

The ASA has promoted these recommendations (abbreviated) for intubation of suspected COVID-19 patients:

- Double gloves will enable one to shed the outer gloves after intubation and minimize subsequent environmental contamination.
- Perform a Rapid Sequence Induction (RSI) or a modified RSI as clinically indicated. If manual ventilation is required, apply small tidal volumes.
- After removing protective equipment, avoid touching your hair or face and perform hand hygiene.

Because most dental procedures, other than a simple tooth extraction, will likely generate significant aerosol, the following should be considered:

- Intubation with a cuffed endotracheal tube will result in decreased exhalation of patient gases and will therefore likely minimize virus aerosolization.
- Nasal intubation is not contraindicated. Virus will be introduced into the lung with both oral and nasal intubation. Although higher levels of virus are likely present on the endotracheal tube with nasal intubation, if high viral load is present in the nasopharynx, the course of the illness suggests the lungs will already have been affected. Additionally, nasal intubation allows for minimal ETT displacement, which can lead to airway irritation intraoperatively and postoperatively.
- A well-fitted rubber dam with individual holes punched for teeth in the area of operation will minimize virus aerosolization and limit patient gas escape in an open airway. Other isolation devices (e.g., Isolite[®]) likely provide some minimization of virus aerosolization but the degree of benefit is unclear.
- High volume evacuation (HVE) should be used meticulously throughout the dental procedure to minimize aerosol spread.
- Consider a pre-procedural mouth rinse as disinfection of the oral cavity may minimize some viral transmission.

AIRWAY MANAGEMENT RECOMMENDATIONS FOR DENTIST ANESTHESIOLOGISTS

- Consider a pre-procedural mouth rinse (1.5% hydrogen peroxide or povidone-iodine) for cooperative patients. If this is not possible, consider swabbing the oral cavity prior to the dental procedure.
- Intubation with a cuffed endotracheal tube will result in decreased exhalation of patient gases and is considered the most certain way to minimize virus aerosolization from patient exhaled gases.
- For short cases, especially if aerosolization will be kept to a minimum, a natural or open airway can be considered.
- Nasal intubation is not contraindicated.
- Double gloves will enable one to shed the outer gloves after intubation and minimize subsequent environmental contamination.

Induction

For patients able to cooperate for IV access, either a moderate sedation or general anesthetic (non-intubated or intubated) may be a reasonable approach depending on the specific procedure(s), length of surgery, and degree of aerosolization expected. Since the intubation period is also a time of high aerosolization risk, the dentist anesthesiologist must weigh the risk and benefits of intubation vs. procedural risks of virus spread, particularly for short procedures.

An adequate period of preoxygenation will minimize or preclude the need for positive pressure ventilation at induction. Alternatives for preoxygenation should minimize exhaled patient gases, if possible (e.g., non-rebreather face mask, face mask attached to protected anesthesia machine).

The rapid sequence induction recommended by the ASA and the APSF⁴⁶ for the COVID-19 positive patient will need to be modified in the dental office setting depending on the advanced airway management skills of supporting staff and availability of airway equipment. Nasal intubation by definition is not a RSI technique; therefore, nasal intubation will by definition, lead to a modified RSI technique. An important aspect for many providing in-office anesthesia is to ensure the ability to ventilate prior to inducing apnea or using muscle relaxants. Although minimizing positive pressure ventilation is ideal, small tidal volumes to verify ventilation may be prudent.

For pre-cooperative or school age children unable to cooperate for dental care, patients with intellectual or behavioral disabilities, or severely phobic patients that prevent the provision of dental care or initiation of IV access, a mask induction or intramuscular ketamine sedation for IV initiation can be considered.

If a mask induction is chosen, the dentist anesthesiologist or a trained assistant should secure the mask using a two-handed technique to minimize aerosolization of exhaled gases. Sevoflurane in 100% oxygen may be considered for induction so that the patient is “pre-oxygenated” for a brief procedure, IV access or intubation. Once IV access has been obtained, propofol or other agents can allow for deepening of the anesthetic, if needed, to provide low tidal volume positive pressure ventilation, again if needed.

