INSPQ INSTITUT NATIONAL DE SANTÉ PUBLIQUE DU QUÉBEC

Aerosol-Generating Medical Interventions on Suspected and Confirmed Cases of COVID-19

Last updated January 22, 2021 – Version 3.2

These recommendations apply to aerosol-generating medical procedures (AGMPs) carried out on suspected or confirmed COVID-19 cases. In contexts of sustained community transmission, a risk assessment must be carried out to determine whether these recommendations shall also apply during AGMPs on individuals who are asymptomatic or have unknown COVID-19 status.

(See Section 4: AGMP management for patients determined to be at no risk of having COVID-19 [“cold patients”])

A table summarizating the recommendations is available in the appendix.

In the context of the SARS-CoV-2 pandemic, a number of interventions and procedures are now considered AGMPs by medical societies while they previously were not. Many of these procedures are not backed by conclusive data that classify them as such, but are often associated with coughing produced during the procedure and by implication, the presumed production of small aerosols.

The Analysis section allows for a good understanding of the concept of an AGMP in relation to risk of COVID-19 transmission.

1 Analysis

The Analysis section will be reviewed following the publication of the document Transmission du SRAS-CoV-2 : constats et proposition de terminologie [In French only]. It will be included in the next update.

Québec

2 Classification

The following classification is largely based on evidence collected by the Unité d'évaluation des technologies et des méthodes d'intervention en santé (UETMIS), which is the technology and healthcare procedure methods evaluation unit at CHU de Québec-Université Laval, whose reports can be consulted on the INSPQ website. More recent reviews of the literature on AGMPs also propose this hierarchy of measures in the context where there is a lack of more rigorous scientific data (Harding et al., 2020; Jackson, T. et al., 2020). Other experts are more categorical in their definition, which is simply a binary one: "It's either an AGMP or not an AGMP," and yet others add another category: uncertain AGMP.	
Known risk	The following procedures are associated with a **known risk** of infectious aerosol transmission (known AGMP) for suspected and confirmed cases of COVID-19, patients with exposure criteria or in emergency situations where waiting for the NAAT is detrimental to a situation considered to pose a high COVID-19 risk, and according to local epidemiology. "Known" refers to procedures that have been listed for years as carrying an increased risk of infection by airborne transmission and recognized as such by the medical community long before the COVID-19 pandemic.
	▶ Tracheal intubation and extubation ▶ Bronchoscopy ▶ Cardiopulmonary resuscitation1 ▶ Manual ventilation before intubation ▶ Aspiration of tracheal secretions with open-circuit suctioning on an intubated or tracheostomized patient. ▶ Sputum induction (saline instillation technique) ▶ Nasopharyngeal aspirate (NPA) in children ▶ Autopsy

[1] According to an analysis by UETMIS, chest compressions done as part of CPR have been classified as an AGMP with uncertain risk and little documentation. Other organizations are in agreement with UETMIS: as quoted in a report from the INESSS: "Seven of them (Ontario Health, Heart and Stroke Foundation, Canadian Red Cross, Public Health England, Resuscitation Council, the European Resuscitation Council, and the American Heart Association) distinguish the risk of transmission according to the components of CPR and consider that chest compressions and defibrillation do not constitute AGMPs." [Translated from the original French].

Possible risk	The following procedures are associated with a possible risk of infectious aerosol transmission (possible AGMPs) for suspected and confirmed cases of COVID-19, patients with exposure criteria or in emergency situations where waiting for the NAAT is detrimental to a situation considered to pose a high COVID-19 risk, and according to local epidemiology.
	▶ High-flow nasal cannula (e.g., Optiflow) ▶ Non-invasive positive-pressure ventilation via face mask (e.g., BiPAP, CPAP, and other similar techniques that actively deliver air into the airway using a device that operates with positive pressure or nebulization such as breath stacking and the cough assist device) ▶ Tracheotomy and deep aspiration of secretions by tracheostomy[2] ▶ Surgical interventions via the nasopharynx or oropharynx, and thoracic surgery[3]
Potential Risk Undocumented	The following procedures are associated with an undocumented risk of infectious aerosol transmission (undocumented AGMPs) for suspected and confirmed cases of COVID-19, patients with exposure criteria or in emergency situations where waiting for the NAAT is detrimental to a situation considered to pose a high COVID-19 risk, and according to local epidemiology.
	▶ Digestive endoscopy procedures ▶ Transesophageal echocardiogram (TEE) ▶ Insertion and removal of a chest tube ▶ Ophthalmology procedures not involving the tear ducts, sinuses, or canaliculi ▶ Laryngoscopy ▶ Nebulization therapy
Not considered AGMPs	CINQ, in collaboration with UETMIS at CHU de Québec, have evaluated the following procedures and do not consider them to be AGMPs.
	▶ Conventional oxygen therapy with face mask (e.g., Ventimask) ▶ Nasopharyngeal swab for adults and children ▶ Insertion of a nasogastric tube ▶ Jejunostomy, gastrostomy ▶ Surgical procedures or interventions for which the site of entry does not contain the virus.[4]

[2] It is important to specify here that the tracheostomy, as in the surgical procedure, is what is considered an AGMP. The tracheostomy care that potentially generates aerosols is the deep aspiration of secretions by the tracheostomy, but dressing changes in the area, secretion suctioning from the outlet of the cannula, application of topical care to the site and cannula changes are not considered AGMPs.

