

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

6/22/2021

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 and Prevention (CDC) guidance.

---

## Aerosol-generating procedures and COVID-19

- Minnesota Department of Health (MDH) and CDC currently recommend that HCWs wear an N95 respirator or higher-level respirator, eye protection, gown, and gloves when performing an AGP on patients with known or suspected COVID-19.<sup>1</sup>
- 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:<sup>2</sup>
  - 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
  - Autopsy procedures or medical/surgical procedures using oscillating bone saws
- Per OSHA guidance, several dental procedures should also be considered AGPs.<sup>3</sup> Refer to the “Dental health care settings” section on page 4.

- 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, utilizing evidence from the SARS outbreak.<sup>4</sup>
- A 2004 study performing polymerase chain reaction (PCR) air sampling around a patient with SARS undergoing nebulizer treatment found no evidence of virus.<sup>5</sup>
- 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.<sup>6</sup>
- A recent literature review by the U.S. Veterans Health Administration concluded that while concern exists for the transmission risk of SARS-CoV-2 with nebulizers, the specific evidence for transmission remains inconclusive.<sup>7</sup>
- 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 HCW:
  - **If patient can tolerate**, switch to metered-dose inhalers with a dedicated spacer.
  - CDC recommends HCW 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.
    - Refer to [Strategies for Optimizing the Supply of N95 Respirators \(www.cdc.gov/coronavirus/2019-ncov/hcp/respirators-strategy/index.html\)](https://www.cdc.gov/coronavirus/2019-ncov/hcp/respirators-strategy/index.html).
  - 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, **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 positive-pressure ventilation (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, consider a short trial of NIPPV with frequent patient reassessment, but providers should not delay intubation if the patient is not improving.
- When patients are on NIPPV, HCWs should take the following precautions:
  - CDC recommends HCW 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.
    - Refer to [CDC Optimizing Personal Protective Equipment \(PPE\) Supplies \(www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html\)](https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html) when shortage exists.
  - Close a 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)<sup>8</sup> 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 higher-level respirator, eye protection, gown, and gloves).
    - Where possible, CPR should be performed in an AIIR with the door closed.
    - Limit personnel in the room to only those essential for patient care.
  - Where possible, 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 necessary.
- 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 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

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

---

## 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.<sup>9</sup>
- 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 or higher-level 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 Healthcare Personnel During the Coronavirus Disease 2019 \(COVID-19\) Pandemic \(www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html\)](https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html)
2. [CDC: Clinical Questions about COVID-19: Questions and Answers \(www.cdc.gov/coronavirus/2019-ncov/hcp/faq.html\)](https://www.cdc.gov/coronavirus/2019-ncov/hcp/faq.html)
3. [Occupational Safety and Health Administration \(OSHA\): COVID-19 Healthcare Emergency Temporary Standard \(ETS\) \(www.osha.gov/coronavirus/ets\)](https://www.osha.gov/coronavirus/ets)
4. [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. \(www.ncbi.nlm.nih.gov/pmc/articles/PMC3338532\)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3338532)
5. [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. \(www.ncbi.nlm.nih.gov/pubmed/15636302\)](https://www.ncbi.nlm.nih.gov/pubmed/15636302)
6. [GOV.UK: COVID-19: infection prevention and control \(IPC\) \(www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control\)](https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control)
7. [Goldstein et al. "Risk of Transmitting COVID-19 During Nebulizer Treatment." Washington, DC: Evidence Synthesis Program, Health Services Research and Development Service, Office of Research and Development, Department of Veterans Affairs. VA ESP Project #09-010; 2021. \(www.hsrd.research.va.gov/publications/esp/COVID-19-risk-nebulizer.pdf\)](https://www.hsrd.research.va.gov/publications/esp/COVID-19-risk-nebulizer.pdf)
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. \(www.ahajournals.org/doi/pdf/10.1161/CIRCULATIONAHA.120.047463\)](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. \(www.ncbi.nlm.nih.gov/pmc/articles/PMC7263217\)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7263217)



Minnesota Department of Health | [health.mn.gov](https://health.mn.gov) | 651-201-5000  
625 Robert Street North PO Box 64975, St. Paul, MN 55164-0975

Contact [health.communications@state.mn.us](mailto:health.communications@state.mn.us) to request an alternate format.