Intramuscular (IM) ketamine is an acceptable alternative although it should be appreciated that many patients may cry and/or scream and this will lead to potentially increased spread of droplet or aerosol. Thus, IM ketamine induction should be provided in the treatment room. After securing IV access, a brief procedure, intubation or other manner of securing the airway may take place.

INDUCTION RECOMMENDATIONS FOR DENTIST ANESTHESIOLOGISTS

- Consider moderate sedation instead of general anesthesia (or brief general anesthesia for local anesthetic administration followed by moderate sedation) if possible.
- Preoxygenate for an adequate period of time with 100% O₂ when possible.
- Depending on the clinical condition and planned airway management, the recommended rapid sequence induction will need to be modified. If manual ventilation is necessary, apply small tidal volumes.
- Ensure there is a high quality viral filter at either the expiratory limb connection to the anesthesia machine and/or between the facemask and breathing circuit. Ensure the gas sampling line is also protected.
- Video laryngoscopes may allow further patient distancing. Others have suggested clear plastic drapes or other barriers over the patient during intubation.
- Re-sheath the laryngoscope immediately post intubation (use outer glove in double glove technique).
- After removing PPE, avoid touching your hair or face and perform hand hygiene.

Maintenance

Maintenance of sedation and anesthesia can be with either inhaled agents or TIVA. For longer cases, techniques that result in rapid awakening and early fitness for discharge, which the dentist anesthesiologist is expert in, may be preferred.

If an intubated approach is chosen, the dentist anesthesiologist should position himself/herself as far as practical away from the surgical field.

If a non-intubated approach is chosen, the dentist anesthesiologist should try to position himself/herself as far as practical away from the surgical field. If the patient requires airway support to maintain adequate ventilation, this places the dentist anesthesiologist at increased risk of viral transmission and consideration for intubation should be made. Supplemental oxygen administration by nasal cannula or via nasopharyngeal airway may increase exhaled patient gases and should be used at the lowest effective flow rate to maintain adequate oxygenation.

Emergence

For an intubated patient, efforts should be made to minimize bucking on the endotracheal tube, coughing on extubation and post-operative sore throat, which may also lead to coughing. Although no approach will completely eliminate these risks in all patients, if deep extubation is considered an option (e.g., good mask airway, minimal intraoral bleeding), it should be considered. If awake extubation is indicated, adequate analgesia will increase the likelihood of a smooth extubation. If remifentanyl is available, this agent will allow for excellent analgesia for extubation and rapid offset of effect on discontinuation, but many other opioids are acceptable. Dexmedetomidine may also be considered but may prolong recovery.

In order to minimize virus transfer to surfaces, have a receptacle close to the patient where the extubated endotracheal tube can be immediately discarded.

MAINTENANCE AND EMERGENCE RECOMMENDATIONS FOR DENTIST ANESTHESIOLOGISTS

- If a non-intubated general anesthetic is chosen and the patient requires airway support to maintain adequate ventilation, this places the dentist anesthesiologist close to aerosol generation and consideration for intubation should be made.
- A well-fitted rubber dam with individual holes punched for teeth in the area of operation will minimize virus aerosolization and limit patient gas escape in an open airway case. Other isolation devices (e.g., Isolite®) likely provide some minimization of virus aerosolization but the degree of benefit is unclear.
- High volume evacuation (HVE) should be used meticulously throughout the dental procedure to minimize aerosol spread.
- If deep extubation is an option, it should be considered. If awake extubation is planned, adequate analgesia may prevent bucking, coughing and post-operative sore throat.
- In order to minimize virus transfer to surfaces, have a receptacle close to the patient where the extubated endotracheal tube can be immediately discarded.