[3] In the context of the COVID-19 pandemic, it is appropriate to add that since SARS-CoV-2 is prevalent in the nasopharynx, oropharynx, and lungs, a surgical intervention performed at these sites, especially when done using a motorized tool, has a high likelihood of generating infectious aerosols containing COVID-19 (Mick et al., 2020; Thamboo A. et al., 2020).

[4] It appears unlikely that surgical procedures or interventions for which the site of entry does not contain the virus (for example, thrombectomy via the groin, laparoscopy without intestinal entry) generate infectious aerosols containing COVID-19 in contrast to sites recognized as containing high concentrations of the virus (for example, the nasopharynx, oropharynx, and thorax). However, for laparoscopies, there are specific recommendations for the insufflation and CO2 exsufflation pressure, smoke evacuation, etc., which can be consulted on the INPSQ website. https://www.inspq.qc.ca/sites/default/files/covid/chuq-laparo-covid.pdf

3 Recommendations

Comments and context for recommendations

The objective of these recommendation is to optimize healthcare quality. Their aim to assist healthcare environments in implementing measures to prevent and control AGMP-related infections. They are supported by a review of UETMIS's data in addition to a review of the most recent literature.[5]

It is important to emphasize that there is a high level of agreement between these recommendations and those of other international learned societies, although they are not identical. This reflects the uncertainty that results from the lack of scientific evidence around certain procedures with "undocumented" risk. Due to this lack of evidence, learned societies have issued recommendations based on expert opinions, which can result in some variation in their recommendations. If airborne transmission remains possible, it is certainly not predominant and is possibly even exceptional. Transmission during the majority of the above-mentioned procedures is itself not well scientifically documented. However, a certain risk cannot be completely ruled out and this risk perception may lead to differing recommendations. Due to the lack of data, some advocate for a more cautious attitude and the application of airborne precautions to minimize risk.

In cases of unknown or relatively low risk, the choice whether or not to apply certain preventative measures is, to a certain extent, related to the perceived risk. The other factors to consider include equipment availability, allocation of resources to the detriment of other needs, ethical decisions, and the implications associated with the prevention of airborne transmission (e.g., negative-pressure rooms, air changes) and the implications of individual transmission. All of these variables are largely outside the scientific framework on which our recommendations are based.

Given the low level of certainty regarding the recommendation for undocumented procedures at risk of producing aerosols, there is possibility for adjustment in how this recommendation is applied in different environments (for example, between different facilities in the province or even different departments in the same facility) according to the local epidemiology and impact. However, this threshold remains to be determined. This adjustment could reflect variation in the different stakeholders' values and risk perceptions. It may be necessary to involve a number of stakeholders to arrive at a local consensus.

[5] For each recommendation, an assessment was also carried out on the magnitude of the alternative options' risks and benefits. A "favourable" analysis of the benefits and risks suggests that the benefits are clearly greater than the risks associated with the recommendation. A "balanced" analysis of the benefits and risks suggest that the risks and benefits are of a similar magnitude.

<table>
<tr><td>General recommendations</td><td colspan="2">▶ Limit these procedures to those that are absolutely necessary.
▶ Try to postpone the AGMP until a time when the patient will no longer be contagious for COVID-19, or replace the procedure with an alternative in the interim (e.g., transthoracic echocardiogram [TTE] in place of a transesophageal echocardiogram [TEE]).
▶ Insofar as possible, try to schedule AGMPs in advance to avoid having to perform them in emergency.
▶ Limit the number of people in the room to experienced healthcare workers who are needed to carry out the procedure.</td></tr>
<tr><td rowspan="2">Additional precautions[6]</td><td>Airborne/contact with eye protection
(Throughout the duration of the AGMP until the end of the post-AGMP wait time, depending on the number of air changes in the room.)</td><td>Droplet/contact with eye protection</td></tr>
<tr><td>▶ Known or possible AGMP</td><td>▶ Undocumented AGMP</td></tr>
<tr><td>PPE</td><td colspan="2">▶ For AGMPs with splash risk, wear a long-sleeved, waterproof gown (either disposable or washable, depending on local regulations) in addition to the recommended personal protective equipment.
▶ A visor is recommended as the first choice over safety goggles for AGMPs with a known or possible risk (except for children’s NPA). Ensure that the chosen eye protection does not interfere with the adjustment and seal of the N95 RPD and that the N95 RPD does not interfere with the eye protection. Prescription eyeglasses are not considered adequate protection.</td></tr>
<tr><td>Wait time</td><td colspan="2">▶ Respect the required wait time according to the ventilation characteristics of the room used (number of air exchanges per hour for a 99.9% elimination rate) before entering the room without personal protective equipment.
▶ If the number of air changes is unknown, it is suggested to apply a wait time of about six hours before entering the room without respiratory protection. This takes into consideration the number of air changes in the table of Canadian tuberculosis standards (PHAC, 2014).</td></tr>
<tr><td>Emergencies</td><td colspan="2">▶ In emergency situations where the patient’s COVID status is unknown and waiting for the NAAT results would be detrimental to them, additional airborne/contact precautions with eye protection should be applied, according to the regional epidemiology.</td></tr>
</table>

