Aerosol-Generating Procedures and Patients with Suspected or Confirmed COVID-19

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Some procedures performed on patients are more likely to generate higher concentrations of infectious respiratory aerosols than coughing, sneezing, talking, or breathing. These aerosol-generating procedures (AGP) may put health care workers at an increased risk for exposure to SARS-CoV-2 and infection. Limited data are available to evaluate which procedures may generate potentially infectious aerosols and pose a risk of transmission to health care workers. This statement is a summary of the evidence surrounding AGP and the current Centers for Disease Control and Prevention (CDC) guidance.

For more information about respiratory protection and relevant Occupational Safety and Health Administration (OSHA) standards, refer to:


Aerosol-generating procedures and COVID-19

- The Minnesota Department of Health (MDH) and CDC currently recommend that health care workers wear a NIOSH-approved N95 or equivalent or higher-level respirator, eye protection, gown, and gloves when performing an AGP on patients with known or suspected COVID-19 (refer to 1 in References). Additionally, health care workers working in facilities located in counties with substantial or high transmission should follow these measures for all AGP, regardless of COVID-19 suspicion or infection: CDC: COVID Data Tracker (https://covid.cdc.gov/covid-data-tracker).
- AGP should be performed in airborne infection isolation rooms, if available.
- The number of health care workers present during the procedure should be limited to only those essential for patient care and procedure support. Visitors should not be present for the procedure.
Per CDC guidance, the following should be considered AGP, due to the creation of uncontrolled respiratory secretions (refer to 2 in References):

- Open suctioning of airway secretions
- Sputum induction
- Cardiopulmonary resuscitation
- Endotracheal intubation and extubation
- Noninvasive ventilation (NIV) (e.g., BiPAP, CPAP)
- Bronchoscopy
- Manual ventilation
- Autopsy procedures or medical/surgical procedures using oscillating bone saws (refer to 3 in References)
- All surgical procedures that may pose higher risk for transmission if the patient has COVID-19 infection (e.g., that generate potentially infectious aerosols or involve anatomic regions where viral loads may be higher, such as the nose and throat, oropharynx, respiratory tract)

There are limited data on whether other procedures may generate infectious aerosols and represent a transmission risk. These may include, but are not limited to:

- Nebulizer administration
- High-flow oxygen delivery
- Tracheostomy
- Nasal endoscopy or endoscopic sinus surgery
- Flexible laryngoscopy
- Transsphenoidal surgeries
- Nasogastric or nasojejunal tube placement

### Nebulizers and infection transmission risk

- A 2012 review article on aerosol-generating procedures concluded that there was no significant evidence of transmission risk related to nebulizers, using evidence from the SARS outbreak (refer to 4 in References).
- A 2004 study performing polymerase chain reaction air sampling around a patient with SARS undergoing nebulizer treatment found no evidence of virus (refer to 5 in References). Current U.K. guidance on infection prevention for COVID-19 does not list nebulizers as a potential transmission risk, due to the fact that the aerosol generated by the device is derived from the medication fluid within the nebulizer chamber and not the patient (refer to 6 in References).
A literature review by the U.S. Veterans Health Administration in 2020 concluded that while concern exists for the transmission risk of SARS-CoV-2 with nebulizers, the specific evidence for transmission remains inconclusive (refer to 7 in References).

Finally, a study in Sweden of air samples collected from March 2020 to April 2021 near hospitalized patients with COVID-19 found that out of nine samples collected while nebulizer treatment with drug inhalation was ongoing, none were positive for SARS-CoV-2 (refer to 8 in References).

Based on these data, nebulizer administration is unlikely to represent an infection risk. However, given the emergence of more highly transmissible variants of SARS-CoV-2, close-range viral aerosol generation remains a possibility.

Based on this potential risk, MDH recommends the following to minimize risk to health care workers:

▪ If patient can tolerate, switch to metered-dose inhalers with a dedicated spacer.

▪ CDC recommends health care workers who enter the room of a patient with suspected or confirmed SARS-CoV-2 infection use a NIOSH-approved N95 or higher-level respirator, gown, gloves, and eye protection.


▪ Upon setup of nebulizer, have health care workers maintain a safe distance (6 feet or greater), possibly outside the door, if safe to do so.

▪ Patients do not need to be transferred to a higher-level of care solely for the purpose of providing nebulizer treatment.