Basic Life Support

Although an unlikely event in dental office anesthesia, if cardiopulmonary resuscitation is required, early intubation should be considered in advanced life support efforts to decrease aerosolization associated with positive pressure ventilation. A viral filter should be placed on the bag-valve-mask to protect the equipment from contamination if used.

POSTOPERATIVE CONSIDERATIONS

Recovery

During emergence and recovery, it is important to keep a full coverage mask over the patient's mouth and nose to reduce virus aerosolization spread during any coughing or crying. In an effort to minimize contamination of multiple places within the dental office, use of the procedure room as the recovery area should be considered. All PPE should be removed prior to exiting the operatory with the exception of the N95 respirator when recovery takes place in the treatment room. An alternative is to have a dedicated room adjacent to the treatment area where removal of PPE can take place.

Upon leaving the room, entry should be delayed until sufficient time has elapsed for enough air changes to remove aerosolized infectious particles⁴⁷ or to allow the suspended particles to settle. Due to the unknown suspension time of aerosolized particles (particularly when no air filtration system is used), it may be appropriate to change to another room

for the subsequent patient. It is unclear how long to wait for virus-containing aerosol deposition to completely descend to surfaces. Some authors have suggested as little as 30 minutes⁴⁸ while other recommend over 3 hours⁴⁹. Dental schools we have surveyed wait from 1 – 3 hours prior to seeing the next patient in that treatment room. Since each dental office has different characteristics (room size, ventilation, enclosed vs. open), the dentist anesthesiologist should discuss with the dentist when the appropriate time for room disinfection should take place to allow for aerosol deposition on surfaces. **Many experts agree 30-60 minutes^{50,51} should be a practical amount of time in most dental offices.**

To mitigate the risk to patients and staff, subsequent patients should wait in the car until the initial patient is fully recovered and meets all discharge criteria.

RECOVERY RECOMMENDATIONS FOR DENTIST ANESTHESIOLOGISTS

- Keep a full coverage mask over the patient’s airway during emergence and recovery and remain vigilant to ensure adequate ventilation.
- Use the procedure room for recovery to avoid contaminating another space.
- If the escort comes into the contaminated procedure room, be sure they are part of the patient’s quarantined circle (during this time of social distancing).
- Wait at least 30-60 minutes for the aerosolized particles to descend before disinfecting anesthesia equipment and supplies (as well as the procedure room by DHCP) with an EPA approved disinfectant while wearing appropriate PPE. The actual time needed to wait before routine cleaning is variable based on room size, room isolation, ventilation and other parameters. Use professional judgment.
- Doffing all PPE (except for the N95) should be done prior to leaving the procedure room when recovery takes place in the treatment room.
- If the dentist anesthesiologist needs to leave the room before final disinfection, consider a dedicated room adjacent to the treatment area where doffing of PPE can take place.
- Be sure to maintain all necessary PPE if the patient is transferred to a dedicated recovery area.

Follow Up

In an effort to monitor and track exposure of anesthesia personnel, it is recommended that post-operative written instructions include the need to notify the anesthesiologist if symptoms of COVID-19 develop. Additionally, patients should be contacted 7 days and 14 days after the procedure to determine if they have experienced any COVID-19 symptoms. For patients who develop symptoms, it will be important to track the progression of their disease and to try to trace the exposure as much as possible. All DHCP involved with that patient should be informed of the possible exposure, obtain testing as available, and monitor their symptoms closely.

WHEN A PATIENT SHOWS SYMPTOMS OR TESTS POSITIVE FOR COVID-19 FOLLOWING A PROCEDURE

- Have the patient seek medical treatment immediately if symptoms worsen.
- Try to determine who may have had contact with the individual who is COVID-19 positive.
- Notify any staff or other patients who were potentially exposed.
- Monitor the symptoms of all exposed staff members and patients.
- Conduct a risk assessment to determine the need for quarantine, testing and/or implementation of any work restrictions.