[6] Due to the aforementioned premises and in consideration of the work done by UETMIS and the review of the most recent literature on the subject, CINQ suggests a risk grading for AGMPs.

Known or possible AGMP: This recommendation is based on a high degree of scientific evidence and a favourable analysis of the benefits and risks (level of certainty: high).

Undocumented AGMP: This recommendation is based on the limited scientific evidence (for example, lack of specific studies on the issue, or the studies being methodologically weak) and a balanced analysis of the benefits and risks (expert opinions, level of certainty: low).

4 AGMP management for patients determined to be at no risk of having COVID-19 ("cold patients")

An asymptomatic patient's risk of contagiousness complicates how the protection of healthcare workers is managed during an AGMP. This is why it is important to assess each patient before carrying out an AGMP to determine their COVID-19 exposure criteria or whether they are asymptomatic but contagious.

A patient is considered "cold" if:

- The four following points apply:*

  1. They are asymptomatic for COVID-19 after a thorough clinical assessment, which must be repeated for admitted patients.
  2. They have no documented exposure to a known case or to an environment where there has been an outbreak (e.g., CHSLD, senior's residence) in the last 14 days.
  3. They have not travelled outside of Canada in the last 14 days.
  4. They have been admitted to a unit where there have been no diagnosed cases of COVID-19 in the last 14 days (patients or healthcare workers).

* If criteria 2, 3, or 4 are not met, the patient is considered "cold" if they have a negative NAAT 48 hours pre-AGMP.

- They have recovered from COVID-19 in the last 3 months (according to the recognized recovery criteria).

Comments and context for recommendations

In May 2020, the Ministère de la Santé et des Services sociaux (MSSS) published the first version of NAAT indicators (priorities M1 to M22) and recommended carrying out this test in the 48 hours prior to certain AGMPs (e.g., pre-intubation, pre-bronchoscopy if N95 RPDs are not worn by all for this procedure). Numerous facilities have accordingly implemented this guideline for both hospitalized patients and outpatients.

With the arrival of the second wave and the accumulation of confirmed cases in certain regions of Quebec, some facilities may want to consider the warning levels developed by the MSSS (green [caution], yellow [early warning], orange [alert], and red [high alert] regions) as exposure criteria. For example, a patient living in a red region would be considered at risk. It is important to highlight that for asymptomatic patients considered "cold," their probability of being a SARS-CoV-2 carrier depends on the current prevalence within the population. If prevalence is very low, use of a pre-AGMP NAAT may not be cost effective and screening via a questionnaire to determine symptoms and exposure criteria would be sufficient (e.g., in a green zone). Conversely, in a high-prevalence context (e.g., a red region), use of additional airborne/contact precautions with eye protection at all times for known and possible AGMPs could be an option.

On the other hand, and for equally justifiable reasons (reduced use of PPE, increased daily workload when most patients are in isolation, constraints caused by the isolation itself and related to the patient's access to therapeutic and diagnostic procedures), use of a NAAT 48 hours before the AGMP may be justified if the result would lead to using different precautions. In this respect, a patient who meets exposure criteria may be considered "cold" when the NAAT is negative 48 hours before the AGMP and application of routine practices would be sufficient (see appended table). In this case, prioritizing the pre-AGMP NAAT for COVID-19 may help minimize exposure risk for healthcare workers.

A **negative** NAAT for COVID-19 carried out 48 hours before the AGMP on an asymptomatic patient who does not meet exposure criteria would conclude that the patient does not have a sufficient viral load for COVID-19 detection and that the AGMP could therefore be carried out using the routine practices, unless another infectious and contagious disease is suspected (tuberculosis, for example). An appearance of new symptoms compatible with COVID-19 on the day of the AGMP requires re-evaluation before the procedure can be carried out.

