Aerosol Generating Procedures (AGP)
FAQs for Clinicians

Aerosol Generating Procedures (AGP) are defined as procedures that may promote the generation of small particle aerosols not filtered by surgical masks that could expose health care workers to pathogens. These AGPs require personal protective equipment (PPE) to protect the health care workers. While many aerosols are large enough and are effectively filtered by surgical masks, some generate smaller aerosols from deep in the lungs that could transmit some infectious diseases. These would require N95 respirators or PAPRs be worn during the procedures. While there are lists of AGPs on various guidelines, the AGPs specified often differ (see Appendix). This understandably causes great confusion and anxiety among health care workers.

What procedures are defined as AGPs?

The most consistently recommended procedures that are considered AGP are bronchoscopy, intubation/extubation, induced sputum, and open suctioning of airways. Some groups have included Bipap, High Flow Nasal Cannulas, Methacholine Challenge Testing and bedside tracheotomy. Systematic reviews of the risk of SARS virus transmission (Tran K, PLos One 2012, see appendix) have found, however, that only the following procedures were associated with an increased risk: tracheal intubation, suction before and after intubation, and tracheotomy. Other procedures, including manipulation of BiPAP mask, endotracheal aspiration, suction of body fluids, mechanical ventilation, manual ventilation, manual ventilation after intubation, high-frequency oscillatory ventilation, administration of oxygen, chest physiotherapy, and collection of sputum sample **were not** significantly associated with an increased risk of infection acquisition. In a separate study of H1N1 influenza patients, bronchoscopy was noted to have an increased risk of viral positive aerosols.

Why is only emergent intubation/extubation considered an AGP?

Defining which procedures are true AGPs that can increase transmission risk, is fraught with issues. Data from retrospective studies of infected healthcare personnel (with SARS, novel influenza, and SARS-CoV-2 most commonly) have contributed to the lists of AGPs, but these data are prone to recall bias and do not provide more nuanced detail regarding the procedures.

For example, intubation and extubation have been noted in several studies as procedures associated with occupational acquisition of respiratory viruses, but an elective controlled intubation is quite different than an intubation conducted emergently. Retrospective studies have not elucidated if the risk noted with intubation was due to all types of intubation or only less-controlled emergent procedures. Recent data have noted that the level of aerosol generation with elective intubation, extubation, and operative airway management is minimal and several orders of magnitude lower than that of a volitional cough, suggesting that most intubation and extubation procedures are not AGPs. Therefore, only those procedures that are emergent (i.e., less controlled) should be considered an AGP.

Is Bipap or CPAP considered an AGP?

Bipap for routine sleep apnea is not considered an AGP. However, Bipap used for patients that are decompensating may be paired with rigorous bagging and eventual intubation. This combination would be recommended for negative pressure and the use of an N95. In studies with SARS, suggested an increased risk of spread to healthcare workers with use of non-invasive ventilation (not further defined). The workers also didn't wear recommended PPE (such as eye protection) and most healthcare workers were infected by a single patient event, raising strong concerns for generalizability. As such, while CPAP is not a clear AGP, we recommend avoidance of its use for confirmed COVID patients.

Aerosol Generating Procedures:

- Bronchoscopy
- Emergent Intubation or extubation
- Open Suctioning
- Induced Sputum
- Bipap (not for sleep apnea)
- CPR
- Bedside tracheotomy
- HFNC: Optiflow, Vapotherm
- Methacholine Challenge Testing

We will perform periodic review of new published COVID-19 information and provide updated guidance to ensure

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What about opening suctioning of the Airways?
This category is often very confusing, as the types and degree of open suctioning vary greatly, from short periodic tracheal suctioning to vigorous, deep, and very frequent suctioning in a patient with thick pulmonary secretions. Guidelines do not clarify this procedure any further, unfortunately. Many of the shorter (5-10 seconds), less invasive suctioning will not induce the smaller particle aerosols. While deeper, frequent and prolonged open suctioning may. For these latter patients, an N95 should be worn as an added precaution.

Is high-flow nasal cannula O2 (HFNC-O2) an AGP?
The studies from SARS did not find that HFNC-O2 use was associated with a higher risk for transmission. However, Optiflow was added to the list of AGP not because there's been a clear identified risk, but because it was a newer intervention (not present for the SARS and H1N1 studies), and there were general concerns raised by frontline that we could not refute because of this. The difference concerning Vapotherm is the presence of evidence and the manufacturer's statement (https://vapotherm.com/covid-19-resource-center/), which is reassuring. It's highly likely Optiflow is the same as Vapotherm in terms of risk, but since we erred on the side of caution for Optiflow use, we elevated Vapotherm to the list of AGPs for consistency for HFNC therapies.

What about procedures that are nebulized like aerosol treatments?
Nebulized treatments always cause confusion in the discussion of AGPs. These create clear aerosolization to deliver medication. Studies have noted that nebs create aerosols, but these are not the small particles and are medication instead of pathogen containing. The particles created by nebulized treatments are filtered by surgical masks. This confusion was evidence back during H1N1 influenza outbreak, as the World Health Organization and CDC included nebulized treatments on their AGPs lists, but after review of the evidence, they revised their guidance to remove them from the list.

Is breaking the ventilator circuit, such as to replace a filter or HME, classified as an AGP?
No. That would not be an AGP and an N95 would not be recommended for that activity.

Where can I find more information on room air exchanges?
For more information regarding the time necessary to achieve 99% removal of Airborne pathogens after an AGP based on the air exchange rates in each room. Please refer to the Air Exchange Chart at https://www.vumc.org/infection-prevention/sites/default/files/public_files/Air%20Exchange%20Chart%20%285%29.pdf.

For any aerosol generating procedure (AGP) as defined by institutional guidance on any suspected (PUI) or confirmed COVID patients, all personnel in the room should:

- Wear an N95 respirator or PAPR, face shield, gloves, and gown for the entirety of the AGP.
- N95s are single use.
- After the AGP is completed, another patient is NOT brought into the room for a designated time. This time is based on air exchanges for that location. Refer to the Air Exchange Chart (link) for specific area type.
- During the timeframe the room is closed to another patient, essential staff may clean room using an N95, gowns, gloves and eye protection.

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