Personal Care

Dentist anesthesiologists should change from scrubs to personal clothing before returning home. Upon arriving home, take off shoes, remove and wash clothing (separately from other household residents), and immediately shower⁵².

Equipment should be disinfected prior to removal and transport from the office. Hand hygiene should be practiced throughout and after packing of equipment into vehicle.

FUTURE CONSIDERATIONS

Point-of-Care Testing

At the time of this writing, although point-of-care testing is available, it is not readily obtainable for most office settings. Antigen testing is necessary to identify patients who are asymptomatic or with very mild symptoms to determine COVID-19 virus infectivity. The reliability of point-of-care testing is highly variable depending on the test. Ideally, the test should be performed within 24 – 48 hours of the procedure and the patient placed in relative quarantine until the procedure. Antibody testing, if positive for IgG, has fair sensitivity and specificity indicating past infection and probable immunity, but adequate IgG levels may take up to 3 weeks to develop post infection. However, test quality is highly variable. The ADA has requested that the US Department of Health and Human Services issue federal recognition that licensed dentists may administer point of service tests authorized by the Food and Drug Administration during the COVID-19 pandemic. With federal recognition, dentists would qualify as “covered persons” under the Public Readiness and Emergency Preparedness Act, which may extend protection from liability associated with the administration or use of FDA-authorized COVID-19 tests⁵³.

Moving forward, a testing strategy will need to be created for each office. Ideally, each patient could be tested before each aerosol-generating procedure; however, due to availability, that currently remains improbable. It may be beneficial for the dentist anesthesiologist to document why the patient was not tested before the surgical procedure. The committee believes ‘testing not available’ is a valid reason.

Most tests fall under the FDA *Emergency Use Authorizations*, such that the sensitivity and specificity is unknown. Health experts have predicted a range of 500,000 to 1,000,000 tests are necessary per day nationwide in order to adequately monitor for SARS-CoV-2 in the community, particularly as states begin to relax social distancing measures. Many view this as critical to implementing effective surveillance and contact tracing. Ideally, testing stations would be widely available to the general public at no cost. This would significantly help us protect our colleagues, our staff, our patients and our communities in the dental setting.

Rapid diagnostic tests (RDTs) have been developed for detecting the presence of SARS-CoV-2, or the presence of antibodies to SARS-CoV-2. Although these RDTs provide two different types of information, both are anticipated to be useful to anesthesia providers at the point of care, specifically in the preoperative phase of treatment.

The first type of RDT detects the presence of viral proteins (antigens) expressed by the SARS-CoV-2 in a sample from the respiratory tract, usually the nasopharynx. If sufficient target antigen is present in the sample, it will bind to specific antibodies fixed to a paper strip enclosed in a plastic casing and generate a visual signal, typically within 30 minutes. The antigen(s) detected are expressed only when the virus is actively replicating; therefore, such tests are best used to identify acute or early infection. The accuracy of this test depends on several factors, including the time from onset of illness, the concentration of virus in the specimen, the quality of the specimen collected from a person and how it is processed, and the precise formulation of the reagents in the test kits. Based on experience with similar RDTs for influenza, the sensitivity of these tests might be expected to vary from 34% to 80%⁵⁴.

Another, more common type of RDT detects the presence of antibodies in the blood of people believed to have been infected with SARS-CoV-2. Antibodies are produced over days to weeks after infection with the virus. The strength of antibody response depends on several factors, including age, nutritional status, severity of disease, status of the immune system, and certain medications that suppress the immune system. Studies suggest that the majority of patients develop antibody response only in the second week after onset of symptoms. Antibody detection RDTs may also cross-react with other pathogens, including other human coronaviruses, resulting in false-positive results. Lastly, there has been discussion about whether RDTs detecting antibodies could predict whether an individual was immunized to reinfection with the SARS-CoV-2 virus. There is no evidence to date to support this.