In circumstances where the wait time for the NAAT result may be detrimental to the patient, any recognized or potential AGMP that is considered urgent (for example, emergency intubation of a patient in the emergency department who cannot be questioned), could be carried out using additional airborne/contact precautions with eye protection without waiting for the NAAT result, still according to regional epidemiology.

The majority of AGMPs are one-time procedures. For this reason, it is possible to know the time frame to carry out a NAAT before an anticipated AGMP (e.g., bronchoscopy). However, for certain AGMPs that are repeated over time (e.g., BiPAP, CPAP), repeated testing by NAAT may be considered appropriate by some clinicians. The arrival of saliva tests may also help in this area.

These are interim recommendations that are evolving as scientific knowledge and regional transmission of the virus develops.

Appendix: AGMP Summary Table

	Medical procedures	Additional precautions for: ▶ Suspected or confirmed COVID-19 cases OR ▶ Patients with exposure criteria OR ▶ Emergency situations where waiting for the NAAT is detrimental to a situation considered to pose a high COVID-19 risk, and according to local epidemiology	Routine practices required for patients considered not to be at risk of having COVID-19 ("cold" patient) (see Section 4)
Known risk	**Known AGMP** ▶ Endotracheal intubation and extubation ▶ Bronchoscopy ▶ Cardiopulmonary resuscitation (excluding chest compressions) ▶ Manual ventilation before intubation ▶ Aspiration of tracheal secretions with open-circuit suctioning on an intubated or tracheostomized patient ▶ Sputum induction (saline instillation technique) ▶ Nasopharyngeal aspirate in children ▶ Autopsy	Airborne/contact with eye protection	▶ At a minimum: Wearing of a medical mask[8] and eye protection ▶ Wearing of a gown and gloves according to the routine practices
Possible risk	**Possible AGMP** ▶ High-flow nasal cannula (e.g., Optiflow) ▶ Non-invasive positive-pressure ventilation via face mask (e.g., BiPAP, CPAP and other similar techniques that actively deliver air into the airway using a device that operates with positive pressure or nebulization such as with breath stacking and the cough assist device). ▶ Tracheotomy and tracheostomy care ▶ Surgical interventions via nasopharynx or oropharynx ▶ Thoracic surgeries	Airborne/contact with eye protection	▶ At a minimum: Wearing of a medical mask[8] and eye protection ▶ Wearing of a gown and gloves according to the routine practices

	Medical procedures	Additional precautions for: ▶ Suspected or confirmed COVID-19 cases OR ▶ Patients with exposure criteria OR ▶ Emergency situations where waiting for the NAAT is detrimental to a situation considered to pose a high COVID-19 risk, and according to local epidemiology	Routine practices required for patients considered not to be at risk of having COVID-19 ("cold" patient) (see Section 4)
Undocumented risk	**Undocumented AGMP** ▶ Digestive endoscopy procedures ▶ Transesophageal echocardiogram (TEE) ▶ Insertion and removal of a chest tube ▶ Ophthalmology procedures not involving the tear ducts, sinuses, or canaliculi ▶ Laryngoscopy ▶ Nebulization therapy	Droplet/contact with eye protection	▶ At a minimum: Wearing of a medical mask[8] and eye protection ▶ Gloves, gown, according to routine practices ▶ Pre-AGMP PCR testing is not recommended for AGMPs with undocumented risk.

Refer to the document SRAS-CoV-2 : Choix et port du masque médical en milieu de soins [in French only].

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Modification history

Version	Date	Pages	Modifications
3.1	2020-11-26	3	▶ Removal of the phrasing “and other similar techniques” in reference to the procedure “Sputum induction (saline instillation technique)”
3.2	2020-01-14	3 and 9	▶ New classification available for the AGMP “High-flow nasal cannula”
			▶ New document layout
			▶ Analysis section removed for review

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AUTHOR

Comité sur les infections nosocomiales du Québec [Quebec Committee on Nosocomial Infections]

Marie-Claude Roy
CHU de Québec – Université Laval

CONTRIBUTORS

Charles Frenette
McGill University Health Centre

Yves Longtin
Centre intégré universitaire de santé et de services sociaux
du Centre-Ouest-de-l'Île-de-Montréal

Fanny Desjardins
Jasmin Villeneuve
Directions des risques biologiques et de la santé au travail

LAYOUT

Murielle St-Onge
Direction des risques biologiques et de la santé au travail

TRANSLATION & REVIEW

Emily Wilson
Claire Maryniak

The French version, entitled *Interventions médicales générant des aérosols chez les cas suspects ou confirmés COVID-19*, is also available on the Institut national de santé publique du Québec website at: www.inspq.qc.ca/publications/2960-interventions-aerosols-covid19

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