

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

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 (AGPs) may put health care workers (HCWs) 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 HCWs. This statement is a summary of the evidence surrounding AGPs and the current Centers for Disease Control (CDC) guidance.

Aerosol-Generating Procedures and COVID-19

- Minnesota Department of Health (MDH) and CDC currently recommend that HCWs wear an N95 respirator or equivalent, eye protection, gown, and gloves when performing an AGP or providing care in the ICU to patients with known or suspected COVID-19.^{1,2}
- AGPs should be performed in airborne infection isolation rooms (AIIR), if available.
- Per CDC guidance, the following procedures should be considered AGPs, due to the creation of uncontrolled respiratory secretions:³
 - Open suctioning of airway secretions
 - Sputum induction
 - Cardiopulmonary resuscitation
 - Endotracheal intubation and extubation
 - Noninvasive positive pressure ventilation (NIPPV) (e.g., BiPAP, CPAP)
 - Bronchoscopy
 - Manual ventilation
- 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

- One study has demonstrated aerosol stability of SARS-CoV-2⁴ in a laboratory setting, but whether this is applicable to clinical situations outside of laboratory conditions is unknown.
- A 2012 review article on aerosol-generating procedures concluded that there was no significant evidence of transmission risk related to nebulizers, utilizing evidence from the SARS outbreak.⁵
- A 2004 study performing polymerase chain reaction (PCR) air sampling around a patient with SARS undergoing nebulizer treatment found no evidence of virus.⁶
- Current UK 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.⁷
- Based on these data, nebulizer administration likely represents a lower infection risk than other AGPs, but close-range viral aerosol generation remains a possibility.
- Based on this potential risk, MDH recommends the following to minimize risk to health care providers:
 - If patient can tolerate, switch to metered-dose inhalers with a dedicated spacer.
 - HCWs should wear a face mask (as well as eye protection, gloves and a gown) during treatment if a respirator is unavailable.
 - Close patient's door when providing nebulizer treatment.
 - Upon set-up of nebulizer, have HCWs maintain a safe distance (6 feet or greater), possibly outside the door.
 - Patients do not need to be transferred to a higher level of care solely for the purpose of providing nebulizer treatment.

NIPPV and Infection Transmission Risk

- Based on clinical experience from China and the U.S., high-flow nasal cannula (HFNC) are preferred over NIPPV for patients with hypoxemic respiratory failure from COVID-19.
- This is due to reports of lack of efficacy of NIPPV as a rescue therapy for those with respiratory failure and a higher likelihood in general of progression to intubation.
- If HFNC are not available, a short trial of NIPPV with frequent patient reassessment is reasonable, but providers should not delay intubation if the patient is not improving.

- When patients are on NIPPV, HCWs should take the following precautions:
 - HCWs should wear a face mask (as well as eye protection, gloves and a gown) during treatment if a respirator is unavailable.
 - Close patient's door when providing NIPPV treatment.
 - Upon set-up of NIPPV, have HCW 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)⁸ ([Edelson et al. Interim Guidance for Life Support for COVID-19](#)) and consider the following principles:
 - Reduce provider exposure to COVID-19 and other hazards to staff:
 - All HCWs involved in providing CPR should wear all appropriate PPE as described above for AGPs (N95 or equivalent, eye protection, gown, and gloves).
 - As far as possible, CPR should be performed in an AIIR with the door closed.
 - Limit personnel in the room to only those essential for patient care.
 - Prioritize oxygenation and ventilation strategies with lower aerosolization risk:
 - Utilize 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.
 - A cuffed endotracheal tube is preferable if intubation is indicated.
 - 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 attempt.
 - Consider video laryngoscopy if available to reduce intubator exposure.
 - 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.

Dental Health Care Settings

- It has not been possible to develop a comprehensive list of AGPs for dental health care settings, due to a lack of data on which procedures may generate potentially infectious aerosols and their potential for infectivity.
- Commonly used dental equipment known to create aerosols and airborne contamination include:
 - Ultrasonic scaler
 - High-speed dental handpiece
 - Air/water syringe
 - Air polishing
 - Air abrasion

Other Procedures

- To date, there are limited data and a lack of expert consensus on whether other potentially aerosol-generating procedures represent an infection transmission risk.
- Therefore, 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.⁹
- Research on this issue is ongoing, but in the absence of data, some level of uncertainty is unavoidable.
- When PPE supplies are short, facilities should work with their clinicians and infection preventionists to identify which procedures may be safely postponed so that N95 and equivalent respirators may be prioritized for those AGPs as defined by CDC.
- Providers are strongly encouraged to monitor MDH communications, CDC, and other guidance for additional updates on this issue.

References

1. [CDC: Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 \(COVID-19\) in Healthcare Settings](https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html) (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html>)
2. [Minnesota Department of Health Health Advisory: COVID-19 Infection Prevention and Control in Healthcare \(PDF\)](https://www.health.state.mn.us/communities/ep/han/2020/mar13ic.pdf) (<https://www.health.state.mn.us/communities/ep/han/2020/mar13ic.pdf>)
3. [CDC: Healthcare Infection Prevention and Control FAQs for COVID-19](https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-faq.html) (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-faq.html>)
4. [van Doremalen et al. "Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1." N Engl J Med 2020 March DOI:10.1056/NEJMc2004973](https://www.nejm.org/doi/full/10.1056/NEJMc2004973) (<https://www.nejm.org/doi/full/10.1056/NEJMc2004973>)
5. [Tran K et al. "Aerosol Generating Procedures and Risk of Transmission of Acute Respiratory Infections to Healthcare Workers: A Systematic Review." PLoS One 2012; 7\(4\):e35797.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3338532/) (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3338532/>)
6. [Wan GH et al. "A large-volume nebulizer would not be an infectious source for severe acute respiratory syndrome." Infect Control Hosp Epidemiol. 2004 Dec;25\(12\):1113-5.](https://www.ncbi.nlm.nih.gov/pubmed/15636302) (<https://www.ncbi.nlm.nih.gov/pubmed/15636302>)
7. [GOV.UK: COVID-19: infection prevention and control \(IPC\)](https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control) (<https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control>)
8. [Edelson et al. "Interim Guidance for Basic and Advanced Life Support in Adults, Children and Neonates With Suspected or Confirmed COVID-19." American Heart Association Circulation. 9 Apr 2020.](https://www.ahajournals.org/doi/pdf/10.1161/CIRCULATIONAHA.120.047463) (<https://www.ahajournals.org/doi/pdf/10.1161/CIRCULATIONAHA.120.047463>)
9. [Harding et al. "Aerosol-generating procedures and infective risk to healthcare workers: SARS-CoV-2 – the limits of the evidence." J Hosp Infect. 2020 Jun 1:S0195-6701\(20\)30277-2. doi: 10.1016/j.jhin.2020.05.037. Epub ahead of print.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7263217/) (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7263217/>)



Minnesota Department of Health | health.mn.gov | 651-201-5000
625 Robert Street North PO Box 64975, St. Paul, MN 55164-0975

Contact health.communications@state.mn.us to request an alternate format.

06/18/2020