New information regarding these RDTs is evolving rapidly, and the guidance for the specific use of these tests is anticipated later this year. At this time, however, the World Health Organization does not currently recommend the use of antigen-detecting rapid diagnostic tests for patient care, although research into their performance and potential diagnostic utility is highly encouraged⁵⁵. It is hoped that the positive predictive value of these tests will improve over time.

Saliva is a promising noninvasive specimen for diagnosis and monitoring. In a small study (N=12) published in February 2020, SARS-CoV-2 was detected in the self-collected saliva in 11 out of 12 patients (91.7%) who were hospitalized and were COVID-19 positive⁵⁶. It was previously demonstrated that saliva has a high concordance

rate of greater than 90% with nasopharyngeal specimens in the detection of respiratory viruses, including coronaviruses⁵⁷. Hopefully a saliva point-of-care test will be developed for use in the dental setting.

Vaccine

The ultimate strategy for controlling this pandemic will depend on a safe and efficacious vaccine against SARS-CoV-2. The estimated timeline for availability of an initial vaccine is early to mid-2021⁵⁸.

ADDITIONAL RESOURCES

(All links originally accessed 4/14/20)

American Dental Association (ADA):

https://success.ada.org/en/practice-management/patients/digital-events/covid-19-transmission-and-emergency-care-q-and-a?utm_source=successadaorg&utm_medium=covid-resources-lp&utm_content=cv-pn-guidance-qa&utm_campaign=covid-19&_ga=2.155895283.934565018.1586586941-806905572.1585070320

American Society of Anesthesiologists (ASA):

<https://www.asahq.org/in-the-spotlight/coronavirus-covid-19-information>

ASA Covid-19 Resources From Other Organizations:

<https://www.asahq.org/about-asa/governance-and-committees/asa-committees/committee-on-occupational-health/coronavirus/additional-resources>

Anesthesia Patient Safety Foundation (APSF):

<https://www.apsf.org/novel-coronavirus-covid-19-resource-center/>

Anesthesiology journal special article series:

https://anesthesiology.pubs.asahq.org/ss/coronavirus.aspx?_ga=2.223608219.1219618886.1586494103-580190068.1586494103

Centers for Disease Control and Prevention (CDC):

<https://www.cdc.gov/coronavirus/2019-ncov/index.html>

CDC Guidance for Dental Settings:

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/dental-settings.html>

Environmental Protection Agency (EPA):

<https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>

Occupational Safety and Health Administration (OSHA):

<https://www.osha.gov/SLTC/covid-19/>

National Institute for Occupational Safety and Health (NIOSH):

<https://www.cdc.gov/niosh/>

Society for Ambulatory Anesthesia (SAMBA):

<https://sambahq.org/covid-19-resources-2/>

World Health Organization (WHO):

<https://www.who.int>

EMR Resources:

<https://www.plexustg.com/aims-anesthesia-touch>

<https://www.sisfirst.com/sis-charts>

<https://iprocedures.com/en-US/iPro-Anesthesia>

APPENDIX

APPENDIX A: Example of Justification While Dental Offices Are Limited to Only Emergent/Urgent Procedures

COVID-19 Pandemic Emergency Dental Treatment Justification

In an effort to mitigate the spread of COVID-19, both the Centers for Disease Control and Prevention (CDC) and the American Dental Association (ADA) recommend dentists nationwide postpone elective and non-urgent procedures until further notice. Further, the state dental board has issued a proclamation that limits dentists to emergent and urgent care only. Dental emergencies are potentially life-threatening and require immediate treatment to stop ongoing tissue bleeding or to alleviate severe dental pain or infection. Urgent dental care focuses on the management of conditions that require immediate attention to relieve severe pain and/or risk of infection and to alleviate the burden on hospital emergency departments. After careful consideration, I have determined that