Noninvasive ventilation (NIV) and infection transmission risk

▪ The National Institutes of Health (NIH) COVID-19 Treatment Guidelines recommend high-flow nasal cannula (HFNC) oxygen over NIV for patients with hypoxemic respiratory failure from COVID-19 (refer to 9 in References). This is based on clinical trial data showing lower rates of intubation and mortality with HFNC compared to NIV.

▪ According to NIH, "NIV is an aerosol-generating procedure, and it may increase the risk of nosocomial transmission of SARS-CoV-2. It remains unclear whether the use of HFNC oxygen results in a lower risk of nosocomial SARS-CoV-2 transmission than NIV" (refer to 9 in References). If HFNC are not available, consider a short trial of NIV with frequent patient reassessment; however, providers should not delay intubation if the patient is not improving.

▪ When patients are on NIV, health care workers should take the following precautions:
▪ CDC recommends health care workers who enter the room of a patient with suspected or confirmed SARS-CoV-2 infection use a NIOSH-approved N95 or higher-level respirator, gown, gloves, and eye protection.


▪ Upon setup of NIV, have health care workers maintain a safe distance (6 feet or greater), possibly outside the door, depending on patient’s clinical stability and need for reassessment.

Cardiopulmonary resuscitation (CPR) in patients with known or suspected COVID-19

▪ The administration of CPR involves performing numerous high-risk aerosol-generating procedures, including chest compressions, positive pressure ventilation, and establishment of an advanced airway.

▪ Clinicians should initiate discussions about advance care directives and goals of care with all patients (or their authorized decision-maker) on arrival to an acute or long-term care facility or with any significant change in clinical status, such as an increase in level of care.

▪ When providing CPR to patients with COVID-19, clinicians should follow guidance from the American Heart Association (AHA) (refer to 10 in References) and consider the following principles:

  ▪ Reduce provider exposure to COVID-19 and other hazards to staff:
    ▪ All health care workers involved in providing CPR should wear all appropriate PPE as described above for AGP (N95 or higher-level respirator, eye protection, gown, and gloves).
    ▪ Appropriate PPE should be donned BEFORE performing the components of resuscitation that are aerosol-generating, as listed above.
    ▪ Where possible, CPR should be performed in an airborne infection isolation room.
    ▪ Close the door to the resuscitation area when possible, to minimize airborne contamination of adjacent indoor space.
    ▪ Limit personnel in the room to only those essential for patient care.

  ▪ Where possible, prioritize oxygenation and ventilation strategies with lower aerosolization risk:
    ▪ Use a closed-circuit ventilation strategy, as described in guidance referenced above from AHA, to decrease the risk of particle aerosolization.
    ▪ Attach a HEPA (high efficiency particle air) filter, if available, to any manual or mechanical ventilation device in the path of exhaled gas.
    ▪ Once on a closed circuit, minimize disconnections to reduce aerosolization.
▪ Minimize the likelihood of failed intubation attempts by assigning the provider with the best chance of first-pass success to intubate and pause chest compressions during intubation attempts.

▪ Consider video laryngoscopy, if available, to reduce exposure risk.

▪ Consider the appropriateness of starting and continuing resuscitation:
  ▪ The mortality for critically ill COVID-19 patients is high and rises with increasing age and co-morbidities.
  ▪ Palliative care consultation should be offered where available to assist with determining an appropriate care plan.

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**Dental health care settings**

▪ When performing aerosol-generating procedures on patients who are not suspected or confirmed to have SARS-CoV-2 infection, ensure that dental health care workers correctly wear the recommended PPE (including a NIOSH-approved N95 or equivalent or higher-level respirator in counties with substantial or high levels of transmission) and use mitigation methods, such as four-handed dentistry, high evacuation suction, and dental dams to minimize droplet spatter and aerosols. Refer to the Setting-specific consideration section at [CDC: Interim Infection Prevention and Control Recommendations for Healthcare Personnel During the Coronavirus Disease 2019 (COVID-19) Pandemic](https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html).

▪ The following commonly used dental equipment is known to create aerosols and airborne contamination, and use of these is considered an AGP:
  ▪ Ultrasonic scaler
  ▪ High-speed dental handpiece
  ▪ Air/water syringe
  ▪ Air polishing
  ▪ Air abrasion

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**Other procedures**

▪ Due to limited data and lack of expert consensus, it is not possible to develop a definitive and comprehensive list of procedures that should be considered aerosol generating for the purposes of PPE recommendations.

▪ Research on this issue is ongoing, but some level of uncertainty is unavoidable.

▪ Providers are strongly encouraged to monitor MDH communications, CDC, and other guidance for additional updates on this issue.
References