_____ DOB: _____ needs emergent or urgent dental care under general anesthesia. _____ (Initial)

All staff members have been told by the anesthesiologist that positive pressure ventilation, intubation, and extubation are all aerosol generating procedures. Further, current studies indicate that many dental procedures can also produce aerosolized particles, which can linger in the air for minutes to hours and are transmissible. All Dental Health Care Personnel (DHCP) will use appropriate Personal Protective Equipment (PPE) during the induction, treatment and recovery for this patient. Each member of the Dental Health Care Personnel (DHCP) acknowledges and accepts this added risk of potential exposure and transmission of COVID-19. _____ (Initial)

- Please describe the dental condition: _____

- Please explain what could happen to this patient if we do not provide the dental care today:

Surgeon/Operating Dentist:

Name (printed): _____

Signature: _____

Date: _____

APPENDIX B: Examples of Advisory/Disclosure/Consent When Dental Offices Are Limited to Only Emergent/Urgent Procedures

COVID-19 (Coronavirus) Disclosure/Consent

Patient Name: _____

The Centers for Disease Control and Prevention (CDC), the American Dental Association (ADA), and the state dental board have all issued a strong recommendation to postpone any non-emergent dental care until further notice during the COVID-19 pandemic.

Current studies indicate that some dental procedures create aerosolized particles (similar to a sneeze), which can linger in the air for minutes to sometimes hours, which can result in transmission of COVID-19.

I understand and acknowledge these recommendations and hereby declare that I have an emergent or urgent dental condition that requires prompt care (or I have a child with an emergent or urgent dental condition). _____ (Initial)

I hereby affirm that my dentist/surgeon and anesthesiologist have offered me the opportunity to reschedule dental treatment under general anesthesia to a subsequent date pending recommendation changes. _____ (Initial)

I also affirm that I have freely elected to proceed with the procedure due to pain/infection that are unmanageable at home with medications. I have consulted the treating dentist for other alternatives. _____ (Initial)

I fully understand that proceeding with the treatment today increases my exposure/my child's exposure and therefore risk of contracting community acquired COVID-19 (Coronavirus) infection. Acquiring such infection can lead to symptoms such as fever, chest pain, shortness of breath and further respiratory complications. Severe disease can also lead to: prolonged hospitalization, intensive care admission, mechanical ventilation, and/or possible death.

I also affirm that neither I/my child, nor any of my family members have been exposed to or had any of the following symptoms in the past 14 days:

- 1) Fever ($\geq 100.4^{\circ}$ F)
- 2) Shortness of breath
- 3) Dry cough
- 4) Fatigue and body aching
- 5) Chest pain
- 6) Confirmed or suspected COVID-19 (Coronavirus) infection

I am consenting to this procedure with full understanding and disclosure of such risks and alternatives, and all my questions were answered to my satisfaction.

Name (printed): _____

Signature: _____

Relationship to patient (if applicable): _____

Date: _____

Patient Advisory and Acknowledgment

Receiving Dental Treatment During the COVID-19 Pandemic

Dear Patient:

You have presented to the office today because you have an urgent dental condition which must be treated at this time and cannot be postponed until the current COVID-19 risk period abates. Please be advised of the following:

While our office complies with State Health Department and the Centers for Disease Control and Prevention infection control guidelines to prevent the spread of the COVID-19 virus, we cannot make any guarantees.

Our staff are symptom-free and, to the best of their knowledge, have not been exposed to the virus. However, since we are a place of public accommodation, other persons (including other patients) could be infected, with or without their knowledge.

In order to reduce the risk of spreading COVID-19, we have asked you a number of “screening” questions below. For the safety of our staff, other patients, and yourself, please be truthful and candid in your answers.

PATIENT/RESPONSIBLE PARTY

DATE

PLEASE ANSWER “YES” OR “NO” WITH YOUR INITIALS, TO THE FOLLOWING QUESTIONS:

ARE YOU CURRENTLY AWAITING THE RESULTS OF A COVID-19 TEST?	_____ YES	_____ NO
DO YOU HAVE A FEVER?	_____ YES	_____ NO
DO YOU HAVE ANY SHORTNESS OF BREATH?	_____ YES	_____ NO
DO YOU HAVE A DRY COUGH?	_____ YES	_____ NO
DO YOU HAVE A RUNNY NOSE?	_____ YES	_____ NO
DO YOU HAVE A SORE THROAT?	_____ YES	_____ NO
DO YOU HAVE SNEEZING, WATERY EYES, AND/OR SINUS PAIN/PRESSURE THAT IS UNUSUAL AND NOT RELATED TO SEASONAL ALLERGIES?	_____ YES	_____ NO
HAVE YOU EXPERIENCED HEADACHES, FATIGUE, OR WEAKNESS?	_____ YES	_____ NO
HAVE YOU LOST YOUR SENSE OF TASTE AND/OR SMELL?	_____ YES	_____ NO
WITHIN THE LAST 14 DAYS, HAVE YOU TRAVELLED TO ANY FOREIGN COUNTRY?	_____ YES	_____ NO
WITHIN THE LAST 14 DAYS, HAVE YOU TRAVELLED WITHIN THE UNITED STATES?	_____ YES	_____ NO
IF SO, WHERE?	_____	

APPENDIX C: Examples of Advisory/Disclosure/Consent When Dental Offices Are Open to Scheduled Cases

COVID-19 (Coronavirus) Disclosure/Consent

Patient Name: _____

Current studies indicate that some dental procedures create aerosolized particles (similar to a sneeze) of the virus that causes COVID-19, which can linger in the air for minutes to sometimes hours, which can result in transmission of COVID-19 (Coronavirus) from an infected person.

I understand and acknowledge this information and hereby declare that I have a dental condition that requires prompt care or I have a child with a dental condition that requires prompt care.
_____ (Initial)

I hereby affirm that my dentist/surgeon and anesthesiologist have discussed with me the preventative measures being taken to minimize the risk of COVID-19 (Coronavirus) transmission.
_____ (Initial)

I fully understand that proceeding with the treatment today increases my exposure/my child's exposure and therefore my risk of contracting community acquired COVID-19 (Coronavirus) infection. Acquiring such infection can lead to symptoms such as fever, chest pain, shortness of breath and further respiratory complications. Severe disease can also lead to: prolonged hospitalization, intensive care admission, mechanical ventilation, and/or possible death.

I also affirm that neither I/my child, nor any of my immediate family members have been exposed to or had any of the following symptoms in the past 14 days:

- 1) Fever ($\geq 100.4^{\circ}$ F)
- 2) Shortness of breath
- 3) Dry cough
- 4) Fatigue and body aching
- 5) Chest pain
- 6) Confirmed or suspected COVID-19 (Coronavirus) infection

I am consenting to this procedure with full understanding and disclosure of such risks and alternatives, and all my questions were answered to my satisfaction.

Name (printed): _____

Signature: _____

Relationship to patient (if applicable): _____

Date: _____

Patient Advisory and Acknowledgment

Receiving Dental Treatment During the COVID-19 Pandemic

Dear Patient:

You have come to our office today for a routine dental evaluation and/or treatment that will be done during the COVID-19 pandemic. Please be advised of the following:

While our office complies with State Health Department and the Centers for Disease Control and Prevention infection control guidelines to prevent the spread of the COVID-19 virus, we cannot make any guarantees.

Our staff are symptom-free and, to the best of their knowledge, have not been exposed to the virus. However, since we are a place of public accommodation, other persons (including other patients) could be infected, with or without their knowledge.

In order to reduce the risk of spreading COVID-19, we have asked you a number of “screening” questions below. For the safety of our staff, other patients, and yourself, please be truthful and candid in your answers.

PATIENT/RESPONSIBLE PARTY

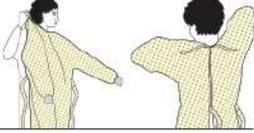
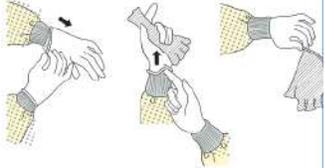
DATE

PLEASE ANSWER “YES” OR “NO” WITH YOUR INITIALS, TO THE FOLLOWING QUESTIONS:

- ARE YOU CURRENTLY AWAITING THE RESULTS OF A COVID-19 TEST? _____ YES _____ NO
- DO YOU HAVE A FEVER? _____ YES _____ NO
- DO YOU HAVE ANY SHORTNESS OF BREATH? _____ YES _____ NO
- DO YOU HAVE A DRY COUGH? _____ YES _____ NO
- DO YOU HAVE A RUNNY NOSE? _____ YES _____ NO
- DO YOU HAVE A SORE THROAT? _____ YES _____ NO
- DO YOU HAVE SNEEZING, WATERY EYES, AND/OR SINUS PAIN/PRESSURE THAT IS UNUSUAL AND NOT RELATED TO SEASONAL ALLERGIES? _____ YES _____ NO
- HAVE YOU EXPERIENCED HEADACHES, FATIGUE, OR WEAKNESS? _____ YES _____ NO
- HAVE YOU LOST YOUR SENSE OF TASTE AND/OR SMELL? _____ YES _____ NO
- WITHIN THE LAST 14 DAYS, HAVE YOU TRAVELLED TO ANY FOREIGN COUNTRY? _____ YES _____ NO
- WITHIN THE LAST 14 DAYS, HAVE YOU TRAVELLED WITHIN THE UNITED STATES? _____ YES _____ NO

IF SO, WHERE? _____

APPENDIX D: CDC Cognitive Aids-Donning/Doffing PPE

SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)	SEQUENCE FOR REMOVING PERSONAL PROTECTIVE EQUIPMENT (PPE)
<p>The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection isolation precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.</p> <p>1. GOWN</p> <ul style="list-style-type: none"> Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back Fasten in back of neck and waist 	<p>Except for respirator, remove PPE at doorway or in anteroom. Remove respirator after leaving patient room and closing door.</p> <p>1. GLOVES</p> <ul style="list-style-type: none"> Outside of gloves is contaminated! Grasp outside of glove with opposite gloved hand; peel off Hold removed glove in gloved hand Slide fingers of ungloved hand under remaining glove at wrist Peel glove off over first gloved Discard gloves in waste container 
<p>2. MASK OR RESPIRATOR</p> <ul style="list-style-type: none"> Secure ties or elastic bands at middle of head and neck Fit flexible band to nose bridge Fit snug to face and below chin Fit-check respirator 	<p>2. GOGGLES OR FACE SHIELD</p> <ul style="list-style-type: none"> Outside of goggles or face shield is contaminated! To remove, handle by head band or ear pieces Place in designated receptacle for reprocessing or in waste container 
<p>3. GOGGLES OR FACE SHIELD</p> <ul style="list-style-type: none"> Place over face and eyes and adjust to fit 	<p>3. GOWN</p> <ul style="list-style-type: none"> Gown front and sleeves are contaminated! Unfasten ties Pull away from neck and shoulders, touching inside of gown only Turn gown inside out Fold or roll into a bundle and discard 
<p>4. GLOVES</p> <ul style="list-style-type: none"> Extend to cover wrist of isolation gown 	<p>4. MASK OR RESPIRATOR</p> <ul style="list-style-type: none"> Front of mask/respirator is contaminated — DO NOT TOUCH! Grasp bottom, then top ties or elastics and remove Discard in waste container 
<p>USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION</p>	
<ul style="list-style-type: none"> Keep hands away from face Limit surfaces touched Change gloves when torn or heavily contaminated Perform hand hygiene 	<p style="background-color: #0056b3; color: white; text-align: center; padding: 5px;">PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE</p> 

CDC.gov
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